

# PC

# MAGAZINE

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## SPECIAL DOUBLE ISSUE



### PC Labs Tests & Reviews

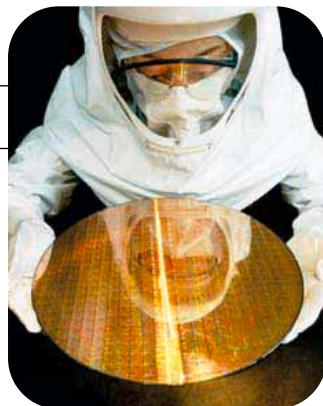
# 16 ROAD-READY NOTEBOOKS

JULY 2004

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## MOBILE SPEAKERS

THE INDEPENDENT GUIDE TO TECHNOLOGY



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