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NEW ANTISPAM TOOLS

NEW MUSIC PLAYERS GUN FOR THE iPOD

5 ESSENTIAL TIPS FOR DEGUNKING WINDOWS

ALL-IN-ONE PRINTERS

THE INDEPENDENT GUIDE TO TECHNOLOGY

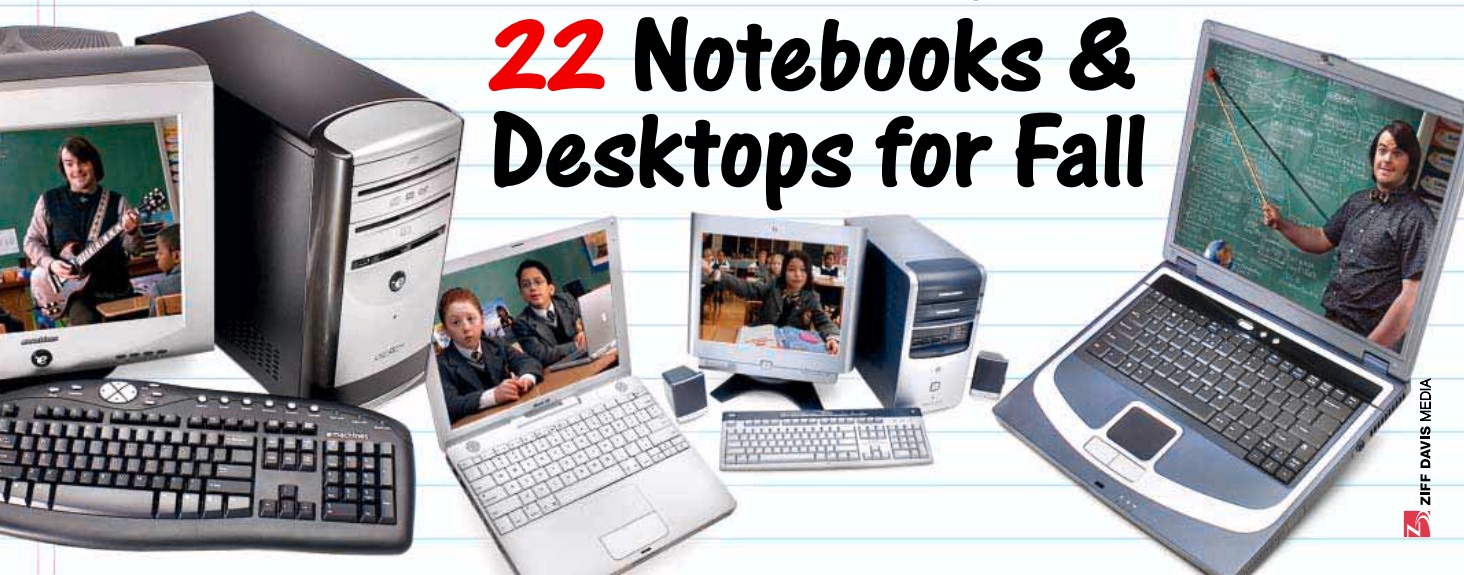
AUGUST 17, 2004

☑ Our Annual Reader Survey

The Best & Worst

Plus Back-to-School PCs

22 Notebooks & Desktops for Fall



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MICHAEL J. MILLER

Forward Thinking

What's Wrong with Tech Support?

PC vendors have a responsibility to provide effective technical support, and they are letting us down.

The reliability of PCs is getting better, but tech support is getting worse. That's the conclusion we draw from this year's reader satisfaction survey, starting on page 76. We used to call the survey "Service and Reliability," but over the years we've broadened it by asking readers more questions about overall satisfaction and the likelihood of their recommending particular vendors to other buyers.

The scores for overall satisfaction and reliability are similar to last year's survey: Our readers score almost all the vendors in the *very good* range on both counts. Most important, the percentage of machines needing repairs continues to drop—from 28 percent of desktops in 2002 to 17 percent in 2004. (Only 10 percent of the Apple desktops needed repairs.) At least part of that improvement is due to Windows XP making systems more stable. Vendors have also reduced returned products by choosing more reliable components.

But all is not well. The average satisfaction ratings for both tech support and repairs have dropped dramatically since last year. In other words, your machine was less likely to need support or repairs this year, but if it did, you were likely to be dissatisfied. Many readers complained about poor phone support—especially reps who didn't speak English well—and made negative comments about offshore support. I don't oppose outsourcing in general, but I do believe that PC vendors have a responsibility to provide effective technical support. In this area, they are letting us down.

Nearly all the vendors tell us, as they do every year, that tech support is improving. But the numbers just don't show it. Let's all make sure the vendors know that we expect them to do better.

READER SATISFACTION	DESKTOPS			NOTEBOOKS		
	2002	2003	2004	2002	2003	2004
Overall	7.8	8	7.8	7.7	8	8
Reliability	7.9	8.1	8	7.9	8.2	8.3
Tech support	6.5	7	6.3	6.4	7.2	6.1
Repairs	6.4	7.4	6.7	6.2	7.2	6.6
Percent needing repairs	28%	24%	17%	21%	21%	19%

Except where noted, average scores are on a scale of 1 to 10, where 10 is best.

PC SATISFACTION SCORES

Apple customers remain the most satisfied computer users. Of course, they almost have to be more loyal, because switching to or from Apple is more difficult than moving among vendors of Windows-based machines. Nevertheless, Apple shows a big decrease in machines needing repairs. The improved quality of Mac OS X and the retirement of the Cube may be significant factors. Other vendors that do well include Dell in desktops and servers and IBM in notebooks. Also, locally built and self-built machines continue to score highly.

One area of concern is servers. For the past several years, satisfaction with them has been higher than with desktops and notebooks. But this year the scores have dropped significantly, from 8.4 last year to 7.9 this year. For more details, see the survey results on page 87.

Online Protection: Why Legislation Fails

The Supreme Court's recent decision to reject the Child Online Protection Act (COPA) was the right one. We should, of course, protect our children from filth on the Internet, but COPA raises First Amendment issues and could prevent people from reaching legitimate sites. The American Civil Liberties Union (ACLU) and several other groups have already challenged it. But the biggest reason why COPA should be stopped is simple: It can't possibly work. Technology remains our best means of blocking inappropriate Web sites.

It seems as if the only reason Congress passes laws like COPA is so our senators and representatives can pretend they're doing something to combat Internet pornography. Doing so looks good to their constituents. But Congress had to know even before COPA was approved that it would end up in the courts for years and wouldn't solve the problem. (The law was enacted in 1998, but has never been enforced because of challenges to its constitutionality.)

COPA authorizes criminal penalties of up to $50,000 per day for Internet sites that make pornography ▶

PHOTOGRAPH: STOCKBYTE/PUNCHSTOCK

Forward Thinking

MICHAEL J. MILLER

Neither software nor legislation is ever a substitute for an involved parent.

available to those younger than 17. The Supreme Court ruling sends the case back to the federal district court, with instructions that the government show why such penalties would be more effective than the voluntary use of filtering software. Essentially, the Court said the government must demonstrate that criminal penalties were the "least restrictive alternative" to accomplish the goal. It seems unlikely that the government will be able to meet this requirement.

More important for the government's case, COPA would not affect Web sites hosted outside the U.S. Software filters, however, block Web sites wherever they are hosted. Filtering software isn't perfect, but it has improved significantly over the past few years. (For reviews, see our issue of August 3.) Any sufficiently motivated child can get around filters, but that's irrelevant. Filters help draw the lines for kids, and more crucially, prevent them from accidentally going to inappropriate sites. Some of the worst offenders are sites whose URLs are misspellings of popular sites for children.

Yet filters will never offer a complete solution. Parents need to talk to their children about how to use the Internet, what is and is not acceptable, and what to do if they land at an inappropriate site. Just as important, parents need to monitor their children's computer use and teach them how to behave online, stressing that they should never share personal information in chat rooms. Neither software nor legislation is ever a substitute for an involved parent.

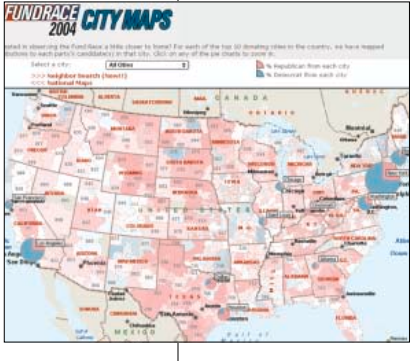
In the high court's majority opinion, Justice Anthony Kennedy wrote that filters "impose selective restrictions on speech at the receiving end, not universal restrictions at the source." If the Supreme Court has figured that out, maybe there is hope yet for Congress.

How Private Is Your E-Mail?

If you think your e-mail is private, think again. A federal district court recently ruled that protections under the federal Wiretap Act cover eavesdropping on live communications like phone conversations, but do not extend to stored communications, such as e-mail stored on a service provider's computers. The decision involved an executive of Interloc, a now-defunct book-listing company, who was accused of violating the law by copying e-mails sent by Amazon.com to book dealers who subscribed to Interloc's e-mail service.

E-mail poses a threat to privacy because most of it goes through multiple servers before reaching the intended recipient. In many cases, copies are stored temporarily. As a result, multiple copies of an e-mail may exist, and all are potentially vulnerable. Most of us accept the scanning of e-mail for viruses, but we also expect some privacy.

Public Names, Public Numbers



What do Bill Gates, Steve Ballmer, Michael Dell, Carly Fiorina, and Sam Palmisano have in common? They all run well-known high-tech companies, and they've all contributed $2,000 to the George W. Bush reelection campaign. (Gateway's Ted Waitt gave $2,000 to Lieberman.)

How do I know this? Candidates are required to disclose where they get their contributions to the Federal Election Commission, which then posts the figures online. Another site, Fundrace.org, lets you search for donations by location; I was able to find the donations of these CEOs very easily. (In a cursory search, I didn't find a tech CEO who had given to John Kerry.)

Similarly, I've heard discussions lately about whether drug companies should post the results of all their drug trials online. A good starting point would be to update the National Institutes of Health's ClinicalTrials.gov. And the Securities and Exchange Commission has recently agreed to post more of its comments on various filings.

This kind of access ensures at least some openness in government. But at some point, I start to wonder. On Fundrace, I could see my neighbors' contributions, and I'm not sure that's any of my business. Not everyone wants their home address and their donations made public.

The common theme in all these cases is the balance between privacy and openness. But we don't yet have any sense of where to draw the line between beneficial openness and the desire to keep communications private. That's something we as a society need to decide soon, or the line will be drawn for us.

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CONTENTS

PC MAGAZINE

AUGUST 17, 2004 • VOL. 23 NO. 14

25 Editors' Choices

A comprehensive list of our current picks in nearly 100 categories.

30 First Looks

30 ChoiceMail One 2.52
31 iHateSpam 4.0.426
32 MailFrontier Desktop 4.0
32 SpamBully 2.0
32 Spam Shredder 1.5
34 Apple iPod 40GB
34 Creative Nomad Zen Xtra 60GB
35 iRiver H140 ▶
35 Rio Karma
36 HP Media Center PC m1050y ▶
36 Microtel SYSWM8001
37 Paint Shop Photo Album 5
37 Nelson Email Organizer Pro 3.0
38 Gmail
38 PentaSuite 7.1
39 JVC MP-XV841 Mini Note PC ▼
39 Delphi XM Roady2
42 Tapwave Zodiac 1 ▲
42 Nokia N-Gage QD
43 Kyocera Finecam M410R
43 Olympus Camedia C-770 Ultra Zoom
44 NEC MultiSync LCD2060NX
44 Envision EN9250
46 Gordano Messaging Suite
46 Scalix Email and Calendaring Platform 9.0

PC LABS

ALSO IN THIS ISSUE

51 Feedback
132 Backspace

COVER STORY

76

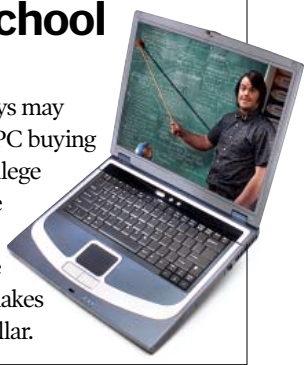
17th Annual Reader Satisfaction SURVEY

Many companies are sending tech support to South Asia to save money. But has customer satisfaction gone south as well? We turned to you, our readers, to tell us what you think of the quality, reliability, and support behind the desktops, notebooks, and servers that you're using.

PCs

91 Back-to-School PCs

Making the grade these days may depend on making a wise PC buying choice. Whether you're college bound or hoping your little one gets more from grade school, we help you decide which laptop or desktop makes the most sense for your dollar.



ON THE COVER

Annual Reader Survey: The Best and Worst *page 76*
Back-to-School PCs *page 91*
New Antispam Tools *page 30*
New Music Players *page 34*
5 Tips for Degunking Windows *page 60*
All-in-One Printers *page 107*

Online

MULTIFUNCTION PRINTERS

107 All-in-Ones: One for All

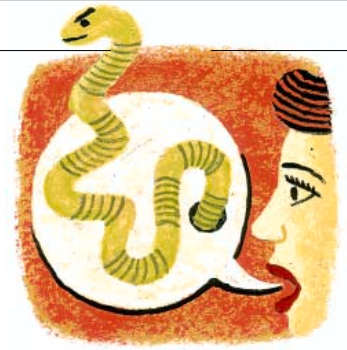
Ink jet printers that also copy, scan, and fax are all the rage, mainly because they're now affordable—at prices as low as $100—and they save precious desktop space. We review and rigorously test nine models, focusing on each one's cost per page and photo production quality.

PRINT SERVERS

113 Unleash Your Printer

Thanks to the Wi-Fi revolution, sharing printers is easier than ever. Wireless print servers allow your printer to talk to any computer on your wireless network. We take a look at six of these devices for homes and small offices and two more complex devices for businesses.

19 Pipeline



19 Apple tames its new Tiger OS.

19 Virtual reality meets the military.

19 Microsoft patents the human body.

20 Projector technology that watches you.

20 IM: The next security threat?

20 The RIAA and your fingerprints.

22 **COMING ATTRACTIONS:** Alera DVD/CD Shredder Plus, Apple Cinema Displays, Motorola A630, and more.

60 Solutions

60 **Degunking Your PC:** Digital "gunk" can bring your computer to its knees. Here are our top five ways to make your PC faster and more reliable.

64 **Hardware:** Our expert tells you how and when to use the RAW format, which gives digital photographers unprecedented control over image processing.

66 **Security Watch:** If malware knocks you off-line, you can still turn the tables on it with just "stone tools" and your wits.

68 **Enterprise:** A digital asset management system helps Scripps Networks deliver television shows on demand to viewers.

73 **User to User:** How to read e-mail more safely, merge letters to large e-mail lists without their being rejected as spam, and more.

Opinions

7 Michael J. Miller: Forward Thinking

53 Bill Machrone

55 John C. Dvorak

57 John C. Dvorak's Inside Track

59 Bill Howard

128 After Hours

128 **Cool School Tools:** It's time to gear up for the classroom again. Learn how to help your kids get an edge in school with the best new educational gadgets and software.

130 **Gear & Games:** PopCap's AstroPop; Nero PhotoShow Elite; Splinter Cell: Pandora Tomorrow; the Antec Aria SFF case; the Creative MuVo Slim; strategy games.

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ONLINE EXTRAS

All-in-One Devices: Check out our online-only features table for the nine tested units that combine printer, copier, scanner, and fax capabilities.
Wireless Print Servers: Get a better look at these devices in our exclusive online slide show.
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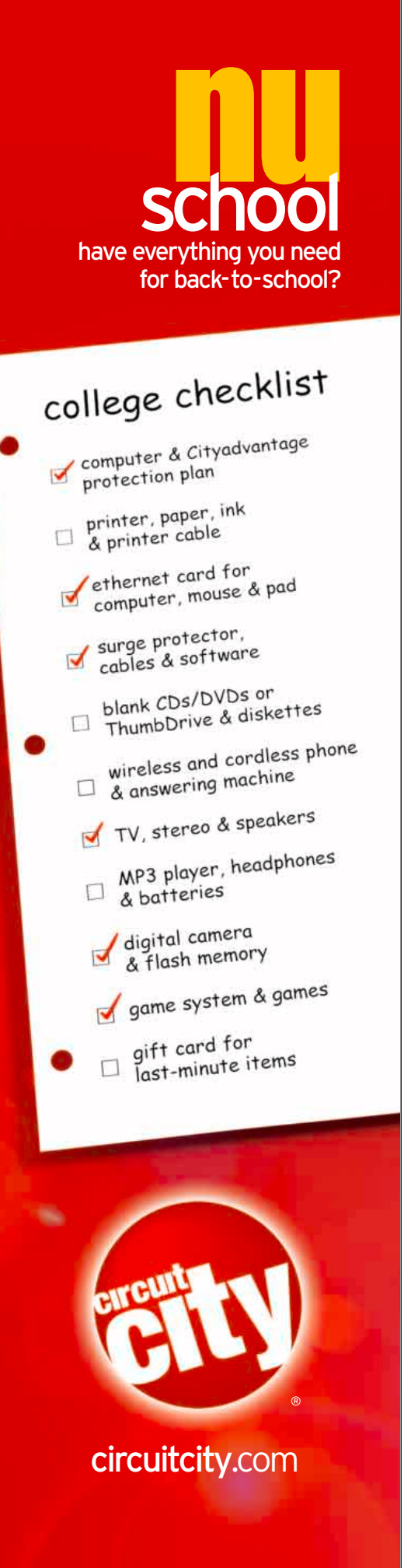

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PIPELINE

TECHNOLOGY TRENDS & NEWS ANALYSIS

Apple's Next Move

The upcoming Tiger version of Mac OS X soups up searching.

CONTINUING THE THEME of naming OSs after big cats, in late June Apple Computer debuted the fifth major version of Mac OS X, dubbed Tiger. CEO Steve Jobs showed a prerelease version of it with over 150 new features at the company's Worldwide Developer Conference in San Francisco. Tiger is slated to ship in the first half of 2005 and will sell for $129.

A new systemwide search technology, called Spotlight, easily qualifies as Tiger's centerpiece. Spotlight does automatic, indexed searches, then organizes and displays the results by category, such as date or people.

The interface Spotlight uses (see the photo) is very similar to the one in Apple's iTunes music store, which lets you find songs by name, artist, or album. In his demonstration, Jobs proposed finding everything on a computer about someone named Bernard. When he typed in a Spotlight search, files appeared in lists, including Bernard-related presentations, documents, e-mails, and images. "I think a whole lot of people are going to stop using Finder," Jobs predicted, referring to the long-standing tool for searches found in Mac OSs.

Jobs also demonstrated a new version of Apple's Safari Internet browser called Safari RSS (Really Simple Syndication). RSS news feeds—where you can view lots of headlines and story summaries at once—are already common on many Web sites. Safari RSS flips easily between RSS and standard views.

Although Tiger is still early in its development cycle, Apple developers are very focused on how systemwide information is stored and found. With storage capacities skyrocketing and Microsoft focusing on similar goals, expect to see big improvements in system searching across the board.—*Sebastian Rupley*

I, Server

Would your body make a good network server? In late June, the U.S. Patent Office took the idea seriously enough to award Microsoft patent number 6,754,472—titled "method and apparatus for transmitting power and data using the human body." The original patent application came in April of 2000.

The patent describes using "the human body as a conductive medium over which power and data is distributed." It also refers specifically to coupling a power source to the body via a set of electrodes. Speakers, displays, watches, and keyboards can connect to the power source.

Microsoft is already a player in the wearable computing market with its services for smart watches, but they have not met with huge success.—*SR*

FILL 'ER UP Toshiba has developed a tiny fuel cell for digital audio players and other handheld devices. The company claims the thimble-size cell can power an MP3 player for 20 hours using 2cc's of methanol fuel. Expect to see it arrive in handhelds in 2005.

In the Virtual Moment

YOU'RE A MILITARY officer with your gun drawn in a crowded square ordering screaming bystanders to stay away from a terrorist with a bomb strapped to his chest. He reaches for the bomb, and you shout instructions. The lights go up. Video screens surrounding you go blank. And trainers tell you that you should have already fired a shot to the head.

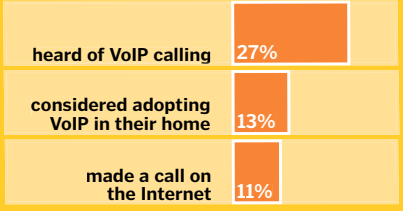
Texas-based Virtra Systems installs 360-degree, photorealistic virtual reality rooms, which have been used for military, police, and Homeland Security training. The simulators use Pentium 4 systems to stream video and sound to high-definition projectors.—*SR*

ILLUSTRATION BY JAMES STEINBERG

Net Calls on the Radar?

Voice over Internet Protocol (VoIP) calls, as offered by companies such as Skype and Vonage, can present some enormous cost advantages over phone calls. But relatively few Internet users even understand that voices can be carried over the Net.

Percentage of U.S. Internet users who have



Based on surveys of 2,204 Internet users. Source: Pew Internet & American Life Project, June 2004.

Casting a Magic Shadow

Your projector is showing PowerPoint slides, and you want to bring the audience's attention to a specific bar on a chart. You could step in front of the screen and simply point to the image; but then your body would be bathed in graphics like a bad 007 movie credit sequence, and you'd risk being blinded by the light.

Now you can park in front of the screen without a problem (see the photo and the absence of graphics on the model), thanks to the iSkia from iMatte. The iSkia looks like a second projector and connects your laptop and projector. The device then tracks your position, and when you step in front of the projected image it automatically creates a mask, casting a shadow on the screen to match your body. Move around and the shadow follows you. No more blinding light or distracting images.

The iSkia is capable of much more, however. For example, it can track the location of your hand, so you can manipulate the program data using gestures. The product is an offshoot of iMatte's background in television and cinema bluescreen technology. "We played a significant role in the effects revolution in those markets," says CEO Paul Vlahos. Sometimes, though, drama comes from avoiding the spotlight. ***—Alfred Poor***

The IM Security Threat?

WORRIES ARE MOUNTING about instant-messaging (IM) security. Citing two of the most notorious worms in recent years as evidence of how fast malicious code can travel, Symantec officials say the next big worm is likely to exploit flaws in IM clients and spread fastest of all.

"Code Red was able to infect every vulnerable machine on the Internet in 14 hours. Slammer did it in 20 minutes," says Eric Chien, chief of research at Symantec Security Response. "An IM threat could spread to a half a million machines in 30 or 35 seconds. We've seen vulnerabilities in every free IM client out there."

That's worrisome because IM clients are widely used on business machines. Of all U.S. companies, 26 percent use IM as an official corporate service and another 44 percent acknowledge that their employees use IM on their own, according to estimates from The Radicati Group.

Naturally, viruses can spread over IM in much the same way they spread over e-mail: via attachments. But this is a minor worry. The real danger is that IM is ripe for an attack involving a virus that exploits a specific software vulnerability to gain access to your machine without your doing anything.

How can you protect yourself? For one, you should run antivirus software. Most engines have plug-ins for IM clients. And on the corporate side, Chien advises, businesses need to crack down on unauthorized use of IM within their walls and avoid the free IM clients.—*Cade Metz*

SIGN O' THE TIMES

In a move that reflects how hard hit the technology industry has been in recent years, the annual Comdex trade show in Las Vegas has been called off. The IT-centric 2003 event attracted 40,000 attendees—far fewer than the 100,000-plus seen in previous years. Show organizers point to "marketing budgets that are at minimums." By contrast, the annual Consumer Electronics Show (CES) in Las Vegas earlier this year drew almost 130,000 technology executives and nearly 2,500 companies, well up from last year.—*SR*

Dusting for Music Prints

IN THE FUTURE when you want to listen to the new U2 song, your fingers may have to do the walking—literally. Biometric firm VeriTouch has a scheme for a new breed of MP3 player that would use built-in fingerprint readers to unlock encrypted music tracks. The first design, dubbed the iVue (shown), would include a music player, a hidden fingerprint scanner, a cell phone, and Wi-Fi and Bluetooth wireless capabilities. Consumers, though, have resisted biometric scans because of privacy concerns.

"We want the end user to be anonymous," says VeriTouch CEO Gary Brant. "The fingerprints stay encrypted on the device's hard drive." Brant emphasizes that the biometric fingerprints do not contain the same kind of data used in law enforcement and that the copyright protection scheme uses public and private keys to maintain privacy. As with the popular PGP system, music buyers would give out their public keys to online music stores. The merchant would then encrypt purchases specifically for the customer, and the customer would use private keys—fingerprint scans—to unlock downloadable files.

VeriTouch has already demonstrated a prototype device to the Recording Industry Association of America. Ultimately, the record companies would have to adopt the technology and woo hardware manufacturers to include biometric readers in their players. Brant says the readers would add only about $10 to the cost of a player. The question is, will music fans give record companies the finger?—*John R. Quain*

ILLUSTRATION BY JAMES STEINBERG

STORAGE SHIFT Following moves by Google and Yahoo! to vastly increase the free storage that's available to Web e-mail users, Microsoft's Hotmail division said users of its service will get 250MB of free storage—up from 2MB—starting this summer.

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$1,299 direct and up. Apple Computer Inc., www.apple.com.

Big, Durable Printouts

Those who enjoy creating banners, flyers, and the like are often thwarted by the elements. Take heart: Espon's new printers, the **Epson Stylus C66** and the **Stylus C86,** use water-resistant, pigment-based DuraBrite ink. The C66 produces borderless 4-by-6 prints as well as text and graphics at up to 17 pages per minute (ppm) and up to 9 ppm in color. The C86 offers 4-by 6-inch, 8-by-10, and letter-size prints at up to 22 ppm in black and up to 12 ppm in color.—*MEB*

C66, $69 direct; C86, $99. Epson America Inc., www.epson.com.

Do-It-All Phone

Don't be fooled by the typical candy bar handset of the GSM-based **Motorola A630:** It opens like a book to reveal a full QWERTY keyboard for text messaging, e-mail, and IM. It also has a 4X zoom VGA camera and Bluetooth technology. Advanced messaging options include MMS (Multimedia Messaging Service), SMS, and POP3. —*MEB*

Price not yet set. Motorola Inc., www.motorola.com.

Rip Up Those CDs

You shred your important papers every time the Feds bang on your door; why not shred your incriminating CDs and DVDs as well? Alera Technologies' new **DVD/CD Shredder Plus** is a scary little machine that uses carbon steel blades and a 1.2-horsepower motor to cut DVDs, CDs, floppy disks, and credit cards into small, unusable strips, forever eliminating unauthorized use. The unit is HIPAA-compliant and includes a four-gallon container to catch the shards.—*MEB*

$99 street. Alera Technologies LLC, www.aleratec.com.

Bring It All with You

For those of you who just can't leave home without your data, Kano Technologies has created the SureFIRE800, a pocket-size external hard drive. Measuring just 5.25 by 3.25 by 0.75 inches (HWD), it sports 5,400-rpm speed, an 8MB cache, and FireWire 800/400 and USB 2.0 connections. Compatible with both Windows and Mac, it comes with Dantz Retrospect Express backup software.—*MEB*

20GB to 80GB, $249 to $399 direct. Kano Technologies Corp., www.kanotechnologies.com.

Keep Data Secure from Prying Eyes

Home and business users who need to keep data secure will be interested in the new Micro Solutions LockBox. This portable external hard drive features a fingerprint reader that allows access only to authorized users. Available in 80GB, 120GB, and 200GB capacities, the drive can be formatted as a single partition or as up to seven logical drives that can each have a distinct authorized user.—*Jamie M. Bsales*

$199 list and up. Micro Solutions Inc., www.micro-solutions.com.

For more new products see **www.pcmag.com/productbulletin**

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- 500 MB of Web space
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- 1&1 Control Panel
- Optional Dedicated SSL Certificate
- Hosted on 1&1 Linux platform

MARKETING TOOLS
- 1&1 Chat - 1 channel
- 1&1 WebStatistics

SITE-BUILDING TOOLS
- WebsiteCreator for 12 pages
- Full version software worth $550
- FrontPage 2002 extensions
- CGI library

DOMAIN NAMES
- Includes 1 domain (.com .net .org only)
- Handling of unlimited domain names
- DNS Management
- Point 50 external domains to 1&1
- 5 subdomains

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- Aliases, auto-responders, forwarding
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- Virus scanner for 1 POP3 account

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- SSH Secure Shell Access
- SSI (Server side includes)
- SSL Secure Server
- Optional Dedicated SSL Certificate
- Hosted on 1&1 Linux platform

MARKETING TOOLS
- 1&1 Chat - 5 channels
- 1&1 WebStatistics
- In2site Live Dialogue
- 1&1 Newsletter Tool
- 1&1 WebElements

SITE-BUILDING TOOLS
- WebsiteCreator for 18 pages
- Full version software worth $550
- FrontPage 2002 extensions
- CGI library & Free CGI programming
- Perl, PHP3 and PHP4
- 1&1 WebDatabase
- 1x MySQL database (100MB)
- Cron Jobs

DOMAIN NAMES
- Includes 3 domains (.com .net .org only)
- Handling of unlimited domain names
- DNS Management
- Point 100 external domains to 1&1
- 50 subdomains

E-MAIL
- 150 POP3 e-mail accounts
- Aliases, auto-responders, forwarding
- 1&1 WebMail
- Virus scanner for 3 POP3 accounts

$19.99 PER MONTH
NO SETUP FEE!

DEVELOPER PACKAGE

Delivering Superior Performance

INCLUDES 5 DOMAINS

PACKAGE FEATURES
- 2,000 MB of Web space
- 25 FTP accounts
- 30,000 MB monthly transfer volume
- 1&1 Control Panel
- SSH Secure Shell Access
- SSI (Server side includes)
- SSL Secure Server
- Includes Dedicated SSL Certificate
- Server priority
- Hosted on 1&1 Linux platform

MARKETING TOOLS
- 1&1 Chat - 10 channels
- 1&1 WebStatistics
- In2site Live Dialogue
- 1&1 Newsletter Tool
- 1&1 WebElements

SITE-BUILDING TOOLS
- WebsiteCreator for 25 pages
- Full version software worth $550
- FrontPage 2002 extensions
- CGI library & Free CGI programming
- Perl, PHP3 and PHP4
- 1&1 WebDatabase
- 3x MySQL database (100MB)
- Cron Jobs
- Advanced Developer Tools

DOMAIN NAMES
- Includes 5 domains (.com .net .org only)
- Handling of unlimited domain names
- DNS Management
- Point 200 external domains to 1&1
- 200 subdomains

E-MAIL
- 300 POP3 e-mail accounts
- Aliases, auto-responders, forwarding
- 1&1 WebMail
- Virus scanner for 6 POP3 accounts

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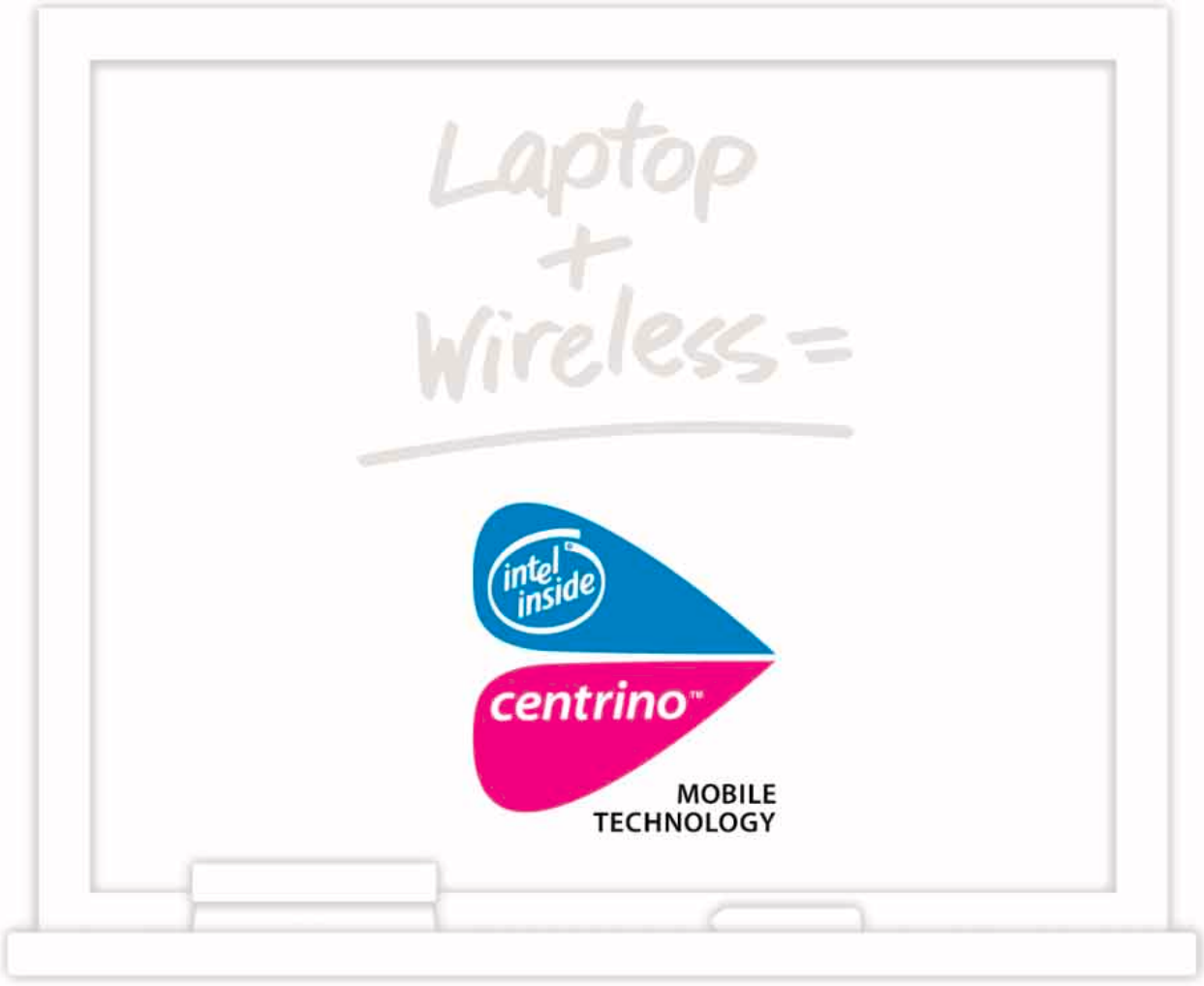

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EDITORS' CHOICES

AUGUST 3–16, 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 & SERVERS

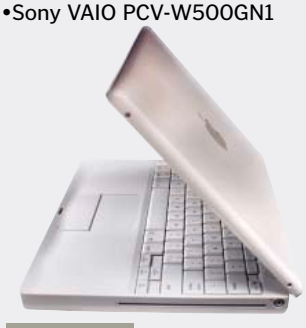
GAMING DESKTOPS
- Falcon Northwest FragBox Pro
- Falcon Northwest Mach V
- Velocity Micro Vision FX

MULTIMEDIA DESKTOPS
- Apple Power Mac G5 Dual 2 GHz
- Dell Dimension 8400

MEDIA CENTER PC
- NEW HP Media Center PC m1050y

VALUE PC
- eMachines T2865

HOME PC
- Sony VAIO PCV-W500GN1



Apple iBook

STUDENT PC
- NEW eMachines T3092

SMALL-BUSINESS PC
- IBM ThinkCentre A50p

CORPORATE PC
- IBM ThinkCentre S50

ENTRY-LEVEL SERVER
- IBM eServer xSeries 306

WORKGROUP SERVER
- Dell PowerEdge 1750

PORTABLE PCs

BUSINESS NOTEBOOKS
- Acer Travelmate 8000
- HP Compaq nc6000

ULTRAPORTABLE
- IBM ThinkPad X40

STUDENT NOTEBOOKS
- NEW Apple iBook
- NEW Velocity Micro NoteMagix B50 Campus Edition

MULTIMEDIA NOTEBOOK
- Toshiba Satellite P25-S670

HP Media Center PC m1050y

GAMING NOTEBOOK
- Dell Inspiron XPS

VALUE NOTEBOOKS
- Averatec AV3225HS
- HP Compaq Presario R3000Z

TABLET PCs
- Motion Computing M1400
- Toshiba Portégé M205-S809

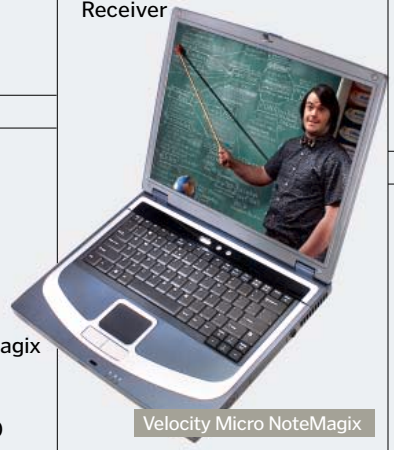
MOBILE DEVICES

PDAs
- HP iPAQ Pocket PC h4350
- palmOne Zire 72

PDA/PHONE COMBOS
- Handspring Treo 600
- Nokia 6600 Video Phone

PHONE
- Motorola MPx200

GPS DEVICE
- TomTom Bluetooth GPS Receiver



Velocity Micro NoteMagix

HOME ENTERTAINMENT

MEDIA HUBS
- Creative 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 CAMERAS
- Casio Exilim Pro EX-P600
- Olympus C-5060 Wide Zoom

SUPERZOOM CAMERA
- Olympus Camedia C-765 Ultra Zoom

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

DIGITAL SLR CAMERA
- Nikon D70

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

DIGITAL IMAGING

FLATBED SCANNER
- Microtek ScanMaker 6100 Pro

IMAGE EDITORS
- Adobe Photoshop CS (pro)
- Adobe Photoshop Elements 2.0 (consumer)

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

VIDEO EDITORS
- Adobe Premiere Pro (pro)
- Ulead VideoStudio 8 (consumer)

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

iRiver H140

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

PORTABLE AUDIO
- Altec Lansing inMotion (iPod speakers)
- Apple iPod Mini
- Belkin Digital Camera Link
- NEW Delphi XM Roady2
- NEW iRiver H140
- iRiver iFP-390T

SOUND CARD
- Creative Sound Blaster Audigy 2 ZS

SPEAKERS
- Creative 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-5140 (laser)
- HP Deskjet 5150 (ink jet)
- Lexmark C510n (color laser)

PERSONAL AIOs
- NEW Brother MFC-3420 (ink jet)
- Brother MFC-8420 (laser)
- NEW Canon MultiPass MP390 (ink jet)

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

NETWORK PRINTERS
- HP LaserJet 9000dn (monochrome laser)

EDITORS' CHOICES

AUGUST 3–16, 2004

- 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
- Sony VPL-CX85

GAMING GRAPHICS CARD
- ATI Radeon 9800 XT

MAINSTREAM GRAPHICS CARD
- PNY Verto GeForce 5700 FX Ultra

DVD BURNERS
- HP DVD Movie Writer dc3000
- Memorex True 8X External Dual Format Recorder
- Pioneer DVR-A07XL
- Sony DRU-700A

EXTERNAL DRIVE
- Western Digital Media Center

REMOVABLE STORAGE
- Iomega Rev 35

PORTABLE PHOTO STORAGE
- 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
- Quicken 2004 Premier

WEB SITE CREATION
- NeoVerve StoreSense

WEB RESEARCH
- 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
- Socialtext Workplace 1.0
- TypePad

UTILITIES

ANTIVIRUS
- Norton AntiVirus 2004

FIREWALLS
- Norton Personal Firewall 2004
- ZoneAlarm Pro 5

SECURITY SUITES
- Norton Internet Security 2004
- ZoneAlarm Security Suite 5

ANTISPYWARE
- SpySweeper 2.2

ANTISPAM
- NEW Cloudmark SpamNet 2.5
- NEW MailFrontier Desktop 4.0
- Qurb

POP-UP BLOCKER
- PopUp Cop

INSTANT MESSAGING
- MSN Messenger 6.1

FILTERING/MONITORING
- Cybersitter 9.0
- Spector Pro 5.0
- The Children's Internet

Vtech V.Smile Learning System, Smartbridge Library

FILE COMPRESSION
- PKZip 8.0 for Windows
- StuffIt Deluxe 8.0

BACKUP
- Retrospect Pro 6.5
- IBackup

ROLLBACK
- Norton GoBack 3.0

DISK IMAGING
- Acronis True Image 7.0

PARTITIONING
- PartitionMagic 8.01

DEFRAGGERS
- Diskeeper 8.0 Pro
- PerfectDisk 6.0

REMOTE ACCESS
- LapLink Everywhere 2.0

FILE MANAGER
- Novatix ExplorerPlus 6.1

MIGRATION
- Alohabob PC Relocator Ultra Control
- Desktop DNA Pro 4.7

TOOLBARS
- Dogpile
- Google Toolbar

DESKTOP CUSTOMIZATION
- Object Desktop 2004

DOWNLOAD MANAGER
- DownloadStudio 1.0

SCREEN CAPTURE
- SnagIt 7.0.3

FILE VIEWER
- IrfanView 3.85

VIRTUAL PC
- VMware Workstation 4.5

PASSWORD MANAGER
- AccountLogon 2.5

ENTERPRISE SOFTWARE & DEVELOPMENT

NETWORK ANTIVIRUS
- Trend Micro Enterprise Protection Strategy

ENTERPRISE ANTISPAM
- BrightMail Anti-Spam 5.1
- Postini Perimeter Manager

E-MAIL SERVER PLATFORM
- IBM Lotus Notes and Domino 6.5

WIRELESS PLATFORM
- GoodLink 3.0

WEB FILTERING
- Websense Enterprise 5.1

CRM
- salesforce.com Enterprise Edition

DATABASE
- Oracle 9*i* Database

WEB CONFERENCING
- WebEx Meeting Center

ENTERPRISE DEVELOPMENT
- Borland JBuilder 9
- IBM WebSphere Studio Device Developer 5.6 (mobile)
- SQL Anywhere Studio 9 (mobile)

WEB SITE DEVELOPMENT
- Macromedia Contribute
- Macromedia Studio MX 2004

WEB SITE ANALYSIS
- WebSideStory HBX

VULNERABILITY SCANNER
- Retina Network Security Scanner

NETWORKING

SERVER OS
- Microsoft Windows Server 2003 Enterprise Edition

WIRELESS INFRASTRUCTURE
- NEW Hawking HWPS12UG (print server)
- Linksys Wireless-G WRT54GS (802.11g)
- Netgear ProSafe-FWAG114 (802.11a/g)

SECURITY APPLIANCE
- ServGate EdgeForce

REMOTE-ACCESS APPLIANCE
- Neoteris Access 1000

GAMES & EDUCATIONAL SOFTWARE

SIMULATION
- Microsoft Flight Simulator 2004

ACTION/COMBAT
- Battlefield Vietnam
- Far Cry
- Halo: Combat Evolved
- Orbz 2
- Savage: The Battle for Newerth

SPORTS
- Madden NFL 2004

REAL-TIME STRATEGY
- NEW Rise of Nations: Thrones and Patriots

VIRTUAL WORLD
- Second Life

ONLINE
- EverQuest: Evolution

EDUCATION
- eMedia Beginner Guitar Method 3.0
- Math Mission: The Race to Spectacle City Arcade, The Amazing Arcade Adventure
- NEW Vtech V.Smile Learning System, Smartbridge Library
- Zoombinis Island Odyssey

MOBILE GAME
- Bejeweled

REFERENCE
- NEW Microsoft Encarta Rerence Library 2005
- Visual Thesaurus

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- Upgradable to 1TB of Internal Hard Drive Storage
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- Upgradable to 12GB of ECC DDR SDRAM
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- Small Business Pricing

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- 1GB 266MHz ECC DDR SDRAM
- Upgradable to 8GB of ECC DDR SDRAM
- 3x36GB (10K RPM) Ultra320 SCSI Hot-Swap Hard Drives
- RAID 5 Included
- Active ID Front Bezel for Monitoring System Health
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Network Storage Options

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Optimized File Storage Across the LAN

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- Microsoft® Windows® Storage Server 2003
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- 4x40GB SATA Hard Drives (Up to 4TB)
- Software or Hardware RAID Available for Data Security

starting at $1799 Lease as low as **$48**/mo., (48 pmts.[3])

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Network Switches starting at $69

POWERCONNECT™ 3324 SWITCH[2]

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- Stacking Functionality of Up to 192 Ports
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Antispam Tools Keep Up

THE MAGAZINE WORLD'S LARGEST COMPUTER-TESTING FACILITY

PC LABS

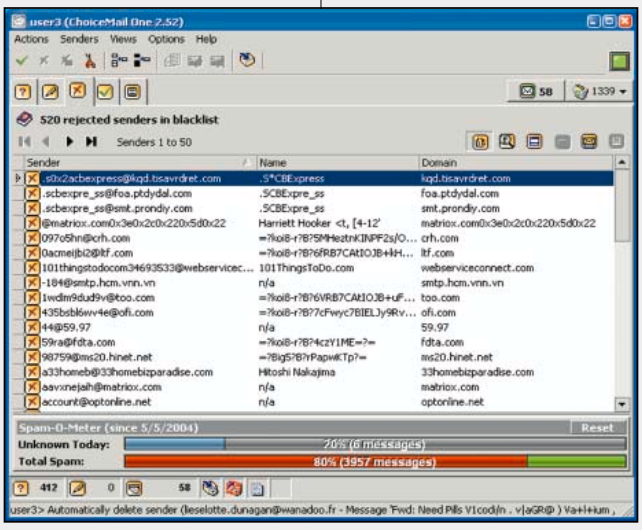
BY NEIL J. RUBENKING

The deluge of spam just keeps increasing, and spammers are getting sneakier every day, so antispam products have to get tougher to stay ahead of the game. We tested the latest versions of five spam blockers to see if they could hold back the flood. • We configured each product according to the vendor's advice for minimizing the amount of legitimate mail misfiled in the spam folder (false positives) while still keeping the most spam out of our in-box (false negatives).

Where there was a choice, we tested with Microsoft Outlook or Outlook Express, based on the vendor's recommendation.

Four of the five products we reviewed use filtering techniques—analyzing message content and headers—to identify spam. To test those, we diverted a stream of spam-infested, real-world messages to multiple e-mail accounts, each protected by one of the products. For comparison, we ran the same e-mail stream through Outlook's own spam filter and through Cloudmark SpamNet and Aladdin's Spam Catcher, both of which did well in our last roundup ("Can E-Mail Survive?," February 17, 2004; *www.pcmag.com/spam*).

For ten days, we manually trained the products, correcting any legitimate mail that was misfiled as spam or vice versa. Then we cleared the in-boxes and configured the programs to use only filtering to identify spam—not whitelists, blacklists, or challenge/response systems. We let them run for ten more days and then exported each product's mail-box using askSam 6. We identified the messages that were received by all of the products and discarded the rest. Next, we manually identified the remaining messages as undeniably spam or undeniably valid, deleting all others. The results, shown in the accompanying chart, reflect only the product's ability to filter spam. When whitelisting, blacklisting, and challenge/response (if available) are enabled, accuracy will naturally improve.



THE DEADWOOD ADDS UP QUICKLY, as you can see when you check the list of rejected senders in ChoiceMail One.

ChoiceMail One 2.52

The exception to the test methodolgy described above was for ChoiceMail One 2.52, which uses whitelists and challenge/response almost exclusively. It does have some very specific filters to weed out blatant spam, but it relies more heavily on the choices you make as to what to block and what to allow.

Contacts in your address book are automatically whitelisted, as are any to whom you send mail. Unknown senders must click on a link in a challenge message and verify their identity. Messages that are positively identified as spam get sent to the Junk Box without a challenge. For a product that doesn't rely on filtering as its main weapon, this identification is surprisingly effective: It correctly identified over three-quarters of our spam messages. Users can also proactively accept or reject senders whose response is pending.

ChoiceMail runs separately from your e-mail client, which must have automatic mail checking turned off. You can check mail after ChoiceMail finishes scanning, though its processing is noticeably slow. On an informal test, Outlook Express downloaded 450 messages in less than 2 minutes, while ChoiceMail spent over 15 minutes on that same batch of mail. This may be a bit frustrating if you're in a hurry to view a weekend's accumulation of mail.

The Junk Box lists rejected mail, including the reason for rejection, with a safe preview. Legitimate e-mail almost never

PRODUCT PHOTOGRAPHY BY THOM O'CONNOR

L O O K S

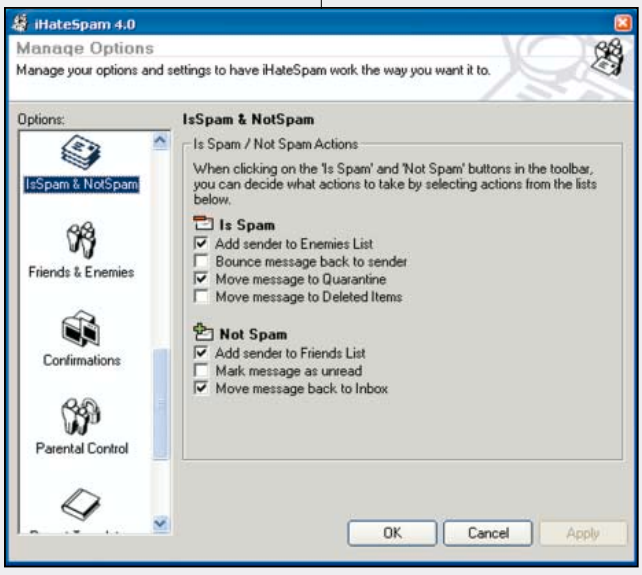
WHAT THE RATINGS MEAN: ●●●●● EXCELLENT | ●●●●○ VERY GOOD | ●●●○○ GOOD | ●●○○○ FAIR | ●○○○○ POOR

38 Gmail
38 PentaSuite 7.1
39 JVC MP-XV841 Mini Note PC
39 Delphi XM Roady2
42 Tapwave Zodiac 1

42 Nokia N-Gage QD
43 Kyocera Finecam M410R
43 Olympus Camedia C-770 Ultra Zoom
43 Concord Eye-Q 5345z
43 Kodak EasyShare LS75

43 Konica Minolta DiMage G600
44 NEC MultiSync LCD2060NX
44 Envision EN9250
44 ViewSonic VP201s
44 Dell 3300MP

44 HP f2304 23-inch High Definition LCD Monitor
46 Gordano Messaging Suite
46 Scalix 9.0
RED type denotes Editors' Choice.



THE TRAINING PANE in iHateSpam lets you easily add senders to your blacklist or whitelist, bounce messages, and more.

winds up there, but if it does, you can approve the sender with a single click. You'll want to review and purge the Junk Box frequently, since access is markedly slow when thousands of messages pile up.

ChoiceMail's user interface is somewhat quirky, and the app's vast number of configuration options are scattered in several distinct dialogs. Instead of a context-sensitive help system, users get a PDF document. Fortunately, the average user won't need to configure ChoiceMail very often.

You can use ChoiceMail with any POP3 client. It supports IMAP accounts as long as you're using Outlook, Outlook Express, or Eudora. Microsoft Exchange users will need to install the server-side ChoiceMail Enterprise product. It can also filter Web-based mail from AOL, Hotmail, MSN, and Yahoo!—and as a bonus, it converts the mail to POP3.

Challenge/response systems can block important e-mails, such as confirmation of merchandise orders sent by a server, not a human. So ChoiceMail now offers each user up to five virtual e-mail addresses: Messages sent to these addresses are accepted automatically. If an account starts getting spam, just delete it and create a new one.

Though ChoiceMail relies primarily on its whitelists, blacklists, and challenge/response system, bonus features like disposable e-mail addresses and filtering of blatant spam enhance its usability. It supports a wide variety of e-mail clients and services. We did find, however, that it slows downloading of mail considerably.

ChoiceMail One 2.52

$39.95 direct. DigiPortal Software Inc., www.digiportal.com. ●●●◐○

iHateSpam 4.0.426

Sunbelt Software's iHateSpam 4.0.426 analyzes incoming e-mail in a variety of ways. Simple "friends" and "enemies" lists identify senders to be allowed or blocked. iHateSpam can also block specific country codes or languages. And of course, it analyzes message content and headers: Its filtering engine can learn from manually marked messages, and its Spam Learning Network can block messages that other users have marked as spam.

Unfortunately, a glitch in the learning module caused the filtering to get progressively worse instead of better. Almost half of the good e-mail was flagged as spam. Sunbelt supplied an update and we rescanned all the messages, but any benefit derived from the ten days of training was lost. In practice, you can expect iHateSpam's accuracy to improve.

You can scan an existing folder of messages using iHateSpam, a feature that made it possible for us to retest the product after the glitch mentioned above. The application also lets you bounce spam or report it to authorities, though these tactics probably won't affect major spammers.

One unusual feature is the Safe Unsubscribe list, which identifies mailing lists or other mass e-mails verified by Sunbelt as having functional unsubscribe options. If you mark such a message as spam or flag the sender as an enemy, iHateSpam will point out that you can simply unsubscribe instead, without worrying that by doing so you're inviting added spam.

iHateSpam integrates best with Microsoft Outlook, where it supports IMAP and Exchange in addition to POP3. You can also filter POP3 mail in Outlook Express, and (new in this version) Eudora and IncrediMail, but not all features are available. In addition, Version 4.04.26 can filter Web-based Hotmail accounts for Internet Explorer 6 users who are running Windows XP.

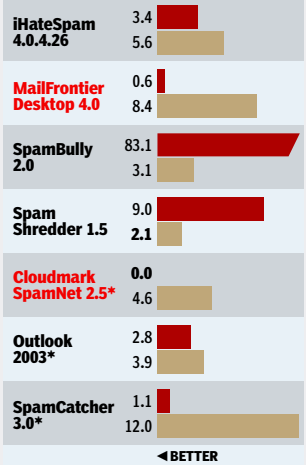
iHateSpam is a user-friendly spam-filtering solution for Outlook users. On our tests, however, its untrained accuracy was no better than Outlook's built-in filter. With training and fine-tuning it will do better, and at $19.95, it's a bargain.

iHateSpam 4.0.426

$19.95 direct. Sunbelt Software Inc., www.sunbelt-software.com. ●●●○○

SPAM-FILTERING TESTS

Legitimate mail misfiled in the spam folder (false-positive percentage)
Spam misfiled in the in-box (false-negative percentage)
Bold type denotes first place.



* Reported for comparison. Since ChoiceMail One 2.52 is not primarily a filtering product, we did not test it with our standard tests.
RED denotes Editors' Choice.

MailFrontier Desktop 4.0

PC MAGAZINE EDITORS' CHOICE

MailFrontier Desktop (formerly Matador) pioneered the combination of challenge/response spam blocking with rule-based filtering, and it does a fine job of filtering out spam based on content. It also offers the unique ability to detect and report phishing scams separately. It can process IMAP, POP3, and Hotmail accounts with Outlook Express, or POP3 and Exchange accounts with Microsoft Outlook.

MailFrontier Desktop requires little configuration. Simple slider controls adjust the program's filtering in several ways: You can control how much weight is given to collaborative filtering (based on other users marking a specific message as junk) and raise or lower the filter's overall aggressiveness. You can also fine-tune the filter to increase or decrease its emphasis on specific areas such as sexual content or gambling.

If you use the challenge/response feature, you can choose either a photo-based challenge that requires the respondent to count puppies or kittens or a more businesslike verification request. Either can be personalized with your name and a note. In addition, you can choose whether to send a challenge to every unknown sender or just to those whose messages appear to be junk mail.

In our testing, MailFrontier Desktop misfiled just one valid e-mail message in its Junk Mail folder (a false positive). It did allow a bit more spam into our in-box than most (false negatives), but we intentionally configured the products to minimize false positives, possibly at the expense of letting more spam through. Its clear reporting module revealed that about 40 percent of our junk mail was blocked based on collaborative filtering and that the remaining 60 percent was blocked based on message content.

As long as you use Outlook or Outlook Express, MailFrontier Desktop is a fine choice for spam protection. Its accuracy in distinguishing good mail from spam is excellent, and it offers the additional protection of a well-developed challenge/response system.

MailFrontier Desktop 4.0

$29.95 direct. MailFrontier Inc., www.mailfrontier.com. ●●●●○

SpamBully 2.0

SpamBully 2.0 contains an option to "punish" spammers by repeatedly hitting the URLs contained in their messages—potentially running up their Web site maintenance bills—which may be satisfying to some. This version adds quite a few new features, such as blocking mail based on country or character set, allowing or blocking mail based on user-defined word lists, optional Bayesian analysis of Web pages linked to by messages, support for blocking domains listed on RBLs (Realtime Blackhole Lists), and a learning mode for fine-tuning the product's filtering.

The program's Outlook-only challenge/response option might go unnoticed, as it is turned off by default. Unknown senders get a simple e-mail challenge with a code word in a bitmap image; they need only respond with the code word in the subject or body. When the response is received, SpamBully moves the challenged message to your in-box.

During the training phase, we found a surprisingly large number of legitimate e-mails from individuals routed to the Spam folder, even though we had configured the product according to Axaware's recommendations to minimize false positives. We dutifully trained the filter by marking these with the Not Spam button. The company advised us that to get better results we could analyze the messages and add words and phrases to the Allow/Block lists. Since we were testing the filtering ability of the product itself, we did not do this.

The final results were dismal, to say the least: More than 80 percent of the good e-mails went into the Spam folder. We experimented with resetting the Bayesian learning filter and even disabling it, but the results were even more out of line. The company indicated that using an active whitelist and training on thousands of manually identified good e-mails and spam messages would provide better results.

Although SpamBully 2.0 has added some nice features, we can't recommend a product whose spam-filtering engine requires such a high degree of training—not when others perform dramatically better out of the box.

SpamBully 2.0

$29.95 direct. Axaware LLC, www.spambully.com. ●○○○○

THE CHALLENGE feature in MailFrontier will have your senders counting cats, or you can choose a more businesslike verification.

Spam Shredder 1.5

Webroot's Spam Shredder installs as a local POP3 server, filtering the mail from your actual POP3 server. It doesn't matter which e-mail client you use, as long as your account is POP3-based. As a side benefit, it can delete blacklisted e-mail right on the server, without ever downloading a copy locally. The deleted message is replaced by a dummy to avoid a mismatch in the expected message count.

We found that Spam Shredder's processing significantly slowed e-mail downloads. Where Outlook Express downloaded 450 messages in under 2 minutes and Outlook took about 3 minutes for the same batch, Spam Shredder took over 25 minutes. Blocked messages are held in an internal quarantine queue, which you must review frequently to keep manageable. When you rescue good e-mail from quarantine, the filtering engine adjusts to improve future accuracy—and you can also whitelist the sender.

The preview window for reviewing quarantined messages is tiny, lacks a scroll bar, and displays all message headers above the message text, which makes it hard to use. Also, when you delete or release a message, the list scrolls back to the top, so it's hard to review systematically. The Delivery Log lists messages that were released to the client, giving the user an option to blacklist senders of any messages that were released in error. But no preview is available for delivered messages, so it may be necessary to match up the subject or sender with spam messages found in the e-mail client.

Spam Shredder let very little spam through, but it flagged 9 percent of our undeniably good mail as spam. And, as noted, rescuing misfiled good mail is an awkward process.

Spam Shredder 1.5

$29.95 direct. Webroot Software Inc., www.webroot.com. ●●○○○

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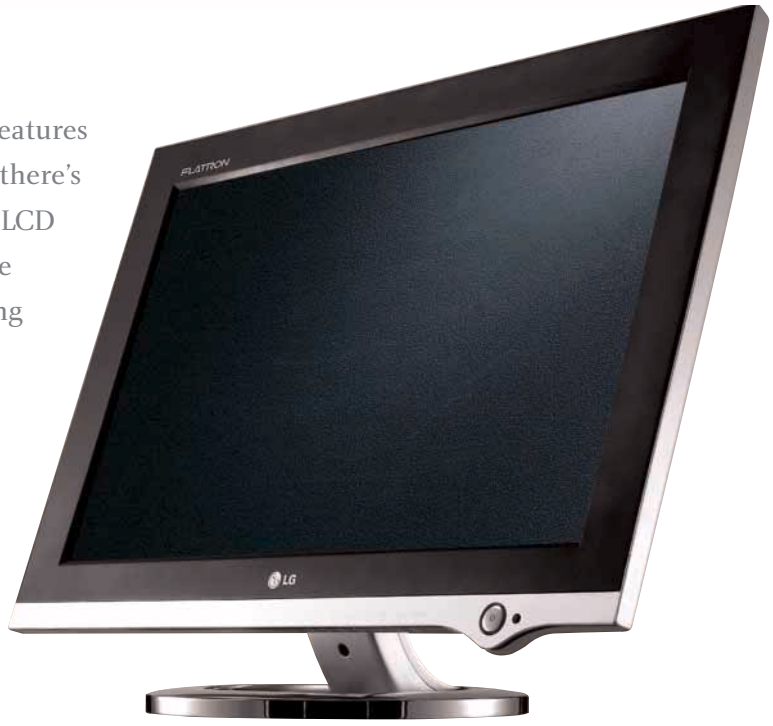

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Life's Good

New Music Players Gun for the iPod

BY BILL MACHRONE

Apple's iPod has fairly well dominated the music player market for the past two years. But that's not for lack of trying on the part of competitors, and now that they've had a while to play catch-up, we're seeing some entries that give the iPod a run for its money.

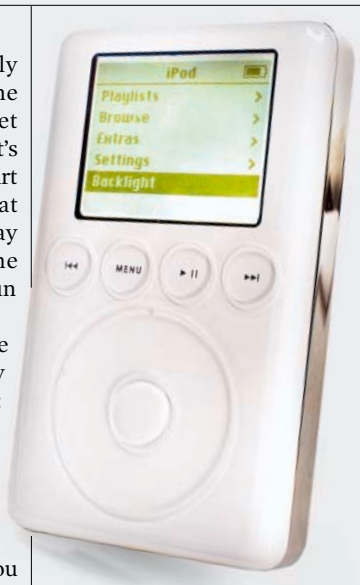
So we gathered six of the latest entries to see how they stack up. Our conclusion: While the iPod still delivers the most intuitive, elegant user interface, the best value in the 20GB-plus class is the iRiver H140. (The iPod Mini is still our Editors' Choice if you want a smaller player and can do with less capacity.)

How all these will compare with the announced but as yet unavailable Sony Walkman NW-HD1 is yet to be seen. Sony's entry, set to be released here in September, will hold 13,000 songs on its 20GB drive (thanks to Sony's compression technology). But if you're in the market to buy now, the reviews here should help narrow your choices.

Apple iPod 40GB

The Apple iPod is the player against which all other players are compared—and rightly so. The design was startlingly original when it was introduced, and it still feels fresh. The 40GB version we tested is slightly larger (6.1 ounces, 4.1 by 2.4 by 0.8 inches, HWD) than the 15GB and 20GB versions, but it's still among the smallest players in the high-end category. But be warned: You do pay a premium for the iPod's reputation, style, and interface, compared with other players.

The iPod's screen is bright, and thanks to the retroreflective background, it's easy to read in most any light. The touch-sensitive controls work smoothly and



logically. In conjunction with the company's iTunes jukebox app, the player organizes your music by artist, album, title genre, and even composer, and all are easily navigable. This model comes standard with a wired remote, which is handy when you're on the go and want to change the volume or advance to the next song.

The iPod offers a wide range of equalizer (EQ) presets but no user-adjustable EQ settings. The measured frequency response into our spectrum analyzer was excellent. The iPod sounded very good all the time but was definitely best playing through our 64-ohm Sennheiser HD280 Pro headphones.

The iPod has other features, including a large-format clock and some PIM functions, such as an address list, calendar, and text file display. It also has some games. But it lacks the voice recorder and FM radio tuner others now offer, unless you add aftermarket devices. And that said, a mini-industry has sprouted to supply iPod users with useful (and some frivolous) accessories, which give it an extensibility others can't match.

Do note that the iPod's battery (which gave us just over 7 hours of runtime on a charge) is not meant to be user-replaceable. So when it stops holding a charge (figure two years' worth of typical use), you'll need to send it to Apple or a third party for a replacement (at a cost to you of $50 to $100).

THE IPOD'S DESIGN is wearing well, but others beat it on value.

The iPod is still the cream of the crop when it comes to the interface. But you'd have to value style and function highly to pay the price, given the new entrants in the field.

Apple iPod 40GB

$460 street. Apple Computer Inc., www.apple.com. ●●●●○

Creative Nomad Zen Xtra 60GB

With an expanse of sheet metal below the screen, the Creative Nomad Zen Xtra looks like it might be missing something when compared with other players, but it's not. An easily replaceable battery (that lasted a laudable 10 hours on our tests) lurks within, and all the controls are along the sides of the player. We tested the 60GB player, and try as we might, we simply didn't have enough music to fill it up.

The Zen Xtra has a broad, mostly flat frequency response, with just a bit of weakness in the low end, but you'd never hear that if you listen through anything other than a stereo with a real subwoofer or studio-quality headphones. In addition to a full complement of EQ presets and custom EQ settings, the Zen Xtra has EAX, which adds echo/room effects, spatialization, and slowdown or speedup of music.

The EQs are mostly unnecessary, though, because the Zen Xtra sounds fine with no additional EQ, and several of the EQ settings dull the sound. In fact, the room size/echo and spatialization effects sound terrible; they're not even amusing. The speed control, however, is useful. You can slow down your music without changing its pitch if you want to learn a riff, and you can greatly speed up voice material, such as audio books, without impairing the sense of it. Evidently, we can listen considerably faster than we can speak.

The belt holster is well designed, and it needs to be: At 7.9 ounces (4.4 by 3.0 by 0.9 inches, HWD), you'll have something substantial on your hip. The supplied ear buds are deficient in high frequencies and sound somewhat fuzzy and indistinct compared with better ones.

With more storage than most portable computers, the Zen Xtra is a formidable ally in conquering your digital music collection. At about $360, the Zen Xtra 60GB is a serious purchase. But if you want the Zen Xtra's features at a lower price, consider the 30GB version ($220 street), which is probably enough storage for most people.

Creative Nomad Zen Xtra 60GB

$360 street. Creative Labs Inc., us.creative.com. ●●●◐○

THE ZEN XTRA's 60GB capacity should more than suffice.

iRiver H140

PC MAGAZINE EDITORS' CHOICE

With superlative sound and a multitude of special features, the 40GB iRiver H140 is the new digital audio player to beat. It goes far beyond the typical player, offering voice and audio recording as well as FM radio.

Recording can be analog or optical/digital, in either MP3 or WAV. Even better, to load the H140, you don't need special drivers: You can drag folders of ripped songs to it via Windows Explorer. The centrally located joystick selector controls the usual navigation functions and volume, while dedicated buttons control play/pause and record mode and bring up the main menu. And finally, Linux and open-source fans will be pleased to note the presence of an Ogg Vorbis decoder.

The screen is chockablock with information: It shows left/right volume, the codec in use, bit rate, and EQ setting, as well as the usual album, artist, and title listings. Preference controls modify just about every aspect of the H140, including the contrast of both the main LCD and the one on the wired remote. You can also change the way the joystick operates, select vertical or horizontal scrolling, and tailor other user interface features to your liking.

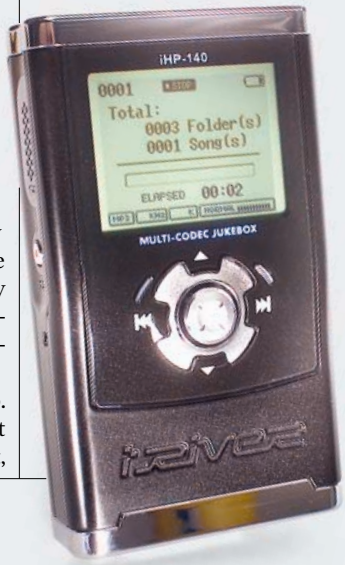
The H140 has a very articulate sound, with strong bass, good highs, and more EQ options than we've seen on any other player. The supplied ear buds are unremarkable, except that they're slightly larger in diameter than most and may not fit smaller ears. But the leather holster/belt clip is very well made and holds the 6.5-ounce unit (4.1 by 2.4 by 1 inches, HWD) securely.

Recording quality is superb. The built-in mic is the best we've heard in a portable unit, although it picks up the hard drive's whine when it spins up. The included lapel mic eliminates the whine and preserves quality. FM reception of both local and distant stations is excellent, as was its 10 hours of battery life.

A very proficient player, the H140 needs only a top-quality set of earphones to be complete. At roughly $370, it's a considerable expense, but if you can scrape by with 20GB, the otherwise identical H120 sells for nearly $100 less.

iRiver H140

$370 street. iRiver America, www.iriveramerica.com. ●●●●●



THE BEST PLAYER in the 20GB-plus class is the iRiver H140.

Rio Karma

Rio invented the MP3 player as we know it, and it continues to innovate in this currently crowded space. The 20GB Rio Karma has serious geek appeal, because it includes Ogg Vorbis and FLAC (Free Lossless Audio Codec) support in addition to the usual MP3 and WMA codecs. The additional codecs make it especially suitable for Linux as well as PC and Mac.

The Karma's squarish, hand-sculpted shape (5.5 ounces, 3.0 by 2.7 by 1.1 inches, HWD) is inviting, and it comes with a base that brings out both USB 2.0 and Ethernet interfaces, so you can use the Karma on your network. The base also has left/right audio jacks, and it's an ideal bridge between your PC and your stereo system. What's odd about the Karma is the lack of a belt clip or holster; the player is too thick to fit comfortably in most pockets.

THE RIO KARMA is also at home as a part of your stereo.

The Karma is a pleasure to use. The face of the player has a menu button and a joystick/selector. A real scroll wheel (not a rocker) gives you another means of navigation, and dedicated buttons on the side control the volume. The menu system is very logical and easy to navigate. On-screen displays are quite legible, and the player lasted more than 14 hours on a single charge.

The player sounds very good through the bundled Sennheiser MX300 ear buds, which deliver solid bass and clear highs. Our frequency sweep and pink noise tests show a noticeable roll-off in both low bass and high frequencies, though with the frequency limitations of most compression schemes, you'd never know it. But if you want to drive a high-end stereo system with losslessly compressed files, you'll need to apply bass and treble boost.

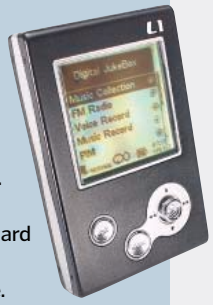
The Karma lacks the FM tuner that others in this price range have, but its network and home-stereo connectivity options are a plus.

Rio Karma

$270 street. Digital Networks North America Inc., rioaudio.com. ●●●●○

IN SHORT

Frontier Labs L1



Pros: Compact size. Large, legible display. Simple controls. PIM features.
Cons: Nonstandard 2.5-mm jacks. Quirky software.
Bottom line: Lots of features for the price, but this player needs polish.
$299 direct. Frontier Labs America, www.frontierlabsamerica.com. ●●◐○○

Philips Recording Audio Jukebox HDD120

Pros: Striking black design, like an anti-iPod. Audio recording function. Wired remote. Very good audio performance and excellent standard ear buds.
Cons: Limited codec support. Separate buttons and screen animations can slow navigation. File management/transfer software is substandard.
Bottom line: Pretty and functional, with the best standard ear buds on any digital audio player. But the HDD120 could use better ergonomics and better file software.
$280 street. Philips Electronics N.V., www.philips.com. ●●●◐○

PoGo! RipDrive 30GB

Pros: Solidly built. Excellent audio performance. Unique, well-executed software. Doesn't require drivers or special software. Very good FM performance.
Cons: Bulky and heavy. Internal mic desperately needs isolation
Bottom line: It's bigger than other players, but the RipDrive is a surprisingly good performer.
$299 direct. PoGo! Products Inc., www.pogoproducts.com. ●●●◐○

www.pcmag.com/mp3players

HP's Near-Perfect Media Center PC

BY JOEL SANTO DOMINGO

PC MAGAZINE EDITORS' CHOICE

Have you been holding off committing to the Media Center platform to see what makers would come up with next? If so, it's time to look at the **HP Media Center PC m1050y.** What sets the m1050y apart is the work HP has put into the platform to make the unit truly media-friendly—for years to come.

The neatest feature is the HP Personal Media Drive. A slot in the front of the PC's case accepts hot-swappable 160GB hard drive cartridges ($219 apiece), which you can insert or remove while the system is running. This gives the m1050y unlimited storage potential for your ever-growing collection of music, photo, and video files. It also lets you back up the system's main drive easily and safely store irreplaceable files off-site to ward off disaster. Combined with the DVR (digital video recorder) features built into the Windows XP Media Center Edition 2004 OS, the drive also solves the biggest problem with TiVo and other set-top DVRs: You never have enough storage. HP has also improved the TV quality this time around; on our tests with a good cable signal, TV reception was nice and clear.

A POP-OUT DRIVE gives you essentially unlimited storage.

The high-end configuration we tested delivered excellent 2D graphics and multimedia performance. In addition, the ATI Radeon X600 PCI Express graphics card helped HP's newest Media Center PC garner respectable 3D gaming scores.

HP Media Center PC m1050y

With Intel Pentium 4 560 (3.6 GHz), 1GB DDR 400 SDRAM, 250GB SATA hard drive, 160GB Personal Media removable drive, ATI Radeon X600 graphics, DVD+RW drive, DVD-ROM drive, Creative Sound Blaster Audigy 2 ZS sound card, Klipsch ProMedia THX 5.1 speakers, Microsoft Windows XP Media Center Edition 2004, $2,876 direct. Hewlett-Packard Development Co., www.hp.com. OVERALL: ●●●●◐. Music: 100 (out of 100); Photo: 100; Video: 99; Gaming: 97.

How Much PC Does $300 Buy?

BY JOEL SANTO DOMINGO

Sold by Wal-Mart, the **Microtel SYSWM8001** is notable for two things: It's a full-fledged computer selling for under $300 (without a monitor), and it runs the Sun Java Desktop System (JDS) on top of a modified version of the SUSE Linux operating system. All things considered, you do get a lot for your money.

The SYSWM8001, based on AMD's low-end 1.6-GHz Duron CPU, is best seen as a second or third home PC. Compared with a $400 system with Windows or a closeout eMac, it has some limitations. For example, almost all the software sold in your local consumer electronics store is not compatible with the Linux and JDS operating systems. The SYSWM8001's compatibility with printers is also limited, though it does work with some HP and Lexmark printers. Also, the Microtel lacks a CD burner; the only optical drive is a CD-ROM.

What is it good for? Actually, quite a lot. The StarOffice 7 suite comes preloaded, so you can use word processing and other productivity apps. StarOffice is no match for Microsoft Office, but it can still get the job done, and it lets you open and modify most Microsoft Office documents. The preinstalled browser, Mozilla 1.4 for JDS, was fast at rendering Web pages.

If surfing the Web and working on the occasional Office document is all you do, then the SYSWM8001 is fine as a budget alternative to a Windows PC. But if you're going to use store-bought games, business software, and educational titles, think about spending a little more for a Mac or a Windows PC.

AS A SECOND PC for Web surfing, this Microtel is fine.

Microtel SYSWM8001

With 1.6-GHz AMD Duron, 128MB DDR 333 SDRAM, 40GB IDE hard drive, integrated SiS Real 256E graphics, CD-ROM drive, integrated audio, Auditek stereo speakers, Java Desktop System/Linux, $298 direct. Microtel (distributed by Wal-Mart), www.walmart.com. ●●●○○

IN SHORT

Cyberpower Gamer Ultra 9900 Pro

Pros: nVidia GeForce 6800 Ultra card pushes 3D performance to new heights.
Cons: Side intake fan and the CPU heat sink fan are loud.
Bottom line: This amazingly priced gaming system is worth every dollar. It comes with the components you crave, for less.
$2,899 direct. Cyberpower Inc., www.cyberpowersystem.com. OVERALL: ●●●●◐.
Music: 61 (out of 100); Photo: 68; Video: 83; Gaming: 100.

Overdrive PC a.Torque FX

Pros: Overclocked processor and graphics equal blazing performance. Quiet fans.
Cons: Pricey.
Bottom line: The builders at Overdrive PC interview you by phone to determine your needs, then build a system tailored to you like a Savile Row suit. If you deserve the best and can pay for it, this system is for you.
$5,999 direct. Overdrive PC, www.overdrivepc.com. OVERALL: ●●●●◐.
Music: 95 (out of 100); Photo: 80; Video: 95; Gaming: 100.

HP Pavilion a550e

Pros: Good multimedia performance and software.
Cons: Good, not great, 3D performance.
Bottom line: The Pavilion a550e makes a good entry point for a person who wants to start getting serious about digital photography and video, with gaming secondary.
$2,599 direct. Hewlett-Packard Development Co., www.hp.com. OVERALL: ●●●◐○.
Music: 90 (out of 100); Photo: 78; Video: 68; Gaming: 80.

www.pcmag.com/desktops

Organize Images with Paint Shop Photo Album

BY BILL MACHRONE

Although previous versions of Jasc's Paint Shop Photo Album had a lot to like, we were awfully frustrated with its interface, which was built on a hierarchical folder system. Competing products—namely Adobe Photoshop Album and Picasa—have proven there are better ways. Now **Paint Shop Photo Album 5** has followed their lead, providing a much improved interface.

You still get the hierarchical folders, but that schema is now supplemented by Calendar and Keyword views. These make it easier to browse through images and find pictures even if you don't know what folder they are stored in. The interface also has new tabs—*Organize, Enhance, Create,* and *Share*—to help you quickly get to the tasks and tools you're looking for.

As photo libraries grow in size, managing images that you've backed up to CD or DVD becomes increasingly important. Paint Shop Photo Album's *Catalog* command creates an inventory of the images on your local hard drive and optical discs. It maintains thumbnails of all your images, so you can browse through your entire library, even images that have been transferred to removable media.

THE NEW CALENDAR VIEW in Paint Shop Photo Album 5 lets you quickly see pictures taken on a given day.

The *Enhance* tab includes an easy-to-use correction wizard and simple adjustment tools. Photo Album doesn't provide the full set of image editing features you get in the company's Paint Shop Pro editing application, but it does offer an impressive set of tools that do a very good job adjusting images. We were blown away by its ability to separate the foreground from the background and adjust their illumination.

Under the Create tab, you can make albums, greeting cards, calendars, and more. Wizards guide you through each step, and the resulting projects are attractive. The *Share* tab lets you create Web pages, share images via e-mail, order prints, and the like. You'll also find a new two-click photo-CD creation tool here.

All told, Paint Shop Photo Album 5 is a fine tool to use to get a handle on your images.

Paint Shop Photo Album 5
$45 direct. Jasc Software Inc., www.jasc.com. ●●●●◐

NEO Pro Organizes Outlook Mail

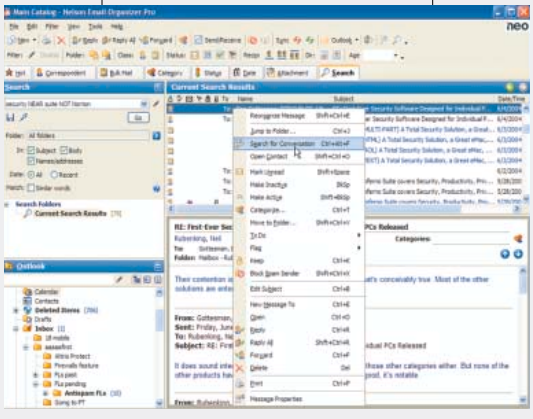
BY NEIL J. RUBENKING

Caelo Software's **Nelson Email Organizer Pro 3.0** automatically organizes Microsoft Outlook e-mail for increased productivity. Outlook folders and messages appear inside NEO Pro, and additional tabs group messages by correspondent, category, date range, and more. It uses Outlook categories but renders them more accessible and flexible. Searching is much faster than in Outlook; it supports Boolean, exact phrase, and wild-card searching.

NEO Pro treats current mail and local archives as a single unified message store, where Outlook must search each separately. Like X1 and Creo Six Degrees, it creates a full-text index of the message store. On one system, initial indexing of 9,000 messages took five and a half minutes. X1 took 13 minutes but also indexed file attachments; NEO Pro just indexes attachment names.

The program's *Hot* tab replaces the Inbox folder as the center of attention. New mail that's not on the spam blacklist appears in this area's Active Mail folder. After reading a message in the *Hot* tab, you can mark it inactive (it still exists but doesn't clutter the *Hot* tab) or leave it there for further attention. The *Hot* tab also contains items from your To Do list as well as other items you've chosen to mark as hot.

NEO Pro is significantly slower than Outlook at deleting or moving messages, since it must update the index for each. The integration is generally smooth, but a couple of common actions will trigger Outlook's warning that another program is attempting to send e-mail. Also, NEO Pro does not replace all of Outlook's functions. For example, you can open nonmail elements (such as Calendar and Notes entries) by clicking on the corresponding folders within NEO Pro, but for that, the program just launches Outlook and has you work there.



FINDING A CONVERSATION or individual e-mail message is fast in convenient with NEO Pro on the job.

For comprehensive indexed searching of e-mail, attachments, contacts, and files, consider X1. But if you just want to use Outlook more productively without adopting an entirely new system, NEO Pro is a good choice, and its search is more flexible than X1. Home users may find that the less feature-rich NEO Standard 3.0 ($39.95 direct) suffices, though it lacks the unified message store, *Categories* tab, and Filter toolbar.

Nelson Email Organizer Pro 3.0
$69.95 direct. Caelo Software Inc., www.emailorganizer.com. ●●●◐○

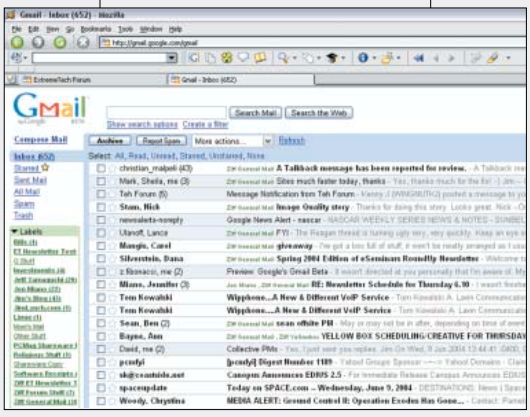
Google Sets Its Sights on E-Mail—Maybe

BY JIM LYNCH

Every once in a while, a product breaks the mold set by others in a category and forces those established products to improve in order to compete. Google did this with its Internet search engine and is set to do this yet again—perhaps—with its free Web e-mail service, **Gmail.** The catch: The company claims Gmail is just a test service right now and has not committed to rolling it out permanently.

The gigantic 1GB of storage per user—that's roughly 500,000 pages of text—blows away MSN Hotmail (which gives no-fee users 250MB) and Yahoo! Mail (100MB). But it's not the mailbox size limit that got us hooked, it's the service's terrific built-in search feature (no surprise, considering the source). It lets you do a quick, simple search or use more advanced options to narrow results down. You can also search the Web directly from within Gmail.

Gmail takes an innovative "conversations" view of e-mail threads. This view lets us see entire threads in our Inbox rather than just isolated, scattered messages. We could opt to show all the messages in a thread, close all messages, or click on the title of a message in that thread to view single messages, leaving the rest collapsed. Another attraction for heavy e-mail users: Instead of folders, Gmail uses labels to help categorize mail. Users can apply multiple labels to the same piece of mail, which is a far more flexible method than folders.



GMAIL'S INBOX provides built-in search, easy access to labels, and a snippet of a thread's subject header.

Gmail isn't perfect. First and foremost, many potential users will be put off by the service's ads—or more precisely, the privacy concerns surrounding them. Gmail scans your messages and serves up targeted text-based ads based on their content. That has a lot or privacy advocates up in arms and may be too Orwellian for some users. The contacts management is also primitive compared with Yahoo! Mail's more advanced address book.

All of this might be moot, of course, as the service is what the company calls a "limited test" and is invite-only. The company won't divulge details on when—or even if—Gmail will be made widely available.

Gmail

Free. Google, gmail.google.com.

●●●●○

Compression and Much More

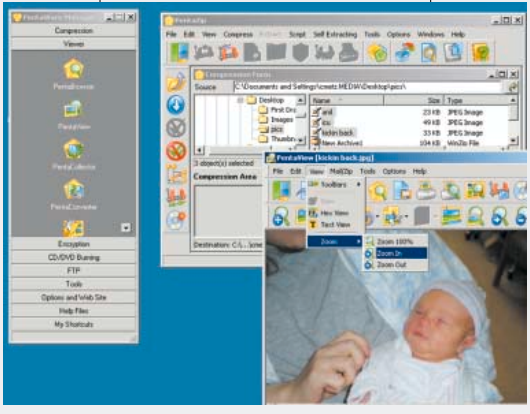
BY CADE METZ

PentaWare isn't just a ZIP company anymore. Last year the company introduced an eclectic collection of file management tools, and the latest upgrade, **PentaSuite 7.1,** offers everything from file viewing, compression, and encryption to CD and DVD burning, video frame capture, and FTP transfer. This jack-of-all-trades is certainly a good option for a multimedia power user, though PC novices may find the breadth of utilities a little hard to master.

Each of the suite's more than 20 utilities can be launched from a single floating window known as the PentaWare Manager. The apps are divided among six clearly labeled tabs: Compression, Viewer, Encryption, CD/DVD Burning, FTP, and Tools. When you click on a tab, the Manager displays shortcuts to each related utility.

The centerpiece of the Compression apps is, of course, PentaZip, which is among the most versatile ZIP packages. You can seamlessly archive files to CD and DVD, send compressed files via e-mail, schedule regular compressions, and even script simple compression programs.

The suite's most innovative apps fall under the Viewer tab. These include tools for perusing your multimedia files, creating a digital photo album (viewable from a Web browser), and grabbing individual frames from digital videos. With the PentaExif tool, you can quickly search the metadata attached to your photos, sorting pictures by, say, the date they were taken. With PentaConverter, you can quickly and relatively easily convert large numbers of photos and other multimedia from one file type to another. New in version 7.1 is PentaPDF, which lets you create PDF files from any file format the viewer supports.



THE FLOATING TOOL palette gives quick access to the suite's various components, such as the file viewer.

The Encryption tab offers a pair of tools, one for encrypting files via PGP and one a wizard for quickly sending such files via e-mail. The CD/DVD Burning apps tab offers a single tool for writing files to disc. The FTP section has an app for uploading files via FTP, and SSL encryption is also available here. The Tools tab includes a standalone app for easily renaming your files.

Sound like a lot? It is—and it may be too much for some users. If you're an experienced PC user constantly juggling files, the suite can certainly be of help. But novices may find the tools aren't as intuitive or tightly integrated as they could be.

PentaSuite 7.1

$99.95 direct. PentaWare Inc., www.pentazip.com.

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Tiny JVC PC Makes a Big Debut

BY CISCO CHENG

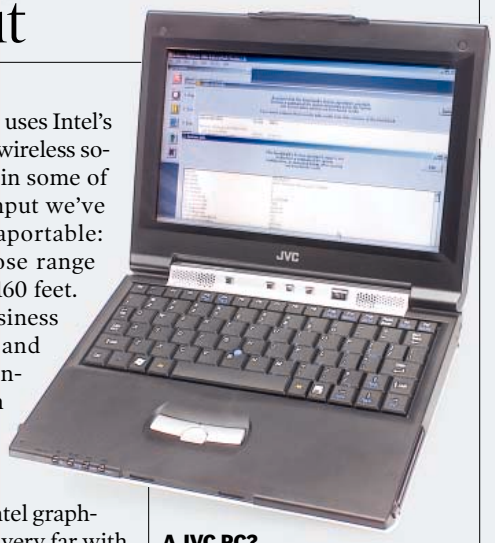
Who would've thought that JVC, best known for its home entertainment products, would be a contender in the ultraportable PC arena? The company's first U.S. model, the **JVC MP-XV841 Mini Note PC,** is based on the Intel Centrino platform and is aimed at the mobile professional. Similar to the Sony VAIO TR5, the Mini Note is an extremely compact (9.2 by 7.0 by 1.5 inches) and lightweight (3.2 pounds system weight) ultraportable that's attractive and well made.

The system comes with a beautiful 8.9-inch-wide screen and a set of features that could give Sony a run for its money. Right below the screen is a button that activates Digital Dolby surround sound, which produces terrific audio for such a compact unit. We watched the entire *Return of the King* DVD and were impressed with how amazingly crisp and detailed each scene was. We were also pleased to see that the system's battery lasted through the entire movie. The Mini Note delivered an impressive 4 hours 32 minutes on our BatteryMark test, though there's a catch: The standard battery connects to the rear of the unit and sticks out 2 inches beyond the chassis, more like other makers' extended batteries.

When we got down to business, we realized that the tight 15.8-mm key pitch doesn't make the Mini Note as typing-friendly as, say, the TR5. But we did find navigating with the pointing stick a pleasure. The unit contains a built-in DVD/CD-RW combo drive, which eliminates the hassle of carrying external drives. The system also has two USB ports, a FireWire port, 100-Mbps Ethernet, a modem, a Type II PC Card slot, and a handy SD slot.

The Mini Note uses Intel's Centrino G 2200 wireless solution, resulting in some of the best throughput we've seen for an ultraportable: 21.3 Mbps at close range and 7.9 Mbps at 160 feet. Its scores on Business Winstone (13.1) and Multimedia Content Creation Winstone (11.9) were also good for this class. The integrated Intel graphics won't get you very far with 3D intensive games but will prove fine for 2D tasks.

All things considered, we prefer the JVC MP-XV841 Mini Note to the Sony TR5—especially considering that the JVC entry is comparably equipped and costs hundreds of dollars less. It still doesn't supplant the IBM ThinkPad X40 as our favorite ultraportable (the IBM's keyboard and support features are second to none), but in the entertainment-oriented ultraportable niche, the Mini Note is the one to watch.



A JVC PC?
This entry shows that the company is no newbie.

JVC MP-XV841 Mini Note PC

$2,399 list. JVC, www.jvc.com.
●●●●○

No-Install Satellite Radio

BY BILL HOWARD

PC MAGAZINE EDITORS' CHOICE

Even jaded technology buffs may let out a low, appreciative whistle when they see the **Delphi XM Roady2.** Delphi offers a complete 100-channel XM satellite receiver and stock ticker for your car packed into a case roughly the size of an iPod music player.

Until now, to make satellite radio work in your car, you had buy a new car radio or an add-on kit that came with a bunch of wires and took up a lot of room on the dash. With the Roady2, you attach a power cord to the cigarette lighter and run the antenna cable to the roof (it works passably well on your dash, too). That's it. Once you make a call to XM to activate the service ($9.95 a month), you're up and running. You don't even need to connect an audio cable to the car radio or cassette player if you don't want to, because an FM modulator is integrated. You simply find an unused FM frequency to broadcast the signal out through your car speakers. For the best sound quality, though, you'll want to connect to the line-in jack on your car radio, if it has one.

THE TINY ROADY2 brings XM satellite radio to any car.

We didn't notice any difference in audio quality between the Roady2 and larger XM satellite tuner modules, nor did the smallish antenna suffer any worse fate than larger antennas do when passing under bridges. If you're under for only a second or so, you'll typically retain the signal; longer, and you'll suffer a couple seconds of silence until the tuner finds the signal again.

In addition to audio, you can get as many as 20 stock quotes beamed to the display in nearly real time. You'll also be able to buy home and portable boom-box mounting kits for the Roady2—notably, the Cambridge SoundWorks PlayDock XM, a first-rate dock with a power supply, rechargeable batteries, and stereo speakers ($200 list).

In deciding between Sirius and XM, consumers should consider which has the best programming beyond the common ground of commercial-free rock, rap, jazz, Christian rock, live traffic, and so on. For instance, Sirius offers NPR, NHL, and NFL; XM offers NASCAR, VH1 music, and call-in DJs. But when small size and easy installation matter most, the clear advantage right now lies with XM and the Delphi Roady2.

Delphi XM Roady2

$120 street. Delphi Corp., www.shopdelphi.com. ●●●●●

ANOTHER EXPERT WEIGHS IN ON THE TCO OF WINDOWS AND LINUX.

Microsoft

"We got to market six months faster, and saw 14 percent in cost savings over Linux, using Windows Server System.™"

—Owen Flynn, Chief Technology Officer
Equifax Inc

Equifax, a leading provider of consumer and commercial credit information, chose Windows Server System because it allowed them to deliver new and improved services with a 14 percent savings in total cost of ownership. With their new Windows-based supercomputer cluster, Equifax is able to manage its database of over six billion data components with dramatic increases in performance and efficiency. To get the full case study, other case studies, or third-party findings, visit microsoft.com/getthefacts

Microsoft® Windows Server System™

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A PDA for the Grown-Up Gamer

BY JENNIFER DEFEO

If you like to play games and need to get yourself organized, the **Tapwave Zodiac** may be a perfect fit. This portable gaming console also doubles as a very capable PDA. Or else it's a PDA that doubles as a very capable portable gaming console. Either way you look at it, you may never look at your work-a-day PDA the same way again.

The Zodiac comes in two memory configurations: the Zodiac 1 (which we tested) with 32MB of memory ($299 direct) and the Zodiac 2 with 128MB ($399). Compared with mainstream PDAs, the Zodiac 1 is slightly larger and heavier (6.3 ounces). The device is sturdy and comfortable to hold, and the 3.8-inch backlit transflective screen is amazingly clear and crisp. The half-VGA (480-by-320) resolution made everything a true treat for the eyes—from game play and video watching to reading text files.

When listening to MP3s, playing Duke Nukem, or viewing the *Shrek 2* movie trailer, all sans headphones, we were impressed by the sound produced by the on-board Yamaha audio circuitry and the two tiny stereo speakers. And during numerous rounds of Stuntcar Extreme, the vibration we felt when we crashed added nicely to the overall sensory experience. (Other popular titles now available include DOOM II, Spyhunter, and Tony Hawk's Pro Skater 4.)

The Zodiac runs on Palm OS 5.2, the same as the recently reviewed Palm Zire 72 (also $299 direct; First Looks, June 22). The OS here, however, is customized to make the most of the Zodiac's unique gaming form factor. For example, the menus are intuitively laid out to work with the joystick. If you don't like the joystick, you can use the stylus housed at the back of the device.

IS IT A GAME CONSOLE or a PDA? The Zodiac is both.

We do have a few complaints. First, the joystick seems a little sensitive in some situations, like when you're playing Atari's Breakout. Also, the stylus positioning in the back isn't ideal; it's too easy to knock off, especially if dropped into a jacket pocket or cluttered bag.

If you want more out of your PDA than a contact database, calendar, and calculator, then consider the Tapwave Zodiac. Though it may not be appropriate for the boardroom, if you like games and want to be better organized, it's worth checking out.

Tapwave Zodiac 1
$299 direct. Tapwave Inc., www.tapwave.com. ●●●◐○

Nokia N-Gage Gets a Little Better

BY PETER SUCIU

With its smaller size and better design, the **Nokia N-Gage QD** is vastly improved compared with the company's original phone/game console hybrid. The new design addresses the biggest complaint of the original—namely, the absurd need to open up the device and remove the battery to change games—but still fails to excel as either a game device or a handset.

Users can now hot-swap the MMC media into an accessible external bay at the bottom of the unit. And once a game is inserted, it will auto-execute, so you don't have to scroll through the menu system to launch a title. The new QD is backward-compatible with all original N-Gage titles, including Tony Hawk's Underground and The Sims, while future games will be playable on both device versions as well.

Although compact compared with other game handhelds, this device is still a behemoth as a phone (5 ounces, 4.7 by 2.7 by 0.9 inches, HWD). Thanks to the phone, however, a multiplayer gaming experience is possible without any cables.

WE LIKE THE N-GAGE'S more intelligent design but still aren't sold on it.

The N-Gage Arena launcher app makes connecting to Nokia's online gaming service very easy via a click from the main menu. You can also connect short range via Bluetooth to other N-Gage users.

The front panel and interface is more streamlined and the screen slightly brighter: same dimensions (1.6 by 1.4 inches) but with 176-by-208 resolution. Controls are more comfortable, and the unit's eight-way D-Pad has been adjusted to make it feel more like a console controller. The numeric dial pad's buttons, which double as game controls, have been raised a bit and have a bit more travel. The 5 and 7 keys are used more often than the other keys for gaming and thus have been made to stand out with beveled circles so that you can find them without taking your eyes off the screen.

What's been dropped is probably what users will miss the least. The built-in radio and MP3 functions are gone, and unlike the original N-Gage, the QD is not a tri-band but a dual-band GSM (850/1900) phone. It uses the same Symbian 6.0 OS found on other Nokia handsets, which gives you full contact, schedule, and e-mail ability.

In the end, the biggest hurdle for the N-Gage will be the continued lack of software titles available. Although several publishers, including Atari and Capcom, have announced plans to release titles for the system, the game selection (which currently includes games from Activision and Electronic Arts among others) remains vastly overshadowed by Nintendo's Game Boy Advance.

Nokia N-Gage QD
$99 direct with service, $199 without. Nokia, www.n-gage.com. ●●◐○○

Kyocera Joins the Superzoom Party

BY GLENN MENIN

Kyocera enters the realm of superzooms (cameras with optical zoom lenses of 10X or higher) with the 4-megapixel **Kyocera Finecam M410R.** Kyocera claims its RTune technology improves speed and quality. The M410R's speed is indeed impressive in some areas: In continuous-shooting mode, it can shoot at 3.3 frames per second until the images fill up your memory card. But we wish the camera had image stabilization, and although it produced good images, they weren't as sharp as those of our Editors' Choice in this class, the Olympus Camedia C-765 Ultra Zoom ("Superzooms," June 22, page 125).

The 10X optical-zoom lens is impressively fast, and the zoom rocker for it is located on the upper right of the rear panel.

IN BURST MODE, the M410R can shoot nonstop until the card is full.

The 1.5-inch LCD screen feels small but performs well in sunlight. We like that you can shoot full-frame video (640-by-480 with audio) at 30 frames per second if you use a high-speed SD card.

The M410R's 3.4-second boot time is around the median for digital cameras in general, but it's the fastest of any of the superzooms that we've tested. Recycle time was slow, at 5.3 seconds with the flash enabled.

The camera's 1,100 lines of resolution are about average for a 4MP sensor, and its pixel transition score of 2.3 percent is good. Our simulated daylight shots were clean, with good color (though slightly warm) and good exposure. Flash results were clean, with good color, but the whites were somewhat blown out.

The Kyocera Finecam M410R is certainly worth a look. It isn't perfect, but its continuous-shooting ability may win you over.

Kyocera Finecam M410R

$500 street. Kyocera Corp., www.kyocera.com. ●●●◐○

Olympus Expands Superzoom Line

BY GLENN MENIN

The Olympus Camedia C-765 Ultra Zoom recently won our Editors' Choice in the superzoom category ("Superzooms," June 22, page 125), thanks to good image quality and compact design. The company has since expanded the Ultra Zoom line with the 4-megapixel **Olympus Camedia C-770,** which adds better video, a twin-bulb flash, a hot shoe, and more metal on the body for $100 more. But the C-770 suffers from many of the C-765's limitations, including mediocre speed and the lack of both lamp-assisted auto-focus and optical image stabilization (recommended for shooting at over 7X zoom without a tripod). Surprisingly, the C-770 also scored slightly lower than the C-765 on our resolution tests, despite having the same optics and image sensor.

THE C-770 IS A FINE CHOICE, but we prefer its less-expensive sibling.

Boxy yet comfortable, the smallish C-770 is easy to hold and suited to one-handed shooting. The zoom lens is smooth and responsive; you can operate it easily via the rocker control near the shutter button. Users can access an impressive array of manual controls, but these are often buried in cryptic menus. A button lets you toggle between the clear, bright electronic viewfinder (with diopter) and the crisp 1.8-inch LCD.

Lab results were good for this class of camera, with 1,150 resolvable lines and 2 percent pixel transition average. With the camera in fully automatic mode, we noted some blowout in whites in both our simulated daylight and flash still-life studies, but otherwise the images were crisp and bright, with good colors. On the downside, the C-770's performance was slow: Boot-up took 7.7 seconds, and the recycle time between shots (with the flash enabled) came to 2.5 seconds.

Olympus Camedia C-770 Ultra Zoom

$599.99 list. Olympus America Inc., www.olympusamerica.com. ●●●◐○

IN SHORT

Concord Eye-Q 5345z

Pros: Sharp pictures. Extremely easy to use.
Cons: Lack of options, controls, and ports. Slow recycle time, no burst mode.
Bottom line: This is a 5-megapixel point-and-shoot model for those who don't want a complicated camera. It's not fast, but it produces sharp images.
$379.99 list. Concord Camera Corp., www.concordcam.com. ●●●○○

Kodak EasyShare LS753

Pros: Sleek, handy design. Crisp, well-exposed images. Quick shooting.
Cons: Our tests show somewhat low resolution for a 5-megapixel camera.
Bottom line: Sharp pictures and a rich feature set make the handy LS753 a good choice for snapshots. The fact that its 4MP (and $50 cheaper) cousin did better on our tests, however, makes the LS743 a better choice over the LS753.
$399.95 list. Eastman Kodak Co., www.kodak.com. ●●●○○

Konica Minolta DiMage G600

Pros: Least expensive 6-megapixel camera we've tested. Solid feel, easy to shoot with.
Cons: Flash shots have a green cast, with muddy shadows.
Bottom line: This solid 6MP compact camera produces sharp images. Enthusiasts will appreciate the depth of the controls, but novices will be disappointed that the camera offers only one preset mode.
$400 street. Konica Minolta Photo Imaging U.S.A. Inc., www.minoltausa.com. ●●●○○

www.pcmag.com/cameras

Why Stop at 17?

BY ALFRED POOR

Buyers who are looking for a big-screen monitor and can afford an LCD model may find the 20-inch **NEC MultiSync LCD2060NX** worthy of attention. At $1,100 (street), it costs more than a pair of 17-inch monitors, but excellent image quality and features make a strong case for considering it.

The display base provides tilt, swivel, and height adjustment. The unit has both digital and analog connections, but only an analog cable is included in the box (an odd oversight at this price level). Printed documentation is far better than usual for monitors, with lots of information and useful illustrations. The control buttons on the front panel are small, but you don't need to use them if you download the free NaViSet utility from the company's Web site: This handy program lets you control all settings from your keyboard.

The panel has a native resolution of 1,600 by 1,200 pixels—nearly 100 pixels per inch—for a sharp, finely detailed image. On our tests with DisplayMate (*www.displaymate.com*), we observed top-notch image quality. There were no apparent pixel defects, and gray-scale response was excellent for both light and dark shades. Viewing-angle performance was well above average, color tracking was good, and we saw no ghosting or streaking. Analog color ramps were smooth, though some faint discontinuities were visible on color ramps when we used a digital signal. The auto-sync feature left slight pixel jitter in the image, but we were able to eliminate it with a small tweak of the timing settings. Moving images revealed some smearing, but this is to be expected for a panel with a 25-ms pixel response.

A BEAUTIFUL IMAGE makes the MultiSync LCD2060NX worth the expense.

NEC MultiSync LCD2060NX

$1,100 street. NEC-Mitsubishi Electronics Display of America Inc., www.necmitsubishi.com. ●●●●○

Affordable Big-Screen LCD

BY ALFRED POOR

With an aggressively low price of $650 street, the 19-inch **Envision EN9250** LCD monitor comes with lots of bonus features and performs well, making it an appealing bargain.

Some value-priced monitors have bases that only tilt; the EN9250's base tilts and swivels, the monitor's height is adjustable, and the panel rotates to portrait mode. To take advantage of this, Portrait Display's Pivot Pro utility comes bundled with the display.

To sweeten the deal further, the monitor has both analog and digital connectors—it even comes with cables for both—and a pair of built-in speakers below the screen. The speakers are better than average for monitor speakers, though not as good as most desktop speakers.

On our image-quality tests, done with Displaymate (*www.displaymate.com*), the auto-sync function did an excellent job of setting the pixel timing. There were no apparent pixel defects, and brightness uniformity looked good. Viewing-angle performance was excellent in the horizontal plane and fairly good in the vertical, with a noticeable hue shift occurring at about 65 degrees above perpendicular. Color ramps were smooth, and color tracking was excellent. The only weak area was in light-gray response with an analog signal, though the digital signal performance was fine.

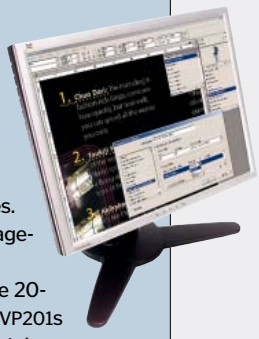
The Envision EN9250 is not perfect, but it's a solid performer. And at a price near that of many 17-inch monitors with premium features, it's a bargain.

A BARGAIN PRICE gets you good image quality and a few extras.

Envision EN9250

$650 street. Envision Monitors, www.envisiondisplay.com. ●●●●○

IN SHORT



ViewSonic VP201s

Pros: High resolution. Portrait and landscape modes. **Cons:** Some image-quality flaws. **Bottom line:** The 20-inch ViewSonic VP201s is a big-screen, high-res LCD with a low price for its size. It has some attractive features, but it also has some flaws that make it less appealing than some alternatives.

$1,050 street. ViewSonic Corp., www.viewsonic.com. ●●●◐○

Dell 3300MP

Pros: Wall-filling brightness. Hard-shelled carrying case. **Cons:** Uses special cables not widely available. Some minor image-quality flaws. **Bottom line:** Priced aggressively for an XGA projector weighing less than 4 pounds, the Dell 3300MP delivers a heavyweight punch in terms of brightness. Its flaws and idiosyncrasies are few and relatively minor, making it an attractive overall value.

$1,699 direct. Dell Inc., www.dell.com. ●●●●○

HP f2304 23-inch High-Definition LCD Monitor

Pros: Very good color and gray-scale tracking. Works very well as a PC monitor and well as a home entertainment display. **Cons:** No remote. Off-axis viewing is not especially good. **Bottom line:** Destined to be primarily a PC display, the f2304 can also handle some part-time duty as an HDTV monitor.

$2,099 direct. Hewlett-Packard Development Co., www.hp.com. ●●●◐○

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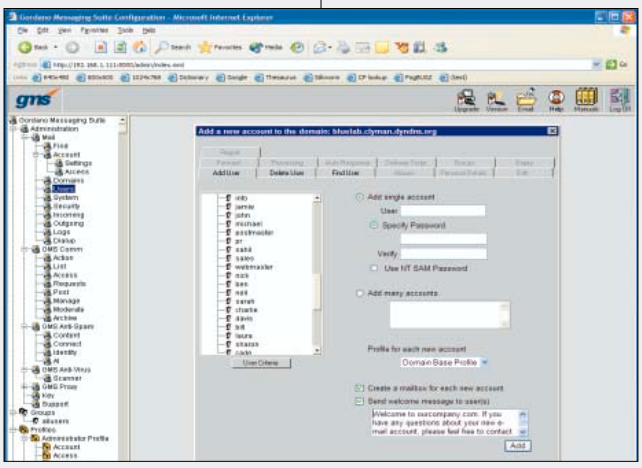
Exchange Your Mail Server

BY JOHN CLYMAN

If your company is running Microsoft Exchange 5.5 or 2000 and you're resisting the upgrade to Exchange 2003, several companies offer alternatives that provide e-mail and basic groupware capabilities that work both in Microsoft Outlook (via a client plug-in) and through Web-mail interfaces. We tested two new versions.



GORDANO'S WEB-BASED administrative interface lets you configure the server from any machine with a browser.

Gordano Messaging Suite

Gordano Messaging Suite is now available with collaboration capabilities, adding it to the lineup of full-spectrum and lower-cost alternatives to Microsoft Exchange. GMS components are sold piecemeal, so pricing is complicated. Fortunately, server installation is a cinch: Just complete a few wizardlike dialog boxes to install the components you select. A Web-based interface lets you perform administrative tasks from anywhere.

The basic GMS Mail server supports core e-mail protocols and features such as authentication and LDAP directory integration. It does not support native MAPI. To add Exchange-like capabilities such as centralized calendaring, you'll need the GMS Calendaring and GMS Collaboration modules. The components are well integrated; for example, if you use GMS Instant Messenger, it can automatically e-mail a transcript to participants when a conversation is complete.

GMS provides a feature called Autoport, which enables easy migration from Exchange Server. The program pulls account information directly from Exchange as users log on. The GMS Collaboration component lets you enable public folders, meeting invitations, and other Exchange-dependent features from within Outlook.

You don't need Outlook to access collaboration features, though, since Gordano's Web-mail interface provides a substitute. You can select either a Professional version or an Express version (which is optimized for low-bandwidth connections). A version for mobile devices is available, too. The Professional version attempts to duplicate some native-client features in a Web interface but succeeds only partially; drag-and-drop, for example, works for filing mail messages but not for rescheduling calendar appointments. We also found that recurring meetings created in Outlook appeared only on their initial date in the Web client, and that printing calendars proved problematic.

Optional GMS components integrate antispam, antivirus, and listserv support. This smorgasbord of components illustrates where Gordano's offering shines: GMS offers lots of flexibility for assembling the right components to meet your collaboration goals.

Gordano Messaging Suite

$2,195 direct for 50 users, including core server, Web-mail interface, calendaring, and Outlook-based collaboration features. Gordano Ltd., www.gordano.com. ●●●◐○

Scalix 9.0

Designed to replace or coexist with Microsoft Exchange Server, the Scalix 9.0 e-mail and calendaring platform provides many comparable features and offers easy client-side deployment. We found that Scalix's native MAPI support enabled effective integration with Microsoft Outlook, and we like the rich interface of its Web-mail client.

Installing the Scalix server requires a number of steps, but they're well within the grasp of anyone with moderate Linux system-administration skills. Scalix provides a simple Web-based interface for managing users and groups, though more advanced administrative features are available only through command-line tools, which also enable batch processing and scripting.

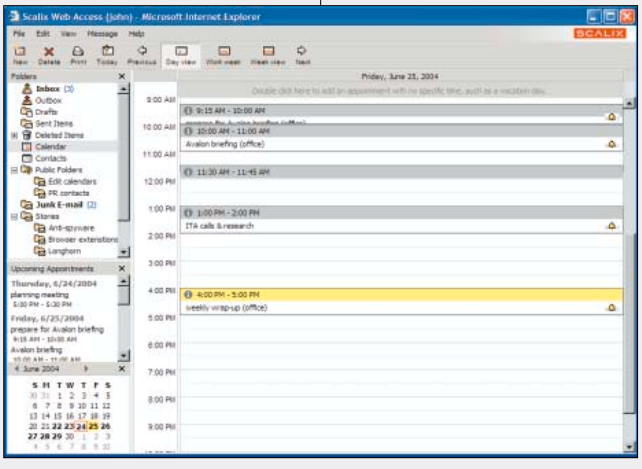
As with most products positioned as replacements for Exchange, Scalix provides two ways to access its groupware capabilities beyond basic POP and IMAP mail. One way is to install a client plug-in that works with Outlook; the other is to use a Web-mail interface. Scalix deserves kudos for making the plug-in installation painless.

The Web client includes such conveniences as drag-and-drop rescheduling and on-the-spot address expansion and verification. We particularly like its incremental search, which lets you locate particular messages or contacts easily. The Web client supports mail, calendars, contacts, and public folders, but not tasks or rules. Scalix also comes with hooks to attach third-party antispam and antivirus solutions.

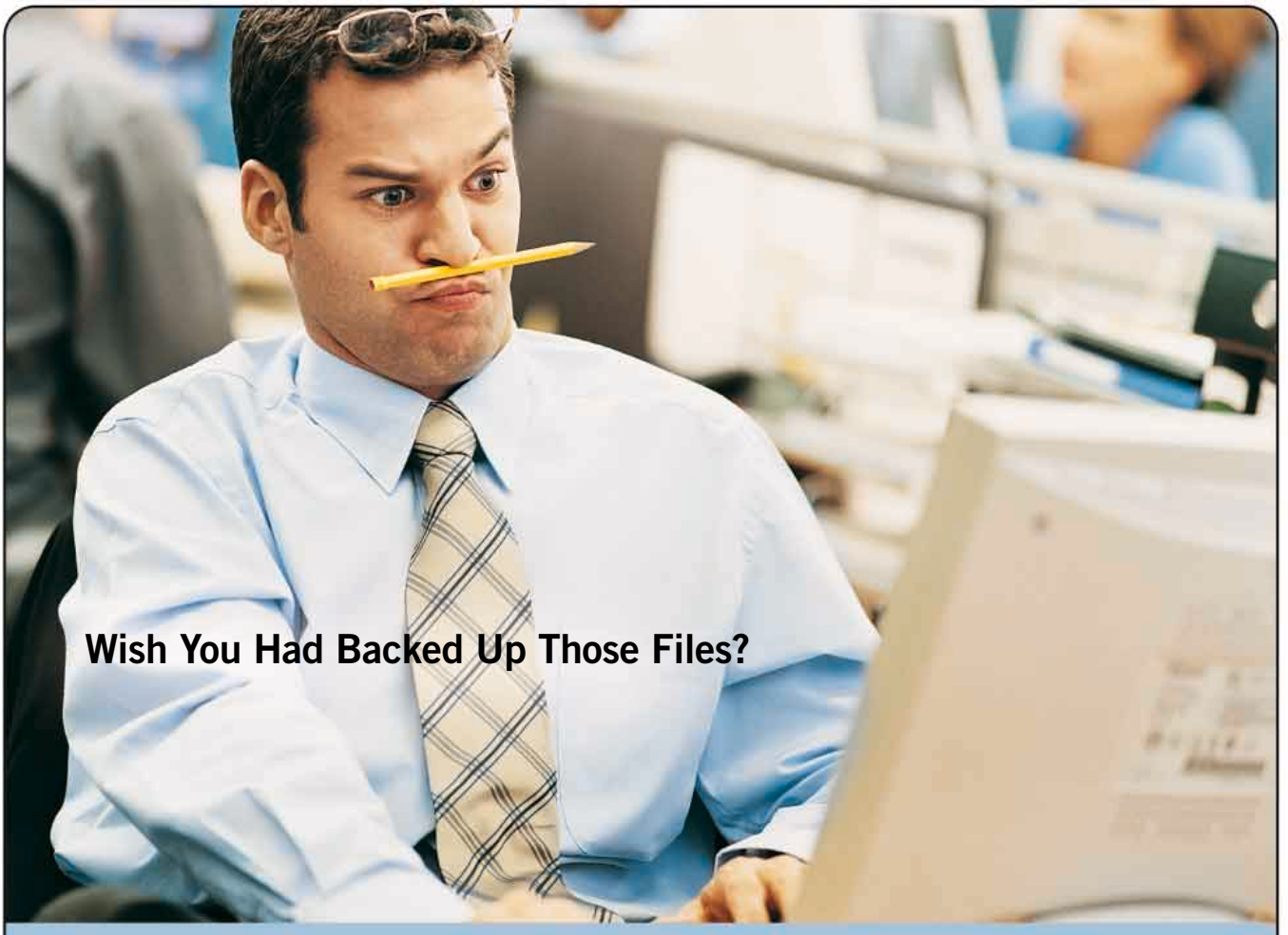
If you're looking for a gentle way to change to a Linux-based mail and groupware solution, Scalix 9.0 is well worth your attention.

Scalix 9.0

Direct price: $60 per client access license. Scalix Corp., www.scalix.com. ●●●●○



SCALIX'S WEB client provides conveniences like drag-and-drop rescheduling and immediate completion of e-mail addresses



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FEEDBACK

> "There is an eager market awaiting microchipping: potential kidnapping targets in South America."

CELL PHONES ON AIRPLANES REVISITED

As a professional pilot, I'd like to reply to "Inside Track" in your November 5, 2002, issue, which I recently came across. In it, John C. Dvorak discounts the danger of cell-phone use on aircraft. While the real reason for the ban on cell phones in flights perhaps hasn't been explained well to travelers, the dangers are clear to those of us in the know.

Cell phones, as well as other personal electronic devices (PEDs) such as laptops and CD players, emit signals from high-frequency clock oscillators. The resulting electromagnetic interference (EMI) can affect aircraft navigation, communication, and control systems. Switched-on cell phones have been proven responsible for spurious warnings about smoke, fuel tank imbalances, and the like, resulting in flight delays. In a particularly scary incident, a Boeing 747 landing at Heathrow suddenly yawed to the right and climbed inexplicably; it was later found that a cell phone had interfered with the aircraft's fly-by-wire system.

Can you afford to depart 2 hours late because a passenger forgot to switch off his mobile? Run out of fuel? Or, God forbid, flip over and crash over London? All these scenarios are possible, and that's the real reason the use of such devices is banned.

Most aircraft flying today were built when PEDs were in their infancy, and their interference with aircraft systems was not an issue. Also, PEDs are not designed to such stringent norms as aircraft electronics. Unfortunately, re-laying cables to eliminate EMI is extremely expensive; that's why there are problems on older airplanes. Take heart, though: The latest airliners from Airbus and Boeing cater to the use of such devices, and many long-distance flights now offer broadband Internet.

ATUL BHATIA

GETTING MICROCHIPPED

In his excellent article on microchipping (July issue, page 75), Bill Machrone missed a potential category for chip implants: humans.

There is an eager market awaiting microchipping: potential kidnapping targets in South America, mainly Argentina, Brazil, and Colombia. Take Brazil, where "flash kidnapping" is booming: People are held for a couple of hours, during which their credit cards are hit. If a card is maxed out, kidnappers call the relatives to top off the account, or else. Some potential targets (affluent adults, managers, and parents of schoolchildren) are eagerly awaiting RFIDs to help others locate them quickly should they go missing. A few entrepreneurs have already been roaming security exhibitions in Korea and Taiwan for human-tolerated RFIDs.

Science fiction got it slightly wrong: Governments may not be the ones to impose implanted chips; instead, people will ask for them in order to protect themselves. Ironic, isn't it?

STEPHANE MAES

AN ALARMING RECOMMENDATION

I was disappointed to read Neil J. Rubenking's praise of ZoneAlarm Security Suite 5 (July issue, page 64). This sentence caught my eye: "ZASuite monitors your antivirus program and alerts you if it becomes disabled...." The fact is, ZoneAlarm's firewall can disable your AV program while telling you it's working fine. This happened when I "upgraded" to 5.0 (the free standalone firewall version, but many Pro users have had similar or worse experiences). The ZA forum at *forum.zonelabs.org/zonelabs/board?board.id=inst* is filled with pages of such complaints. Zone Labs has turned into an organization that is not to be trusted, and any review of any of its products should note this.

HYLEN SMURR

REVVING UP A LEMON?

I could not believe Bill Machrone's glowing review of Iomega's Rev 35 (Editors' Choice and perfect 5 rating, June 22, page 67).

I owned Iomega Zip and Jaz Drives for several years. During that time both drives failed and were replaced ten times, and their respective disks failed more than two dozen times.

Since there was no real competition to these products, I kept using them until they were discontinued. When they failed after that, Iomega technicians suggested that I buy their refurbished counterparts. Are they joking? I would rather spend the extra time burning DVDs than entrust my data to such inferior products.

ORI STEINBERG

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Corrections and Amplifications

- In the June 22 story "VoIP: The Right Call," we incorrectly listed International Computer Graphics as one of the big national providers of hosted services in the United States and Canada (page 146). The correct company is ICG Communications Inc. (*www.icgcomm.com*).
- Because of insufficient data about NOD32's ability to detect unknown viruses, the review of the product that appeared in our June 8 issue (page 115) has been removed from our Web site.
- In our 2004 Utility Guide (June 8, page 122), we incorrectly said that only SoftInform's FineBrowser lets you open multiple Web sites simultaneously. Other browsers, including MyIE2, let you do much the same thing.

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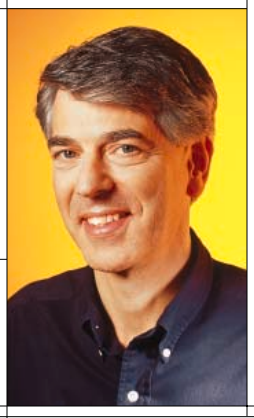
Bill Machrone



A Musical Summer

Summertime is self-improvement time. It's the time of year that I always earmark to learn something new or undertake a large project—or even multiple projects. This year, I'm taking down the big Lionel train table and building a new electronics workbench. My basement is already subdivided into woodworking and machinist/metalworking areas, but I have to put away woodworking projects to do electronics projects, and vice versa. I have two partially made guitars in progress and a third on the drawing board. And although they won't get done by the end of the summer, I'll at least be able to get them moving again.

Although I can't take my basement on vacation with me, I will definitely use some of that time to expand my musical horizons. Last year I started learning jazz chords and have pushed myself to play more solo lines and melody lines, a tough transition from my strum-and-sing heritage. Of course, I enlist the computer in these efforts and have found eMedia's (*www.emediamusic.com*) Guitar Method and Guitar Songs instructional CD-ROMs very helpful over the years.

TEACH YOUR CHILDREN WELL

More recently, I've looked at eMedia's Piano and Keyboard Method, which has some very nice features, including the ability to monitor your playing on a MIDI keyboard. Little feedback balloons pop up and tell you, "You held that note too long" or "You played too soon." Mom! Dad! Whatever else you do for your children's musical education, give them keyboard lessons at some early point. Getting both hands involved and playing the bass and treble clefs will give them a solid musical foundation while helping hand-eye coordination. Human teachers are irreplaceable, of course, but with a little help and encouragement from you, Piano and Keyboard Method could teach your kids a lot.

As computer scientist and inventor Alan Kay once said, point of view is worth 50 IQ points, which puts me in the moron brigade when it comes to the latest dance/electronica software. I'm hopelessly mired in the linear world of chords, melodies, choruses, and refrains that make up songs. But when I showed Cakewalk's new Kinetic to multitalented DJ Cyzum (*www.konvocation.com/?s=cyzum*), he was like a seasoned pilot slipping into the cockpit of a plane he hadn't flown before—a quick orientation, and the next thing I knew, we were flying.

As new beats and sounds swirled around us, Cyzum peppered me with questions I couldn't answer. After we returned safely to earth, his main disappointment was that Kinetic can't function as a MIDI sync slave, although it will work as a ReWire client, which will please Sonar and Cubase users. If it sounds as if I've slipped into an arcane language, I have. Welcome to the burgeoning world of DJs and of the software that gets young bodies writhing at dance clubs all over the world.

BACK HERE ON MY PLANET

I'm much more comfortable with Guitar Tracks Pro, Cakewalk's 32-track analog recording suite. The latest version (3.0) shares its underlying technology with Cakewalk's highly regarded Sonar, but adds guitar-specific effects, including a guitar amp simulator that can substitute for a whole studio full of classic tube amps. You can record at a full 24 bits/96 kHz for maximum fidelity, and build a track at a time or record multiple tracks if you've got the hardware.

In keeping with modern software and musical styles, you can sample sounds and other music easily. I pulled the opening chords off a Roy Orbison song and looped them. I created a swirling effect with a pan envelope, moving the loop from left to right and back again. Guitar Tracks now supports Groove Clips, which, like Acid Loops, automatically adjust to your tempo.

I inserted a modern drum riff over the reverb-dripping Orbison chords. I sent the loop to a new track, grabbed a guitar, and recorded some riffs over the progression. I made up some dumb lyrics on the spot and recorded a voice track. It sounded pretty bad. I sampled my own voice track and turned it into a series of rhythmic chants. I decided to modify the background so that the Orbison chords and simple drum work would lead off, while the modern drumming would slowly insinuate itself into the music, then ultimately dominate the track.

If I hadn't stopped myself, this column would never have been written. But I gained insight into how sampling and editing can make a new musical statement. I learned enough to be dangerous, if not good. I'll settle for that.

Little feedback balloons pop up and tell you, "You held that note too long" or "You played too soon."

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

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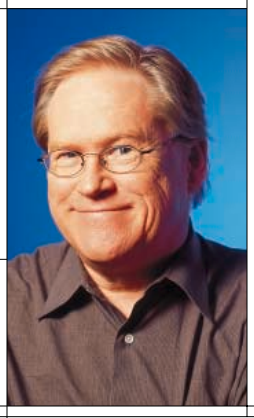

The Myth of Disruptive Technology

By Prof. Christensen's measure, the Daewoo car is disruptive technology. Are you scared yet, Toyota?

People love a good, unified explanation for the ways things are. One current favorite is the concept of disruptive technology, a coinage and concept put forth by Harvard Business School professor Clayton Christensen and explained in his book *The Innovator's Dilemma*. This guy has so many honors that apparently whatever he says is gospel. The concept of disruptive technology goes to the top of my list as the biggest crock of the new millennium.

A disruptive technology is defined as a low-performance, less expensive technology that enters a heated-up scene where the established technology is outpacing people's ability to adapt to it. The new technology gains a foothold, continues to improve, and then bumps the older, once-better technology into oblivion. Sounds good. The problem is that there is not one example of this ever happening. When boiled down, the notion is essentially a rewrite of the adage Adam Osborne devised to explain the mediocrity of the Osborne 1: "Adequacy is sufficient."

The theory goes on and on, with a seemingly reasoned explanation of how this unfolds. Christensen says the idea stems from his fascination with the collapse of Digital Equipment Corp. Eureka! The microcomputer came along as the cheap, inferior, disruptive technology, eventually supplanting the mini. "Throw out the VAX, Gomez, we've got an Apple II!"

No matter that the CEO of DEC was a screwball who thought advertising was only for proving to your mom that you worked for a real company. No matter that HP, IBM, and Sun continued to prosper selling "minicomputers"—though Sun has a zany CEO too!

The microcomputer was never a "less expensive" and "inferior" replacement for minicomputers. It was a more expensive and superior replacement for calculators and slide rules. It was never used "instead of" a minicomputer (or mainframe for that matter) but "in addition to."

Even the spreadsheet, which is what actually made the desktop computer popular, had no real antecedent except a pad and pen. It didn't replace anything better. It was new.

In the Harvard Business School alumni bulletin highlighting this nonsense, there is a list of supposedly disruptive technologies. Not one is disruptive. At the top of the list are electric cars supplanting gasoline vehicles. On what planet? Internet sales supplanting bookstores. Hmm, Barnes & Noble is packed with people. Restaurants are being affected by the disruptive technology of grocers' takeout. Are you laughing yet? Motorcycles being affected by the disruptive technology of dirt bikes—does anyone see a pattern here? Is this an April Fools' gag?

James Burke's marvelous PBS TV series *Connections* offers a better explanation for disruption. When there is true disruption, it comes from inventions, regulatory and social change, complementary technologies, coincidence, and demand.

The closest Christensen comes to a real disruptive technology is digital photography. But it was invented in 1972 and has never been "cheaper" than film. The atom bomb is surely disruptive, but neither cheaper nor inferior. The car replaced the horse, but it costs more, and it became a success because of the invention of pavement and the pneumatic tire; asphalt was never cheaper than or inferior to dirt.

There is no such thing as a disruptive technology. There are inventions and new ideas, many of which fail while others succeed. That's it. This concept only services venture capitalists who need a new term for the PowerPoint show to sucker investors.

One could almost make an argument for Linux as a disruptive technology. It's free, so that helps. But what is it disrupting? Microsoft? In 1992, when Linux was invented, Microsoft had about $2.2 billion in the bank. Now Microsoft has over $70 billion in the bank and continues to grow. Some disruption.

One problem in our society is the increasing popularity of false-premise concepts that are blindly used for decision making. The amount of money squandered during the dot-com era because of "paradigm shifts" and "new economies" is staggering. People actually believed that all retailing would be online and that all groceries would be delivered to the home as they were in the 1920s, despite changes that make delivery impractical. Who cares about reality? We have a disruptive technology at work!

The concept of disruptive technology is not the only daft idea floating around to be lapped up obediently by the business community. There are others. But the way these dingbat bromides go unchallenged makes you wonder whether anyone can think independently anymore.

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

Dongle Mem Dept.: If you haven't gotten on the USB thumb drive bandwagon, you will. These are the **diminutive** dongles that are loaded with memory that people carry around on their key chains. With capacities as high as 2GB, you can store important files, PowerPoint presentations, contact lists, and even executable software on them.

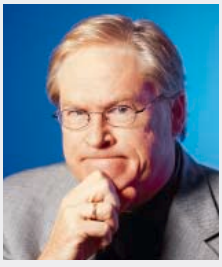
Now Microsoft and a few others want to **make the devices bootable.** You could then carry around a personal system on a dongle and boot rented or borrowed machines with your own environment. The little Migo device is built with this sort of thinking. In 2003, 23 million of these dongles were sold, and sales are expected to increase to **67 to 120 million** this year.

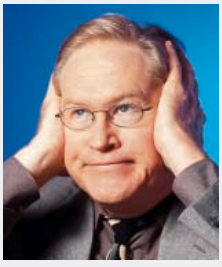
Already many of the makers are coming up with tricks to make the devices more secure. The newest dongle mem from Crucial Technology has a small file that runs a privacy program, making it impossible to use the device without a password. Eventually I expect to see many of these devices loaded with utility programs.

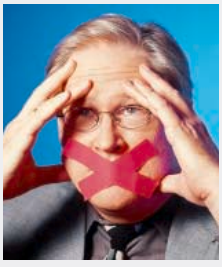
The Latest Roadblock to Linux Dept.: Now Microsoft is enforcing its patent for a long filename version of the FAT (file allocation table) version of its disk data format. Microsoft wants the Linux folks to stop using it. The company might opt for a license, but, golly, because of the GPL, it can't without getting itself into trouble. So stop using it! This situation is being debated everywhere. Since the FAT concept itself actually appeared on IBM **System 1** machines back in the 1970's, it's possible that Microsoft is infringing on something too. This all gets really funny when IBM is involved, since IBM owns so many patents.

I was chatting with a patent lawyer recently, **lamenting the horrid** number of patent suits going around. He said things have actually improved in that regard since the advent of the Internet. "The patents get a lot of publicity and people on the Internet come out of the woodwork citing prior art, killing most lawsuits." We'll see.

Genuinely Interesting Software Dept.: If you've been tempted to play with Linux but don't want to go through the process of installation or dual boot or other hassles, then the various versions of Linux Live are for you. These are **preinstalled** and semi-preinstalled versions of the software you **boot from a** CD **drive** and which run from that drive. The best one I've found is Knoppix Linux (the work of programming legend Klaus Knopper), available for download at *www.knoppix.com*. You download an ISO image, burn it to a 700MB CD-R, then boot it and go. This version is an **entire disc** of compressed files, and it might take all night to download. Included on the disc are games, an office suite, browsers, everything. The experience alone is worth the wait.







If you're tempted to play with Linux but don't want to go through installation, dual boot, or other hassles, then Live Linux is for you.

I have no idea how many machines this works on, but it booted easily on an Athlon 64 with a lot of new peripherals. With it I could immediately play around with the newest iteration of the KDE **interface,** which is in many ways far more advanced than the Windows XP GUI, with more slick Mac-like features. Outstanding work.

If you want to see some other implementations of the code, check out the Knoppix for Kids software, available at *www.osef.org*. Although this derivative iteration isn't quite as clean as Knopper's own, it worked better on the network (though worse on the Internet). It contains some fun kids' games and is also impressive. The best part is that it's **all free** except for the 10-cent CD-R. These and other "live" products will give you a nice feel for what's going on with Linux.

Genuinely Interesting Software II: As anyone who reads this column knows, I have a few favorite products. One of them is Disk Jockey, a **modern file manager** program, which helps you organize and view everything on the disk in ways not possible with Windows. The key to its success is its 232 file viewers that can work even with files with no extensions. It lets you look at proprietary-formatted files without having to own the originating software or use converters. And you can cut and paste everything. This is very handy when you are blowing through a lot of files, looking for something. It's been renamed File Viewer and is an absolute steal for $29.95. Go to *www.clear-simple.com* and get a copy. This is one of the most **satisfying** pieces of software you can own.

Genuinely Interesting Software III: Another perennial favorite is Cerious Software's peerless ThumbsPlus, a tool for photo viewing and editing and for Web-page generation. Features aside, this program has a leg up on the competition for **one main reason.** It can read more photo formats than any other program, including lots of **dead formats** like Kodak's defunct KDC format.

With a lot of competitive album systems out there, Cerious has once again upped the ante. Its upcoming Version 7 Pro will read all the **various** RAW **file formats.** As more people wisely begin to use RAW, they generally have to convert them to JPEG to get photo programs to catalog the photos. This becomes an **exercise in redundancy,** especially with a RAW-only camera like the Sigma SD-10. Boom. Problem solved. At around $90, this tool is a must for anyone who is into digital photography. Go to *www.cerious.com* for ordering information.

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Bill Howard

Geek-Free Home Automation

If the size of its standards committee is an indicator of success, ZigBee, with 62 vendors lined up, could be the next big thing.

One of life's ironies is that those of us who can dim the living-room lights and switch the stereo to soft jazz at the press of a single button are probably the geeks who can't get a date and take advantage of the romantic atmosphere.

No less an authority than the *Queer Eye* team recommends dimmed lights everywhere. And that is the core of home automation today: making the remote dimming of lights and switching of appliances work for as many people as possible. New technologies and products over the next year will make automation something to think about even if you don't safety-pin your eyeglasses' hinge.

The old faithful of home automation is X10, which dates to the late 1970s; its products can be found at Radio Shack and *www.x10.com*. X10 technology sends power pulses from a switch over your household current to a device. Maybe 95 times out of 100, half a second after you press the button, you get the desired result; say, the porch lights come on. Besides wall plugs for lights (dimmable) and appliances (switchable), there are X10 wall switches and even drapery pulls, thermostats, and lawn-sprinkler switches.

A generation of home AV and security installers have developed enough tweaks and workarounds to raise the X10 success rate to 98 times out of 100—good enough to turn the coffeemaker on but not good enough to turn it off. With PC-based controllers, you can make a PC or a wall switch turn on different lights at different levels.

You may lose one or two cheap X10 devices a year to power surges, so you're better off with Leviton or X10 Pro switches ($30 to $50 versus $10 to $20), or switches from direct suppliers like Home Automation Inc. (HAI) and Smarthome. Get a whole-house surge suppressor too.

X10 has other drawbacks: Most switches are one-way, so you can't confirm when they're activated. Lights controlled by the cheaper X10 switches have to come on at full brightness before they can be dimmed, which can be a mood-breaker. Most circuits are split between two 120-volt legs, which must be bridged; unless you install a coupler in your circuit breaker box, it may be difficult to signal the X10 devices that are not on the same leg of your home wiring. And X10 is mostly a wired technology.

X10 stalwart Smarthome recently announced a wired and wireless protocol called Insteon, which works with existing X10 devices. The 900-MHz Insteon wireless adapters also serve as bridges between the two legs of your home wiring. Insteon's drawback is that the wireless isn't standards-based; its ace in the hole is the installed base of X10 fans. Expect Insteon products in 2005, priced about the same as the X10 Pro series.

Another intriguing wireless protocol is Z-Wave, from Copenhagen-based Zensys. Z-Wave is a mesh network; every device that hears the signal passes it along, enabling you to reach throughout the house. The protocol is not standards-based, but Z-Wave has Intel's support (for creating a path to UPnP AV and PC devices). Sylvania sells a starter kit (two modules and a wireless controller) for $150; HomeSeer makes more sophisticated PC controllers and software.

If the size of its standards committee is an indicator of success, ZigBee, with 62 vendors lined up, could be the next big thing. It's a wireless mesh network that will control dishwashers, furnaces, and washing machines as well as lighting. Something like universal ZigBee (or Insteon, or Z-Wave) could reduce peak demand at power plants on the hottest days if it deferred washing dishes or clothes until late at night. Many analysts are bullish on ZigBee, though that could be because so many cover it. As with Insteon, ZigBee products aren't likely to appear until 2005.

Who will prevail? I suspect the winners will be the ones that Intel and Microsoft embrace. But I'm the last person to predict the future after having been sure X10 would be blown away in the 1990s by something called CeBus (now defunct). ZigBee has the most widespread support, Z-Wave works now, and Insteon can take advantage of the several million X10 homes. For appliance control, you'll likely need a new suite of appliances. Retrofits don't work, except for HVAC systems where the controller is the thermostat.

True home automation is about audio, video, security, and the Internet—as well as romantic lighting. Imagine a $200 Wi-Fi Pocket PC three years from now—bridged to Insteon, ZigBee, or Z-Wave—controlling your video, music, and lights and even browsing the Web. But even if this automation arrives too late to provide you with a romantic evening, perhaps your teenage children will thank you.

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.**

Degunking Your PC

Here are five ways to rid your PC of digital "gunk" and make it run faster and better. **BY JEFF DUNTEMANN**

Perhaps you've wondered, "Is it just me, or is my PC getting slower?" Well, your PC *is* getting slower, as what we affectionately call *gunk* collects in it. Gunk is data, files, and programs you don't need, and debris from applications you've uninstalled. It's the entropy of hard drive fragmentation, and chaos in the Windows Registry from abandoned or corrupted keys. It's spyware and adware, which beyond compromising your privacy can slow your PC and make it unstable.

All this is reversible, though. Once you've swept out your PC, it will be faster and more reliable. Discipline and good habits are important; with regular care, digital gunk will never get the better of you again.

Here are our top five PC degunking techniques. They're most effective when done in the order given.

☑ PURGE YOUR SENT ITEMS FOLDER

Nearly all e-mail clients keep a copy of every sent message. Though most messages are small, in aggregate their size quickly grows. If you mail large files, you may have many megabytes of them—most of which are stored elsewhere and can be deleted—saved in the *Sent Items* folder.

You can quickly free up some serious space while sparing the bulk of the messages. Open your *Sent Items* (or *Outbox*) folder, and make sure you have the *Size* column displayed in the message index. In Outlook Express, go to *View* | *Columns*, and click on *Size*. In Outlook, select *View* | *Current View* | *Customize Current View*, and then click on the *Fields* button (Figure 1). With *Size* displayed, click on the *Size* column header to sort the index by message size; then select the larger messages that you want to get rid of and delete them. Outlook 2003 contains a very useful *Large Mail* search folder that organizes all your mail by size, making it easy to spot really big messages.

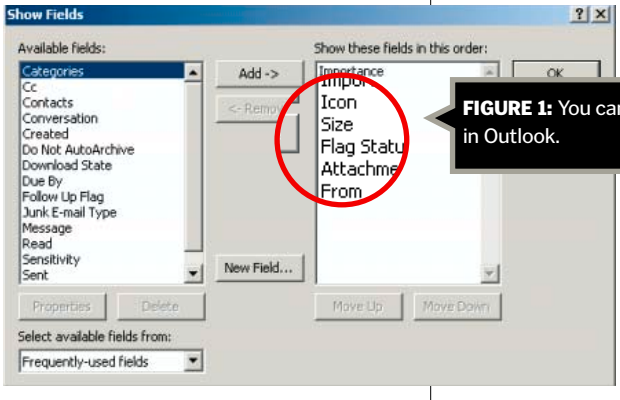

FIGURE 1: You can sort messages by size in Outlook.

Outlook also allows you to delete sent messages automatically after a specified period of time. Choose *Tools* | *Options*. Click on the *Other* tab and then select the *AutoArchive* button. One option lets you permanently delete items older than a specified age. For other e-mail clients, you may be able to write a filter that automatically deletes messages after a period of time, but the easiest way may be to sort your messages regularly by date, highlight messages older than 30 or 60 days, and then delete them as a batch.

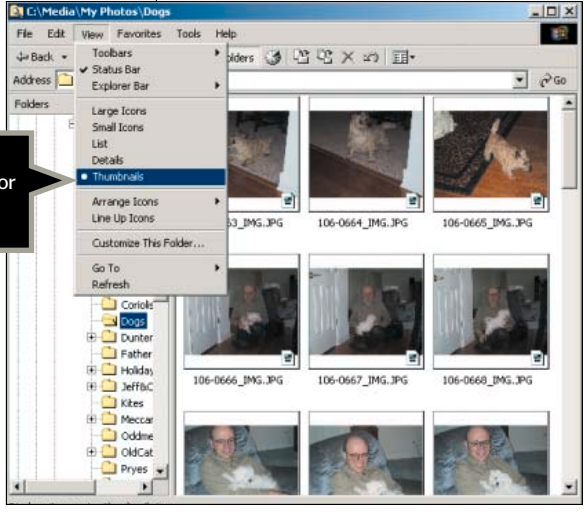

FIGURE 2: Use Windows Explorer's *Thumbnails* view for a quick look at image files.

☑ CONSOLIDATE YOUR MEDIA FILES

Nothing fills hard drives faster than digital media. Between digital photos, MP3s, rips of DVDs, and MPEG home movies, even an 80GB disk isn't so big anymore. Here are steps you can take to keep your media collection from devouring your hard drive.

Consolidate digital media under one folder. A logical place is under My Documents, where Windows already creates My Music and My Pictures subdirectories. You can make additional folders for videos, scanned images, and more. Your digital media will be easier to manage if it's all in one place. Backups will also be easier, because if you just want to protect your data, you need only back up My Documents. Should your C: drive, in which Windows places My Documents, fill up too quickly, you can move My Documents to another drive by right-clicking on *My Documents*, selecting *Properties*, and then entering a new target and clicking on *Move*. All the files will be sent to the new location.

Purge your digital photo archives of unneeded shots. Most of us save near-duplicate or bad shots. With higher-end cameras, they can take up several megabytes each. The easiest way to purge them is with a thumbnail viewer; Windows Explorer can act as a primitive one. From your photos directory, select *View* | *Thumbnails* (Figure 2).

64 HARDWARE: Working with RAW photos.
66 SECURITY WATCH: Clean up your system.
68 ENTERPRISE: Digital asset management.
73 USER TO USER: Tips and tricks.

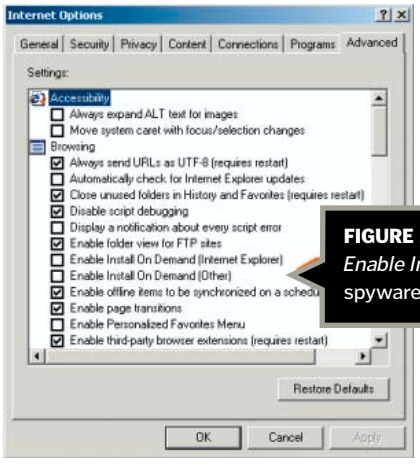

FIGURE 3: Uncheck Internet Explorer's two *Enable Install on Demand* options to protect against spyware/adware installation.

Many scanners and digital cameras come with better viewers. ZoomBrowser, which is bundled with Canon digital cameras, and Hemera Graphics Desk, which comes with HP scanners, are both excellent. With many shots visible at once, you can quickly eliminate failed photos and choose the best of several similar shots. If you really don't want to part with them, off-load them to a recordable CD or DVD.

Purge your digital video clips of bad shots and editing culls. Digital video files are huge, and raw dumps from a DV recorder contain much useless footage. One approach is that your hard drive is for *processing* videos, and DVD-Rs are for storing them. Try to develop the discipline of editing your video files soon after taking them, then immediately burn them to DVD.

Purge your music collection of duplicate song files. If you get your MP3s from various sources, you no doubt have duplicate tracks, especially if you don't use a database to manage your music. The problem stems from a lack of filename conventions. MP3 filenames may begin with a track, album, or artist name. But is "Norwegian Wood" under "The Beatles" or "Beatles, The"? (Or even "The Beetles"? Early on, file traders misspelled artist names to get around blocking systems.) Consider creating a file convention, then editing the names of your music files to follow it. This will turn up all the dupes: Windows won't let you have two files in the same directory with the same name.

You could also sort music files by size. This is best for files obtained online, which have often been renamed. In Windows Explorer, sort on size; duplicate tracks—which should be the same or very similar in size—will be adjacent and easy to spot.

Purge old versions of your artwork. If you create computer drawings or animations, you may have many old versions of each on disk. Unless an earlier version has an unusual technique, it's mostly wasted space. Force yourself to let them go—or at least archive them to CD or DVD.

GET RID OF SPYWARE AND ADWARE

You should eliminate spyware and adware. Many "free" utilities install a program that transmits details about your Web browsing habits to a server owned by an advertising company (if you're lucky). This process will tailor ads (often pop-ups) to your interests, but it may also bring a torrent of spam. Such programs are installed with little warning and are hard to remove. They slow your machine, clog your Registry, and may compromise your PC's network machinery.

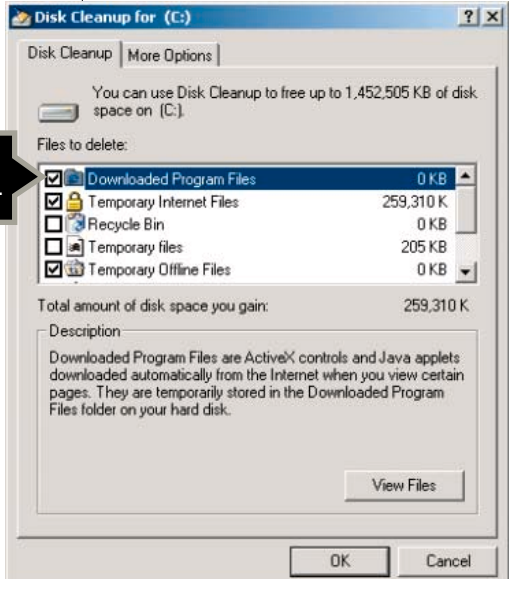

FIGURE 4: Windows Disk Cleanup lets you choose which files to delete.

And that's just the "legitimate" spyware. Related programs (and much worse) are Trojan horses that steal passwords and open network back doors into your PC for malefactors to exploit. They can also turn your PC into a spam proxy without your knowledge.

It's best to avoid installing spyware in the first place. Before you install a "free" program, see if it comes with spyware. Read the licensing agreement carefully. Also, go to Google and type the program's name, followed by "spyware." If spyware is associated with it, you'll find Web sites carrying other users' cries of agony.

Not all spyware is installed with another application; it may come from a Web site. A pop-up may ask if you want to install something and make it appear that it's a condition of entry. *Don't click on Yes.* Better, use a pop-up stopper utility, or a Web browser like Mozilla Firefox (*www.mozilla.org/products/firefox*) with a built-in pop-up stopper. (An upgrade to Internet Explorer in the forthcoming Windows XP Service Pack 2 will also have a built-in blocker.)

If your Web browser (particularly Internet Explorer) isn't configured correctly, some Web sites can install spyware *without asking permission.* IE6 has two options that you *must* disable. (On IE5 and earlier, only the first will be present.) Bring up IE, and select *Tools* | *Internet Options.* Click on the *Advanced* tab; under *Browsing* is a list of minor topics. The two to uncheck are *Enable Install on Demand (Internet Explorer),* and *Enable Install on Demand (Other)* (Figure 3). Then click on *OK.*

The most notorious spyware sources are file-sharing utilities, spam-promoted Web sites, and sites offering *sleazeware* such as porn, *warez* (pirated software), and *cracks* (tools to defeat software serial-number registration.) Stay away from these and your defenses won't be tested as often.

Some spyware goes to great lengths to avoid removal. Some nastier items modify the Registry and install small boot-time service routines: If removed, they will reinstall themselves from a hidden file!

The best way to get rid of spyware and

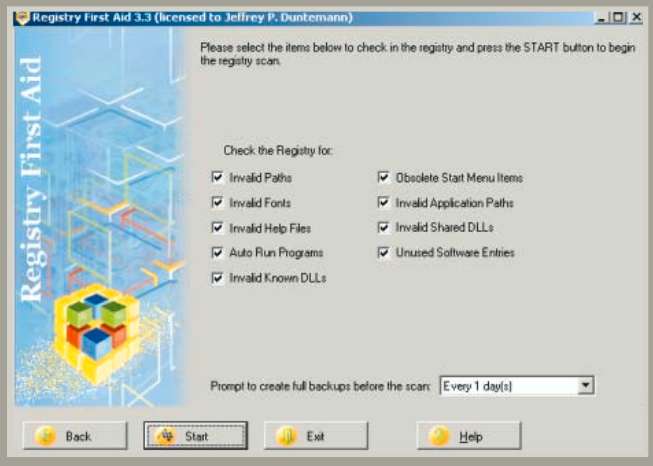

FIGURE 5: You can select which potential Registry problems you'd like Registry First Aid to check.

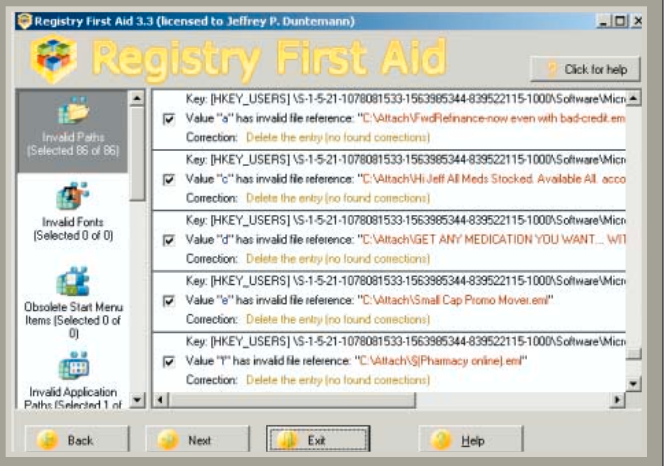

FIGURE 6: Registry First Aid displays a list of problem keys that you may want to delete.

adware is to use a utility that's specifically designed for this. Our current favorite is Webroot's Spy Sweeper (*www.pcmag.com/spystoppers;* $30 direct), followed closely by the free Spybot Search & Destroy (*www.safer-networking.org;* donations are encouraged). In addition to spyware, these programs remove cookies from known spyware and adware companies. Both programs are very easy to use; run them regularly to be sure that nothing sneaks past you.

☑ USE WINDOWS DISK CLEANUP AND THEN DEFRAG YOUR HARD DRIVE

Windows Disk Cleanup removes cached and temporary files from your PC. To run it, select *Start* | *Programs* | *Accessories* | *System Tools* | *Disk Cleanup*. Or you can start it from a button on the main *Properties* display for any nonremovable hard drive. Once you select a drive to clean, Cleanup will determine what it can remove—this may take a while—and then supply a list of file categories (Figure 4). Check the ones that you want to clear, and click on *OK*. If you're unsure about the files in a given category, you can click on the *Files* button to review them, but you're unlikely to find any tagged files worth keeping.

After using Disk Cleanup, defragment your hard drive. Windows 2000 and XP have a built-in defragging utility, which is in the same *System Tools* menu as Disk Cleanup. But you can have better, more reliable defragging with Executive Software's Diskeeper 8.0 Professional Edition or Raxco's PerfectDisk 6.0. Both received Editors' Choice in our recent Utility Guide (June 8; or *www.pcmag.com/utilityguide*).

Disk defragmentation will reverse a sort of entropy that gradually breaks down the files stored on your hard drive into small, scattered chunks. When you erase a file, Windows reuses that space. Deleting files opens up free space holes on your drive, which Windows fills as new files are created. Windows knows exactly where each piece of a fragmented file resides, but it has to do a lot more chasing in order to access the scattered fragments. Defragmentation reorganizes your hard drive so that its files are stored as single sequential blocks and thus reading these files can be done as quickly as is physically possible.

☑ CLEAN YOUR REGISTRY

Abandoned, incorrect, and corrupted entries in the Windows Registry top our list of gunk. Often people are terrified of trying to clean the Registry, having been told that doing so is about as safe as defusing a nuclear weapon.

There is some truth in this. The Registry is Windows' most vulnerable subsystem, in that relatively small changes *done incorrectly* can render the system unbootable. The Registry is crucial because it is the central database where Windows "remembers" how its thousands of pieces are configured and work together—everything from what color your title bars are to how Windows boots the system and what files it uses when it does.

As you install and uninstall applications, keys are abandoned or invalidated. Many applications store their lists of recently accessed files in the Registry, and as you move files around or swap removable media, keys representing these lists are invalidated and must be built again—adding still more keys to the Registry and slowing your system down. (Windows needs time to determine that a given Registry key is invalid, then it must search the Registry again for a valid instance of the same item.)

The safest way to deal with Registry gunk is with one of several excellent third-party Registry cleaners. V Communications' RegistryFixer, part of the company's Fix-It Utilities 5, is our current Editors' Choice in this category, as described in our Utility Guide (June 8, 2004).

Another decent product in the category is Rose City Software's Registry First Aid (*www.rosecitysoftware.com*). It's inexpensive ($21 direct) and extremely careful with your system. It backs up the Registry before each cleaning run and prompts you to back up your system through Windows Backup if you choose. It deletes only keys it knows it can remove without harming Windows; fortunately, these are the most common ones and the ones most to blame for system slowdowns. Registry First Aid lets you select what sorts of Registry problems to scan for (Figure 5). As the program scans, it builds a list of problem keys (Figure 6). Though the scan can take time, removing the bad keys takes just seconds. The program lets you schedule Registry cleanings regularly.

You may well have performed some of these steps before, but more important than any one technique is cleaning your PC *regularly* so that it lasts longer and runs better. The problem is neither you nor the PC: *It's the gunk.* Clean it out and become a degunking believer.

Jeff Duntemann is a writer, editor, and industry analyst specializing in system maintenance and wireless networking. He is a cofounder of Paraglyph Press and is a coauthor of Degunking Windows. *His latest book is* Jeff Duntemann's Wi-Fi Guide.

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HARDWARE

Photos in the RAW

The RAW format gives digital photographers unprecedented control in processing images. **BY DAVID CARDINAL**

Many midrange and high-end digital cameras offer the option to save photos in RAW format instead of JPEG. If your camera can do this, you've probably wondered what the RAW format's strengths are and whether you should try it. We'll walk you through how and when to shoot RAW, and how to make the most of your RAW images.

A RAW file is the unprocessed image data as captured by the camera's sensor. It is the photographic equivalent of the image captured by your eyeball before your brain has had a chance to process it. (See the example of RAW data together with the image of a race car in Figure 1.) Unlike a JPEG, for which your camera itself processes the image data before you ever view it, you must do all the processing of RAW files on your computer. This lets you fully customize settings, including white balance, sharpening, and tone. You can do some exposure correction, but you're still limited to what was captured in the initial image. RAW files also avoid the artifacts associated with JPEG compression. This isn't much of an issue unless you enlarge your prints to poster size or crop them quite a bit, but for purists, RAW preserves every bit of the original image, acting as a digital negative.

The most common reason to shoot RAW is to handle tricky lighting situations. Getting the color right in a digital image is hard, and the automatic white balance setting on your camera does not always work. But instead of worrying about setting the white balance, you can make your best guess, shoot in RAW mode, then change the white balance of the images later on the computer.

Figure 2 shows a standard JPEG image of Half Dome in Yosemite in the upper left and, on the right, the dialog box with options you can set for RAW file conversion using the built-in RAW processor in Adobe Photoshop CS. We've changed the color temperature to make the mountain appear warmer than it did in the shadows when the scene was originally photographed. We were also able to increase the saturation of reds and of the overall image. You can see the resulting image in the lower left.

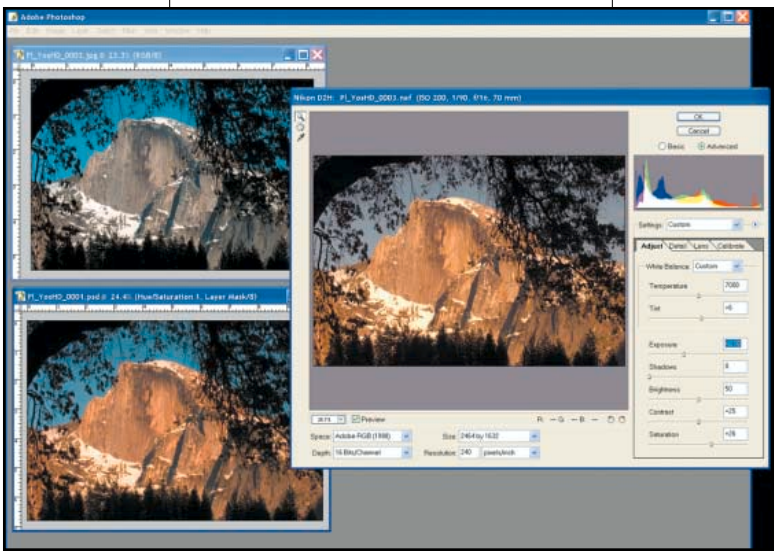

FIGURE 2: By shooting RAW, you can use software tools to change the color balance of your image and create warm sunlit tones, even if the image was shot in cool light.

The disadvantages of RAW files are that you need to process them, they take more disk space than JPEGs, and not all image browsers let you view them. You can process them with the software provided with your camera, with the built-in RAW file processor in Photoshop CS, or with certain other graphics programs.

For those who miss having a film darkroom, RAW processing gives back to photographers some of the creative control they had when developing film and printing negatives. To extend that analogy, RAW is much like shooting film negatives, while JPEG is closer to shooting slides. With slides, the image is complete the moment you press the shutter, whereas with negative film you need to perform additional steps to create the final printed image.

FIGURE 1: Digital camera sensors capture only one color per sensor, depending on the tiny filter placed over that sensor. This results in a mosaic of red, green, and blue, as shown in the raw sensor data. The data is then "demosaiced" to create a more typical RGB value for each pixel. Finally, the data is adjusted for the contrast (gamma) of your display and for pleasing color.

Complete car image (processed).

Raw sensor data of the number 7 on the car.

"Demosaiced" data.

Gamma- and color-corrected data.

David Cardinal is a professional photographer and software author. He publishes the Web site nikondigital.org *as an information resource for serious photographers and sells DigitalPro software through* proshooters .com. *He is coauthor of* The D1 Generation *and teaches digital photography throughout the United States.*

MPC recommends Microsoft® Windows® XP Professional.

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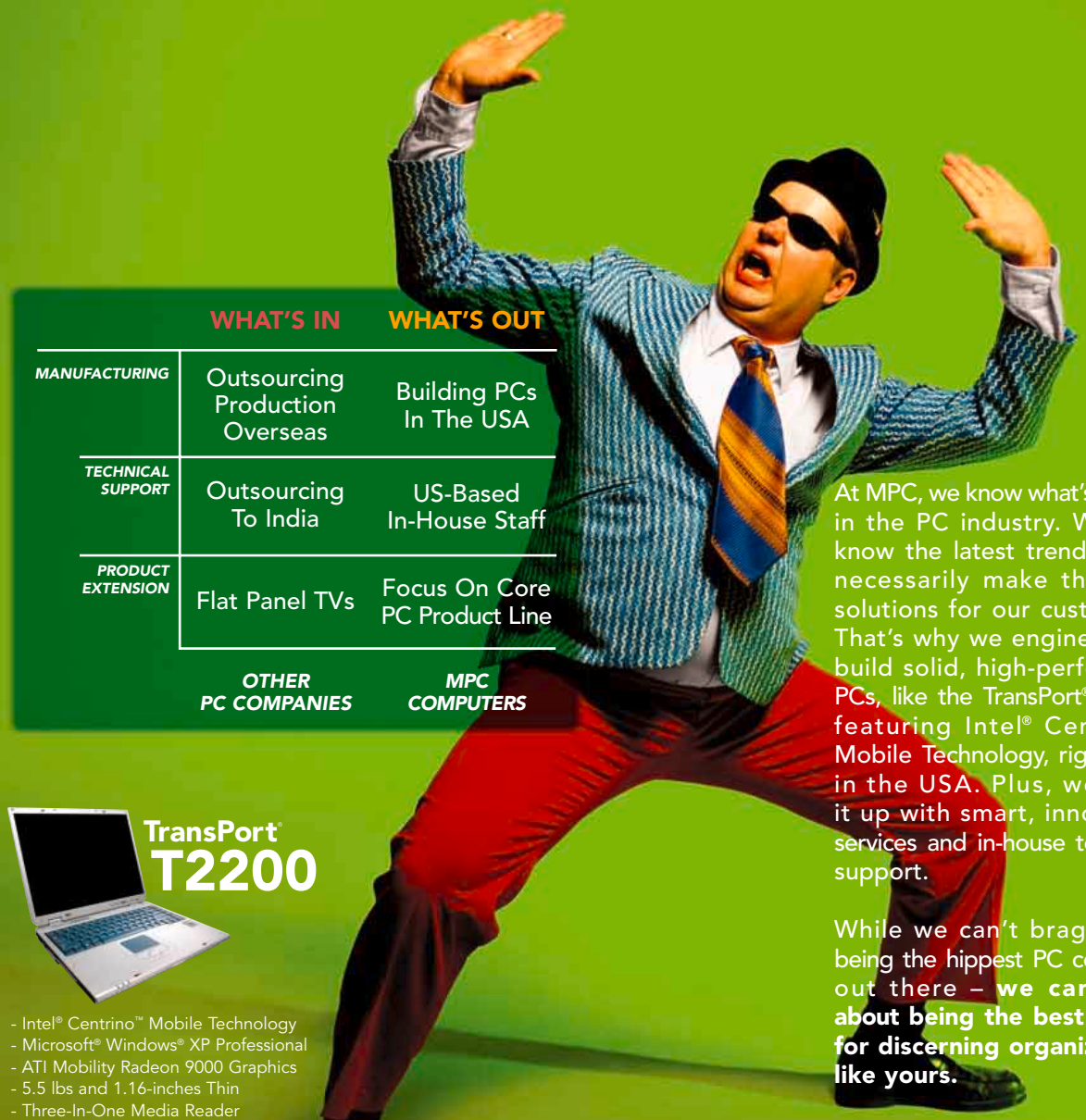

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SECURITY WATCH

Disinfecting Your PC

If malware knocks your computer off-line, you can still turn the tables on it. **BY LARRY J. SELTZER**

What would you do if your Windows computer suddenly became unresponsive? Or if you could no longer access the Internet?

Viruses and spyware can cause that, even when you're running up-to-date protection against them. Tools aren't perfect, and it's possible that some malware sneaked by.

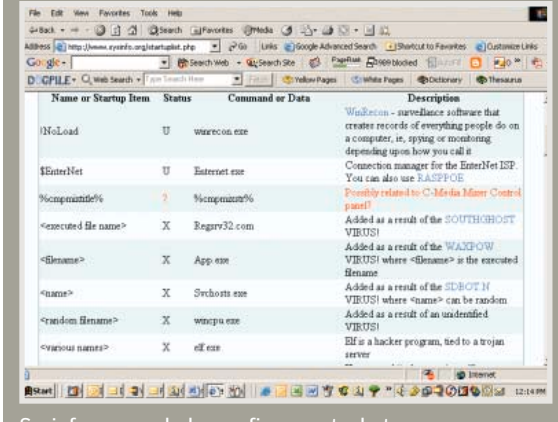
If you can't get online, you're stuck with the tools built into Windows XP. Your first step is to reboot into Safe Mode. This will prevent much of the software on the system from loading, including whatever might be causing your problem, but will still leave you in a position to correct it. To get into Safe Mode, press F8 as soon as your system beeps on bootup and select the appropriate option from the menu that appears.

One way to get back to a working state is with System Restore, accessible from *Help and Support* on the *Start* menu. Unless you've told it not to, Windows periodically saves the system state so you can restore it relatively easily. System Restore undoes changes such as program installations, intentional or otherwise, but leaves your documents and most other changes untouched. It's a rather coarse tool, though, and you might want to avoid endangering other changes you've made—or perhaps you've already disabled it.

A better way may be to take a surgical approach to cleaning your Windows startup. There are a dizzying number of ways, which malware can exploit, to start programs when Windows boots. Windows XP comes with two programs you can use to check what's launching at boot time.

The better program for viewing the information is System Information, located in the System Tools section of the Accessories group on the *Start* menu. Click on *Software Environment,* then *Startup Programs.* You'll see a list of the programs that start with Windows, including in each case the actual program location and parameters, the user name under which it is run (or an indication that it's run for all users), and the location of the command to start it with Windows—either a Registry key or a folder.

But what are all these programs? If you have another system that can still get online, or a friend to help you over the phone, you can search a database of start-up apps at *www.sysinfo.org.* If not, you'll have to guess, based on each program's location and the trial and error of removing it.



Sysinfo.org can help you figure out what programs are being loaded at start-up.

Unfortunately, System Information is read-only. You can't change the settings. The safest way to proceed is with Windows' System Configuration utility (click on *Start,* select *Run,* then type *msconfig* and press Enter). The narrow window is not resizable, but you can double-click on the column separators to make them fit the width of the data. Click on the *Startup* tab to reveal a list of programs with much of the same information you saw in System Information. Uncheck the programs you want to disable, close the utility, and reboot and those programs will not load.

If this hasn't gotten you back online, your problems may lie in Internet Explorer. These difficulties are often caused by programs called Browser Helper Objects (BHOs). They plug right into IE, adding toolbars and changing behaviors, often for the worse. Many tools for removing BHOs exist, but without Internet access they're probably not available to you. You do have Windows' Registry Editor, through *Start | Run | regedit.* (The instructions that follow require you to know what you're doing in Regedit. If you don't, you run a serious risk of making things even worse.)

Click on *Start | Run* and type *regedit* to start. Browse on the left side to this key: *HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\Browser Helper Objects.*

The keys that you'll see each have a class ID (usually written as "CLSID"), which is a 128-bit value like {06849E9F-C8D7-4D59-B87D-784B7D6BE0B3}. Each of these keys corresponds to a BHO loaded by Internet Explorer; a feature at *www.sysinfo.org* identifies the BHO that corresponds to each CLSID.

You could prevent Internet Explorer from loading BHOs by deleting them from below the Browser Helper Objects key, but we wouldn't advise it. Just right-click on a given BHO's key, select *Rename,* and add *NOLOAD* or the like to the front of the key. This will stop the BHO from launching and is easily undone if need be. Quit Internet Explorer; when you restart the browser, it should be BHO-free.

These steps may not be a cure-all, but they should be enough to get you back up and running and online.

Larry Seltzer is the editor of eWEEK's online Security Center (security.eweek.com).

THE LOOKOUT

URL PARSING BUG

A bug in fully patched versions of Microsoft Internet Explorer allows violations of the Web browser's security zones, with the result that an unknown malicious site could assume the privileges of more trusted zones.

The same vulnerability could be used for phishing attacks, in which the URL in the address bar appears to be for one site but is in fact a link to a different site. Both of these problems rely on certain misconfigurations of the DNS and Web server on the malicious Web site.

For more information on this, read the complete article at *www.pcmag.com/urlparsingbug.—LJS*

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ENTERPRISE

Hungry for Video

Digital asset management helps Scripps Networks deliver television shows on demand. BY SARAH L. ROBERTS-WITT

Who among us wouldn't like to remodel a living room for $1,000 or make crispy duck salad with bitter orange vinaigrette in less than 30 minutes? Any fan of Scripps Networks' collection of home and hospitality cable channels, which includes The Food Network and Home & Garden Television, and which currently has a combined 209 million subscriptions, knows such things are possible.

The problem for most people is finding the time to watch the programs that offer those tips, which is why Scripps now delivers video content to consumers via both the Internet and digital cable. For individuals who subscribe to either service, segments from popular series like *Before and After* and *30-Minute Meals with Rachel Ray* are literally at their fingertips. What makes this possible on the back end is Scripps' digital asset management (DAM) system.

When DAM first surfaced in the mid-1990s, it was primarily a technology for helping media, entertainment, and advertising companies archive and access their video files more effectively. Since then, DAM solutions—like those from Artesia Technologies; INSCI, which now owns DAM pioneer WebWare; and Vignette, which recently acquired MediaBin—have evolved to manage a veritable smorgasbord of digital assets from video to audio to digital photographs and other images. Typically, the files are stored in a single repository and assigned metadata tags that describe the various media types and contents. The files can then be accessed and edited by accompanying browser-based client software.

In addition to the core audience of media companies like Scripps Networks, organizations in finance, retail, and government are now using DAM. This expansion is reflected in growth projections. Research firm IDC expects the DAM market to reach $1 billion in revenues by 2007, which translates to a compound annual growth rate of 30 percent. And according to Frost & Sullivan, the DAM market will grow from its current level of $330 million in software licenses and service revenues to $2 billion by 2012.

Scripps Networks started working with DAM technology two years ago, when the company decided to overhaul its asset management strategy. "We wanted to be able to reuse all our digital assets for Web sites and on-demand video, and DAM is obviously a critical part of that," says Karen Fitchpatrick, director of media applications for Scripps. After evaluating several products, Fitchpatrick and her team eventually landed on WebWare Active Media.

Today, video from all four channels is sent directly to Scripps' duplication center, where it is automatically encoded and entered into the WebWare system. Using a homegrown content-tracking system, Scripps' employees can access information about video that is currently in production, already archived, or available for video-on-demand or broadband distribution. Available video titles are then distributed to Scripps' cable service and broadband partners, including Comcast, MSN, and Time Warner.

Once the files are distributed, users are free to view them at leisure. "If you want to see a compilation of segments on bathroom remodeling, you just go to the appropriate digital cable channel, select that topic, and watch away," Fitchpatrick says. "You can pause, fast-forward, or rewind the video; everything is on demand."

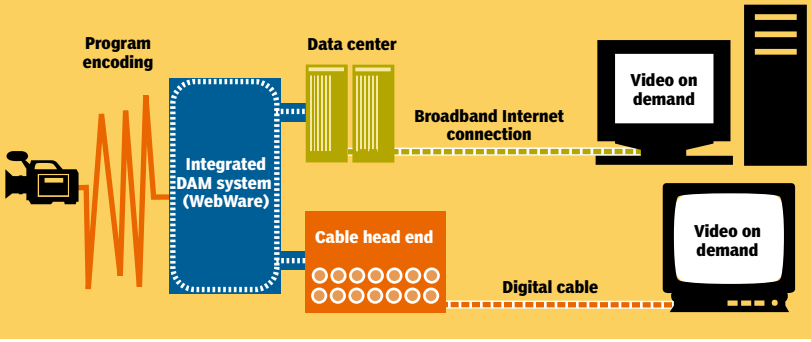
Broadband Internet subscribers at either a Comcast or MSN Web site can also view on-demand videos. Some videos are also available on *fineliving.com, hgtv.com, www.diynet.com,* and *www.foodnetwork.com.* Today, these are served from a different system, but those files will eventually migrate to WebWare.

Scripps has only scratched the surface of what is possible with its DAM systems, according to Fitchpatrick. On the technical side, the company will continue to develop the content-tracking system so that all of its 900-plus employees can access the Scripps library of digital assets for distribution and promotional purposes. This system, along with capabilities from WebWare, will eventually let Scripps build much more customized on-demand videos that contain bundles of segments from multiple programs. In addition, still photographs will eventually be embedded into the videos to provide step-by-step outlines of any number of home improvement or culinary projects.

All this means that lots more options are on the way for consumers hungry for advice on how to prepare the most succulent meals, pick the best wine, or overhaul the dining room.

A Smorgasbord of Digital Assets

Scripps Networks' collection of home and hospitality cable channels, including The Food Network and Home & Garden Television, are available on demand to paying subscribers. A digital asset management system from WebWare keeps everything organized. Scripps distributes video titles via its cable service and broadband partners including Comcast, MSN, and Time Warner. The plan is to fold the entire video collection into the system.



Driving Business Efficiencies Through Your Imaging & Printing Environment

When it comes to lowering costs, one of the last places that organizations look is their imaging and printing environment. With the right tools in place, significant savings can be realized.

Never has there been more pressure on organizations to improve operational efficiency and productivity. They must do this to be competitive—the global marketplace has never been a tougher place to do business. They must do it to satisfy the demands of emerging regulatory requirements—violators of the Sarbanes-Oxley and Health Insurance Portability and Accountability acts face big fines and even jail sentences. And they must do it simply to lower costs.

The fact is, we have arrived at a time when doing more with less, maximizing potential and minimizing budgets are all part of the same mantra. Yet despite the reasons for change, many C-level executives and top technical managers have often overlooked or not been aware of the increased savings and decreased total cost of operations that are waiting to be realized from a coherent, well-organized imaging and printing strategy.

Most businesses can save up to 30 percent of document production costs annually if they properly manage their printer, copier, fax and multifunction product fleets.[1]

Research results from International Data Corp. confirm the seriousness of the situation. According to IDC, few companies have assessed their imaging and output infrastructures with the goal of optimizing their hardcopy deployment. So why haven't more corporations tapped into these potential cost savings?

PARADIGM SHIFT

There are several imaging and printing-related technology trends impacting IT environments today that must be understood and assimilated if companies expect to lower costs and increase productivity. First, e-mail—which has become indispensable to nearly all businesses—means *more* printing, not less. Research shows that printing in organizations increases by up to 40 percent when e-mail applications have been introduced.

Second, even the most basic tenets of printing have undergone significant change. For example, the long-standing print-then-distribute paradigm has been turned on its head. Now, instead of printing documents at central printers or presses and distributing them physically via mail or courier, documents are *distributed electronically* and then *printed locally* at the discretion of the recipient.

A shift away from copying and towards printing has also occurred. Surveys have shown that most copy jobs are relatively small. As a result, users have transitioned from making copies to printing multiple originals on devices closer to them.

These changes mean that the right imaging and output devices must be available to end users in order for them to maximize their productivity levels. However, this is often not the case. Despite the business-critical value of properly organizing these devices, they remain scattered haphazardly throughout organizations where they are frequently underutilized.

Further complicating matters is the astronomical growth rate of all forms of data. This runaway growth is placing a heavy load on imaging and printing environments. So heavy, in fact, that Internet/intranet access and digital convergence are creating a new model for printing and sharing documents. As a result, businesses are moving to different workflow processes through which digital and paper-based content must be integrated and utilized, whenever and wherever needed.

Finally, the highly fragmented profit-and-loss responsibility for various elements in the imaging and output environment may well be standing in the way of optimizing cost structures. Networked devices such as printers and scanners, for example, are typically maintained by IT organizations, while standalone copiers and fax machines that may be located next to the networked devices are managed by a separate facilities organization. This fragmented management structure leads directly to inefficiency because no single department can ensure that hardcopy devices are optimally deployed in an organization.

FRAGMENTED RESPONSIBILITY MAY INCREASE COSTS

Part of the reason why imaging and printing costs are higher than need be is fragmented P&L responsibilities. This leads directly to inefficiencies, since no one department can ensure that all devices are optimally deployed.

Direct Costs	Responsibility
Help desk	
Printers, MFPs and digital copiers	IT
Copiers, fax machines	Facilities/operations
Hardware/supplies	
Hardcopy devices, ink/toner	IT, department managers, facilities/operations
Storage (square feet and labor)	
Ink, toner, media; paper document archives	Facilities/operations
Records management	IT and department managers
Outsourced hardcopy jobs	Facilities/operations and department managers
Copy center and mail room	Facilities/operations
Fax	Telecommunications
Indirect and Soft Costs	**Responsibility**
Employee productivity	
Time lost due to device downtime	IT, department managers, facilities/operations
Time to retrieve or recreate documents (paper or electronic)	Department managers
Unrealized revenue	
Lost documents preclude invoicing	Finance department
Opportunity costs	
Data not in right place at right time	Companywide

Source: IDC, January 2004

THE HIGH COST OF DOING NOTHING

Given the enormity of these changes, coupled with tight budgets and lack of centralized control, it's no wonder that many corporations are saddled with outmoded imaging and printing infrastructures that are more of a liability than an asset. Indeed, even if devices are used regularly, many still lack what is now considered to be baseline functionality—such as intelligent networking capabilities that enable both local and remote management. Regardless, companies hang onto these devices because they may not have thought out long-term imaging and printing strategies, which means there is no compelling reason for replacement.

The costs of maintaining these devices can be prohibitive. For example, excessive support and maintenance expenditures comprise some 60 percent of printer and copier costs, while the other 40 percent are attributable to less obvious costs such as deployment and configuration, updates and upgrades, problem resolution/help desk and software.

How much money is actually at stake? Data from Gartner indicates that the savings opportunity can be substantial—from 10 percent to 30 percent of print spending annually.[2] For example, if a company's annual print spending ranges from $5 million to $15 million (typical for a business that generates $500 million per year in revenues), it could save up to $4.5 million per year. These savings may be achieved in part by deploying multifunction products.

There is also a substantial opportunity cost associated with settling for the status quo. This cost must be paid as a result of eschewing such productive new technologies as scan-to-function, security, private print, wireless and color.

And those holding out for the advent of the paperless office may have to wait longer than they expected. According to IDC, in 2002, 1.49 trillion document pages were printed annually by U.S. companies and consumers. That number is expected to burgeon to 1.84 trillion pages by 2006.

Inefficient workflows, excessive help-desk calls and runaway energy costs that aging technology may create further contribute to the same, inevitable conclusion: The time is *now* to rethink imaging and printing strategies. Some productivity champion must step up and take action against this disorganization. The cost of doing nothing is just too high.

MAKING THE MOVE TO MULTIFUNCTION

The tremendous pressure to increase operational efficiency and productivity while reducing costs provides the perfect backdrop for the implementation of a cost-efficient imaging and output strategy. Indeed, there has never been a better time to replace aging and underutilized devices with up-to-date hardware and software. Even if time, dollars and productivity have been lost, the competitive playing field is still relatively level. However, the competitive landscape may soon tilt in favor of those organizations that get their imaging and output acts together first.

Businesses must commit to an imaging and output deployment strategy that relies strongly on a mix of multifunction products—including printing, copying, faxing and scanning capabilities—as well as single-function devices. These MFPs and all other hardcopy devices can be deployed as part of a sensible strategy that consolidates and reduces the number of devices under management. This, in turn, can increase user productivity and create new workflow processes that can be employed to accommodate corporate governance regulations and other infrastructure demands.

MFPs make a great deal of sense for corporations today because they can help to save time, money and space, while enhancing performance, maximizing assets and reducing network connections and traffic. They may also assist companies with lowering telecommunications costs, enhancing output quality and improving reliability. That's a lot of dollars gained for a relative few invested.

'Organizations are incurring excessive costs for extra footprints, supplies, maintenance and help-desk support because printers, copiers and fax machines are not managed.'—International Data Corporation

KEY MFP BENEFITS

- Save time, money and space
- Increase performance
- Improve reliability
- Lower telecommunications costs
- Enhance output quality
- Reduce network traffic and connections

Gartner concurs. "Most enterprises can trim their document output fleet spending by 10 percent to 30 percent while increasing the level of service they provide to users.

"However, they must pay closer attention to their multifunction products and printer fleets, first gathering information about the current state and determining the needs of each organization. Then they can employ a number of strategies to match the characteristics of the fleet to the needs of the organization. Enterprises that do so can expect large and recurrent savings."[2]

SOLUTION: HP

The HP Total Print Management integrated family of hardware, software and services—including leading-edge MFPs—can increase user productivity and reduce the total cost of end-user imaging and printing environments by up to 30 percent annually. As part of this methodology, HP recommends a balanced deployment strategy employing multifunction products, as well as single-function devices when appropriate.

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Part II: How to lower costs and drive efficiencies with HP Total Print Management solutions and multifunction devices.

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[1] "Small Businesses: Manage Your Printers to Save Money in 2004," Gartner, March 2, 2004.

[2] "Printer and Copier Fleets: The Gold Mine in the Hallway," Gartner, August 19, 2003.

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They multifunction, multitask and multi-simplify.

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USER TO USER

PC MAGAZINE'S COMMUNITY OF EXPERTS AND READERS

Use a Formula as a Named Range in Excel

Regarding the article "The Ultimate Sum Formula in Excel" (*www.pcmag.com/article2/0,1759,1401321,00.asp*): I have a better way than those complex formulas to sum all cells above a certain point. Define a named range as =OFFSET(A$1,,ROW()-1) and call it A. Do this step while the cursor is in column A. Now define a second range name S as =SUM(A). Enter the simple formula =S anywhere on the current sheet and it will calculate the desired sum of all numbers above.

To make this work for any sheet in the workbook, modify the range name A to read =OFFSET(INDIRECT("R1C",),,,ROW()-1). This formula is slightly longer than the previous one, but it does not require matching the cell address to the current column when creating the formula, and it will work in any sheet of the workbook. Leave the second name unchanged, and the rest of the process is the same.

SHANE DEVENSHIRE

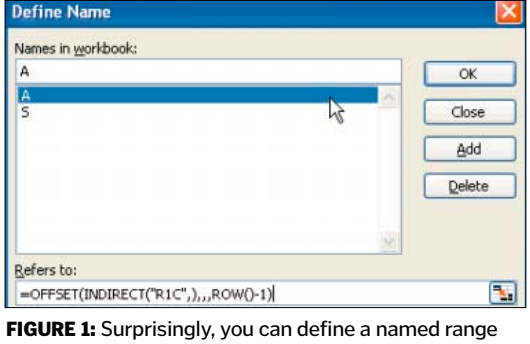

FIGURE 1: Surprisingly, you can define a named range with a formula.

Although this technique is not a formula as such, it reveals amazing possibilities. Most of us have probably assumed that named ranges can only refer to—well, ranges—rectangular areas of cells on the worksheet. The idea that a named range can be defined by a formula is surprising.

For those less familiar with using named ranges in general, here are more detailed steps. Select *Insert* | *Name* | *Define* from the menu. In the edit box at the top enter A, and in the "Refers to" box at the bottom enter =OFFSET(INDIRECT("R1C",),,,ROW()-1), then click on Add. Enter S and =SUM(A) in the same way, click on Add again, and click on Close. Now you can sum all the numbers above any cell by entering =S. Insert or delete rows at will; the result will always be the sum of all the numbers above the cell.—*Neil J. Rubenking*

Merge to E-Mail

I use Microsoft Outlook and maintain a distribution list for a group I belong to so that I can send a weekly newsletter. Lately I've run into a problem, though. My ISP rejects the e-mail going to the list, apparently because of the number of recipients (about 50). According to Comcast, the only way I can get around this is to send to just a few names at a time, which certainly defeats the purpose of a distribution list! Are there any other workarounds so I don't have to spend an hour typing in a few names at a time?

JIM TRAXLER

In Word 2002 and 2003, the mail-merge feature includes a Merge to E-Mail option. When used this way, it sends individual e-mails to the list of people you select. Word can merge directly from your Outlook Contacts list, but it doesn't handle distribution lists. Create a new folder within Contacts to hold your list, then copy the members from the list to this folder.

Launch Microsoft Word 2002 or 2003 and select *Tools* | *Letters and Mailings* | *Mail Merge* to bring up the mail-merge wizard. Choose *E-mail messages* and click on *Next: Starting document*, then click on *Next: Select recipients.* Click on the option *Select from Outlook contacts* and click on the *Choose Contacts Folder* link. Select the folder you just created and click on *OK*. You'll see a list of recipients; click on *OK* again. Proceed through the remaining steps of the wizard, creating your e-mail, possibly adding a personal greeting, and previewing the results. When you're ready, click on the *Electronic Mail* link on the wizard's last page. Word will e-mail a separate message to each recipient.—*NJR*

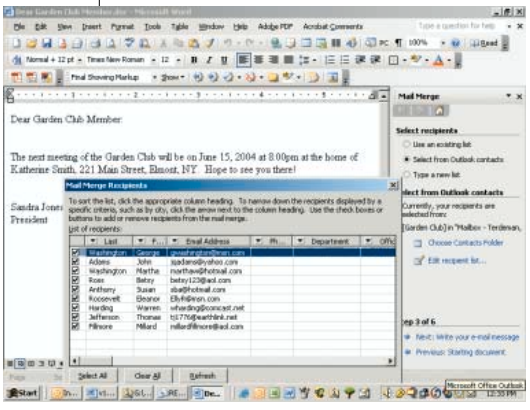

FIGURE 2: If your ISP won't let you send e-mail to a large number of recipients at once, you can use Microsoft Word's Merge to E-Mail feature to accomplish the same thing.

Drive Capacity Discrepancy

I was wondering if you could tell me what's up with hard drive capacity. Mine, for example, was advertised as a 20GB drive, but when I look in Properties, I see only 18.6GB. I've also been shopping around for a new computer for some time, and I have seen a discrepancy of as much as 40GB in the larger drives. I've heard this is because of the operating system, but I can't believe 40GB is taken over by the OS.

JERRY F.

This question comes up fairly frequently, and it doesn't have anything to do with the operating system. The problem is this: In Windows Explorer and other software applications, terms like *megabyte* and *gigabyte* refer to powers of 2, while in the hardware industry they tend to refer to powers of 10. One kilobyte in software is 2 to the 10th power, or 1,024 bytes. In hardware it's 10 to the 3rd power, or 1,000 bytes. The discrepancy mounts as sizes go up, as the table shows.

The idea that a named range can be defined by a formula is surprising.

E-mail viruses attack through either attachments or HTML code.

BINARY VS. DECIMAL MEASUREMENT

	Kilobytes	Megabytes	Gigabytes	Terabytes
Binary	1,024	1,048,576	1,073,741,824	1,099,511,627,776
Decimal	1,000	1,000,000	1,000,000,000	1,000,000,000,000
Difference	24	48,576	73,741,824	99,511,627,776
Percent difference	2.34%	4.63%	6.87%	9.05%

Take away 6.87 percent of your drive's stated capacity of 20GB and you get 18.6GB. If you could purchase a 1-terabyte drive, its actual capacity would be short by nearly a tenth of the capacity it would have had if measured in binary terabytes.—*NJR*

Printing in Black

I prefer to print some of my photos in black and white, rather than in color, for artistic effect. I was disappointed to find that the photo printer I recently bought prints black-and-white pictures with a distinct brown tinge. Is there any way to correct this?

BRIAN C. WILLIAMS

The reason for the tint is that the black ink in most ink jet printers can't print on glossy paper. So to print black or gray, the printers have to mix cyan, yellow, and magenta inks to create what's called composite black. If the pigments were chosen perfectly and exactly color-balanced, they would mix together to create true grays and black. In the real world, however, composite black often shows an obvious tint—whether blue, green, pink, or brown. Even if you get neutral grays with one set of inks, a tint may show up when you change to a cartridge from a different dye lot.

A few high-end printers come with a utility to balance colors each time you change ink, but if your printer doesn't have such a utility, there's not much you can do. If you don't insist on having glossy prints, you might try printing on matte photo paper, to see whether the printer driver will use black ink instead of composite black on that paper. If that doesn't work, and you're serious about black-and-white photography, you should consider getting one of the few printers with black or gray inks that work with glossy paper. Canon's i860, for example, uses two black-ink cartridges, one for glossy paper and one for other papers.—*M. David Stone*

Reading E-Mail Safely

I am very concerned about keeping viruses off my system. But I don't really know if the procedure that I follow to try to avoid them is of any use. To read e-mail messages, I choose the option to view the message source. A window pops up where I can read the message and all the information about it. Is this a safe way to view messages?

P. M. TEETERS

The best way to prevent a virus from infesting your system is to install an antivirus program and keep its virus definitions updated. But even up-to-date antivirus software can miss a fast-spreading attack within the virus's first several hours in the wild, so using additional techniques to prevent infection isn't a bad idea.

You can halt e-mail viruses without digging into the source code. E-mail viruses attack through either attachments or HTML code. Never open any executable e-mail attachment, no matter who sent it. Never open any other attachment unless you expect it and know the person it comes from. To avoid attacks using HTML code, view your messages as plain text. In Microsoft Outlook 2003, select *Options* from the *Tools* menu, click on the *E-Mail Options* button, and check the box titled *Read all standard mail in plain text*. If you decide later that you want to see a message in its original format, you can click on a button to display it as HTML or as Rich Text.

In Microsoft Outlook Express 6, select *Tools* | *Options,* click on the *Read* tab, and check the box titled *Read all messages as plain text*. Viewing the actual message is not as easy in OE, as it gets sent along as an HTML attachment. You must launch the attachment to see the message, and OE is set to block attachments by default. To read the message you will have to turn OE's blocking of attachments off temporarily. Bring up the *Options* dialog again, click on the *Security* tab, and uncheck the box whose text begins *Do not allow attachments....* Be sure to turn that option on again afterward.

Viewing the source code isn't any safer than reading the message as plain text, but if the idea intrigues you, here's how. In Outlook Express 6, right-click on the message subject in the Inbox, choose *Properties,* click on the *Details* tab, and click on the *Message Source* button. In Outlook 2003, you can simply right-click in the message body and choose *View Source.* The header data will be displayed separately. To see it, right-click on the message subject in the Inbox and choose *Options.*—*NJR*

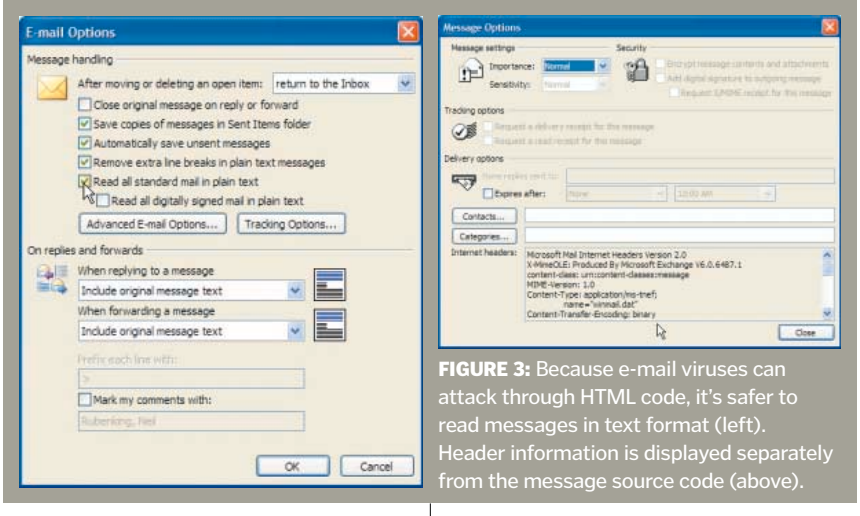

FIGURE 3: Because e-mail viruses can attack through HTML code, it's safer to read messages in text format (left). Header information is displayed separately from the message source code (above).

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17th Annual Reader Satis SURVEY

Computers should work right. When they don't, the manufacturer should be there to help. Who's doing a good job, and who isn't? Here's what you told us. By Cade Metz

Five days after its warranty expired, Jerry Shipley's Toshiba Satellite went on the fritz, its USB port turning on and off at random. "Over and over again, my external keyboard and mouse would just quit working," says the telecom consultant from Frederick, Maryland. When he phoned Toshiba, the company agreed to fix the problem free of charge, despite his expired warranty. Toshiba sent Shipley a packing box with prepaid postage. He shipped the laptop back to Toshiba, which returned it a few days later, with a new motherboard.

Unfortunately, not only was the USB port still problematic, but the system had become terribly unstable, crashing every few minutes. This time Toshiba refused to help, attributing his problems to a hard drive he'd installed several months before. Shipley took the system to a local repair shop and paid a technician $95—only to hear that the hard drive was in perfect working order.

Shipley phoned Toshiba again, explaining the latest wrinkle, and, to his surprise, the company did a complete about-face. It didn't just fix his problems, it also mailed him a check for $95. "I've had my Toshiba notebook for three years now," Shipley says. "I love it, and I'd buy another."

Owning a PC is an up-and-down affair: Sometimes things go well, and sometimes they don't. Even the best machines have problems, and from time to time, even the best manufacturers have trouble fixing them. As Jerry Shipley will tell you, the key is finding a machine whose problems are few and far between—and a manufacturer that can, and will, tackle those problems.

To help you find the most dependable computers and PC manufacturers, we give you our 17th annual Reader Satisfaction Survey, in which Jerry Shipley and more than 8,000 other PC *Magazine* readers describe experiences with the desk-

80 ABS **80** Apple **81** Dell **82** eMachines **84** Fujitsu **84** Gateway **85** Hewlett-Packard/Compaq **86** IBM **87** MPC **87** Sony **88** Sun

faction

tops, notebooks, and servers that they use at home and at work: over 17,000 computers in all.

As you peruse the results, you'll see that no company is beyond reproach. Each is guilty of selling machines that need repair and providing poor technical support at times. The leading vendors—Apple in the desktop and notebook categories, Dell in desktops and servers, and IBM in notebooks—are those that keep criticism to a minimum.

As in past years, respondents rated PCs on several criteria using a 1-to-10 scale, but this year we defined each scale more clearly: 1 to 2 means *poor,* 3 to 4 is *fair, 5 to 6 good,* 7 to 8 *very good,* and 9 to 10 *excellent.* We suspected that overall ratings would be in the 6-to-7 range, as few people continue to use a computer they dislike. But we hardly ever hear people tell us how much they love their systems. Apparently, though, you do like them; you really like them. Desktops receive an average "overall rating" score of 7.8, notebooks 8.0, and servers 7.9.

The same enthusiastic attitude doesn't apply to technical support or repair service, however. Desktop and notebook tech support rate 6.3 and 6.1, respectively, while repairs aren't much better, at 6.7 and 6.6.

MORE ON THE WEB

For additional statistics, visit us on the Web at www.pcmag.com

A growing challenge for vendors is helping customers during virus outbreaks, which were fierce in the 12 months leading up to April, when our survey went out into the field. Six percent of desktop users seeking support say their most recent call was for help recovering from a virus, and this response may be underreported. Users don't always know when viruses are causing their problems; many believe that the problems are defects in their machines or the software shipped with them. Many makers reported a significant increase in support calls in the wake of worms like Blaster and Sasser, which infected millions of systems worldwide. Some makers have struggled to keep pace with the increased volume of support calls.

Aren't manufacturers moving away from phone support in favor of the Internet? Not really. For years, vendors have hyped e-mail, chat, and remote control as the way forward, but most readers still prefer the phone. Over three quarters of respondents needing support used the phone, more than twice as many as used any other means of contact. Respondents are clearly much less happy with Web-based support—consistently the lowest-rated support method for respondents' most recent tech-support experiences.

Toshiba has actually discontinued its chat and e-mail support. "When customers get that live voice and are able to actually talk about the issue," says John Mehrmann, Toshiba's director of channel services, "they end up getting a much higher level of service."

Unfortunately, phone support is also

Apple: Desktops and Notebooks
In a Windows-dominated world, it's not surprising that people who choose Apple computers do so because they love them. But evangelism alone can't explain the impressive high marks Apple receives again this year. In nearly every aspect, the company scores higher than any other vendor. We prefer more open platforms, but it's hard to argue with this level of satisfaction.

Dell: Desktops and Servers
People trust Dell, especially when it comes to desktops and servers, two categories in which the brand wins Readers' Choice awards. But declining tech-support scores may foretell troubles ahead.

IBM: Notebooks
IBM's decision to go against the prevailing trend and provide tech support only through domestic call centers seems to have been an important factor in Big Blue's continued success. No competitor comes close to the company's tech-support ratings.

SURVEY RESULTS: DESKTOPS

▲▲ Signficantly better than average*
▲ Better than average**
▼ Worse than average**
▼▼ Significantly worse than average*

	OVERALL RATING	POOR (1–2.4)	FAIR (2.5–4.4)	GOOD (4.5–6.4)	VERY GOOD (6.5–8.4)	EXCELLENT (8.5–10)	RELIABILITY	TECH SUPPORT	REPAIRS	PERCENT NEEDING REPAIRS	LIKELIHOOD OF RECOMMENDING
ALL DESKTOPS											
ABS (51 responses)	8.1						8.1	—	—	26%	7.9
Apple (165)	8.8 ▲▲						9.0 ▲▲	—	—	10% ▲	8.9 ▲▲
Dell (3,460)	8.1 ▲▲						8.2 ▲▲	6.2	6.8	16% ▲	8.4 ▲▲
eMachines (217)	7.6						7.8	6.4	—	13%	7.6
Gateway (726)	7.5 ▼▼						7.6 ▼▼	6.5	5.9 ▼	19%	6.8 ▼▼
HP/Compaq (1,628)	7.3 ▼▼						7.4 ▼▼	6.0 ▼	6.3 ▼	18%	7.1 ▼▼
IBM (277)	7.1 ▼▼						7.4 ▼▼	7.0 ▲	7.9 ▲▲	18%	6.8 ▼▼
MPC (125)	7.9						8.2	—	—	18%	7.4
Sony (248)	7.9						8.0	5.7	—	15%	7.9
Clone (594)	8.1 ▲▲						8.2 ▲	7.2 ▲▲	7.4 ▲	20%	8.0 ▲
Self-built (917)	8.5 ▲▲						8.6 ▲▲	6.9 ▲	7.9 ▲▲	19%	8.7 ▲▲
AVERAGE	7.8						8.0	6.3	6.7	17%	7.6
WORK											
Apple (99)	8.6 ▲▲						8.7 ▲▲	—	—	13%	8.6 ▲▲
Dell (2,129)	7.9 ▲▲						8.1 ▲▲	6.3 ▼	6.6	16% ▲	8.3 ▲▲
eMachines (81)	7.4						7.8	—	—	20%	7.7
Gateway (376)	7.2 ▼						7.4 ▼▼	6.6	6.1	20%	6.6 ▼▼
HP/Compaq (910)	7.2 ▼▼						7.4 ▼▼	6.3	6.4	19%	6.9 ▼▼
IBM (217)	6.9 ▼▼						7.2 ▼▼	6.9	—	18%	6.5 ▼▼
MPC (64)	7.9						8.3 ▲	—	—	14%	7.4
Sony (90)	7.8						7.9	—	—	18%	8.0 ▲
Clone (324)	8.0 ▲▲						8.2 ▲	7.2 ▲	7.4 ▲	19%	7.8 ▲
Self-built (360)	8.4 ▲▲						8.6 ▲▲	6.9	8.2 ▲▲	19%	8.8 ▲▲
AVERAGE	7.6						7.9	6.5	6.4	17%	7.5
HOME											
Apple (88)	9.3 ▲▲						9.4 ▲▲	—	—	7% ▲	9.4 ▲▲
Compaq (337)	7.5 ▼▼						7.6 ▼▼	5.5	6.4	16%	7.2 ▼▼
Dell (1,644)	8.3 ▲▲						8.4 ▲▲	5.9	6.8 ▲	16%	8.6 ▲▲
eMachines (156)	7.8						7.9	—	—	11%	7.7
Gateway (412)	7.8 ▼						7.8 ▼	6.4 ▲	5.8	19% ▼	7.1 ▼▼
HP (507)	7.4 ▼▼						7.5 ▼▼	5.6	6.1	19% ▼	7.4 ▼▼
IBM (72)	8.1						8.1	—	—	18%	7.9
MPC (77)	8.0						8.2	—	—	20%	7.6
Sony (190)	8.0						8.2	5.9	—	14%	8.0
Clone (357)	8.3 ▲						8.3 ▲	7.3 ▲▲	7.4 ▲▲	18%	8.3 ▲
Self-built (668)	8.6 ▲▲						8.7 ▲▲	7.1 ▲▲	7.8 ▲▲	20% ▼	8.8 ▲▲
AVERAGE	8.0						8.1	5.8	6.3	16%	7.9
DESKTOPS LESS THAN ONE YEAR OLD											
Dell (1,066)	8.4 ▲▲						8.5 ▲▲	6.0	6.6	11%	8.5 ▲▲
eMachines (97)	8.1						8.2	—	—	9%	8.1
Gateway (88)	8.1						8.2	—	—	15%	7.7
HP/Compaq (436)	7.9 ▼						8.1	5.9	—	11%	7.8
IBM (61)	7.8						8.0	—	—	15%	7.1 ▼
Sony (101)	8.4 ▲						8.5	—	—	10%	8.3 ▲
Clone (233)	8.7 ▲▲						8.7 ▲▲	6.9 ▲	—	16%	8.4 ▲
Self-built (386)	9.0 ▲▲						9.0 ▲▲	7.1 ▲	8.2 ▲▲	17% ▼	8.9 ▲▲
AVERAGE	8.1						8.2	5.9	6.6	12%	7.9

* At least 2 confidence intervals from the average. ** 1 confidence interval from the average. **RED** denotes Readers' Choice. Except as noted, scores are on a scale of 1 to 10, where 10 is best. A dash indicates that we do not have enough survey data to give the company a score.

OUR CONTRIBUTORS: Cade Metz is a senior writer at *PC Magazine*. **Sebastian Rupley** is a senior editor of the magazine. Executive editor **Ben Z. Gottesman** and associate editor **Sean Carroll** were in charge of this story.

among the most expensive support methods. In order to cut costs, many vendors have moved call centers overseas. Big vendors Dell, HP, Gateway, and Toshiba all use at least some foreign call centers, and many readers complain of difficulty communicating with technicians.

Unlike many of its competitors, IBM refuses to use overseas technicians, and its tech-support scores are impressive. Readers give IBM a 7.0 overall score for desktop tech support and a 7.6 for notebooks. They rate IBM support techs' ability to comprehend user problems and to speak in a clear, understandable manner at least a point higher than they do Dell, HP, Sony, and Toshiba techs.

"We really wrestled with the idea of using call centers in India, but all our calls still go through Atlanta," says IBM's Owens. "If you use India, you might save ten cents on the call itself, but you'll blow that away ten times over if the call is handled improperly, if customer satisfaction numbers start to drop."

> In order to cut costs, many vendors have moved call centers overseas.

Dell, in particular, may want to reexamine its strategy of outsourcing support. As usual in our survey, the company performs very well in desktops and servers. Dell again tops the server ratings, and only Apple's overall numbers are higher for desktops. But Dell's technical-support numbers have started to drop. They're never better than average on this year's survey, and with servers, they're actually worse than average.

It's too early to tell if cheaper support abroad will win out in the long term. Cutting costs allows companies to undercut competitors on price. But losing customers through frustration with support may ultimately prove to be a costly proposition. How the struggle plays out over the next year will be interesting to see.

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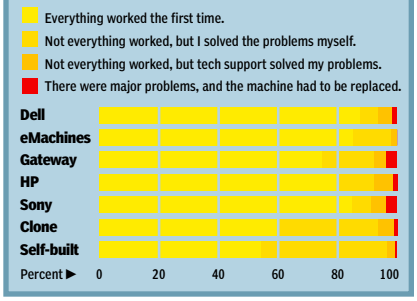
INITIAL SETUP EXPERIENCE

Desktops purchased within the past year



METHODOLOGY

This survey was in the field from April 27 to May 10, 2004. The results are based on answers from 8,250 PC *Magazine* subscribers. Scores are reported for vendors achieving at least 50 responses.

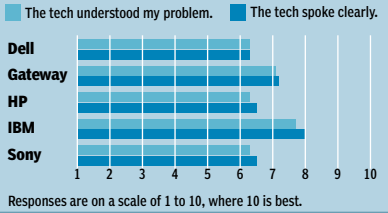
Note: A statistical t-test was used to calculate significant difference between a vendor's score and the industry average. This objective mathematical formula sometimes presents identical scores with different meaning. Scores are said to be average, better or worse than average, and significantly better or worse than average. Take the example of Dell and ABS's "overall rating" scores for all desktops. While readers give both companies an 8.1 score, the t-test indicates that statistically, Dell's score is significantly better than average, whereas we can report ABS's score to be only average.

ABS Computer Technologies

ABS was the sleeper in last year's survey, getting a Readers' Choice selection for desktop PCs the first time it qualified for inclusion. This year its desktops (mainly the Awesome, Harmony, and Ultimate Gaming product lines) get mostly high ratings. ABS also makes notebooks, but we didn't receive enough responses to report a score for them.

SCORING COMMUNICATION SKILLS

Desktops



Responses are on a scale of 1 to 10, where 10 is best.

At 8.1, the company's "overall rating" score is slightly above the industry average of 7.8. ABS's score for reliability is also 8.1; the average is 8.0. Respondents are enthusiastic about the ABS brand, and the company's "likelihood of recommending" score of 7.9 is slightly above the average of 7.6.

There are some indications that ABS has quality control issues to resolve, however. Among ABS desktop users, 26 percent report that their machines needed fixes, compared with the average, 17 percent. This gives ABS the worst "percent needing repairs" score of any desktop maker, although it is still within the average range.

We didn't receive enough responses about ABS's tech-support and repair services to give them a score, but we hope readers are having better luck than we did when we tried to contact the company. On one occasion we received busy signals for several hours when trying to reach the company's main operator, tech-support line, and sales line. At other times, we reached the main operator, but only after several minutes on hold.

ABS desktops have one-year parts and lifetime labor warranties unless otherwise specified, and the company offers lifetime toll-free technical support, which some other manufacturers don't.

ABS officials stress that a big part of their approach to customer satisfaction is an ongoing education program for techs. "Our technicians are continuously trained to ensure that they are up-to-date on all of the latest software and hardware," says marketing manager Roger Wong. The company's "overall rating" score in our survey reflects very good satisfaction, but the percentage of units needing repairs is a concern. —*Sebastian Rupley*

TOP THREE SYSTEM TYPES PER COMPANY

Desktops purchased within the past year

Dell	Multimedia	34%
	Mainstream	26%
	Corporate	17%
eMachines	Value	47%
	Mainstream	40%
	Multimedia	38%
Gateway	Multimedia	36%
	Workstation	15%
	Value	14%
HP	Multimedia	35%
	Corporate	21%
	Mainstream	21%
IBM	Corporate	49%
	Workstation	16%
	Multimedia	13%
	Small Biz	13%
	Value	13%
Sony	Multimedia	78%
	Media Center	31%
	Mainstream	9%
Clone	Multimedia	52%
	Mainstream	21%
	Gaming	13%
Self-built	Multimedia	61%
	Gaming	29%
	Mainstream	25%

Multiple choices are allowed, so totals may not equal 100 percent.

Apple Computer

Can all of Apple Computer's survey success be chalked up to fanatical users? Once again, the company turns in a top-notch performance. Apple has enough responses to qualify for the desktop and notebook categories, and it receives the best "overall rating" score in both: 8.8 in desktops, significantly better than the industry average of 7.8, and 9.0 for notebooks, also significantly better than the 8.0 average. These scores qualify as *excellent* on our 1-to-10 scale, earning the company Readers' Choice awards for both categories.

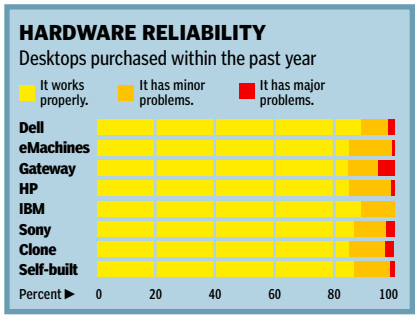
At 9.0 for desktops and 9.2 for notebooks, Apple's impressive reliability scores are at least a point higher than the industry averages. Nearly all respondents to our survey who supplied quotes about their Apple desktops found them extremely reliable. Compared with other brands, a much lower percentage of Apple desktop systems needed repairs over the last year.

A great number of the readers who sent in comments regarding Apple said that their older desktop systems were so dependable that they upgraded them instead of buying new systems. "I have a PowerMac 9500 from the mid-1990s," said reader Dallas Blair. "It has been upgraded with USB, FireWire, a PCI IDE card for hard drives, and a faster processor. It's the kind of workhorse that Windows machines can only aspire to."

Apple users are similarly positive about their new Apple notebooks. The company's scores are far better than the competition's in the "overall rating" score, reliability, and the likelihood of being recommended. (We had fewer than 50 respondents who purchased Apple desktops within the last year, so we couldn't rate the company in this area.)

According to Apple support managers, one reason the company does well in repair and support is that it makes both software and hardware: "Because Apple creates the hardware, software, and operating system, we provide integrated support. Nobody else can offer this kind of end-to-end support." Of course, Macintosh fans can choose machines from only one vendor.

Every Apple system comes with 90 days of toll-free telephone support and a one-



year limited hardware warranty; some other vendors offer lifetime toll-free telephone support. Too few respondents report needing support with or repairs to their Apple computers to rate the company in these areas. Last year, Apple had better-than-average support for its desktops and notebooks, and its notebook repairs were similarly well regarded. (There were also too few respondents to rate desktop repairs in 2003.)

Part of the reason for Apple's high scores could be the user community's long-standing and exceptional brand enthusiasm, but it's hard to argue with such consistently high ratings.—*SR*

Dell

For the 13th time in 14 years, Dell's desktops receive our Readers' Choice. Dell's servers also earn the award, as they have in each of the 4 years that we've asked about servers. Readers are less enthusiastic about Dell notebooks—particularly its work notebooks, which are too likely to need repairs. Interestingly, however, while the company's notebooks receive a worse-than-average "overall rating" score, Dell's "likelihood of recommending" score in this category trailed only Apple's and IBM's. Readers are also less than enthusiastic about Dell's technical support this year.

In desktops, only Apple fares better. Dell's "overall rating" score, 8.1, is significantly better than average, and its desktops and servers both had among the best reliability scores for all named brands in those categories. Over the past year, Dell has worked to improve system reliability through its new Customer Assurance and Resolution Team Lab, where technicians test Dell machines with third-party hardware and software. "They've tested over 100 products with Dell systems," says Bobbi Dangerfield, director of U.S. consumer customer experience, "making sure that everything works together when customers receive their machines."

Yet, despite impressive overall ratings, readers have mixed opinions about Dell tech support. When the hard drive died in Robert Glenn's Dell Dimension, for instance, the company sent him a new drive. He had it installed within 48 hours, but dialing the company wasn't as easy as it could have been. "There's a little delay getting service at times on the phone," says the Virginian, "and occasionally, there is some accent problem when you get someone in Pakistan or India."

The company's tech-support scores are slightly lower than average for desktops and statistically worse than average for servers. Support for work desktops rates only a 6.3, compared with an industry average of 6.5. More specifically, Dell users rate company techs' ability to understand problems and speak clearly far below what readers say about techs from IBM and Gateway, the leaders in this area. Some Dell call centers are located abroad. (Among vendors in this report, only IBM and MPC provide entirely domestic support.)

Concerned users have the option of paying extra for Dell's Gold Technical Support, which guarantees that when they call for help, they'll be connected within 2 minutes or less to a high-level technician who's been specifically assigned to them and their business.

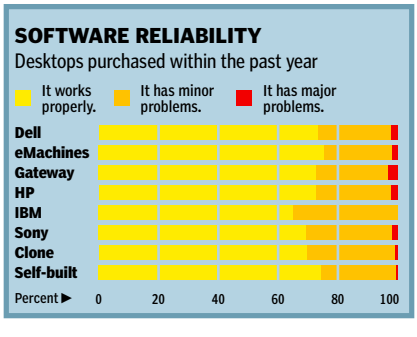
Dell's business market woes are worse in our notebook survey, but here the problem is quality. Among work notebook users, Dell's "overall rating" score is worse than average, as is its reliability score. According to readers, a whopping quarter of Dell's business notebooks needed repairs, by far the worst rate among work notebook vendors (the next worst is HP's 22 percent). On the home side, the numbers are mostly average, but the work numbers drag down HP's scores in the "all notebooks" category.

Apparently a well-executed repair can go a long way toward making up for high frequency of repairs. Dell's work notebooks actually receive a better-than-average rating for repairs. Despite problems, readers are still very likely to recommend the company's notebooks. Dell's "likelihood of recommending" score, 8.2, is better than the survey average of 8.0. In case it wasn't clear before: People trust Dell.

Dell recently rolled out its Enterprise Command Center, a round-the-clock operation supporting server and storage products. "It looks a lot like a 911 response environment or army command center," says Mark Oldani, director of customer technical support. "All the people and all the tools and all the processes are in one room—everything needed to make a decision about a customer's system." Unfortunately, the company's tech-support scores show that this investment hasn't yet paid off in the customers' eyes. Dell's servers are at the bottom of the pack for tech support.

The company leads on other measures,

Apple's impressive reliability scores were at least a point higher than the industry averages.



SURVEY RESULTS: NOTEBOOKS

▲▲ Signficantly better than average*
▲ Better than average**
▼ Worse than average**
▼▼ Significantly worse than average*

	OVERALL RATING	POOR (1–2.4)	FAIR (2.5–4.4)	GOOD (4.5–6.4)	VERY GOOD (6.5–8.4)	EXCELLENT (8.5–10)	RELIABILITY	TECH SUPPORT	REPAIRS	PERCENT NEEDING REPAIRS	LIKELIHOOD OF RECOMMENDING
ALL NOTEBOOKS											
Apple (140 responses)	9.0 ▲▲						9.2 ▲▲	—	—	17%	9.3 ▲▲
Dell (1,736)	7.9 ▼						8.0 ▼	6.1	6.9	24% ▼▼	8.2 ▲
Fujitsu (62)	7.9						8.3	—	—	13%	8.0
Gateway (228)	7.7						7.8 ▼	6.5	—	19%	7.1 ▼▼
HP/Compaq (952)	7.4 ▼▼						7.6 ▼▼	5.9	6.0 ▼	22% ▼	7.3 ▼▼
IBM (662)	8.1 ▲						8.3 ▲	7.6 ▲▲	7.3 ▲	20%	8.3 ▲▲
Sony (265)	7.8						7.9 ▼	4.8 ▼	—	16%	7.7
Toshiba (591)	7.9						8.1	5.8	6.2	17%	8.0
AVERAGE	8.0						8.2	6.1	6.6	19%	8.0
WORK											
Apple (120)	9.0 ▲▲						9.2 ▲▲	—	—	19%	9.4 ▲▲
Dell (1,501)	7.8 ▼						8.0 ▼	6.2	6.9 ▲	25% ▼▼	8.2 ▲
Fujitsu (51)	7.7						8.2	—	—	12%	7.9
Gateway (192)	7.7 ▼						7.7 ▼	6.8 ▲	—	20%	7.0 ▼▼
HP/Compaq (778)	7.4 ▼▼						7.6 ▼▼	5.9	5.9 ▼	22%	7.4 ▼▼
IBM (608)	8.1 ▲						8.3 ▲	7.6 ▲▲	7.3 ▲	21%	8.3 ▲
Sony (211)	7.7						7.9	4.5 ▼	—	16%	7.8
Toshiba (477)	7.9						8.0	5.9	6.2	18%	8.0
AVERAGE	7.9						8.1	6.2	6.6	19%	8.0
HOME											
Compaq (104)	7.1 ▼▼						7.4 ▼	—	—	24%	6.8 ▼▼
Dell (298)	8.1						8.2	5.4	6.1	17%	8.2 ▲
HP (108)	7.9						8.0	—	—	20%	7.7
IBM (76)	8.4 ▲						8.5 ▲	—	—	15%	8.7 ▲▲
Sony (67)	7.9						7.9	—	—	16%	7.5
Toshiba (150)	8.3 ▲						8.5 ▲	—	—	15%	8.2 ▲
AVERAGE	8.0						8.1	5.4	6.1	18%	7.9
NOTEBOOKS LESS THAN ONE YEAR OLD											
Apple (59)	9.1 ▲▲						9.3 ▲▲	—	—	14%	9.4 ▲▲
Dell (616)	8.2 ▼						8.3 ▼	5.8	6.5	15%	8.4
Gateway (83)	8.4						8.6	—	—	12%	8.1
HP/Compaq (380)	7.9 ▼▼						8.2 ▼▼	5.8	—	12%	7.9 ▼▼
IBM (229)	8.5						8.6	7.7 ▲▲	—	16%	8.5
Sony (81)	8.4						8.4	—	—	9%	8.2
Toshiba (238)	8.3						8.5	5.6	—	14%	8.2
AVERAGE	8.4						8.6	6.2	6.5	13%	8.4

* At least 2 confidence intervals from the average. ** 1 confidence interval from the average. **RED** denotes Readers' Choice. Except as noted, scores are on a scale of 1 to 10, where 10 is best. A dash indicates that we do not have enough survey data to give the company a score.

however: Its "overall rating" score, 8.1, is better than average for servers and significantly better for desktops. Server and desktop scores for the percentage needing repairs are significantly better and better than average, respectively.

People still like their Dells, but there are clearly areas where the company needs to improve. Tune in next year to see what's changed—Dell's support or our readers' minds.—*Cade Metz*

eMachines

How can eMachines afford to sell such powerful PCs for as little as $400 apiece? By keeping repairs and returns to an absolute minimum. Since last spring, the company has paid special attention to quality control, and according to our readers, the hard work has paid off. This year, eMachines' scores show a vast improvement over last year's survey, climbing to respectable levels in every major desktop category. Among systems less than a year old, eMachines users report the fewest serious problems with initial setup.

eMachines' low-cost PCs are less likely to need repairs than systems from any other vendor save Apple. Whereas only 9 percent of eMachines desktops less than a year old needed repairs, according to readers, the rates of comparably new systems from Dell and Gateway needing repairs were 11 and 15 percent, respectively. Only 1 percent of all eMachines systems needed to be replaced. This translates into a lower cost of doing business, which helps keep prices down.

eMachine's reliability may be a result of the company's decision to place responsibility for quality assurance in the same division as its support services.

> eMachine's low-cost PCs are the least likely Windows systems to need repairs.

Mike Zimmerman, the company's senior vice president for customer care services and quality assurance, felt that the people who handle technical-support issues are better prepared than anyone else for improving product reliability and working to avoid such problems. "Typically, quality assurance is handled on the manufacturing or product side of a company," he says. "We're really taking ownership of QA and really looking to reduce the number of problems in the field." The customer care division even has a say in system design and component choice.

eMachines' tech-support score, 6.4, is close to the survey average. It's not quite as impressive as the company's reliability score (7.8), but it still bests the tech-support scores of Dell, HP, and Sony. eMachines has finally included a full one-year warranty with its desktops. It has stopped charging for tech-support calls and offers to service machines over the Web via Windows XP's Remote Assistance tools.

HE DOESN'T PLAY FAIR.

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Of course, this last development is of little use to people who can't get online—the reason stated for a fifth of the calls to eMachines tech support, according to our readers. For Gateway, the next-worst scorer in this regard, 13 percent of tech-support calls were attributed to this problem.

Now that Gateway owns eMachines, will the brand's service and reliability continue to improve? Or will recent gains be lost as operations are folded into Gateway, many of whose desktop scores are significantly worse than average on this year's survey? Or will the acquisition boost Gateway's scores? We won't know until next year's survey, but the initial signs are good. Zimmerman now oversees customer care for both brands. He has already consolidated the companies' call centers, offering chat and e-mail support as well as remote assistance, and he continues to handle quality assurance and support services.—*CM*

Dells' "likelihood of recommending" scores in desktops and servers are significantly above average.

Fujitsu

Fujitsu qualifies this year in our notebook systems category. Fujitsu users award the company a *very good* "overall rating" score of 7.9 and a *very good* reliability score of 8.3. Tied with IBM, it has the highest reliability score for a Windows-based notebook manufacturer.

In our "percent needing repairs" category, only 13 percent of Fujitsu notebook users say they had to seek fixes—the best score of any notebook maker we evaluated. Reader Marc Miller uses a Fujitsu LifeBook, and although he says it's "the best notebook I've ever been issued," he adds that the case "isn't very sturdy." Several people in his office have the same LifeBook, and, according to Miller, "a common problem with these machines is that something inside related to the [wireless networking] hardware gets loose and the switch becomes stuck in the *on* or *off* position. Our IT department has made a habit of opening these laptops up and hardwiring the internal wireless NIC to being always on."

The company's *very good* score of 8.0 for the likelihood of being recommended reflects strong enthusiasm for the Fujitsu brand.

Fujitsu's Executive Mobile Service is responsible for on-the-road satisfaction among business users. If the company determines that immediate repairs are necessary, it sends a trained technician directly to the user's location, anywhere in the continental United States.

On purchase of Fujitsu notebooks, customers can choose a 1-year or 3-year limited warranty. Toll-free technical support is available 24 hours a day, seven days a week.—*SR*

TOP THREE SYSTEM TYPES PER COMPANY

Notebooks purchased within the past year

Apple	Mainstream	51%
	Desktop replacement	41%
	Ultraportable	17%
Dell	Desktop replacement	44%
	Mainstream	36%
	Value	15%
Gateway	Mainstream	41%
	Desktop replacement	39%
	Ultraportable	19%
HP	Mainstream	48%
	Desktop replacement	34%
	Value	18%
IBM	Mainstream	46%
	Corporate	32%
	Desktop replacement	17%
Sony	Desktop replacement	35%
	Ultraportable	35%
	Mainstream	30%
Toshiba	Mainstream	38%
	Desktop replacement	33%
	Value	21%

Multiple choices are allowed, so totals may not equal 100 percent.

Gateway

Gateway's survey scores take a downturn this year, but its merger with eMachines and a recent overhaul of its customer care organization may bode well for the future, given eMachines' dramatic improvement on this year's survey in support and quality assurance. The merger had just happened when our survey went into the field, however, so we doubt that it had any effect on our results.

This year, readers give Gateway desktops an "overall rating" score of 7.5—in the *very good* range but significantly worse than the survey average. Only HP and IBM scored lower. The company's scores for reliability and likelihood of being recommended are also significantly worse than average, and only ABS PCs needed more repairs. The one ray of light is Gateway's technical-support score in the home desktop category. Although its 6.4 translates to just *good,* that's a higher score than any other brand-name vendor got.

PC Magazine reader Bob Blubaugh, an Indianapolis retiree, had major problems with two different Gateway systems. One wouldn't boot when he first took it out of the box, and the other, after a serious software error, forced him to reformat its hard drive. But he had little trouble reaching Gateway technicians over the phone, and they helped him resolve each problem without much hassle.

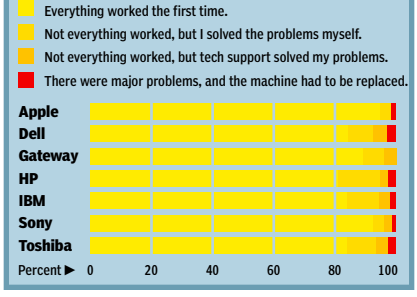
On the notebook side of things, only HP got an "overall rating" score worse than Gateway's 7.7. Readers are also less likely to recommend Gateway notebooks than any other brand of mobile system; the company's 7.1 score on this measure is significantly worse than average.

The good news is that among desktops and notebooks less than a year old, Gateway fares much better. On our surveys in these two categories, the company's scores fall within the average range.

The union with eMachines has already meant the consolidation of the two brands' call centers and merged support and quality control operations. Technicians now use chat, e-mail, and Windows XP's Remote Assistance tool to help Gateway customers. In the coming months, Gateway plans to equip its systems with BigFix

INITIAL SETUP EXPERIENCE

Notebooks purchased within the past year



(*www.bigfix.com*)—an application that eMachines owners can already use to get new drivers, security updates, and software patches seamlessly.

We received too few responses from Gateway server owners to include them in this year's server survey results, but the recently merged customer-care operation oversees that side of the business as well. A dedicated network support center handles server customers, and for a period of 30 days after purchase, the company will help you integrate its servers into your existing network. "Think of it as 30 days' worth of consulting services," says Jake Patterson, Gateway's senior director of professional services.

This year, readers didn't rate Gateway all that highly, but given its new customer-care operation, next year may be a different story.—*CM*

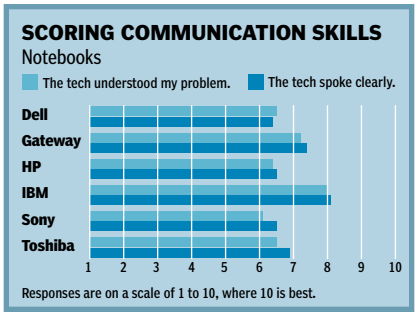
Hewlett-Packard (including Compaq)

Hewlett-Packard continues to sell both the HP and Compaq brands to the home market, so we evaluate them separately there. For example, HP sells machines labeled HP/Compaq for the business market but sells HP Pavilion and Compaq Presario machines for the home market. Outside the home market, we evaluate the companies together, as HP.

While the "overall rating" scores for HP and Compaq desktops and notebooks qualify as *very good,* their scores in every category are almost all worse than average. The one bright spot is tech support and repairs for servers, where HP outscores Dell. We also see some promising signs in the reader evaluations of new HP desktop PCs.

HP's tech-support scores of 6.0 for desktops and 5.9 for notebooks, while technically *good,* are near the bottom in both categories. All of these individual ratings help explain the company's significantly worse than average scores for the likelihood of being recommended.

There is little difference between the



Do It Yourself

In this year's survey, Apple owners are the happiest with their desktop PCs. But did you notice who's just behind? Not Dell owners. Not Sony buyers. After Apple users, the most satisfied readers built their own machines.

Do-it-yourselfers give their desktop machines an "overall rating" score of 8.5 this year, significantly better than the survey average. They claim their PCs are more reliable than most commercial systems, and they are pleased with technical support and repairs.

But what does this mean exactly? Aren't they providing their own technical support and repairs? Doesn't this smack of self-praise? Can their opinions be trusted?

Such ratings are more telling than you might think. Yes, people who build their own computers may be patting themselves on the back. They do handle most support and repair themselves (though they can phone individual part manufacturers). But you can't ignore the fact that they're happy. The question is, would you be as happy if you built your own machine?

DIYers may be happier because they're more familiar with PC hardware and software. For one, if you're a computer geek, you're much more likely to build your own machine. It also follows that, in building your own machine, you're more likely to *become* a geek. "By seeing exactly where the pieces go and what they do, you have a better understanding of what's gone wrong or what needs upgrading," says Matthew J. Walsh, a 56-year-old physician who built his own system.

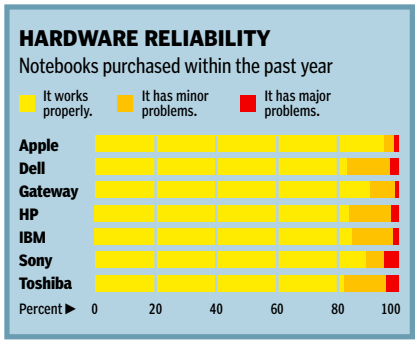
Indeed, most computer DIYers get so proficient that they never make support calls; they *enjoy* handling their own problems. "I've educated myself to the point where I know whether it's a Windows problem or a hardware problem. I know where to find answers on the Web," says Norval Baird, a pilot from Charleston, South Carolina. "I can find answers to problems on my own pretty quickly."

What if a part breaks down entirely? Self-built systems aren't under warranty, but individual parts are. If a hard drive or a motherboard dies, it's just as easy (or hard) to get a replacement free of charge. "I buy all my parts from Newegg.com," says Baird, "and I've only ever had one problem with RMAs [return merchandise authorizations]." And when you've installed the part, replacing it is usually a no-brainer.

The days of saving money building your own system ended with the onset of the price wars and inexpensive machines from Dell, eMachines, Gateway, and others. Unless you're buying closeouts, you're unlikely to beat a system house on price. On the other hand, as we said, the only machines that top DIY desktops in terms of satisfaction are Apples, and Apple systems aren't cheap.

If you're willing to go through some trial and error, doing it yourself isn't a bad idea. It's not as hard as you might think, you have more control over what components you get, and, once you get the hang of it, you might be better off when things go wrong. Check out our "Build or Buy" story (June 22, page 93) for more information.—*Cade Metz*

Become a geek: The best way to learn about PCs is to build one.



ratings for Compaq and HP's home brands in desktops. But users clearly favor HP's home notebooks over those of its sibling, giving them an "overall rating" score of 7.9, pretty much on a par with the industry average (8.0). Compaq's 7.1 is the worst in the category.

Things may be looking up for HP's desktop business. Although the "overall rating" score of 7.9 for desktops purchased within the past year is worse than average, its scores for reliability, tech support, the percentage needing repair, and the likelihood of being recommended are within the average range.

HP support officials note that they're working to diversify the kinds of repair options business hardware users can choose. Customers can return machines to the factory, take care of problems themselves, or get on-site repairs within a specific time, but premium plans cost more.

With an eye to catching problems early, the company has introduced an innovative program where the first 58 users reporting problems with a new product line get replacements, and HP engineers evaluate the sources of the problems. Why 58? HP's statistical analyses showed it to be the optimal number.

Server users give HP a *very good* "overall rating" score of 7.9—exactly average. Scores for reliability, tech support, the percentage needing repair, and the likelihood of being recommended are all also in line with industry averages. But the company does score better than Dell in satisfaction with technical support and repair service.

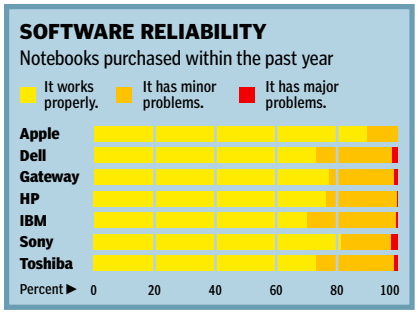
Many readers—especially long-term Compaq server users—told us they felt HP has more to do when it comes to integrating support. "The transition from Compaq to HP has resulted in confusion," said one IT manager who uses Compaq ProLiant servers at a small business.

HP is implementing numerous efforts to improve service and reliability, many on the consumer side. "We will announce several new support programs in August," says Deborah Nelson, vice president of marketing for HP personal systems. Details aren't available, but Nelson says the goal is to recognize that "customers don't just buy a product, they buy a relationship—and we are working hard to improve our customers' total experience with HP at every touch point."

The company has added a toll-free number for free support, but it has yet to turn tech-support ratings around, obviously. It also has a new, free Web-based support system, Instant Support Professional Edition, for diagnosing and fixing problems. On the consumer side, Nelson points to the Total Care program—introduced in the past year—as making a difference. Total Care offers a portfolio of support services across over 16 product lines, including real-time chat with support technicians and e-mail responses within an hour.

These all seem like good steps that could help improve our readers' satisfaction with HP in the coming years.—*SR*

> Although reader scores for Compaq and HP home desktops are very close, users clearly favor HP's notebooks over Compaq's.



IBM

This year, readers leave little doubt that IBM knows how to help customers better than any other manufacturer. In desktops and notebooks, IBM users give the company unrivaled tech support and repairs ratings. On the other hand, while readers give *very good* marks for reliability to IBM notebooks and decent marks to its servers, they're so disappointed with the reliability of its desktop PCs that IBM's "overall rating" score for desktops is worse than that of any other vendor in our survey.

Unlike many of its competitors, including Dell, Gateway, and Toshiba, IBM doesn't route technical-support calls overseas. Since last summer, all support calls and e-mails have been funneled through a single IBM-operated call center in Atlanta. "If all your technicians are in one place, it's easier to train them, and it's easier to weed out poor call-takers," says Bill Owens, vice president in charge of service and support for IBM's personal computing division. "Consolidating everything in Atlanta makes for better synergy and better overall customer satisfaction."

If Owens's Atlanta-based technicians can't solve your problem, they'll forward you to more experienced technicians in Raleigh, North Carolina, who can bounce issues off the people who actually design IBM's desktops, notebooks, and servers. "These Raleigh technicians literally sit side by side with our product engineering teams," Owens says.

The strategy is paying off. On the desktop part of our survey, IBM's tech-support score, 7.0, is better than average; its repairs score, 7.9, is significantly better than average; and both scores are better than those of any other vendor. Only clones score better in tech support, at 7.2, and only self-built machines tie IBM's repairs score. The company also bests the competition in our notebook category, with a better-than-average repairs score (7.3) and a significantly better-than-average tech-support score (7.6). When it comes

to server scores, IBM registers as respectably average.

IBM also knows how to build a laptop. In the notebook section of our survey, Big Blue's scores for reliability and the likelihood of being recommended are second only to Apple's. This is undoubtedly one of the reasons behind the company's "overall rating" score of a better-than-average 8.1. Again, only Apple's is better. And readers are reasonably impressed with the quality of IBM servers, which receive an "overall rating" score of 7.9 and an 8.2 on reliability. "It's solid as a rock," reader Anthony Kazarian says of his IBM xSeries server. "Everything is designed to keep the unit up and running as long as possible."

Readers are, however, extremely unhappy with the quality of IBM desktops. On our desktop survey, the company receives a reliability score of 7.4—tied for the worst with HP. Presumably because of these reliability problems, IBM's scores for the overall rating and the likelihood of being recommended in this category are also significantly worse than average, at 7.1 and 6.8, respectively.

The good news is that IBM's scores among desktops less than a year old are slightly better. In this subcategory, at 7.1, the company's score for the likelihood of being recommended is still worse than average, but its reliability score, 8.0, is average, and so is 7.8, its "overall rating" score.

Why are IBM's desktop scores so poor? Though readers are quite pleased with the hardware reliability of PCs purchased in the last 12 months, they've had an unusual number of problems with software. Only 65 percent of first-year IBM owners say their system software "works properly." No other vendor drops below 69 percent, and most are in the 70 to 75 percent range. Clearly, IBM has technical support licked, but it still needs to work on reliability when it comes to desktops.—*CM*

SURVEY RESULTS: SERVERS

▲▲ Signficantly better than average*
▲ Better than average**
▼ Worse than average**
▼▼ Significantly worse than average*

	OVERALL RATING	POOR (1–2.4)	FAIR (2.5–4.4)	GOOD (4.5–6.4)	VERY GOOD (6.5–8.4)	EXCELLENT (8.5–10)	RELIABILITY	TECH SUPPORT	REPAIRS	PERCENT NEEDING REPAIRS	LIKELIHOOD OF RECOMMENDING
ALL SERVERS											
Dell (920 responses)	8.1 ▲						8.3	6.8 ▼	7.1	20% ▲▲	8.4 ▲▲
HP/Compaq (557)	7.9						8.1	7.3	7.5	26%	7.9
IBM (175)	7.9						8.2	7.7	—	27%	8.0
Sun (53)	7.8						8.2	—	—	38%	7.8
Clone (255)	8.0						8.2	7.9 ▲	7.9	20% ▲	8.1
Self-built (163)	8.2 ▲						8.4	—	—	18% ▲	8.5 ▲
AVERAGE	7.9						8.2	7.2	7.3	28%	8.0
SERVERS LESS THAN ONE YEAR OLD											
Dell (299)	8.1						8.3	6.4	6.9	17%	8.4
HP/Compaq (103)	7.9						8.0	—	—	14%	8.2
Clone (85)	8.2						8.4 ▲	—	—	14%	8.5
Self-built (65)	8.3						8.5 ▲	—	—	14%	8.9 ▲
AVERAGE	8.0						8.1	6.4	6.7	16%	8.3

* At least 2 confidence intervals from the average. ** 1 confidence interval from the average. **RED** denotes Readers' Choice. Except as noted, scores are on a scale of 1 to 10, where 10 is best. A dash indicates that we do not have enough survey data to give the company a score.

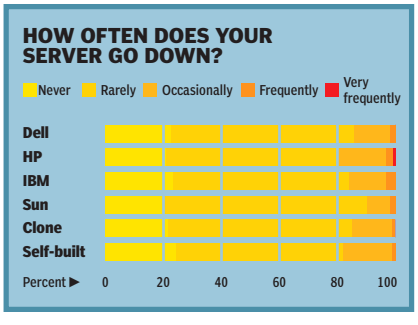
MPC Computers

Based on the number of respondents, MPC Computers, formerly MicronPC, qualifies in the desktop systems portion of our survey, and it receives a *very good* "overall rating" score of 7.9, close to the industry average.

For reliability, readers give the company's computers an 8.2, which ties for second with Dell among brand-name makers, behind Apple's 9.0. (Self-built machines score 8.6.) Users of MPC desktops at work award them a score of 8.3 for reliability, better than the industry average of 7.9. Eighteen percent of MPC users say their systems needed repairs, in line with the industry average of 17 percent.

We had fewer than 50 MPC users report on needing tech support or repairs, so we couldn't rate the company's service in these areas. MPC officials say that the company pursues customer satisfaction by following an anti-outsourcing model. "While other PC companies are following the trend of outsourcing functions like PC assembly and phone support to foreign countries, MPC has kept these operations in-house," they told us. "We feel that staffing these positions internally enables us to be more responsive and flexible."

The company sells direct and through selected channel partners. Support policies for consumer and commercial/government purchases vary. MPC states explicitly that the company is no longer focused primarily on home users. Company officials told us that MPC instead "focuses specifically on the public sector, including federal government, state, local, and educational organizations." This change may explain some of its poorer scores, such as for the likelihood of being recommended, since home users represented more than half of our MPC responses.—*SR*



Sony

Sony's survey results are a good news/bad news story. The company's desktop and notebook PCs, especially its newer systems, are generally well regarded and are less likely to break down than most other brands. But when they do, users are in for arguably the worst support experience in our survey.

"Overall rating" scores for Sony notebooks and desktops are average for this survey, at 7.8 and 7.9, respectively; these qualify as *very good*. An industry-leading 9 percent of owners of notebooks less than a year old report needing repairs. For desktops less than a year old, only 10 percent of users report needing repairs, a score only eMachines beat.

Tech support is where Sony falls apart. The tech-support score for all Sony note-

books is 4.8, which barely qualifies as *good*. It's the worst score in this category. Desktops also get a bottom-of-the-table 5.7. Users of Sony notebooks at work give the company a 4.5 for tech support, the worst score in this category—or in any category in the entire survey.

Things didn't get any better when we looked at the more specific questions about support. The worst areas cited were the company's inability to resolve problems promptly in one call and the relative helpfulness of the service reps.

Steven Nickel, Sony's director of service operations, indicated that some problems may lie with partners helping support Sony products. "As a result of a major initiative to improve our tech-support operations," says Nickel, "we realized that some of our outsource partners were not performing up to our expected standards. We took action to sever relationships with these partners, move more of the support function in-house, and engage with new, more reliable partners whom we are closely monitoring and training to ensure their success." Although this a recent development, Sony says its own internal metrics are showing signs of improvement.

Despite support woes, users of Sony notebooks give the brand a 7.7 score for the likelihood of being recommended—only slightly below the average score, 8.0. Desktop users give it 7.9 in the same category—a bit higher than the average, 7.6.

Sony has recently improved its offerings by eliminating the registration requirement for a one-year warranty and adding the option of extending the warranty to three years. Check back next year to see how readers receive the company's support strategy.—*SR*

Sun Microsystems

After receiving a better-than-average score for frequency of failure in the server component of last year's survey, Sun Microsystems' servers draw average Reader Satisfaction Survey scores this year. Users of Sun servers award the company an "overall rating" score of 7.8—the lowest here but still within the average range for this survey.

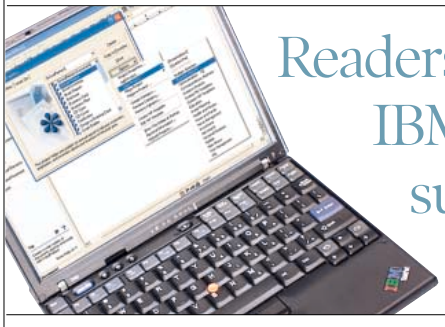
Sun's score in the "likelihood of recommending" category is 7.8. Although lower than other companies' scores, this is close to the industry average of 8.0, indicating good enthusiasm about the brand.

In our "percent needing repairs" category, Sun falls behind the competition, with 38 percent of Sun server users reporting their machines required repairs. Because of the relatively small number of Sun users in the survey, this is within the average range, but the next-highest rate of repairs needed is IBM's, at 27 percent.

Still, many readers who responded to our survey had good things to say about the reliability of Sun servers running Solaris. For example, one reader said: "Running for over a year without a reboot isn't uncommon. I don't know any Microsoft-powered systems that can do the same."

Sun's support policies vary widely according to server models. As of June, the company introduced Sun Preventive Services, which may affect support costs. It is designed "to enable customers to reduce operational risks before they affect uptime," according to Sun tech-support representatives. The subscription-based offering provides over 100 services to IT professionals, and Sun is giving companies that achieve preset computing and uptime goals up to 20 percent off on long-term subscription prices. The goal is "a preemptive service approach to IT problems—avoiding them before they occur."

With respectable scores in all the server categories this year, Sun achieves a reasonable level of satisfaction among its users. Rates of repair are where Sun's scores fall behind those of other server manufacturers.—*SR*



Readers leave little doubt: IBM knows customer support better than the competition.

Toshiba

In the notebook portion of our survey, readers give the world's largest notebook vendor respectably average ratings, with home users giving the company some above-average scores. But we're somewhat concerned about the company's slightly subpar rating for satisfaction with repairs. We hope that Toshiba's partnership with UPS, which according to the company has cut repair turnaround times in half, will improve ratings by next year.

Only home users feel that the company's performance is better than average. They give Toshiba better-than-average scores on overall rating and reliability.

Unlike many vendors, Toshiba doesn't offer support via Web chat or even e-mail. Either you use the self-service tools on the Toshiba's Web site or you call its toll-free number. Toshiba previously offered chat and e-mail support but decided that serious problems are typically solved more quickly by phone. "We found that customers were getting into very extended e-mail and chat sessions, and it was very difficult for us to get to the root cause of their issues," says John Mehrmann, Toshiba's director of channel services. "Verbal communication is the way to go."

Toshiba routes some U.S. calls to Istanbul. The first three times that reader Rich Pollard called the Toshiba support line, he had trouble conversing with the tech reps he reached. Ultimately, he solved the problems on his own. "They spoke English, but they were extremely difficult to understand," says Pollard, a Toshiba Satellite owner from Omaha, Nebraska. "Though they were extremely conscientious, they couldn't help me out."

When it comes to repairs, however, Toshiba has big plans. In April, the company set up a repair depot *inside* a UPS sorting facility in Lexington, Kentucky. Customers can now mail systems from more than 3,300 UPS storefronts nationwide, and Toshiba can return machines or send replacement parts until 2:00 A.M. They claim that packages sent that late at night reach customers the next day, sometimes as early as 8:30 A.M. We'll find out how customers respond to this plan in next year's survey.—*CM*

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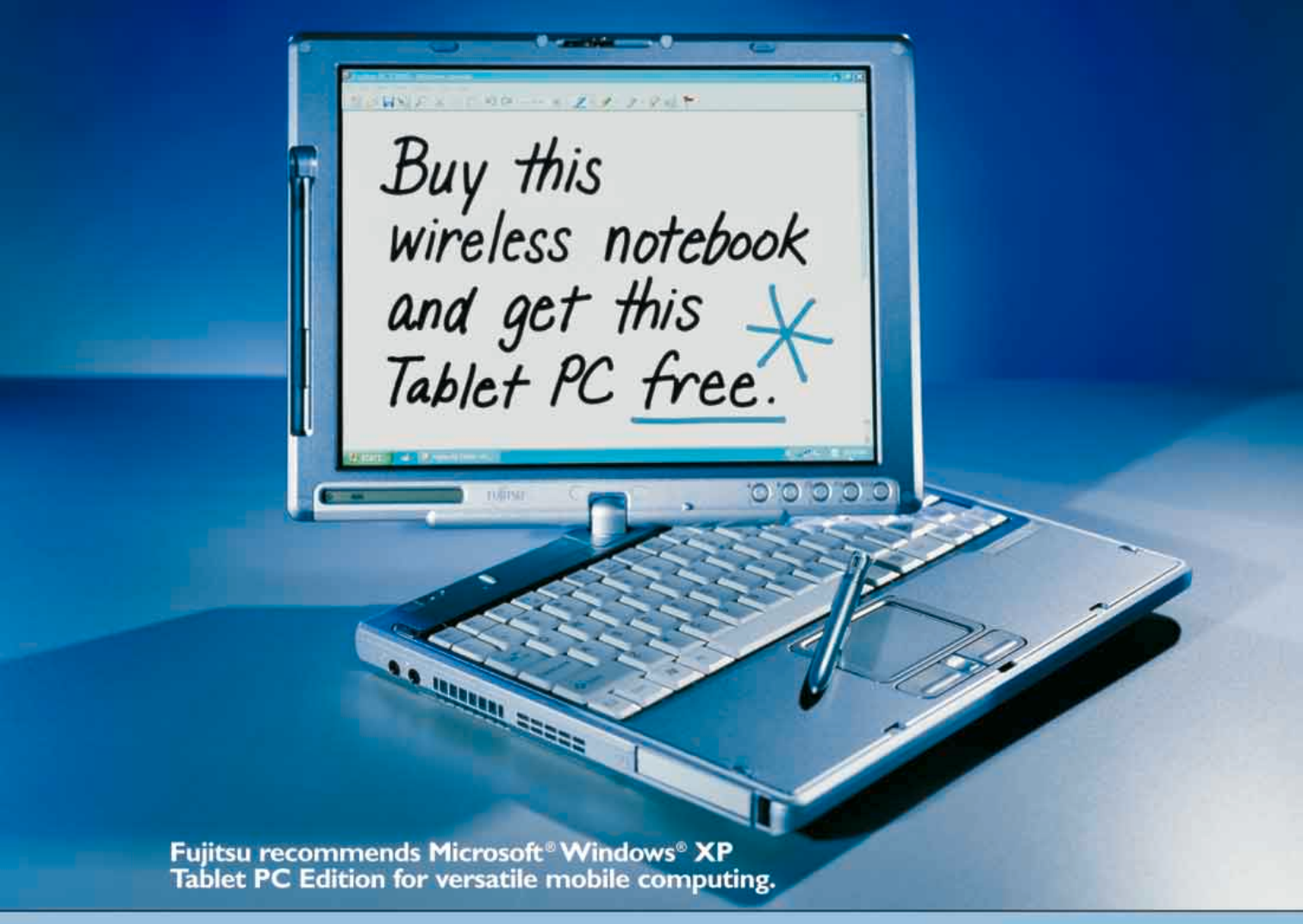

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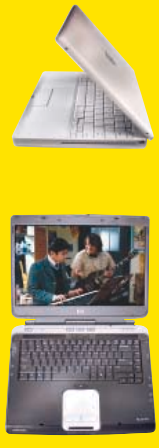
BACK-TO-SCHOOL PCs

PC MAGAZINE BRINGS YOU 12 NOTEBOOKS & 9 DESKTOPS THAT WILL HELP YOU MAKE THE GRADE THIS FALL.



Notebooks!

Lightweight, easy-to-use... take 'em to class!

Desktops!

High power, budget pricing, and entertainment galore!

By Konstantinos Karagiannis

Photography by Thom O'Connor

Whether you're off to college or your little one is off to grade school, one of the most important supplies to get before autumn is a PC. According to a recent study by the U.S. Department of Education, 99 percent of public schools have some kind of Internet access, meaning that computers are playing a larger role than ever in education—even in its earliest stages. At the other end of the educational spectrum, equipping college students with PCs is a no-brainer, since many colleges offer free broadband both in dorm rooms via Ethernet jacks and around campus via Wi-Fi.

As with buying any PC, its intended use and your budget should dictate your choice. Budget considerations are especially important in light of the current tuition costs at most higher-education institutions.

WHO SHOULD GO MOBILE

Notebooks still command a premium, but for college-bound students in particular, they're clearly the preferred PC. They provide the ultimate in flexibility, allowing you to use them in a dorm room or take them to class or the library. And now with wireless Internet connections available on many campuses, a laptop lets you do research under a tree or in a campus common between classes. Consider too that e-book versions of textbooks and online textbook subscriptions are becoming available; your notebook may soon be a 6- or 7-pound replacement for 40 pounds of dead trees in any given semester.

Most college dorm rooms are small, of course, making a laptop the perfect solution to maximize desk space—or to turn your bed into an impromptu work space if you're really cramped. Students commuting to school by train or bus will also find that notebooks can really boost productivity, making it possible perhaps to finish your homework on the trip home.

Parents are opting for notebooks for

IN THIS STORY

NOTEBOOKS

93 $1,000 to $1,500
99 Less than $1,000
94 Notebook Performance Tests
98 Notebook Summary of Features

DESKTOPS

100 Less than $800
100 Desktop Summary of Features
101 Dorm Entertainment Systems
102 Desktop Performance Tests

92 Editors' Choice

- **Notebooks $1,000 to $1,500: Apple iBook G4, Velocity Micro NoteMagix B50 Campus Edition**
- **Notebooks less than $1,000: Averatec AV3225HS**
- **Desktops: eMachines T3092**

PC MAGAZINE EDITORS' CHOICE

The Velocity Micro NoteMagix B50 Campus Edition gets you the best bang for your buck, combining strong performance and high-end components, not to mention reasonable weight and battery life. For a smaller, lighter option, however, the Apple iBook G4 (12-inch) can't be beat—especially for the price. It, too, warrants an Editors' Choice.

Another killer system, the eMachines M6810 gets an honorable mention. But at 7.7 pounds, it's a stay-in-the-dorm notebook. If you're on a tight budget, the Averatec AV3225HS, at less than $1,000, is a light, compact notebook with solid performance.

In the desktops category, the eMachines T3092 takes the title; with its DVD burner and 160GB hard drive, the T3092 gets you a lot of computer for little money. Most students will be happy with it as is. Close runners-up are the HP Pavilion a610n for its features, and the iBuyPower Back to School for its raw performance and flashiness.

some younger students too. Notebook sales for kids in kindergarten through grade 12 were up 37.3 percent in 2002, according to the latest study by research firm Gartner. That's almost the same as the percentage increase in college notebook sales, which Gartner found to be up 38 percent in the same year. Still, we don't think notebooks make sense for most families with kids in primary education. Grade school homework is done mostly at home anyway, and a PC used for this purpose might as well be the shared family PC.

College students shopping for a notebook should consider what kind of infrastructure their campuses have. A notebook that doesn't have Gigabit Ethernet, for instance, may work just fine if the school supports only 10/100 (Fast Ethernet) anyway. Also, a school may have specific system and software requirements, so it's good to find that out before buying.

Perhaps the most important thing to understand when shopping for a notebook, though, is that this is a notebook! Even though you can add a monitor and input devices for desktop use, you're married to the machine's weight, keyboard, and screen size. For students expecting to tote their notebooks around on a daily basis, systems of roughly 6 pounds or less and more than 3 hours of battery life make sense. Those planning to carry their notebooks only occasionally can save some money by going with a desktop replacement machine in the 7-pound-or-heavier range. These heftier systems often have a fuller set of features, because they don't skimp to save on space and weight.

Get the best processor you can afford, but don't count on much upgradability. Adding memory later is doable, but replacing a hard drive can be pricey. Having a built-in CD burner is becoming standard, and that will at least enable you to off-load some files to CD for long-term storage.

In the less-than-$1,000 range, you should keep in mind when you shop that you can reasonably expect only around three years of use. Consider adding an extended warranty for at least that period of time. To reach even the three-year mark, however, you will likely have to replace the battery after about a year and a half (lithium-ion batteries are limited to about 500 recharge cycles).

WHICH TO BUY?

Notebooks

- Are great for note taking in class or the library.
- Fit on even the tiniest desks.
- Can help commuting students get homework done while in transit.

Desktops

- Offer the greatest horsepower for the buck.
- Can be easily shared with the whole family.
- Are easy to upgrade and repair.

DESKTOPS HAVE BENEFITS, TOO

With desktops you really do get a lot of features for a lot less money than with notebooks. Some budget systems still manage to include plentiful memory, CD burners, big CRT monitors, and large hard drives. And many perform as well as or better than notebooks costing nearly twice as much.

Of course K-to-12 students are a natural market for desktops, as so few of these students have any real need for a portable PC. College students on a really tight budget will be better served with a desktop, too. Furthermore, because most desktops are upgradable, they may even survive a four-year campus stint without becoming totally obsolete.

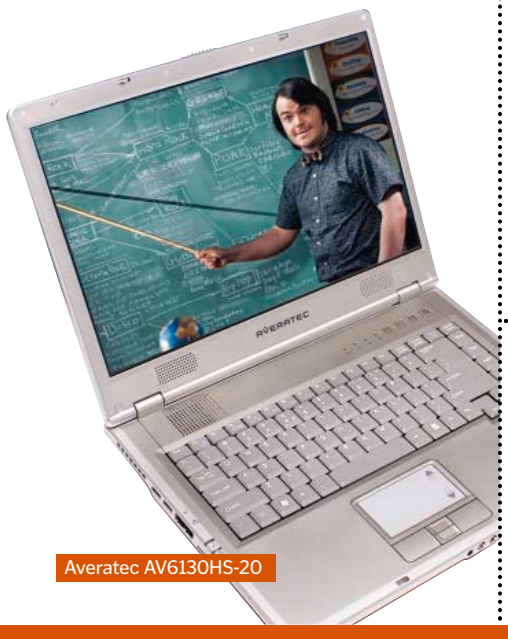
Some college students who can afford the higher cost of notebooks might still want to consider going with a desktop, particularly if they are computer science majors or engineering students who do heavy graphics work. A $1,500 desktop for such students will obviously provide that much-needed raw horsepower.

Most students, however, will find that a budget system in the $800 range, with a 2-GHz Intel or AMD CPU, about 512MB of RAM, and an 80GB hard drive will serve them well for a while. Unlike notebooks, desktops allow you to go cheap on a couple of things now and upgrade later.

On the following pages, we look at notebooks that meet two price classes—nine in the $1,000-to-$1,500 range and three for less than $1,000. And for desktops, we review six systems below the $800 price point, monitors included. And for college students who want to make a desktop PC their primary entertainment center, see our sidebar "Dorm Entertainment Systems." Considering that you won't have to spring for a TV, DVD player, and stereo—or make room for them—the slightly higher prices of multimedia PCs can still make them worthwhile.

MORE ON THE WEB **Point your browser to www.pcmag.com for more reviews of notebooks and desktops that could end up on your short list of school supplies this fall.**

Our contributors: **Omar Cintron, Joseph A. Guilbeau IV, Lawrence Judd, William Pagan, Alphonse Ragusa,** and **Charles Rodriguez** are staff members of *PC Magazine.* Senior editor **Konstantinos Karagiannis,** associate editor **Jenn DeFeo,** and PC Magazine Labs lead analysts **Cisco Cheng** and **Joel Santo Domingo** were in charge of this story.


Averatec AV6130HS-20

Dell Inspiron 600m

Apple iBook G4

NOTEBOOKS [$1,000 TO $1,500]

Apple iBook G4 (12-inch)

$1,099 direct. Apple Computer Inc., www.apple.com/education. ●●●●○

PC MAGAZINE EDITORS' CHOICE

The cool factor of this notebook has withstood the test of time. It's still very sleek and very small, weighing just 4.9 pounds with a 12-inch screen; you'll barely notice it in your backpack. The price, too, is hard to resist ($1,099). College students and K-to-12 teachers get an even better deal with Apple's Education Discount: $999. For all these reasons, it earns an Editors' Choice.

What impresses us most is the iBook's improved battery life. The system played the entire *Titanic* DVD (3 hours and 15 minutes) yet still had 12 percent of its battery life remaining. This is the most we've seen in any iBook or PowerBook to date. The ATI Mobility Radeon 9200 graphics card will get you through your DVD collection but don't expect to do anything 3D intensive. To get the most from the iBook, we suggest upgrading the memory to 512MB ($100). Mac OS X 10.3 Panther is included, as are QuickTime, iMovie, iTunes, iPhoto, iDVD, AppleWorks, and Mac OS X Mail.

The system comes with two USB ports, one FireWire 400 port, a Video Out port, an Ethernet port, and a modem port. The DVD/CD-RW combo drive is now standard in iBooks, and the system also comes with the built-in Apple AirPort Extreme 802.11g wireless solution. In testing, the Apple's 802.11g signal was strong through 160 feet.

If mobility is at the top of your list, the wee iBook is the perfect notebook to tote. And its battery will get you through class, and then some.—*Cisco Cheng*

Averatec AV6130HS-20

$1,449 list. Averatec Inc., www.averatec.com. ●●●○○

Little-known vendor Averatec has proven to be a winner in the budget market. The Averatec AV3225HS notebook won an Editors' Choice in our First Looks budget notebook roundup (June 8). In the back-to-school market, however, the Averatec AV6130HS-20 just missed the mark. The cool features are certainly there, but poor battery life and wireless range keep us from recommending it for the classroom.

Like other notebooks, the AV6130HS-20 emulates Apple's PowerBook design. Its crisp 15.4-inch wide-screen display can handle 3D graphics and DVD movies smoothly. The S/PDIF (Sony/Philips Digital Interface) port—increasingly popular for outputting digital audio—is in the front. We were impressed with the inclusion of a DVD±RW drive; the only other notebook in this roundup to include one is the Toshiba Satellite A45-S250. We also appreciate the Secure Digital slot, which always comes in handy.

Despite all these nice features, however, this notebook's weak spot is its portability. Its battery didn't last even 2 hours on our tests. Carrying the 1.8-pound power adapter with you isn't ideal either, since the notebook itself already weighs 7.7 pounds. As for wireless performance, its 802.11g signal was lost past 120 feet.

The AV6130HS-20 is a cool-looking system with plenty of impressive features, but it's definitely more of a plug–in-and-stay-put kind of notebook.—*CC*

Dell Inspiron 600m

$1,499 direct. Dell Inc., www.dell.com. ●●●◐○

For students who don't want to add a monstrous laptop to their backpack load, the Dell Inspiron 600m is a great option. One of the lightest notebooks in this roundup at 5.4 pounds, this system includes the latest 1.5-GHz Pentium M 715 processor and a fast 5,400-rpm hard drive. Add to that a sturdy magnesium alloy case and impressive battery life (4 hours 8 minutes on our tests), and the 600m is ready to travel.

We like the 14.1-inch screen size, and though it is limited to 1,024-by-768 resolution, DVD playback is smooth. The 600m's performance scores were mostly middle of the road. And 802.11g wireless throughput was subpar, although it did maintain a signal out to 160 feet.

The 600m offers a bundle of software worth noting, including its proprietary Digital Media Experience (think Media Center "Light"), the full McAfee SecurityCenter suite, and WordPerfect Office 11.

Dell made some sacrifices to deliver this small form factor; for example, there's no FireWire port or memory card slot. And there are only two USB ports, while many competitors offer at least three. Although the hard drive is one of the fastest in the group, at 40GB it's smaller than most others.

For a good combination of portability and performance, the lightweight 600m is a solid choice. Yet it still can't compete with the hard-core components of the slightly heavier Velocity Micro system.—*CC*

eMachines M6810

$1,499 direct. eMachines Inc., www.emachines.com. ●●●●○

Although it's a bit heavy, the cool and sleek eMachines M6810 is a feature-packed system that can fill the bill for back to school.

The system feels solid yet maintains a streamlined design, with a black exterior and blue LEDs. The 15.4-inch wide-screen display is the best in our roundup; its image quality is clear and crisp, especially when displaying DVD movies.

The M6810 comes with ample connectivity options, comprising four USB ports, a FireWire port, and a handy 6-in-1 memory card reader for transferring digital pic-

PERFORMANCE TESTS

We put our 18 back-to-school systems through a battery of performance tests, described below.

Wireless tests measure 802.11x throughput from an 802.11g access point. We test in an RF-free area, placing each system on a table rotating at 20 rpm.

Business Winstone 2004 measures a PC's performance while running Windows-based business applications like Microsoft Office and Norton AntiVirus.

Multimedia Content Creation Winstone 2004 measures a PC's performance when running content creation apps like Adobe Photoshop and Macromedia's Dreamweaver MX.

3D Mark03 runs through scenes using various DirectX calls, including the latest version, DirectX9, to derive a score reflecting a graphics card's hardware and driver performance.

Serious Sam: The Second Encounter is a game we run using the OpenGL renderer; the scores reflect a graphics card's hardware and OpenGL driver performance.

Business Winstone 2004 BatteryMark uses the tests of Business Winstone 2004 to drain a notebook's battery. BatteryMark inserts pauses between keystrokes and between tasks allowing the CPU to clock down as in a real-life scenario.

MOBILE VS. DESKTOP PROCESSORS

Seven systems had mobile processors, one had a Mobile Pentium 4 (in the Toshiba Satellite A45-S250), three had Pentium M processors, and three had Athlon XP-M processors. The Pentium M and 855 chipset are designed to slow a processor's clock speed dynamically and reduce voltage, thus reducing the power demand on the battery and power subsystems. The Mobile AMD Athlon XP-M is designed to extend system battery life using the AMD PowerNow! technology. The Velocity Micro NoteMagix B50 Campus Edition, loaded with the 1.7-GHz Pentium M 735, a 5,400-rpm hard drive, and an ATI Mobility Radeon 9700 with 128MB of DDR memory, achieved top marks on Business Winstone 2004 and most of our gaming tests.

The Averatec AV6130HS-20 and the HP Pavilion zx5000, both with the 3.06-GHz Pentium 4, tied for second place on the same test. This processor takes advantage of the LightWave multithreaded tests, part of the Multimedia Content Creation test.

Although the Pentium M processors in the Dell Inspiron 600m and WinBook W320 have the same clock speeds, the Dell system prevailed on Business Winstone, Content Creation Winstone, and BatteryMark tests. That's because Dell's model featuring the latest Pentium M 715 is based on 90 nanometer (nm) design, 2MB of L2 cache, and 21-watt thermal design, while the WinBook W320 is based on a 130-nm design, 1MB of L2 cache, and 24.5-watt thermal design.

The Fujitsu and Toshiba systems had the top two wireless scores in the $1,000-to-$1,500 roundup, and both carry the Atheros AR5001X wireless chipset.

—Analysis written by Cisco Cheng

High scores are best. Bold type denotes first place within each category.	802.11 ACCESS POINT Average throughput (Mbps)							
	"b"-only mode				"g"-only mode			
Distance ▶	1 foot	60 feet	120 feet	160 feet	1 foot	60 feet	120 feet	160 feet
$1,000 TO $1,500								
Averatec AV6130HS-20	4.9	5.5	5.2	—	20.6	10.7	7.9	—
Dell Inspiron 600m	6.0	6.0	5.3	3.9	19.8	15.6	4.9	2.0
eMachines M6810	**6.5**	**6.1**	**5.7**	4.9	21.4	17.4	6.4	2.8
Fujitsu LifeBook S2020	5.5	5.5	5.4	**5.3**	**21.9**	**22.3**	**15.6**	5.3
HP Pavilion zx5000	6.1	**6.1**	**5.7**	5.1	21.7	19.0	10.6	5.4
Toshiba Satellite A45-S250	5.4	5.4	5.3	**5.3**	21.8	22.2	11.9	**5.9**
Velocity Micro NoteMagix B50 Campus Edition	3.3	3.3	1.5	1.2	15.9	14.4	1.4	—
WinBook W320	5.5	5.2	4.9	1.6	20.4	18.2	5.8	—
LESS THAN $1,000								
Averatec AV3225HS	6.1	6.1	5.7	**5.4**	20.0	**16.6**	**13.0**	**7.3**
Dell Inspiron 1150	6.1	6.1	1.6	0.6	**20.3**	13.0	2.1	0.8
HP Compaq Presario R3000	**6.4**	**6.4**	**5.8**	4.1	N/A	N/A	N/A	N/A

RED denotes Editors' Choice. N/A—Not applicable: The notebook could not complete this test. The Apple iBook G4 (12-inch) is not compatible with our Windows-based tests. A dash idicates that no wireless signal was received at this range.

High scores are best. Bold type denotes first place within each category.		Business Winstone 2004	Multimedia Content Creation Winstone 2004	Business Winstone 2004 BatteryMark (hr:min)	3DMark03	3DMark03	Serious Sam SE (fps)	Serious Sam SE (fps)
Resolution ▶					1,024 x 768	1,600 x 1,200	1,024 x 768	1,600 x 1,200
Anti-aliasing/Anisotropic filtering ▶	Processor				*2X/2X*	*4X/4X*	*2X/2X*	*4X/4X*
$1,000 TO $1,500								
Averatec AV6130HS-20	Pentium 4 (3.0 GHz)	16.3	22.7	1:59	1,913	N/A	52.9	N/A
Dell Inspiron 600m	Pentium M 715 (1.5 GHz)	16.4	19.2	**4:08**	329	N/A	41.0	N/A
eMachines M6810	Mobile Athlon 64 3000+ (1.8 GHz)	18.0	**23.7**	2:53	1,881	N/A	52.5	N/A
Fujitsu LifeBook S2020	Athlon XP-M (LV) 2100+ (1.6 GHz)	13.2	14.1	3:17	N/A	N/A	15.8	N/A
HP Pavilion zx5000	Pentium 4 (3.06 GHz)	16.2	22.7	2:46	1,506	N/A	**57.1**	N/A
Toshiba Satellite A45-S250	Mobile Pentium 4 (2.8 GHz)	19.1	21.8	3:50	N/A	N/A	19.8	N/A
Velocity Micro NoteMagix B50 Campus Edition	Pentium M 735 (1.7 GHz)	**21.5**	19.6	3:46	**2,394**	**1,017**	46.2	**20.6**
WinBook W320	Pentium M 715 (1.5 GHz)	13.6	17.1	3:25	N/A	N/A	17.4	N/A
LESS THAN $1,000								
Averatec AV3225HS	Athlon XP-M 2000+ (1.7 GHz)	**13.6**	15.4	2:53	N/A	N/A	N/A	N/A
Dell Inspiron 1150	Celeron (2.6 GHz)	10.1	11.9	**3:03**	N/A	N/A	5.6	N/A
HP Compaq Presario R3000	Athlon XP-M 3000+ (1.6 GHz)	13.1	**16.6**	2:42	N/A	N/A	**28.4**	N/A

RED denotes Editors' Choice. N/A—Not applicable: The notebook could not complete this test. The Apple iBook G4 (12-inch) is not compatible with our Windows-based tests.

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tures or class notes, for example.

Thanks in part to its Mobile Athlon 64 3000+ (the only 64-bit PC processor in this lineup), the system ranked number one on Multimedia Content Creation Winstone (23.7), and near the top on Business Winstone (18.0). And with the AMD PowerNow! technology, the M6810's battery life was a surprising 2 hours 53 minutes—not bad for a desktop replacement.

The system's 3D scores were also superb (1,881 on 3DMark03 and 52.5 on Serious Sam SE, both at 1024-by-768 resolution). On our wireless tests, the M6810 maintained a decent signal out to 160 feet.

When it comes to productivity and entertainment value, the M6810 would make a great companion for a student. But at 7.7 pounds, it's probably best to keep this system mostly deskbound.—*CC*

Fujitsu LifeBook S2020

$1,379 list. Fujitsu PC Corp., www.fujitsu.com.

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The lightest notebook in our roundup at 4.2 pounds, the Fujitsu LifeBook S2020 will appeal mostly to students who need to do basic computing (e-mail, word processing, and Internet browsing). This machine also offers high portability at a low price.

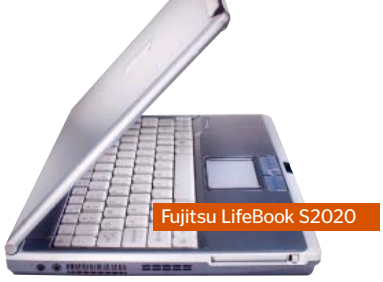
The 13.3-inch screen might be a bit small for researching term papers, but it delivers a bright, crisp image with a resolution of up to 1,600-by-1,200.

There's no Secure Digital slot, but the necessary ports are covered: two USB ports, one FireWire port, 100Mb Ethernet, and a modem. The DVD/CD-RW combo drive is standard fare in this class of notebooks and is sufficient for burning CDs and playing DVDs.

The S2020 includes a 1.6-GHz Mobile Athlon XP-M 2100+, which is decent. But its 256MB of RAM is barely enough for today's computing tasks, so we recommend upgrading to 512MB for about $100. Also note that the ATI Mobility Radeon 9200 graphics solution shares its 16MB video memory with the unit's system memory, so don't expect exceptional graphics performance.

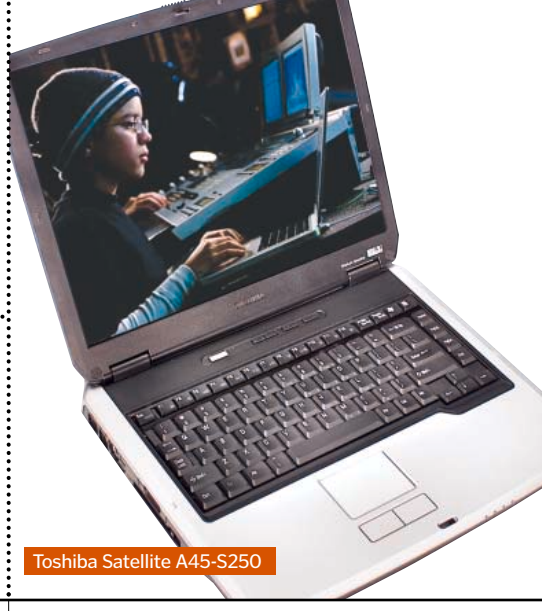
In general, the S2020's performance was low, though its BatteryMark score reached 3 hours 17 minutes, which is acceptable in light of the system's small battery. The S2020's wireless performance, however, impressed us; its 802.11g solution delivered 5.3 Mbps at 160 feet.

The S2020 is a good system for toting across campus, and it has enough battery power to get you through a morning of classes. But just remember, portability is its specialty, not features or performance.—*CC*



Fujitsu LifeBook S2020

eMachines M6810



Toshiba Satellite A45-S250

HP Pavilion zx5000

$1,423 direct. Hewlett-Packard Co., www.hp.com.

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The heavyweight of this roundup, the 8.5-pound HP Pavilion zx5000 is a desktop replacement in every sense of the term. No one would buy it to carry around campus. But as a multimedia system that stays put in a dorm room, this is a superb value that won't disappoint.

Both the bright 15.4-inch wide-screen display and outstanding Harman Kardon speakers lure gamers to the zx5000, as does its high graphics performance: It scored tops (57.1) on the 3D-intensive Serious Sam SE test, thanks to the ATI Mobility Radeon 9600 graphics solution.

Aside from your standard ports, there are three USB ports, a 5-in-1 flash card reader, as well as a proprietary USB digital drive for reading SD cards.

The Pavilion's software bundle stands out with Microsoft Office 2003, Quicken 2004, and multimedia applications, including Roxio's Easy CD Creator and InterVideo WinDVD.

The zx5000 was in the middle of the pack on Business Winstone (16.2), and it scored above average on Multimedia Content Creation Winstone (22.7). Although it will mostly stay plugged in, its battery life (2 hours 46 minutes) is impressive for a desktop replacement. And its 802.11g wireless solution is also solid, receiving strong throughput (5.4 Mbps) at 160 feet.

The zx5000 is a feature-packed workhorse—good for both work and play, as long as you don't plan on sprinting across campus with it.—*CC*

HP Pavilion zx5000

Toshiba Satellite A45-S250

$1,499 list. Toshiba America Information Systems Inc., www.toshiba.com. ●●●◐○

The Toshiba Satellite A45-S250 is a fast, durable, desktop replacement system that can easily become an integral part of a student's dorm life. It's a good performer, but as with many desktop replacements, the trade-off is added weight.

The A45-S250's case is contoured at a sharp angle toward the front edge, which makes surfing on your lap a bit uncomfortable after half an hour or so. The 15-inch, 1,024-by-768 (XGA) display is a good size, but the Velocity Micro system offers better resolution.

Having four USB ports is useful, as is the dual-format DVD±RW drive—one of only two systems in this roundup to include this drive. Also included are a FireWire port, Secure Digital slot, and S-Video capabilities. But the word processing application—a must-have for students—is left out.

The A45-S250 made the grade on Business Winstone and Multimedia Content Creation Winstone, scoring 19.1 and 21.8, respectively. But it falls short on graphics, with the integrated Intel 855GME.

Its 802.11g wireless solution produced strong throughput at all distances. And the system turned in an exceptional score on BatteryMark (3 hours 50 minutes).

The A45-S250 has excellent performance

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WinBook W320

Velocity Micro NoteMagix B50

and durability, and students will appreciate the dual-format DVD drive and abundance of ports. But all in all, the eMachines M6810 and the HP Pavilion zx5000 are more well-rounded desktop replacement systems to get you through school.—*CC*

Velocity Micro NoteMagix B50 Campus Edition

$1,500 street. Velocity Micro Inc., www.velocitymicro.com. ●●●●◐

PC MAGAZINE EDITORS' CHOICE

Students who act fast can score a fantastic deal with a limited edition notebook from Velocity Micro. Through September 30, the NoteMagix B50 Campus Edition offers top-notch components, including the 1.7-GHz Pentium M 735, 128MB ATI Mobility Radeon 9700, and 60GB hard drive—all for $1,500. That's easily the best combination of components in our roundup—all in a 6.2-pound system, which earns the B50 our Editors' Choice.

The B50 is a stylish and rugged, thin-and-light system. All the standard ports are included: S-Video, VGA, FireWire, and USB 2.0 (3). There's also a Secure Digital slot for removable storage. The software bundle also warrants a mention, because it includes a decent multimedia suite (with DVD playback, photo, and video apps) and the WordPerfect Productivity Pack (which includes WordPerfect, plus spreadsheet and address book apps).

The B50's graphics solution and 15-inch display (with 1,400-by-1,050 native resolution) are ideal for CAD designers and aspiring programmers who fit multiple windows and as much code as possible onto one screen. The B50 scored an impressive 2,394 on 3DMark03 and a 46.2 on Serious Sam SE at 1,024-by-768 resolution.

Perhaps the only disappointment is the B50's Intel Centrino 802.11g wireless solution, which performed below average out to 120 feet and lost its signal at 160 feet.

If you're a student looking for some serious productivity (and fun) but don't want to lug around a heavy system, then the B50 is right up your alley. It's built with hard-core components at a very competitive price. Catch it while you can.—*CC*

WinBook W320

$1,499 list. WinBook Computer Corp., www.winbook.com. ●●○○○

At first glance, the WinBook W320 may look perfect for students traipsing about campus; it has a 15.4-inch wide-screen display and weighs only 6.2 pounds. But its below-average performance, choppy DVD-movie playback, and lack of a word processor app make it tough to recommend.

The W320 includes a 1.5-GHz Pentium M 715 and is the only system here loaded with Win XP Pro. And thanks to the low-voltage processor, the system turned in a respectable battery score (3:25). But the W320's performance lagged behind the rest, with a meager 13.6 and 17.1 on Business Winstone and Multimedia Content Creation Winstone, respectively. The system's Centrino 802.11g wireless performed well out to 120 feet but lost signal at 160 feet.

The W320 comes with one FireWire, one VGA, one S-Video, one 100Mb Ethernet, and three USB ports. Like the Averatec AV6130HS-20, the W320 is also equipped with an S/PDIF port for digital audio. The 3-in-1 memory card reader comes in handy for storing and transferring files.

For a wide-screen notebook, the lackluster performance and choppy DVD playback are disappointing. This system as a whole just can't compete with the likes of the Velocity Micro notebook.—*CC*

SUMMARY OF FEATURES

Back-to-School Notebooks

$1,000 to $1,500

■ YES □ NO	Apple iBook G4 (12-inch)	Averatec AV6130HS-20	Dell Inspiron 600m	eMachines M6810	Fujitsu LifeBook S2020	HP Pavilion zx5000	Toshiba Satellite A45-S250	Velocity Micro NoteMagix B50 Campus Edition	WinBook W320
Price (tested configuration)	$1,099 direct	$1,449 list	$1,499 direct	$1,499 direct	$1,379 list	$1,423 direct	$1,499 list	$1,500 street	$1,499 list
Processor	PowerPC G4 (1.0 GHz)	Pentium 4 (3.0 GHz)	Pentium M 715 (1.5 GHz)	Mobile Athlon 64 3000+ (1.8 GHz)	Athlon XP-M (LV) 2100+ (1.6 GHz)	Pentium 4 (3.06 GHz)	Mobile Pentium 4 (2.8 GHz)	Pentium M 735 (1.7 GHz)	Pentium M 715 (1.5 GHz)
Installed RAM	256MB	512MB	512MB	512MB	256MB	512MB	512MB	512MB	512MB
Hard drive capacity	30GB	60GB	40GB	60GB	40GB	60GB	60GB	60GB	60GB
Screen (diagonal, in inches)	12.1	15.4	14.1	15.4	13.3	15.4	15.1	15.1	15.4
Built-in wireless type	802.11g	802.11g	802.11g	802.11g	802.11g	802.11g	802.11g	802.11g	802.11g
System/travel weight (pounds)	4.9 / 5.7	7.7 / 9.5	5.4 / 6.3	7.7 / 8.8	4.2 / 4.9	8.5 / 9.6	7.6 / 9.1	6.2 / 7.0	6.2 / 7.0
Graphics chipset	ATI Mobility Radeon 9200	ATI Mobility Radeon 9600	ATI Mobility Radeon 9000	ATI Mobility Radeon 9600	ATI Mobility Radeon 9200	ATI Mobility Radeon 9600	Intel 855GME	ATI Mobility Radeon 9700	Intel 855GME
Optical drive	DVD/CD-RW	DVD±RW	DVD/CD-RW	DVD/CD-RW	DVD/CD-RW	DVD/CD-RW	DVD±RW	DVD/CD-RW	DVD/CD-RW
Key pitch (mm)	19	19	19	19	19	19	19	19	19
Pointing device	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad
Parallel/serial/VGA port	□□■	■□■	■■■	□□■	□□■	■□■	■□■	■□■	□□■
USB/FireWire ports	2 / 1	3 / 1	2 / 0	4 / 1	2 / 1	3 / 1	4 / 1	3 / 1	3 / 1
Memory card types accepted	None	SD	None	CF, MD, MMC, MS, MSP, SD	None	MMC, MS, MSP, SD, SM	SD	SD	MS, SD, SM
Standard lithium ion battery (whr)	61	63	52	65	43	88	91	63	48
Warranty (parts and labor)	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year

RED denotes Editors' Choice. CF—CompactFlash, MD—MicroDrive, MMC—MultiMediaCard, MS—Memory Stick, MSP—Memory Stick Pro, SD—Secure Digital, SM—SmartMedia.

HP Compaq Presario R3000

Dell Inspiron 1150

Averatec AV3225HS

NOTEBOOKS [LESS THAN $1,000]

Averatec AV3225HS

$999 list. Averatec Inc., www.averatec.com.

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PC MAGAZINE EDITORS' CHOICE

Looking for a notebook that won't weigh you down, has terrific wireless performance, and handles everyday computing tasks with aplomb—all for under $1,000? If so, look no farther than the Averatec AV3225HS, which earned our Editors' Choice in a recent sub-$1,000 roundup and retains its title in this budget roundup.

The AV3225HS weighs just 4.5 pounds and measures just 1 inch thick, with a 12.1-inch XGA display. The keyboard is full size, except for the <Period>, <Comma>, Alt, and Ctrl keys, which are 25 percent smaller.

For the most part, the AV3225HS didn't cut corners to keep the price and weight down. It includes a 40GB hard drive, three USB 2.0 ports, a VGA port, 100Mb Ethernet, a modem, and a PC Card slot. We found the DVD/CD-RW combo drive to be a little noisy during DVD playback.

Built around the low-voltage 1.7-GHz Athlon XP-M 2000+ processor, the AV3225HS garnered a respectable BatteryMark score of 2 hours 53 minutes. Of the budget notebooks, it came in first on Business Winstone and second on Multimedia Content Creation Winstone. Wireless performance was also strong, registering 7.3 Mbps at 160 feet.

The AV3225HS is great for taking to and from class, researching via the Internet, or writing term papers, but if you want a multimedia system and don't mind sacrificing portability, opt for the HP Compaq Presario R3000 with its wide screen. But if portability is your main concern, the AV3225HS won't weigh you down—or break the bank.—*CC*

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

Less than $1,000

Averatec AV3225HS	Dell Inspiron 1150	HP Compaq Presario R3000
$999 list	$999 direct	$993 direct
Athlon XP-M 2000+ (1.7 GHz)	Celeron (2.6 GHz)	Athlon XP-M 3000+ (1.6 GHz)
512MB	256MB	256MB
40GB	30GB	40GB
12.1	14.1	15.4
802.11g	802.11g	802.11b
4.5 / 5.3	7.0 / 8.1	8.0 / 9.6
VIA S3G	Intel 855GME	nVidia GeForce4 420 Go
DVD/CD-RW	DVD/CD-RW	DVD/CD-RW
19	19	19
Touch pad	Touch pad	Touch pad
□□■	□□■	■□■
3 / 0	2 / 0	3 / 0
None	None	None
44	63	65
1 year	1 year	1 year

Dell Inspiron 1150

$999 direct. Dell Inc., www.dell.com.

●●◐○○

All notebooks with a price tag under $1,000 have to make sacrifices. But the Dell Inspiron 1150 has made more than the others in this roundup, and that shows in its performance.

With an Intel Celeron processor, the 1150 is no speed demon. Of the sub-$1,000 systems, the 1150 scored lowest on Business Winstone and Multimedia Content Creation Winstone.

The system also comes with only two USB 2.0 ports, compared with the three ports that the other two budget notebooks in this roundup provide. This system's 30GB hard drive is also smaller than the others. But to the 1150's credit, it is well-stocked with WordPerfect Office 12 for term papers, as well as Paint Shop Pro and Paint Shop Photo Album for photo editing and storage. Also, including an 802.11g wireless solution is a plus; the HP Compaq Presario R3000 comes with only 802.11b. The 1150's signal dropped drastically, however, after 120 feet.

The 1150's 14.1-inch XGA display is a good size for writing papers and Web surfing. At 7 pounds it may not be the best notebook to lug to a lecture hall, but it is manageable. And its battery life of 3 hours 3 minutes bests all the other budget notebooks by at least 10 minutes.

The 1150 is a decent budget notebook, but we can't recommend it when others offer more features and better performance at a comparable price.—*Lawrence Judd*

HP Compaq Presario R3000

$993 direct. Hewlett-Packard Co., www.hp.com.

●●●◐○

If you're looking for a bargain basement system to ease the back-to-school burden but don't want to sacrifice multimedia features, then the HP Compaq Presario R3000 could be the notebook for you.

The 8-pound R3000 has a sharp 15.4-inch WXGA display. The system had no problem displaying our test DVD movie clearly, and its JBL Pro speakers delivered superb sound quality. The nVidia GeForce4 420 Go graphics solution helped the R3000 win first place on our 3D performance tests. (Although our test system came with 802.11b, HP is offering free upgrades to 802.11g.)

On Multimedia Content Creation Winstone and our Serious Sam SE gaming demo, the R3000 had the best scores of the budget machines with 16.6 and 28.4, respectively. But we were surprised to find no memory card reader on a system with such multimedia-centric components. On BatteryMark, the R3000 lasted 2 hours 42 minutes, which was lowest among the budget systems.

The R3000 offers very good bang for the buck if you're on a budget but still want a spiffy multimedia system that will impress your dormmates. (Hey, you even get Microsoft Office SE 2003 for when it's time to get to work.) Shy away from the R3000, however, if you're looking for a more mobile system to carry around campus.—*Charles Rodriguez*

DESKTOPS [LESS THAN $800]

Apple eMac

$799 direct. Apple Computer Inc., www.apple.com.

●●●○○

The entry-level Apple eMac is a good introduction to the Macintosh world, and it has the power to keep elementary- and middle-school students happy. With the extensive educational software selection found in your local Apple Store, the eMac makes a great learning tool. And like with the iBook, college students can save $50.

The 1.25-GHz PowerPC G4 processor and 256MB of RAM make the system fine for basic tasks, such as word processing, e-mail, and spreadsheets, although for all-around better performance, we recommend a $75 upgrade to 512MB of RAM. The 40GB hard drive is small by today's standards, but large enough to hold thousands of one-to-five-page papers in addition to a host of educational titles. High school and college students might want to consider the eMac with a larger hard drive and SuperDrive optical drive.

Besides Mac OS X 10.3 Panther, QuickTime 6 and the excellent iLife suite are installed. The included software suite has the AppleWorks 6 word processor for writing papers, and the World Book Encyclopedia for researching them.

We found the eMac's Photoshop performance to be similar to the Windows desktop PCs reviewed here after we upgraded the eMac to 512MB of RAM. And with its ATI Radeon 9200 graphics card, it's capable of playing basic to intermediate 3D games and 2D educational games, although the Windows platform supports more games in general. If it's gotta be a Mac, young students will be well equipped with this box. —*Joel Santo Domingo*

Dell Dimension 2400

$799 direct. Dell Inc., www.dell.com.

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The Dell Dimension 2400 provides a decent feature set for students at a reasonable price. Although it's powered by the older 2.66-GHz Pentium 4, the system is loaded with 512MB of RAM, a spacious 80GB hard drive, a 19-inch CRT monitor, dual optical drives (one DVD-ROM and one CD-RW drive), and stereo Altec Lansing speakers with a subwoofer. But unlike the eMachines, HP, and iBuyPower offerings, the 2400 has no memory card reader.

Dell packs a generous software bundle with the 2400, though, including apps for word processing, researching papers, and

SUMMARY OF FEATURES

Back-to-School Desktops

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

■ YES □ NO	Apple eMac	Dell Dimension 2400	eMachines T3092	HP Pavilion a610n	iBuyPower Back to School	WinBook PowerSpec 6244
Price (tested configuration)	$799 direct	$799 direct	$710 direct	$770 direct	$799 direct	$794 list
Installed OS	Mac OS X 10.3 Panther	Windows XP Home	Windows XP Home	Windows XP Home	Windows XP Home	Windows XP Home
Processor	PowerPC G4 (1.25 GHz)	Pentium 4 (2.66 GHz)	Athlon XP 3000+ (2.16 GHz)	Athlon XP 3000+ (2.16 GHz)	Athlon XP 3200+ (2.2 GHz)	Athlon XP 2800+ (2.25 GHz)
Installed/maximum RAM	256MB / 1GB	512MB / 2GB	512MB / 1GB	512MB / 1GB	512MB / 3GB	512MB / 2GB
Hard drive capacity	40GB	80GB	160GB	160GB	80GB	80GB
Hard drive speed	5,400 rpm	7,200 rpm	7,200 rpm	7,200 rpm	7,200 rpm	7,200 rpm
Screen (diagonal, in inches)	17	19	17	17	17	17
Maximum screen resolution	1,280 x 960	1,600 x 1,200	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024
Graphics chipset	ATI Radeon 9200	Intel 845GL	nVidia GeForce4 MX	VIA S63 UniChrome	nVidia GeForce 3 Ti200	VIA KM400
Primary optical drive	DVD/CD-RW	DVD-ROM	CD-ROM	DVD-ROM	DVD/CD-RW	CD-RW
Secondary optical drive	N/A	CD-RW	DVD±RW	CD-RW	N/A	DVD-ROM
Parallel/serial/VGA port	N/A	■■■	■■■	■■■	■■■	■■■
USB/FireWire ports	3 / 2	6 / 0	5 / 0	7 / 2	5 / 0	6 / 0
Speaker manufacturer	Apple	Altec Lansing	eMachines	Harmon Kardon	Mitsuko	Inland Pro Sound 2000
Memory card types accepted	N/A	N/A	CF, MMC, MS, MSP, SD, SM	CF, MMC, MS, MSP, SD, SM, xD	CF, MMC, MS, MSP, SD, SM	N/A
Warranty (parts and labor)	1 year	1 year	1 year	1 year	1 year parts, 3 years labor	1 year

RED denotes Editors' Choice. N/A—Not applicable: The product does not have this feature.
CF—CompactFlash, MMC—MultiMediaCard, MS—Memory Stick, MSP—Memory Stick Pro, SD—Secure Digital, SM—SmartMedia, xD—xD-Picture Card.

organizing photos.

With a compact design, the 2400 has only one internal 3.5-inch bay for the hard drive. The lack of an AGP slot marries you to the integrated Intel graphics solution. You can, however, upgrade to 2GB of system memory, and there are three PCI slots, although one is used by the included 56K modem.

The 2400's performance was a mixed bag. It came in last on Business Winstone with a score of 17 and fared next to last on Multimedia Content Creation Winstone with a score of 22.9. Its performance was middle of the road on 3DMark03 with a score of 79, but was a top scorer on most of our Photoshop 7.01 tests.

Although the limited upgradability of this unit might be too restricting for those with computer-heavy majors, it does make a great buy for students with simple computing needs.—*William Pagan*

eMachines T3092

$710 direct. eMachines Inc., www.emachines.com. ●●●●◐

PC MAGAZINE EDITORS' CHOICE

Students will have a hard time passing up the eMachines T3092, which earns our Editors' Choice. The built-in DVD±RW drive makes this system stand apart from other machines in the roundup, and the rest of its components make it a great value too.

For example, the 160GB hard drive—a capacity that only HP could match at this price point—makes this system ideal for a budget-conscious photo enthusiast or budding film student. While there is a memory card reader for photo transfer, film students will have to add a FireWire card to use a DV camera.

Upgrades are certainly possible, thanks to room for a couple of PCI cards and another hard drive. The nForce2-based motherboard also has an 8X AGP slot, which can be used to upgrade to a high-power 3D graphics card. Although the system is a good 2D performer, as shown by its Business Winstone 2004 score (18.5), our gaming tests show you'll need an upgrade if you want to play 3D-intensive games.

The T3092 includes Microsoft Works 7.0, with Picture It! Premium. With Works, you can write reports and adorn them with digital pictures—all of which will look fine on the 17-inch CRT.

The T3092 is a good alternative for students who are into instant gratification. While you have to order direct from vendors like Dell, eMachines systems can be found at local electronics megamarts, so you can try before you buy. For now, take our word: Most students can't go wrong with the T3092.—*JSD*

Dorm Entertainment Systems

Those who are planning to get a desktop PC for their dorm rooms anyway might want to consider one that's loaded with Microsoft Windows XP Media Center Edition or similar multimedia applications. Such PCs can double as your TV, DVD player, and stereo, saving valuable space and bringing your dorm some of the entertainment luxuries of home. Although the previously reviewed systems we outline below may seem pricey, most of them can be custom-configured to lower the cost. The same holds true for our new Editors' Choice in this category, the HP Media Center PC 1050y, which is reviewed in this issue's First Looks.—*KK*

ABS Awesome 4300 Although not a true Media Center PC, the installed tuner card and DVR software make the 4300 act like one at a reasonable price.

With AMD Athlon 64 3000+, 512MB DDR 400 SDRAM, 120GB SATA hard drive, Samsung 19-inch CRT, 128MB nVidia GeForce FX 5700, DVD±RW and DVD-ROM drives, integrated six-channel audio, Creative I-Trigue 2.1 3300 speakers, Microsoft Windows XP Home Edition, $1,295 direct. ABS Computer Technologies Inc., www.abspc.com. ●●●◐○

Medion m3 5000 Director Surprisingly easy to find in U.S. retail stores, this Media Center PC from a German company is reasonably priced and powerful.

With 3.0-GHz Pentium 4, 512MB DDR 333 SDRAM, 160GB hard drive, 17-inch LCD, 128MB nVidia GeForce FX 5200 graphics, DVD±RW and DVD-ROM drives, integrated audio, 2.1 speakers, Windows XP Media Center Edition, $1,450 street. Medion USA Inc., www.medion.com. ●●●●○

Sony VAIO PCV-V200G This all-in-one form factor is great for tight spaces and quite stylish, although the screen and hard drive are a bit on the small side.

With 2.8-GHz Pentium 4, 512MB DDR 333 SDRAM, 120GB hard drive, 15-inch LCD, integrated SiS 651 graphics, DVD-RW drive, integrated audio, integrated Sony stereo speakers, Microsoft Windows XP Home Edition, $1,699 direct. Sony Electronics Inc., www.vaio.net. ●●●●○

HP Pavilion a610n

$770 direct. Hewlett-Packard Development Co., www.hp.com. ●●●●○

The beginning of a school year brings with it plenty of concerns. The suitability of the stellar HP Pavilion a610n should not be one of them.

The a610n has an AMD Athlon XP 3000+ processor and large 160GB hard drive, along with separate DVD-ROM and CD-RW drives. HP takes advantage of this hardware with a nice software bundle. Microsoft Works 7.0 with Encarta will help in researching and writing papers. You can also copy CDs easily with Sonic Record Now! software, and touch up photos with HP's Image Zone Plus. Even Apple iTunes comes installed.

The system comes with a 17-inch CRT and two speakers (no subwoofer), which are sufficient to play video and listen to your music collection.

Attaching devices is easy with one FireWire and three USB ports on the front of the box. A sliding cover on the front hides a memory card reader and an

essentially obsolete floppy disk drive.

Finishing in the middle of the pack for this roundup on our benchmark tests (it does have integrated VIA S63 graphics), the a610n provides sufficient power to get school tasks done for years to come. For students who also want to enjoy music and digital photos along the way, the HP Pavilion a610n is a steal and worthy of an honorable mention.—*Alphonse Ragusa*

iBuyPower Back to School

$799 direct. iBuyPower Computer, www.ibuypower.com. ●●●●○

Preteens and up will love the iBuyPower Back to School. Its case has a clear side panel, a neon strobe light inside, and a light-up letter *Z* cutout on the front-panel door. Inside, the powerful 2.2-GHz Athlon XP 3200+ CPU, snappy DDR system memory, and responsive 80GB hard drive with 8MB buffer helped the machine blow away the competition on our benchmark tests.

This system beat the WinBook PowerSpec 6244 (the second-best performer) by more than four points on Multimedia Content Creation Winstone and by more than one point on Business Winstone. And on 3DMark03 it scored far better than the second-best performer, the eMachines T3092. This is not surprising, because of the system's 128MB nVidia GeForce3 Ti 200 AGP graphics adapter.

As potent as the machine is, however, it lacks productivity software, such as a word processor. The system comes with only CyberLink PowerDVD to play movies and Ahead's Nero to burn CDs. There's no photo software, but there is a memory card reader installed.

The included 17-inch CRT monitor is sharp. The three-piece speaker set, however, leaves something to be desired. There are three USB 2.0 connectors up front, in addition to headphone and microphone jacks.

The iBuyPower system is the right choice for students who know they'll occasionally need to alleviate school-related stress with games. Although it comes with few applications, it's easier to add software than it is to add the kind of performance that this machine already has.—*Omar Cintron*

WinBook PowerSpec 6244

$794 list. WinBook Computer Corp., www.winbook.com. ●●◐○○

The WinBook PowerSpec 6244 certainly has enough get-up-and-go for your basic academic computing tasks, but it trails similarly priced systems in features.

The 6244 doesn't include a word processor, and the CD-RW drive has to make due with Windows-writing capabilities. Roxio PhotoSuite 5 is included for work with photos, and the 17-inch CRT's display impressed us. You can store tons of MP3s on the respectable 80GB hard drive and queue them up with Musicmatch Jukebox. When playing tunes or movies with PowerDVD and the DVD-ROM drive, sound quality from the Inland Pro Sound 2000 speakers is mediocre at best.

Four USB 2.0 ports reside on the back of the chassis, and two USB ports and an open media drive bay are conveniently provided on the front of the tower. The sides of the tower also have cool built-in air vents.

The 2.25-GHz Athlon XP 2800+ is one of the lowest-rated processors in this roundup, but it still managed a second place score on Business Winstone at 19.2 and turned in a middle-of-the-road score of 23 on Multimedia Content Creation Winstone. Because of its paltry 32MB of shared graphics memory, the 6244 bombed out on 3DMark03 with a less-than-favorable score of 34.

Unless you enjoy excessive upgrading, you should pass on the 6244. Its mediocre performance and features just won't cut it on campus.—*Joseph A. Guilbeau* IV

PERFORMANCE TESTS

PC LABS

For primary- and secondary-school work, any of the PCs in this roundup will deliver fine performance, as shown by our Winstone performance scores. The difference between the top and bottom performers in this group is only about 20 percent on our Business Winstone 2004 test.

The Multimedia Content Creation Winstone 2004 scores show a larger gap. The top scorer, the iBuyPower, was about 26 percent above the lowest performer. The iBuyPower was the only box to go with an add-in graphics card, and it showed. The rest of the Windows PCs are clustered in the 22- to 24-point range, which means they will be competent at media creation for even college design classes.

The nVidia GeForce 3 Ti200 card in the iBuyPower Back to School also helped it achieve top scores on 3DMark03. This means that the iBuyPower system alone will be able to handle a good number of 3D games as configured. Note that the Dell Dimension 2400 and Apple eMac are not upgradable with AGP graphics cards if your student "needs" a higher degree of gaming performance.

The Photoshop scores show that the eMac performs similarly to the Windows-based desktop PCs in this roundup, especially after we upgraded the eMac to 512MB of RAM, which was necessary for our testing.—*Analysis written by Joel Santo Domingo*

▲ High scores are best. ▼ Low scores are best. Bold type denotes first place.	Processor	Business Winstone 2004 ▲	Multimedia Content Creation Winstone 2004 ▲	3DMark03 1,024 x 765 ▲*	PHOTOSHOP 7.01 TESTS (seconds) ▼ Gaussian blur (radius) 100	Gaussian blur (radius) 250	Unsharp mask	Lighting effects	Resize to 200%
Apple eMac	PowerPC G4 (1.25 GHz)	N/A	N/A	N/A	7	19	5	4	21
Dell Dimension 2400	Pentium 4 (2.66 GHz)	17.0	22.9	79	**4**	**15**	**2**	3	**20**
eMachines T3092	Athlon XP 3000+ (2.16 GHz)	18.5	23.9	152	5	16	3	**2**	23
HP Pavilion a610n	Athlon XP 3200+ (2.2 GHz)	17.8	21.7	67	6	18	3	3	31
iBuyPower Back to School	Athlon XP 3200+ (2.2 GHz)	**20.6**	**27.3**	**1,041**	**4**	**15**	**2**	**2**	**20**
WinBook PowerSpec 6244	Athlon XP 2800+ (2.25 GHz)	19.2	23.0	34	6	18	3	3	22

RED denotes Editors' Choice. * Anti-aliasing off, 2X anisotropic filtering. N/A—Not applicable: The desktop could not perform this test.

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CUSTOMER TESTIMONIALS

I was pleasantly surprised that tech support got back to me quickly and their answers were courteous, accurate, and succinct. Great! - Alan

I am very impressed with how fast you got back to me, I feel great knowing that I can e-mail you with a problem and know that I will receive a response within minutes. - Susan

I can say without reservation that I have never received better support. Everything you did was timely and error-free. - Bob

I just wanted to tell you how pleased I am with the software, training, and speed. It was much easiier than I thought, and I could not be happier! Thanks! - David

I'm really impressed with the fast service you guys provide and the polite way you deal with what must seem very basic questions to you. Brilliant service! Thanks! - Sarah

I now have a few sites with you guys and believe me, I know the quality of your service, and it is a pleasure dealing with you. Your company is tops. Thanx again. - Dusty

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IN THIS STORY

108 Brother MFC-3420c ●●●●○
108 Canon MultiPass MP360 ●●●○○
109 Canon MultiPass MP390 ●●●○○
109 Dell Personal All-In-One Printer A960 ●●◐○○
109 Dell Photo All-In-One Printer 922 ●●◐○○
110 HP Officejet 9130 All-in-One ●●●◐○
110 HP PSC 2410 Photosmart All-in-One ●●●○○
111 Lexmark X2250 All-in-One ●◐○○○
111 Lexmark X5250 All-in-One ●●●○○

■ Brother MFC-3420c

■ Canon MultiPass MP390

ALL-IN-ONES: ONE FOR ALL

INK JET ALL-IN-ONES ARE BETTER CHOICES THAN EVER FOR PRINTING, FAXING, COPYING, AND SCANNING. WE PUT THEM TO THE TEST WITH INTENSIVE COST-PER-PAGE AND PHOTO-QUALITY ANALYSES.

BY M. DAVID STONE

Whether you think of them as multifunction printers (MFPs) or all-in-ones (AIOs), printer and scanner bundles are now the peripherals of choice for those who want it all—printer, copier, scanner, and fax machine. We look at nine of the latest.

AIOs have become so affordable—as low as $100—that they're muscling in on the low-end scanner market. According to research firm IDC, U.S. flatbed scanner shipments will drop from 5.8 million in 2002 to a projected 2.9 million in 2004, leveling off at about 2 million in 2007.

We were particularly interested in how well these units would handle photos, since several manufacturers are touting them as photo printers. We put them through our new photo test suite, which you can read more about on page 110.

We also include a cost-per-page analysis, with run-down tests on all the printers—and *all* their cartridges. Vendors' testing methodologies differ, so we used one methodology across the board to see whether vendor claims are comparable. Find out if they are on page 108.

All of these printers have a simple setup routine and install Twain and WIA drivers. They all print, scan, and copy, and some fax.

We were generally pleased with most of these printers. They fared reasonably well, with photo quality scores ranging from good to excellent. If you're willing to sacrifice a little speed or quality in the area you care least about, you really can have everything you need in one device.

Brother MFC-3420c

$180 street. Brother International Corp., www.brother.com. OVERALL RATING: ●●●●○ QUALITY RATINGS: Text: ●●●●○ Graphics: ●●●●○ Photos: ●●●◐○

PC MAGAZINE EDITORS' CHOICE

The Brother MFC-3420c doesn't outshine the competition in every category, but it is the most well-rounded of the bunch, turning in more than acceptable text, graphics, and photos at speeds you can live with and a price you can afford.

With a 20-sheet ADF (automatic document feeder), built-in fax modem, and front-panel controls that let it work as a standalone fax machine and copier, the MFC-3420c is a full-function unit. It also offers a separate cartridge for each of the four colors, which helps lower the cost per page. Although photos printed a little slowly on our performance tests, the MFC-3420c showed good speeds for text and graphics. On our business applications suite, the MFC-3420c was the fastest unit, claiming first or second place on 9 of the 13 individual tests, and first place in overall time, at 20 minutes 24 seconds. For the photo suite, however, it averaged 4 minutes for each 4-by 6-inch photo, and 9:32 for each 8-by-10.

Output quality rated very good for text and graphics and just short of that for photos. Cost per page was 2.6 cents per monochrome page, the second best in this group, but 15.1 cents per color page, the third most expensive.

■ **Canon MultiPass MP360**

If you're looking for a photo printer that also handles text and graphics reasonably well, the MFC-3420c isn't your best choice. But if you print mostly from standard business applications and just need some decent photos from time to time, this one is perfect.

Canon MultiPass MP360

$130 street. Canon USA Inc., www.usa.canon.com. OVERALL: ●●●○○ Text: ●●●●○ Graphics: ●●●●○ Photos: ●●●●●

As far as photo printing from an AIO is concerned, Canon's got you covered. But printing from business apps is another story. The Canon MultiPass MP360 lacks an ADF and isn't the best or fastest at text and graphics. But if you need something that prints, scans, and copies and delivers beautiful photos, this one is worth considering.

As with most Canon printers, setup requires installing a printhead and two cartridges and then running a manual alignment routine. The cartridges are relatively small, so you'll have to replace them more often than you would with other printers. The unit has no fax modem or fax support.

Performance on our business applications suite was unimpressive. The entire suite took 43 minutes 21 seconds to complete, making the MP360 the second slowest, behind the Lexmark X2250. It also ranked in the bottom third for every test in the suite that included color—which is all but one test.

Performance for photos was significantly better; the MP360 averaged 2:33 for each 4-by-6, and 5:44 for each 8-by-10. Output quality was also better for photos, earning an excellent rating, compared with the very good rating for text and graphics. Cost per page on our tests was 3.3 cents for a monochrome page and 12.4 cents for color—midrange rankings, though far closer in both cases to the least expensive printers to run. The MP360 isn't the ideal all-in-one, but if you're primari-

OUR CONTRIBUTORS: Associate editor **Sarah E. Anderson** and lead analyst **M. David Stone** were in charge of this story.

COST-PER-PAGE ANALYSIS

PC LABS

When buying a printer, you should weigh the up-front cost and the cost per page (CPP), which can vary widely. But figuring out which printer is the least expensive to run is impossible when you have only vendor claims and no industry standard to go by.

For this roundup, we focused first on testing all the AIOs the same way to get comparable results. Second, we compared our findings with vendors' claims to see whether you could reasonably compare them against one another.

For each unit, we printed the same test file and tracked the number of pages printed for each cartridge. We considered a tricolor cartridge empty when any of the three ink colors ran out, but we tracked single-color cartridges separately.

After determining the average yield for each cartridge, we calculated the yield for 5 percent black coverage on a monochrome page and for 5 percent coverage of each color—or 20 percent total coverage—for a color page. We then divided the cartridge cost by the yield. We calculated vendors' claimed cost per page by dividing the cartridge cost by the vendors' claimed yields.

If you compare the claimed CPP with the tested CPP, you'll see that sometimes the vendor claims closely match our results and sometimes don't. The HP Officejet 9130, for example, scored best for cost per monochrome page on our tests and had the best claimed cost, with a difference of only 0.2 cents; for color, however, it ranked fourth in claimed CPP but had the best score on our tests, with a larger difference of 2.6 cents.

As expected, our results show that comparing vendors' claims won't help you determine which printer costs the least in the long run, but this table should.—*MDS*

Low numbers are best. Bold type denotes first place.	BLACK CARTRIDGES			COLOR CARTRIDGES		
	Claimed cost per page	Tested cost per page	*PC Magazine* ranking (5% coverage)	Claimed cost per page	Tested cost per page	*PC Magazine* ranking (20% coverage)
TWO-CARTRIDGE PRINTERS						
Canon MultiPass MP360	2.3¢	3.3¢	4	**3.2¢**	12.4¢	5
Canon MultiPass MP390	2.3¢	3.2¢	3	**3.2¢**	11.9¢	3
Dell Personal All-In-One Printer A960	—	5.2¢	8	—	17.8¢	8
Dell Photo All-In-One Printer 922*	3.9¢	4.1¢	7	5.3¢	12.2¢	4
HP PSC 2410 Photosmart All-in-One	4.4¢	3.4¢	5	8.7¢	12.5¢	6
Lexmark X2250 All-in-One*	7.1¢	8.8¢	9	11.6¢	21.8¢	9
Lexmark X5250 All-in-One*	5.3¢	3.9¢	6	6.7¢	11.5¢	2
FOUR-CARTRIDGE PRINTERS						
Brother MFC-3420c*	3.3¢	2.6¢	2	12.3¢	15.1¢	7
HP Officejet 9130 All-in-One	**1.9¢**	**1.7¢**	**1**	7.8¢	**10.4¢**	**1**

RED denotes Editors' Choice. * Tested with a high-yield cartridge. A dash indicates that the information is not available.

ly interested in photos, it's one of the two best choices in this roundup, along with its near twin, the MP390.

Canon MultiPass MP390

$200 street. Canon USA Inc., www.usa.canon.com., OVERALL: ●●●○○ Text: ●●●●○ Graphics: ●●●●○ Photos: ●●●●●

With borderless printing, memory card slots, and some of the best photo output in this roundup, the Canon MultiPass MP390 leaves little doubt about its purpose. Like the Brother MFC-3420c (the other Editors' Choice), the MP390 is a well-rounded option; its strong suit, however, is photography, whereas the MFC-3420c's strength lies in business applications. With the exception of an ADF, the MP390 provides every feature you could hope for.

The MP390 offers a PictBridge USB camera port on the bottom right. Memory card slots hidden behind a small door let you print photos without a computer from eight types of cards. The front-panel buttons and LCD-based menu allow for direct printing as well as copying, faxing, and scanning.

Speed, however, is not one of the MP390's strengths. It took 42 minutes 6 seconds to complete the business applications suite, compared with the Brother entry, which reigned at 20:24 (the Lexmark X2250 All-in-One was last at 69:21). But it came in a strong third for both 4- by 6-inch photos and 8-by-10s. The output quality for everything ranges from very good to excellent, making up somewhat for the lackluster speed on business apps.

With only two cartridges, the MP390 manages to keep costs reasonably low, ranking third. Cost per page on our tests was 3.2 cents for monochrome and 11.9 cents for color.

The slow speed and low-capacity ink cartridges make this the wrong choice if you print lots of pages from business apps, but if you print primarily photos and still need to fax—or just print from Microsoft Word and Excel once in a while—you'll be more than pleased with this choice.

Business Applications: Brother MFC-3420c
Photos: Canon MultiPass MP390

PC MAGAZINE EDITORS' CHOICE

Picking the Editors' Choices for this story wasn't easy. We took into consideration each printer's initial price, cost per page, features, and quality and speed for both photos and business application documents, as well as the overall rating.

Many of the products performed well on some parts of our tests, but none performed well on every part. Since an all-in-one should be just that, we chose the two that really can function that way, with an emphasis on speed and output quality for business apps in the case of the Brother MFC-3420c and on photos in the case of the Canon MultiPass MP390.

Along with the MP390, the MFC-3420c offers very good business applications output. It also comes in first for speed and ranks second in cost per monochrome page, behind only the HP Officejet 9130, which costs $820 more.

The MP390, on the other hand, produced excellent photo output (along with the MP360, which we also highly recommend for those who don't need fax support). The MP390 ranks third behind the 9130 and the Lexmark X5250 for cost per color page, but the X5250 lags far behind the MP390's photo speed. Most important, though, both the Brother and Canon units delivered passable results even in the categories that aren't their strengths. With these two printers, you truly do get it all—in one.

Dell Personal All-In-One Printer A960

$180 street. Dell Inc., www.dell.com. OVERALL: ●●◐○○ Text: ●●●○○ Graphics: ●●●○○ Photos: ●●●●○

With its 50-page ADF and standalone fax capability—along with copy, scan, and print features—the Dell Personal All-In-One Printer A960 easily qualifies as a full-function AIO. But it doesn't win any contests for speed or quality.

On our tests, the A960 was relatively slow for both test suites. It completed the business applications suite in 36 minutes 1 second, compared with 20:24 for the Brother MFC-3420c, which offers similar features for the same price. In addition to the faster overall speed, the Brother unit beat the A960 on 10 of the 13 individual tests. For photos, the A960 was somewhat faster than the MFC-3420c, averaging 3:45 for each 4-by-6 and about 8:51 for each 8-by-10.

The A960 earned a rating of good for both text and graphics quality and very good for photos. Here again, the Brother MFC-3420c did better for business applications and worse for photos, with a very good rating for text and graphics but a little short of very good for photos. More important, the A960 is the second most expensive printer in this group to run, at 5.2 cents per monochrome page on our tests and 17.8 cents per color page.

This combination of performance, output quality, and running costs suggests you should look elsewhere if you print mostly from business apps or print lots of pages. But if features come first, the A960 has the edge with its hefty ADF and fax capability.

Dell Photo All-In-One Printer 922

$130 street. Dell Inc., www.dell.com. OVERALL: ●●◐○○ Text: ●●●○○ Graphics: ●●●○○ Photos ●●●◐○

The Dell Photo All-In-One Printer 922 is the only AIO here built around a photo printer engine instead of a standard one. That explains why it is one of the fastest for photos but is relatively slow for business apps. As you might expect for the price, its AIO features are minimal, with no ADF or fax modem.

The 922 does offer the choice of four or six colors in its two cartridges, bringing its focus slightly more to photography. You can either load black and tricolor cartridges for four-color printing, or replace the black cartridge with one that has black, light cyan, and light magenta for six colors.

Photos are fast, averaging 2 minutes 13 seconds for each 4-by-6 and 5:07 for each 8-by-10. That's a virtual tie with the $300 HP 2410, which averaged just 2 seconds faster for a 4-by-6. The 922 also

■ **Dell Personal All-In-One Printer A960 (left),**
■ **Dell Photo All-In-One Printer 922**

■ **HP Officejet 9130 All-in-One (left),**
■ **HP PSC 2410 Photosmart All-in-One**

ties the HP printer for photo quality at just short of very good.

The photo speed doesn't carry over for business apps, but the 922 performed well when printing just black text. Its time on our business applications suite was 35:08, compared with 26:57 for the HP 2410. But with a rating of good for both text and graphics, the 922 slightly beat the HP 2410 for quality. Running costs are uneven, at a high 4.1 cents per monochrome page on our tests, but a relatively low 12.2 cents for a color page.

The 922 is a reasonable choice if you're more interested in photos than documents and spreadsheets, and if you plan to print them in color rather than black and white.

HP Officejet 9130 All-in-One

$1,000 street. Hewlett-Packard Development Co., www.hp.com. OVERALL: ●●●◐○ Text: ●●●●○ Graphics: ●●●○○ Photos: ●●●○○

Clearly in a class by itself here, the $1,000 HP Officejet 9130 All-in-One is the most expensive choice by far to buy, but it's the least expensive to run. It's also the only one with an Ethernet connection, and one of two models we tested with a 50-page ADF. Most interesting, it's the only one that lets you scan and e-mail directly from the unit, with a little built-in keyboard for entering e-mail addresses.

You can either set up the 9130 as a standalone fax machine, copier, and digital sender (for e-mail), or connect it to a network or PC via a USB or parallel port.

Performance was a mixed bag. The 9130 did well on our business applications suite, placing first or close to it on 9 of the 13 documents with a total time of 21 minutes 21 seconds, compared with 20:24 for the leader. For photos, however, it was next to last, averaging 4:45 for each 4-by-6 and just shy of 16 minutes for each 8-by-10.

Photo quality ratings are acceptable, but not good enough to justify the long wait. The 9130 also earned a rating of good for graphics quality and very good for text. Costs per page were the best in the group, at 1.7 cents per monochrome page and 10.4 cents per color page.

The 9130 is not for everyone, but its long list of features, combined with strengths in text quality, running costs, and speed for business applications, clearly makes it one of the best AIOs for a small office or workgroup.

HP PSC 2410 Photosmart All-in-One

$300 street. Hewlett-Packard Development Co., www.hp.com. OVERALL: ●●●○○ Text: ●●●○○ Graphics: ●●◐○○ Photos: ●●●◐○

As you might guess from the name, the HP PSC 2410 Photosmart All-in-One offers a variety of photo features and fast times for photo printing. But it's also a good fit for most other purposes, including copying, scanning, faxing with the built-in fax modem, and printing from business applications. The only important missing capability is an ADF, but the 2410 does offer USB 2.0 and parallel ports.

Built around a standard ink jet engine rather than a photo engine, the 2410 still lets you swap out the black ink cartridge for a photo cartridge to switch between four- and six-color printing. Cost per page ranked in the middle but was toward the low end for actual costs, at 3.4 cents per mono-

PERFORMANCE TESTS

What the New Numbers Mean

Photo printing is all the rage—even with AIOs. So now is a great time to upgrade our benchmark tests. We started by switching to Microsoft Office 2003 for business applications and PageSense 4.0 for our testing application. (You can find out more about this software at *www.qualitylogic.com*). We also updated our test images, changed the name of one of our test suites, and added a new suite.

We've been using these tests in First Looks for a few months, and you'll see them there and in feature stories to come.

What was the Performance suite is now the Business Applications suite, since we test with Adobe Acrobat and Microsoft Excel, PowerPoint, and Word. We've also incorporated more graphics and photos

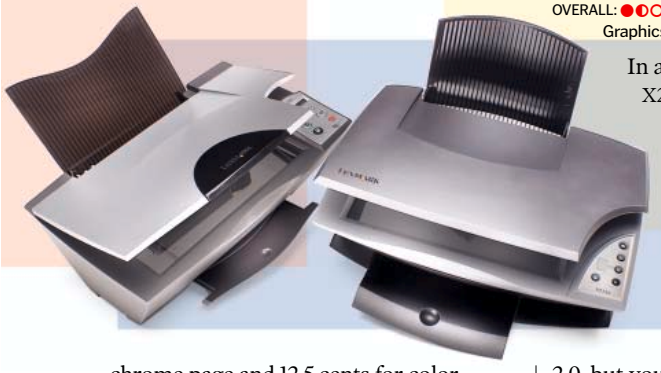
BUSINESS APPLICATIONS (default settings)

All times are in minutes:seconds. Low scores are best. Bold type denotes first place.

	Adobe Acrobat 6.0		Microsoft Excel 2003			Microsoft PowerPoint 2003	Microsoft Word 2003				
	4 pages, text and photos		1-page table		3 pages, charts and graphs	4 full-page slides	2 pages, text	2 pages, text and clip art	2 pages, text and photos	12 pages, monochrome text	12 pages, color text
	Portrait mode	Landscape mode	With grid	Without grid							
Brother MFC-3420c	**1:46**	**2:01**	0:23	0:23	1:32	2:20	0:52	0:51	0:53	4:08	4:13
Canon MultiPass MP360	5:23	5:02	0:27	0:28	3:37	5:20	2:25	2:27	2:25	2:11	10:38
Canon MultiPass MP390	5:18	4:57	0:22	0:22	3:33	5:14	2:21	2:22	2:20	2:07	10:22
Dell Personal All-In-One Printer A960	6:06	5:49	0:13	0:13	3:46	5:47	1:24	1:24	2:27	1:56	4:54
Dell Photo All-In-One Printer 922	4:48	4:30	**0:11**	0:10	2:58	4:26	1:59	2:01	1:59	**1:42**	8:07
HP Officejet 9130 All-in-One	4:20	4:31	0:14	0:15	**1:14**	**1:57**	**0:48**	**0:50**	**0:50**	2:31	**2:26**
HP PSC 2410 Photosmart All-in-One	3:16	3:02	0:27	0:22	2:05	3:17	1:32	1:32	1:30	2:45	5:13
Lexmark X2250 All-in-One	11:45	10:58	0:20	0:19	7:11	11:23	3:05	3:06	4:56	2:52	9:54
Lexmark X5250 All-in-One	4:50	4:31	**0:11**	**0:09**	2:58	4:26	1:59	2:01	1:59	1:43	8:03

RED denotes Editors' Choice. N/A—Not applicable: The product could not complete this test. * Total derived from all the tests in this suite, including some not shown here.

■ **Lexmark X5250 All-in-One (left),**
■ **Lexmark X2250 All-in-One**



chrome page and 12.5 cents for color.

The 2410 ranked first on our photo suite, averaging 2 minutes 11 seconds for 4-by-6s, and 4:58 for 8-by-10s. With standard business apps, it beat most of the competition on all but three individual tests, and it came in third for a total time of 26:57, only about 6 minutes behind the Brother MFC-3420c, which took first place at 20:24.

Unfortunately, the 2410's output quality was not as impressive as its speed, with a rating of good for text, a little better than fair for graphics, and just short of very good for photos. These translate to decent, but not terrific, output. You can get better quality at a slightly slower speed for less money.

Lexmark X2250 All-in-One

$100 street. Lexmark International, www.lexmark.com.
OVERALL: ●◐○○○ Text: ●●○○○
Graphics: ●●●○○ Photos: ●●●●○

In almost every way, the Lexmark X2250 All-in-One offers minimal capabilities, with no fax modem and no ADF. It prints good graphics and very good photos, but its speed and text quality are barely passable—if that. At only $100, however, it is the lowest priced unit here.

The X2250 connects via USB 2.0, but you'll find little need for the extra throughput, as slow speed is this printer's trademark. On our business applications suite, it came in last overall and on 9 of the 13 tests. It offered slow but tolerable speeds for monochrome text, printing a 12-page monochrome Word file in 2 minutes 52 seconds.

Slowing down even more for files with graphics, photos, and color, the X2250 turned in a total time of 69:21 for the suite, 26 minutes longer than the next slowest printer. For 4- by 6-inch photos, it averaged 11:26 each. We didn't test it with 8-by-10s, because it didn't meet our required 10-minute maximum for 4-by-6s.

Output quality was inconsistent, with ratings of very good for photos, good for graphics, and fair for text. The low text rating, however, stems from problems printing two highly stylized fonts; with more common fonts, the text is readable at 5 points or smaller. Although it's the least expensive to buy, our cost-per-page tests rank the X2250 as the most expensive printer in this group to run, at 8.8 cents per monochrome page and 21.8 cents per color page.

The combination of slow speed, middling quality, and high running costs leaves little reason to consider the X2250. You can get a much better printer at only a slightly higher price.

Lexmark X5250 All-In-One

$120 street. Lexmark International, www.lexmark.com.
OVERALL: ●●●○○ Text: ●●●○○ Graphics: ●●◐○○
Photos: ●●●●○

The Lexmark X5250 offers basic AIO functions, with no fax modem or ADF. But what it does, it does reasonably well.

The X5250 is neither speedy nor intolerably slow. On our business applications suite, it took 35 minutes 6 seconds, making it the fourth fastest. It even scored first place on the three monochrome-only tests. For photos, it was one of the slower units, averaging 4:24 for the 4-by-6s and 10:09 for the 8-by-10s. That translates to about twice as long as the fastest models in the group, but well under half the time of the slowest.

And the photos are worth waiting for, with a quality rating of very good. Text and graphics quality are a bit lower, with a rating of good for text and a bit better than fair for graphics. Running costs on our tests came out to a relatively high 3.9 cents per monochrome page, but a low 11.5 cents per color page—the second least expensive here.

If initial price is paramount and you're primarily interested in photos, you might want to spend just a bit more for the Canon MP360, which offers better photo quality at faster speeds. If you're more interested in general-purpose printing, the X5250 is a reasonable choice. But be sure to consider the Dell 922 also, which closely matches the X5250 for text and graphics but is somewhat faster for photos, with slightly lower quality.

into these business documents to reflect how people print today. The Quality suite has been replaced by the Photo suite, focusing on quality and speed specifically for photos.

We have also changed the way we report quality results. Now we provide separate scores for text, graphics, and photos, so you can see the score for the types of output that interest you. Each element is rated on an ascending scale from 1 to 5. Photo quality scores are based primarily on the photo suite output using high-quality paper. For an extended explanation of what the numbers mean, visit *www.pcmag.com/printers.—MDS*

PHOTOS (high-quality settings)

Adobe Photoshop 7.0

TOTAL OUTPUT TIME*	4" x 6" color photo A	B	C	TOTAL OUTPUT TIME: 4" x 6" prints	8" x 10" monochrome photo	8" x 10" color photo	8" x 10" color photo montage	TOTAL OUTPUT TIME 8" x 10" prints
20:24	3:16	4:31	4:13	12:00	12:08	7:11	9:19	28:38
43:21	2:33	2:35	2:34	7:42	5:45	5:44	5:44	17:13
42:06	2:25	2:31	2:30	7:26	5:39	5:40	5:40	16:59
36:01	3:45	3:45	3:45	11:15	8:49	8:53	8:52	26:34
35:08	**2:11**	2:14	2:14	6:39	5:12	5:00	5:10	15:22
21:21	4:38	4:33	5:12	14:23	17:20	15:21	15:10	47:51
26:57	2:15	**2:09**	**2:09**	**6:33**	**4:56**	**4:59**	**4:59**	**14:54**
69:21	11:27	11:28	11:22	34:17	N/A	N/A	N/A	N/A
35:06	4:22	4:26	4:24	13:12	10:17	10:02	10:09	30:28

MORE ON THE WEB

For more information on the latest printers, as well as an extended benchmark table, What the Numbers Mean, and a features table, visit **www.pcmag.com/printers.**

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Ad Code: 115360

Unleash Your Printer

Adding a wireless print server to your network won't make you rich or powerful, but you will have one less cable to trip over.

BY CRAIG ELLISON AND OLIVER KAVEN

CONTRARY TO POPULAR BELIEF, THE benefits of a home wireless network don't begin and end with a free-flowing Internet connection. Wireless print servers are liberating printers everywhere, allowing users to print with reckless abandon from anywhere in the house.

Of course, printer sharing at home and in small offices is nothing new. Wired print server devices have been doing the job for years, and many network-enabled printers have sharing capabilities built-in. Most people, however, have shared their personal printers by using a single Windows PC on a given network as a print server. There's a downside to this: The dedicated PC must always be on for others to print.

Wireless print servers simplify the concept and save on electricity, too. You simply plug one into any printer via a USB or parallel port; the server then communicates with your wireless router and in turn with any wireless or wired PCs on your network.

You can also manage such print servers remotely via a Web browser interface or through telnet, so you can manage a printer that is in another room or even in an entirely different location.

Before you buy one, though, there are several things to consider. Make sure that

IN THIS STORY

114 Axis OfficeBasic USB ●●●◐○
114 Belkin F1UP001 ●●●○○
115 D-Link DP-311U ●●◐○○
115 Hawking HWPS12UG ●●●●○
115 Linksys Wireless-G WPS54GU2 ●●●○○
116 SMC EZ Connect SMC2621W-U ●●○○○
115 Editors' Choice
115 Performance Tests
116 Two for the Office

the print server you are interested in supports a network protocol that your PC's OS can understand (such as NetBEUI, SMB, or AppleTalk). Also keep in mind that if you own or plan to purchase a multifunction printer, a print server won't support features like faxing or scanning in such devices. Finally, most print servers won't support useful feedback features that many printers provide when they are directly attached to a PC: alert messages warning when ink levels are low, paper is jammed, or your printer is out of paper.

Security can be an issue as well. All of the print servers we review here support only WEP. This may be sufficient for home use, but businesses might find it problematic and should consider WPA security instead. The manufacturers assure us that WPA support will appear in more models soon.

Following are reviews of six wireless print servers (a mix of 802.11b and 802.11g) for the home and small office. We also look at two more expensive and more complex products for business use.

SCORECARD

Our **setup and installation** rating favors products that are simple to deploy. Products providing multiple and intuitive **configuration and management** interfaces fare best. Those products with useful and innovative additional **features** receive high marks. **Security** could have been better on all the products: We think WPA support should be mandatory, but none go beyond WEP. Products with the best print times and longest range receive the highest **performance** ratings. The **overall** rating is not a mathematical average but an aggregate score based on testing and debate among PC Magazine Labs staff.

●●●●●—EXCELLENT
●●●●—VERY GOOD
●●●—GOOD
●●—FAIR
●—POOR

	Setup and installation	Configuration and management	Features	Security	Performance	OVERALL
Axis OfficeBasic USB	●●●	●●●	●●●●	●●●	●●●●	●●●●
Belkin F1UP001	●●●	●●●	●●●	●●●	●●●●	●●●
D-Link DP-311U	●●●	●●●	●●●	●●●	●●●	●●●
Hawking HWPS12UG	●●●●	●●●●	●●●●	●●●	●●●●	●●●●
Linksys Wireless-G WPS54GU2	●●●●	●●●	●●●	●●●	●●●●	●●●
SMC EZ Connect SMC2621W-U	●●	●●●	●●●	●●●	●●	●●

RED denotes Editors' Choice.

Axis OfficeBasic USB

$139 list. Axis Communications, www.axis.com.
●●●●○

With broad protocol support, excellent range, and a low price, the Axis OfficeBasic (OB) USB print server impressed us for the most part. Despite its lack of an external antenna the OB delivered average print times throughout our entire 160-foot wireless test range.

This 802.11b server has a single USB 1.1 port for connecting to a printer. Unlike other products here, it lacks an Ethernet port, so initial configuration has to be done wirelessly. By default, the OB server associates with the access point (AP) with the best signal and obtains an IP address.

One thing not mentioned in the instructions for initial hardware installation is that you must disable WEP on your access point to configure the server. Only in subsequent configuration is this noted.

The interface also includes a site-survey tool showing the SSID of all of the APs that the server hears, along with operating channel, signal strength, and encryption mode.

Two final features impressed us: the product's print queue, which allows you to view pending jobs, and the log, which displays and records each job by size, port number, and the protocol used.—*CE*

Belkin F1UP001

$129.99 list. Belkin Corp., www.belkin.com. ●●●○○

The highlights of this handsome 802.11g print server are consistent wireless performance all the way out to 160 feet, two USB ports instead of one, and a nice price.

The USB 1.1 ports let you attach and share two printers. An integrated wired Ethernet port is included, so you can wire the printers directly to the network; when using this port, however, the wireless capabilities of the server are automatically disabled.

We found the setup process a bit clunky, with too many steps as compared

Two for the Office

Although the devices in our main roundup are for homes and very small offices, HP and TROY each offer business-focused 802.11b wireless print servers that cost about $100 more. Their features include extended protocol support, centralized management, and in the case of the HP product, bidirectional alerts (paper out, ink out, and the like) for some HP printers.

HP Jetdirect 380x

What the HP Jetdirect 380x lacks in wireless performance and cutting-edge technology, it makes up for in security, protocol support, and centralized management tools. It does require a bit more expertise to configure, but with its Web JetAdmin utility, you can manage multiple HP print servers

The HP device also provides the most security of all the products in this story, with 168-bit encryption, access control lists, and RADIUS for user authentication.

Its extensive, built-in protocol support includes IPP, LPD, and FTP printing as well as Netware and AppleTalk support.—*OK*

$239 list. Hewlett-Packard Development Co., www.hp.com. ●●●●○

TROY PocketPro USB

Despite impressive management tools, the TROY PocketPro USB is disappointing, particularly in its performance: It scored lowest among all the print servers. But it does offer support for the HP JetAdmin utility, Netware, and more.

The PocketPro also has an impressive level of print control. It is the only device here that lets you configure each print service—such as binary, Postscript, text, and AppleTalk—for network protocols and specific print strings. The device is limited to WEP, though support for WPA is scheduled to arrive in 2005.—*CE*

$240 direct. TROY Group Inc., www.troygroup.com. ●●○○○

with some of the other products. For instance, the installation wizard instructs you to connect your printer directly to each computer that will be sharing it, and then install the printer manufacturer's drivers before running the rest of the wizard. At this point the wizard directs you to set up the Belkin port redirector. Finally, you run a separate program, found on the installation CD, that searches for your print server and launches the Web-based management interface.

Overall, Belkin's print server is a solid choice, though the Hawking HWPS12UG offers even more at about the same price.—*CE*

D-Link DP-311U

$149 direct. D-Link Systems Inc., www.d-link.com.
●●◐○○

This basic device offers few features and mediocre performance, at a higher price than most of the other print servers in our home/small-office roundup. Only the Linksys print server is more expensive.

You discover the D-Link DP-311U's shortcomings immediately: It's the only device in this group that lacks a wizard-driven setup. Instead, you need to adjust your PC's IP address to be on the same subnet as the DP-311U—not ideal. But at least the process is well described in the printed setup booklet. An included CD provides a dated-looking but mostly functional administration utility; oddly, though, Netware settings are included that the print server doesn't support.

After logging on to the management interface, users can configure basic network, wireless, and security settings, including either 64-bit or 128-bit encryption.

To configure your printers and the appropriate redirect port, you must rely on the Add Printer wizard in Windows XP; no setup utility is provided. The Win XP wizard works fine, but we would have preferred a dedicated application. Overall, the DP-311U is just an average print server.—*OK*

Hawking HWPS12UG

$130 street. Hawking Technology, www.hawkingtech.com. ●●●●○

Combining a comparatively comprehensive feature set, a great user interface, good 802.11g wireless performance, and a low price, the Hawking HWPS12UG handily earns our Editors' Choice.

This is the only device in our roundup with an Ethernet port for configuration, as well as two USB 1.1 ports and a parallel port, allowing you to connect up to three printers simultaneously. Six status LEDs indicate power, LAN, WLAN, and all printer port activity.

We were especially impressed with the integrated wireless site-survey tool, which discovered more than ten wireless networks in our labs. The HWPS12UG is also the only device to include a DHCP server that can be activated if needed. Netware, SMB, and AppleTalk printing support and 64-bit and 128-bit WEP and SNMP are part of the extensive feature set as well.

Included with the installation CD are setup wizards for both the print server and the client-side port utility, which installs the appropriate redirect ports on your PC. For configuration and management, you can use either the Web-based interface, which was the best we saw in this roundup, or an included Windows application.

The one feature we would have liked to see is some form of print queue display or management interface similar to that found in the Axis product. But this is hardly a deal breaker. The HWPS12UG has plenty going for it: notable features, solid performance, and an affordable price.—*OK*

Linksys Wireless-G WPS54GU2

$159 list. Linksys, www.linksys.com.
●●●○○

As the *54G* and *U2* in its model number suggest, the Linksys Wireless-G WPS54GU2 takes advantage of two high-speed tech-

Hawking HWPS12UG

PC MAGAZINE EDITORS' CHOICE

The Hawking HWPS12UG offers the best combination of features and performance, not to mention a relatively low price. Its ability to control up to three printers (two via USB and one via parallel) and its well-organized Web-based management interface won us over, as did its easy installation and strong, steady wireless range.

In a growing market that hasn't yet fully matured, the HWPS12UG has the most to offer a home or small office. Businesses looking for more security and wide-ranging protocol support, however, should consider the HP Jetdirect 380x.

PERFORMANCE TESTS

For this story, we wanted to determine how far the wireless signals of the print servers could reach, and how fast they could execute print jobs. The wireless range is what set these devices apart; the differences in speed, for the most part, are insignificant.

We conducted the tests in our wireless testing lab, a 160-foot long, L-shaped office-building basement hallway 40 feet below ground. We placed a workstation with test files and an 802.11g access point in a conference room at the end of the hallway. We then placed a Samsung CLP-550 color laser printer on a Rubbermaid cart, along with the eight print servers, one by one. We tested each print server at 60 feet, 120 feet, and 160 feet from the workstation and access point.

Low scores are best. All scores are in minutes:seconds. Bold type denotes first place within each category.	Adobe Acrobat 5.0 (5-page PDF, text and graphics)			Adobe Photoshop 7.0 (1-page bitmapped image)		
Distance to printer (feet) ▶	60	120	160	60	120	160
HOME-/SMALL-OFFICE						
Axis OfficeBasic USB	1:17	1:17	1:18	0:52	0:53	0:54
Belkin F1UP001	1:20	1:22	1:20	0:44	0:45	0:45
D-Link DP-311U	1:17	1:17	—	1:03	1:03	—
Hawking HWPS12UG	1:13	**1:13**	1:27	0:43	0:42	0:43
Linksys Wireless-G WPS54GU2	**1:12**	1:14	**1:15**	**0:37**	**0:38**	**0:39**
SMC EZ Connect SMC2621W-U	**1:12**	—	—	0:42	—	—
BUSINESS-CLASS						
HP Jetdirect 380x	**1:12**	**1:13**	—	**0:39**	**0:40**	—
TROY PocketPro USB	1:27	—	—	1:30	—	—

RED denotes Editors' Choice. A dash indicates that the product could not receive the print job at this distance.

SUMMARY OF FEATURES

Print Servers

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

■ YES □ NO	Axis OfficeBasic USB	Belkin F1UP001	D-Link DP-311U	Hawking HWPS12UG	Linksys Wireless-G WPS54GU2	SMC EZ Connect SMC2621W-U
Price	$139 list	$129.99 list	$149 direct	$130 street	$159 list	$99.99 list
Provides list of supported printers	■	■	□	■	■	■
Wireless standard	802.11b	802.11g	802.11b	802.11g	802.11g	802.11b
External/removable antenna	□□	■□	■■	■■	■□	■□
Internal memory buffer for printing	8MB	8MB	2MB	16MB	3MB	512K
Internal flash memory for firmware upgrades	2MB	2MB	512K	2MB	1MB	512K
MANAGEMENT						
Console/Web/proprietary management	□■■	□■□	□■■	■■■	□■□	□■□
SNMP management	■	□	■	■	■	□
Firmware updates through Web/TFTP	■□	■□	■■	■□	■□	■□
Reset/print status button	■■	■■	■□	■□	■■	■■
PROTOCOL SUPPORT						
DHCP client/server	■□	■□	■□	■■	■□	■□
TCP/IP / SMB / AppleTalk	■□■	■□□	■■■	■■■	■□■	■■■
NetBEUI/IPP/LPR	□■■	□□■	■■■	■■■	■■■	■■■
LED INDICATORS						
LAN/WLAN	□■	■■	■■	■■	■■	■■
Activity/Error	■□	■■	■□	■■	■■	■■
USB	□	□	■	■	■	■
PORTS						
LAN	□	■	■	■	■	■
Parallel	□	□	□	■	■	□
USB 1.1 / 2.0	■□	■□	■□	■□	■■	■□

RED denotes Editors' Choice.

nologies, 802.11g wireless and USB 2.0. It also excels in performance, topping all other products in five out of six tests. Still, it runs a little too high on price and short on features to earn our Editors' Choice.

This is the only device in our story to offer a high-speed USB 2.0 port. In addition, it includes a parallel port for printers without USB connectors. Both ports can be used at the same time, allowing you to share two printers on your network.

Configuring the Linksys with the step-by-step installation guide is easy and straightforward. Once configuration is complete, the Linksys print-driver setup utility must be installed—also painless. Unlike some print servers, such as the HP Jetdirect 380x, the WPS54GU2 does not let you configure your printer's drivers on the fly; you have to install all drivers in advance. Assigning existing printer drivers to one of the two Linksys ports is easy, though. You can print a status page by pressing the Reset button.

Surprisingly, the Web interface is virtually identical to that of the SMC EZ Connect Wireless Print Server SMC2621W-U. Aside from cosmetic graphical differences, all features, configuration, and status components were the same.

The wireless range of this print server is undoubtedly impressive, as is the inclusion of USB 2.0. But the low price and features of the Hawking device give it the edge.—*OK*

SMC EZ Connect Wireless Print Server SMC2621W-U

$99.99 list. SMC Networks Inc., www.smc.com.

●●○○○

We cannot recommend the SMC EZ Connect Wireless Print Server SMC2621W-U to anyone because of its poor wireless range—it barely reached the 90-foot marker of our test area—and other shortcomings. This no-frills 802.11b wireless print server has just one Ethernet port for wired connectivity and one USB 1.1 port to connect a single printer.

The included installation wizard is primitive too, and many portions of the text seem to have been hastily translated into English. We also disliked the WEP key entry field, which offers no help regarding the length and format of the WEP key strings.

After configuring the print server, the wizard proceeds with installation of the printer driver utility and creates the appropriate port in Windows to communicate with the server.

All subsequent configuration must be done through the Web-based user interface, which closely resembles that of the Linksys print server. You can configure basic network and wireless settings, including WEP keys; retrieve status information; and configure AppleTalk or IPP. But apart from this versatility, the configuration tools, like the other features, are unimpressive. Add to that the EZ Connect's poor performance, and you will be better off looking elsewhere for a print server for your home or small office.—*OK*

MORE ON THE WEB

Check out **www.pcmag.com** for detailed photos of the products reviewed in this story, as well as additional testing information.

OUR CONTRIBUTORS

Craig Ellison is the director of operations at PC Magazine Labs. Associate editor **Davis D. Janowski** and PC Magazine Labs lead analyst **Oliver Kaven** were in charge of this story.

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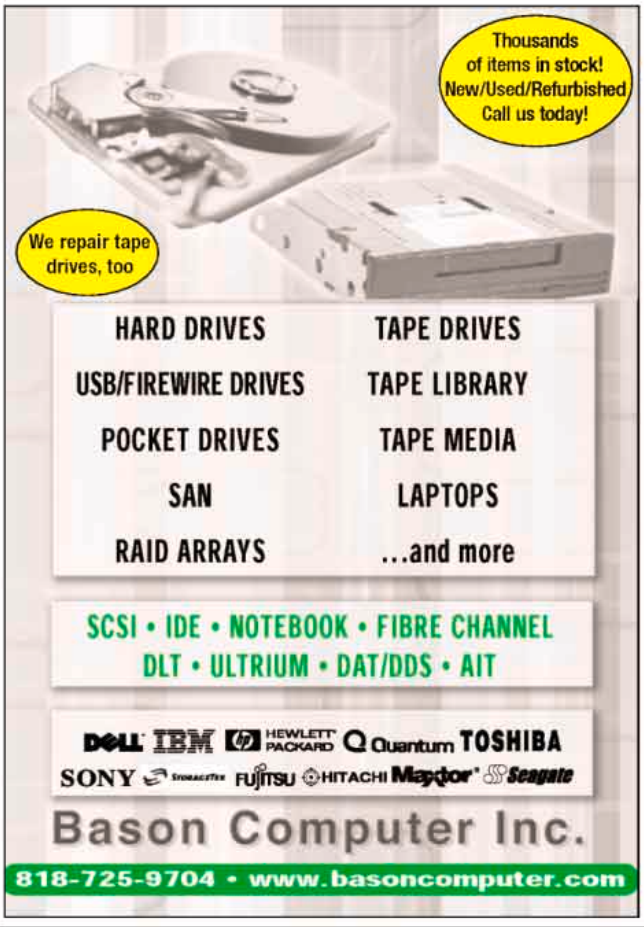

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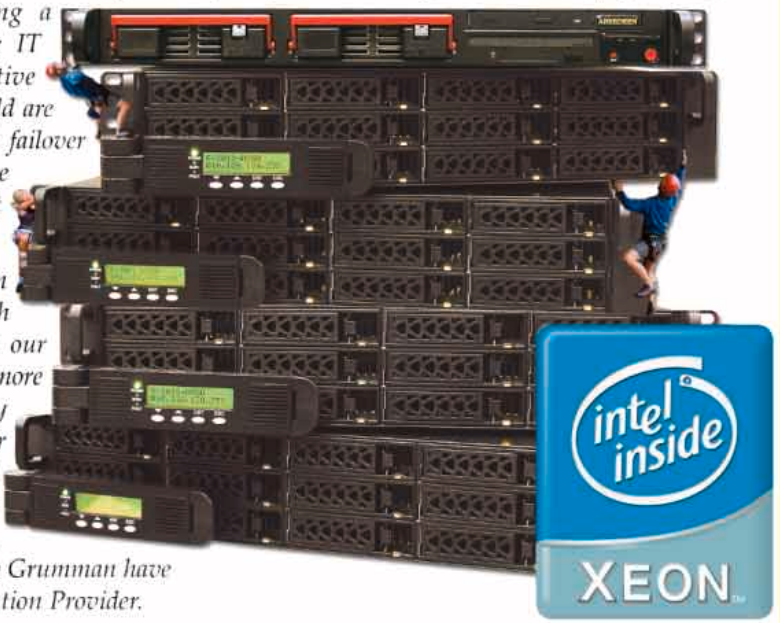

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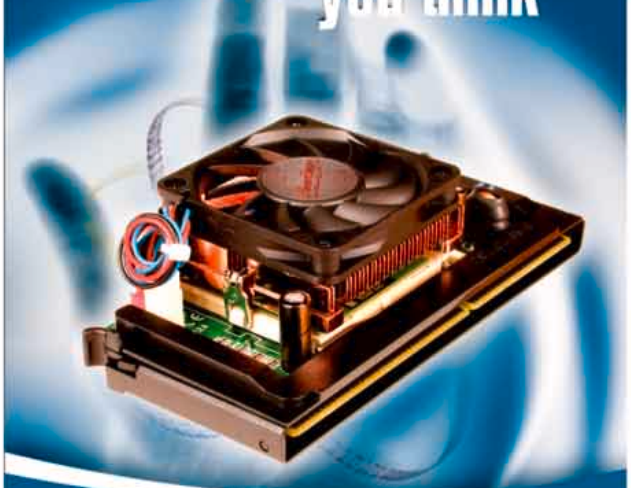

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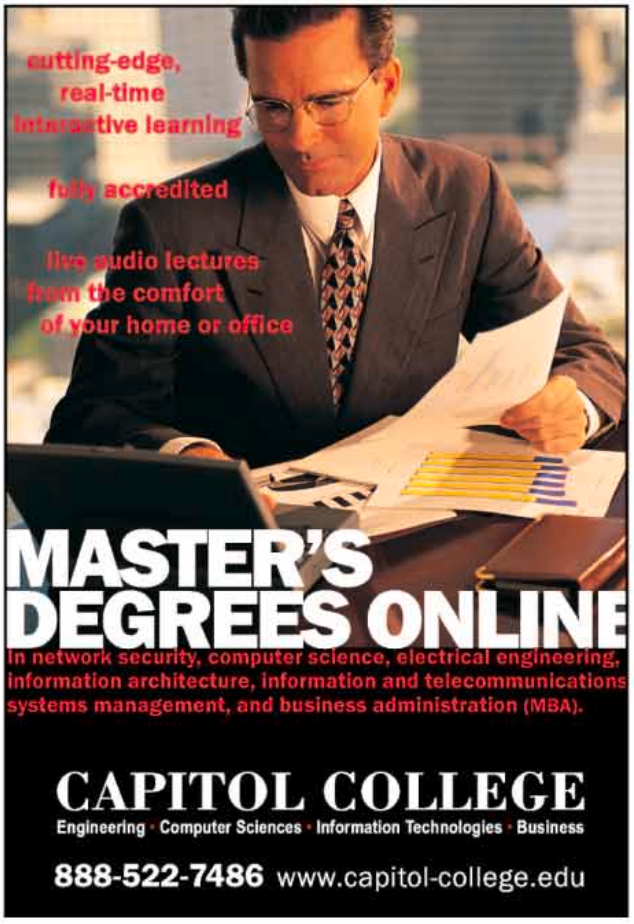

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"I collect timepieces. When I received my Steinhausen, I knew from the look, feel, and quality of the watch that this would be one of my favorites. I have spent thousands of dollars for inferior watches. It will be my gift of choice this holiday season." Sol S., Mt. Vernon, NY

So rare that only a handful were made in 1923

In 1923, a Swiss watchmaker crafted the most advanced watch of its time. After 80 years, the Steinhausen watch has finally been "reborn," preserving its mastery of technology and classic design. Once only displayed in high priced collections, this rare timepiece from history can now be yours.

Step back in time to Steinhausen, Switzerland circa 1923. A master watchmaker works for months, trying to create the world's most perfect watch. Finally he succeeds—the first of its kind to display the date, day and month, and the only one to designate AM/PM.

Collectors Pay Thousands $$$$

He makes a limited number of these distinctive handmade timepieces, which eventually find their way onto the wrists of only the world's most distinguished gentry. Today, collectors are willing to pay thousands of dollars to add one of these original Steinhausen masterpieces to their own collection.

Reborn After 80 Years

Until now, that was the only way you could own a Steinhausen, still one of the world's rarest and most prized wristwatches. But for the first time in 80 years, the original Steinhausen masterpiece is now being painstakingly reproduced for modern day collectors. Still manufactured by hand, this 21st-century reproduction carries the same graceful styling and features as the original. The scratch-resistant crystal comfortably rests in a surgical grade stainless steel case and bezel, which provides the ultimate in precision and protection.

Powered by You

This handsome timepiece has been updated with a kinetic automatic movement that is powered by the motion of the wearer's arm, so the watch never needs winding or batteries.

Hand-crafted Elite Movement

The Steinhausen movement consists of 185 parts, that are assembled entirely by hand. To prevent wear on gears, fine watches use tiny gemstones to reduce friction. The Steinhausen features up to 35 jewels, 15 more than most of the worlds elite watches. The movement is then rigorously tested for flaws and accuracy. Only 6% of the movements made ever meet the stringent requirements to be placed in this noble timepiece, making the Steinhausen one of the most accurate in the world.

Adapted from Swiss Technology

A Swiss engineered movement comparable to the Steinhausen has never been produced at this low price. Each watch comes housed in a handsome storage case and includes two interchangeable leather wristbands in black and brown.

$14.95 "Wear It and Love It" Trial Offer

Until now, most of us couldn't afford an original 1923 Steinhausen. For a limited time though, the manufacturer has decided to offer this masterpiece of technology and design to watch lovers worldwide "risk free."

In fact, they are so confident you'll love the Steinhausen masterpiece, they want you to try it on your wrist for a full 30 days for **only** $14.95 plus s&h. Experience this unparalleled value for thousands less than comparable collectable watches. If not satisfied, return the Steinhausen for a full refund of the trial fee.

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THE HISTORY OF WATCH MAKING

1868 Steinhausen masterpiece is created

1923 Patek Philippe makes first wrist watch

1953 1st Automatic movement in a wrist watch

1966 Lips produced the first battery powered watch

2003 Girard-Perregaux introduces the Swiss quartz watch

Steinhausen masterpiece is reproduced for first time

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Cool School Tools

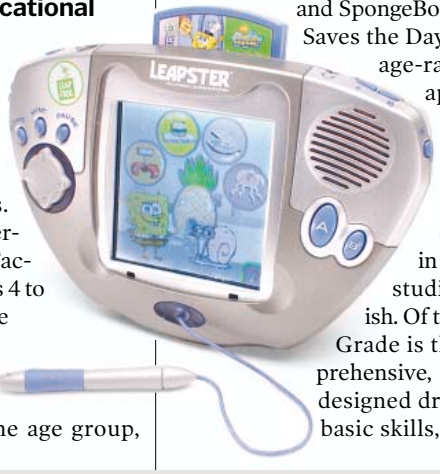
BY CAROL ELLISON

School bells are ringing for another generation growing up with the Game Boy, PS2, and Xbox. But parents who want to replace arcade action with learning are in luck: Educational game-playing devices are a big trend these days. Kids no longer need to be tethered to a desktop computer to practice their skills; they can take devices along with them and work in a little brain-training just about anywhere. (Our favorite, though, is the nonportable VTech V.Smile, which turns your TV into a teacher.) In addition to the gadgets, we take a look at some of the new software offerings that can help your kids learn.

LeapFrog Leapster Educational Game Cartridges

The 18 new video cartridges for the handheld LeapFrog Leapster ("Gadget Mania," December 9, 2003, page 120) are a lot more fun than flashcards. We looked at Leapster Interactive Video: The Letter Factory for ages 4 to 6, Dora the Explorer Wildlife Rescue for the same age group, and SpongeBob SquarePants Saves the Day, which is not age-rated and will appeal to fans of all ages. All feature reading and math exercises; Dora adds in science, social studies, and Spanish. Of the group, First Grade is the most comprehensive, with 70 well-designed drills that teach basic skills, ranging from punctuation to subject-verb agreement and sorting to subtraction. Educationally speaking, SpongeBob's drills are lighter-weight than the others—but kids will love the quips and gibes, which are as funny as those on the TV show.—*CE*

The Letter Factory, $20 street. Others, each $25. Also required: Leapster Multimedia Learning System, $80 street. LeapFrog Enterprises Inc., www.leapfrog.com. ●●●●○



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●●●○○ GOOD
●●○○○ FAIR
●○○○○ POOR

LeapFrog Turbo Twist Extreme

Built like a flashlight and just as rugged, this device delivers fun-filled drills wherever your kids carry it. They'll appreciate the gaming action as they guide Turbo Monkey over crevices and under flying objects on a liquid-crystal window display, "slamming" correct answers to spoken problems. The unit comes with a cartridge that includes more than 400 workbooklike drills in math, spelling, science, and social studies. As kids score points, they earn keys that open with 39 riddles each make for hours of play; kids really need to use their thinking caps. You won't find as much curriculum content as in other games, but the fun factor is powerful; you'll enjoy yourself just as much as the kids, helping them with solutions. Grades 1 through 6.—*CE*

$19.95 list. Scholastic Inc., www.scholastic.com. ●●●●○

BRAIN-ENHANCING SOFTWARE

Dragon Tales: Learn and Fly with Dragons

In Dragon Tales, kids apply basic math and logic skills—like sorting and matching colors, shapes, and sizes—as they help Cassie the Dragon's brothers and sisters do good deeds and earn badges and toys to pay for flying lessons. Once airborne, they can go to the next level or return to DragonLand to practice skills or enter more flying races. There are 11 games in three separate adventures. Kindergarten to first grade.—*CE*

$19.95 list. Scholastic Inc., www.scholastic.com. ●●●●○

Encarta Reference Library Premium 2005

PC MAGAZINE EDITORS' CHOICE

New this year in our perennial favorite encyclopedia software is content for a younger crowd, ages 7 to 12. Encarta Kids offers narrated slide shows, word and category search, and fun elements like games and yucky pictures (grossest: horse teeth). Another new feature is Math Help Online, for high schoolers; you can search by textbook to find the very problems you're trying to solve and get help working through them. Finally, you can add an Encarta search bar to your desktop; if you enter a search term and like what it finds, you can launch the program from the bar. This title is one of the best homework helpers we can imagine. —*Carol A. Mangis*

$74.95 list. Microsoft Corp., www.microsoft.com. ●●●●●

I SPY Spooky Mansion Deluxe

This game takes the familiar theme of finding objects in busy scenes to a haunted house, where kids must solve puzzles to escape. Once they're out, a friendly skeleton invites them to the next level. Random games

Mia's Language Adventure: The Kidnap Caper

Grandma Mimi has disappeared, and kids help Mia, the cute and courageous mouse, find her. The Mia series features truly fun, interactive adventures that educate along the way.

doors and win them titles such as Amazing Artiste. Additional cartridges can be purchased separately. For first to fifth grades.—*CE*

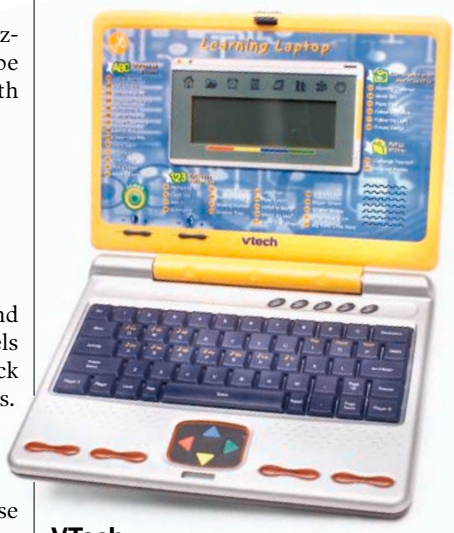
$34.99 list; cartridges, $9.99 each. LeapFrog Enterprises Inc., www.leapfrog.com. ●●●●○

Oregon Scientific Barbie B-Book Laptop, Hot Wheels Accelerator Electronic Learning Computer

The Barbie B-Book Laptop is pink and purple (naturally), and the Hot Wheels Accelerator has flame decals on its black case; both have true QWERTY keyboards. Each delivers 60 educational games (including ten in Spanish), and spoken instructions prompt kids to type the words and phrases they're taught. These devices are better suited for older children, as vocabulary exercises assume an understanding of vowels and word construction. Although some

play more like Wheel of Fortune–style letter-guessing games than vocabulary lessons, more substantive exercises are included, as are two-player games. For kindergarten and up.—*CE*

$59.99 list (each). Oregon Scientific Inc., www2.oregonscientific.com. ●●●○○



VTech Learning Laptop

Kids can practice keyboarding skills on a QWERTY keyboard as they play the 38 learning games on the VTech Learning Laptop. It uses a gray liquid-crystal screen similar to that of the Hot Wheels and Barbie laptops; blocky graphics diminish the fun, but the excellent value makes up for that. The Laptop is rated for pre-K and kindergarten-age kids who are just learning to associate words with pictures. They might, however, be better off with colorful picture books, which pack more learning power and appeal for young readers. Ages 4 and up.—*CE*

$30 street. VTech Electronics, www.vtechkids.com. ●●●○○

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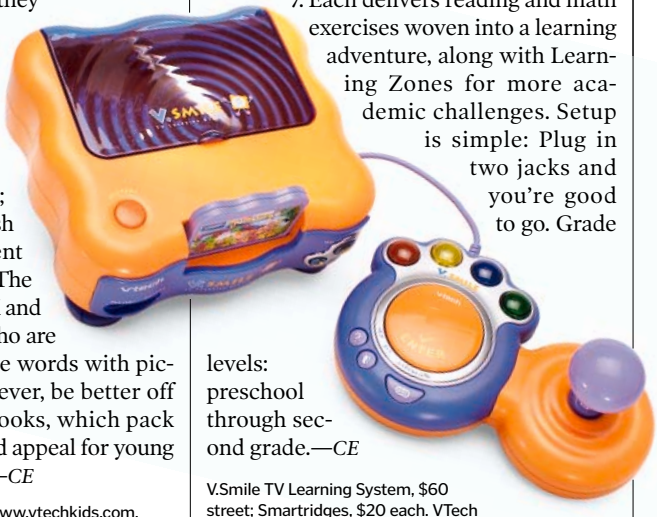
VTech V.Smile TV Learning System and Smartridge Library

PC MAGAZINE EDITORS' CHOICE

Kids acquire basic skills while playing games on the V.Smile TV Learning System, using a joystick or Enter key to choose the difficulty level and a one- or two-player game. The V.Smile comes with Alphabet Park, a single Smartridge (game cartridge) for early learners, preschoolers, and kindergarteners.

The console can scale to your kids' levels with ten additional cartridges (sold separately): the Junior Thinkers series for ages 4 to 6 and MasterMinds for ages 5 to 7. Each delivers reading and math exercises woven into a learning adventure, along with Learning Zones for more academic challenges. Setup is simple: Plug in two jacks and you're good to go. Grade



levels: preschool through second grade.—*CE*

V.Smile TV Learning System, $60 street; Smartridges, $20 each. VTech Electronics, www.vtechkids.com. ●●●●◐

In previous titles, Mia covered math, science, and reading; now she's going global. Kids can begin to explore the French and Spanish languages in mini-games within the story. Parents may want to help younger kids get started, as game play can be a bit complex.—*CAM*

$20 street. Kutoka Interactive, www.kutoka.com. ●●●●○

SAT, PSAT, ACT 2005 Gold, Platinum

For 2005, Topics has updated SAT, PSAT, ACT—a Gold Edition three-CD set and Platinum Edition five-CD set—to reflect changes in the tests: Analogies will disappear and reading passages will be shorter, but test takers will now have to write an essay. Serious students will opt for the Platinum edition and its two extra discs: One offers writing and vocabulary exercises to help with the essay portion of the test and the other gives tips and guidance on admissions and applying for scholarships, loans, and tuition assistance. Both editions feature more than 2,500 sample test questions and tutorials that guarantee a better score—or you'll get money back. So be sure to save your sales slip, discs, data files, and test scores.—*CE*

Gold, $39.99 list; Platinum, $49.99. Topics Entertainment Inc., www.topics-ent.com. ●●●○○

Princeton Review SAT Preparation

With this new application from Vocel and The Princeton Review, SAT preparation can now accompany your kid anywhere—assuming you have the right phone and mobile service provider. Flash cards and minitests pop up in your phone's display window to drill kids on vocabulary, critical reading, sentence structure, grammar, arithmetic, algebra, and geometry. Answers in text explain what's correct and incorrect and, better yet, explain why.

Kids can schedule times for automated alerts; the phone rings with new questions that are constantly refreshed by the service. Adults can ask to receive updates on how well their children are doing via SMS or the Web.

The tiny-screen format requires a lot of scrolling to read lengthy writing exercises, and other phone fun (photos, games, and old-fashioned conversation) could be distracting. But this is a great reinforcement tool, especially when used with other test-prep resources. Grade level: High school and up. Check with your mobile phone carrier to determine support.—*CE*

$5.95 to $12.95 per month, depending on carrier. Vocel, www.vocel.com. ●●●●○

GEAR + GAMES

Small Wonder

The Creative MuVo Slim is the size of a business card, measuring only .3-inches thick and weighing just 1.2 ounces; you won't even know you're carrying it. Despite its size, the Slim holds 256MB of MP3 or WMA files, a voice recorder, an FM radio tuner with 32 presets, and a radio recorder. It connects via USB 2.0 and has a rechargeable lithium-ion battery that lasts up to 17 hours. The Slim worked perfectly in our testing, although the minimalist controls can be challenging.—*Troy Dreier*

$199.99 list. Creative Labs Inc., www.creative.com. ●●●●○

Mousing Everywhere

For those of us who get impatient with laptop touch pads and pointing sticks, the ambidextrous BenQ M310 Wireless Optical Mouse has a terrific design for portability: The RF USB connector tucks right into the mouse when it's not in use. When you eject the receiver, the mouse powers on, and it turns itself off when you replace the receiver (you can also turn power off manually). The 800-dpi resolution makes the mouse responsive and accurate, and it works well on a variety of surfaces.—*CAM*

$39.99 list. BenQ America Corp., www.benq.com. ●●●●◐

Fashion for Gadgets

Want to wrap your Blackberry, iPod, Treo, or other pricey handheld in something more elegant than pleather? Bellagio Designs makes device-specific cases out of real Italian leather that fit like, well, gloves. You can charge, change memory cards, and perform any other necessary functions without removing your device from its case. See the company's site for the models and colors available for your gadget.—*CAM*

$27.99 direct and up. Bellagio Designs, www.bellagiodesigns.com. ●●●●○

A Case of Style

The ultraquiet, illuminated Antec Aria case is a great way for do-it-yourselfers to build a small form factor (SFF) system. It's a marvel of industrial design, combining distinctive styling with a lift-out drive bay and removable side and top panels. Edges are smooth to reduce the risk of cuts. The case has a hefty 300W Antec power supply, two fans, an 8-in-1 card reader, four drive bays, three full-height PCI slots, and front-mounted USB 2.0, FireWire, and audio connectors. Best of all, unlike proprietary SFF cases, it can accept any standard MicroATX motherboard.—*Don Labriola*

$130 street. Antec Inc., www. antec.com. ●●●●○

Strategic Moves

BY PETER SUCIU

"Strategy without tactics is the slowest route to victory. Tactics without strategy is the noise before defeat." The great military thinker Sun Tzu never played PC strategy games, but he would have made a challenging opponent. With this wave of new-release games, you can hone your skills as a PC desktop general.

Besieger

The land is divided and in chaos. Hideous monsters amass their forces as Viking and Cimmerian warriors prepare for battle. Through 12 enormous levels, you build and defend a mighty stronghold using more than 40 types of structures, and then bring the siege to your enemy's castles. Dynamic environments offer numerous options for massive citadels, and the photo-realistic landscape helps evoke an ancient age. Overly challenging game play and some silly mythical creatures clutter an otherwise grandly historical game.

$29.99 list. Dreamcatcher Interactive Inc., www.dreamcatchergames.com. ●●●○○

Ground Control II: Operation Exodus

If you don't feel like saving the universe by yourself, play through two linear-based campaigns over a LAN or in an Internet-based cooperative mode in this science fiction title. In addition to 24 single-player/co-op missions, Ground Control II features ten skirmish-mode maps for one-off engagements. Though the two opposing sides have unique units with special abilities, the game could use a bit more diversity to extend replayability. But with the numerous maps and immersive campaigns, chances are you'll be fighting for control for some time.

$49.99 list. Vivendi Universal Games Inc., www.vugames.com. ●●●◐○

Rise of Nations: Thrones and Patriots

PC MAGAZINE EDITORS' CHOICE

Are you up to the challenge of guiding your people from the dawn of time to the space age, exploring the world, expanding your cities, and keeping the peace along the way? This expansion of last year's smash hit adds six new playable powers, more diverse campaigns, and a new government option that lets you create a freedom-loving democracy or rule as a tyrannical dictator. Multiple modes of play allow for single-player real-time scenarios and turn-based campaigns to conquer the world, letting you savor each victory.

RISE OF NATIONS

$29.99 list. Microsoft Game Studios, www.microsoft.com/games. ●●●●●

Spartan

This turn-based empire builder features more than 100 nations of the classic age, spanning Greece and the Near East. You must carefully manage resources, develop new technologies, and grow your cities, while erecting vast structures such as the Colossus and Oracle. As conquest is the key to victory, you'll have to create massive armies. But you don't have direct control over your men in the real-time battles. The turn-based aspects are winners, but the real-time aspects need some attention.

SPARTAN

$29.99 list. Graphsim Entertainment, www.graphsim.com. ●●○○○

Warlords Battlecry III

When cultures meet, they often clash. But when entirely different species meet, total war results, as when human merchants encounter the snakelike Ssrathi. A campaign mode lets you plot your grand moves in distant lands; you can then jump into real time to fight individual battles. The game even offers role-playing, with an in-game hero to lead your army. Despite somewhat dated graphics, you'll be hard pressed not to hear this battle cry.

$29.99 list. Enlight Software Ltd., www.enlight.com. ●●●●○

QUICK CLIPS

Splinter Cell: Pandora Tomorrow

This game is not as clever or as moody as the original spy thriller. It's also not quite a sequel; the only notable changes are updated graphics and an addictive multiplayer mode, in which spies must complete their objectives while remaining undetected by mercenary opponents. Single-player mode is a bit short and unchallenging for veterans, but Pandora Tomorrow is still a head above most other new games. It's an enjoyable refresher for the upcoming Splinter Cell 3.—*Ari Vernon*

$39.99 list. Ubi Soft Entertainment, www.splintercell.com/us/home.php. ●●●●○

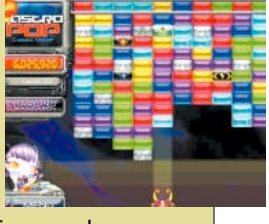
Nero PhotoShow Elite

This addition to the Nero product family packs an array of one-click photo and slide show capabilities behind a slick, friendly interface. Intuitive learning aids, navigation controls, and graphical tools appear on most screens, but many features are self-explanatory. PhotoShow's copious features are split into three areas: Manage (organize images, browse, and edit), Make (create Kodak prints, slide shows, mouse pads, and more), and Share (distribute images and slide shows online or on disc). The result is a remarkably easy-to-use package to complement Ahead's comprehensive Nero 6 digital media suite.—*Don Labriola*

$49.99 list. Ahead Software Inc., www.nerophotoshow.com. ●●●●○

AstroPop

If your taste runs toward puzzles and arcade games, you can spend some happy hours with this new PopCap game. Play as one of three intrepid spaceship pilots (later you can unlock a fourth) and try to pop as many multicolored bricks as possible without letting them fill the screen. A light but cute story line propels you through increasingly difficult levels.—*CAM*



$19.95 direct. PopCap Games, www.popcap.com. ●●●◐○

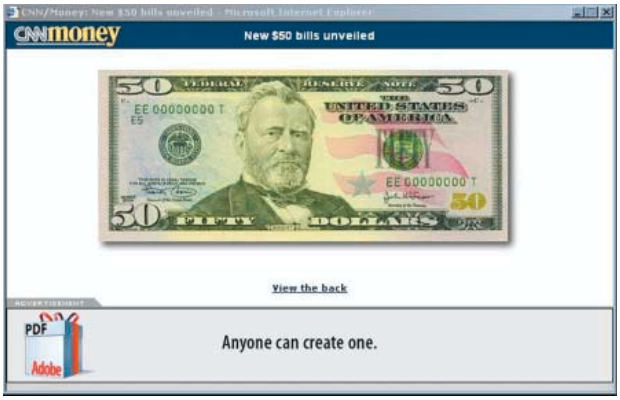
BACKSPACE

TURN TO US WHEN YOUR COPPERTONE RUNS OUT

Edited by Don Willmott

<< Wait a minute—does David know about Gary? (Google News)

>> The Wharton School's site teaches a powerful business lesson in positive reinforcement.

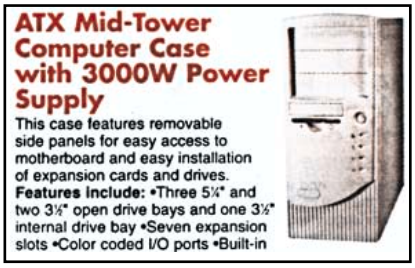


<< What an interesting potential use for Abode's top-notch document creation software! (Adobe ad on the CNN Money site)

>> But first you have to catch the gophers. (GopherCentral.com ad)

<< Oh, yeah? We spot at least one! (Universal Studios Florida site)

>> So powerful that it can lift off and fly around the room! (MCM Computers ad)



<< Faithful readers—and nappers—Dean and Benjamin Langfitt prove that *PC Magazine* can protect you from harmful UV radiation.

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Ziff Davis Media Inc. shall own all property rights in the entries.
Winners this issue: Joe Ganci, Dean Langfitt, Andrew Large, Michael Maker, Kirk McVey, Richard Smith, and Steve Worzman.

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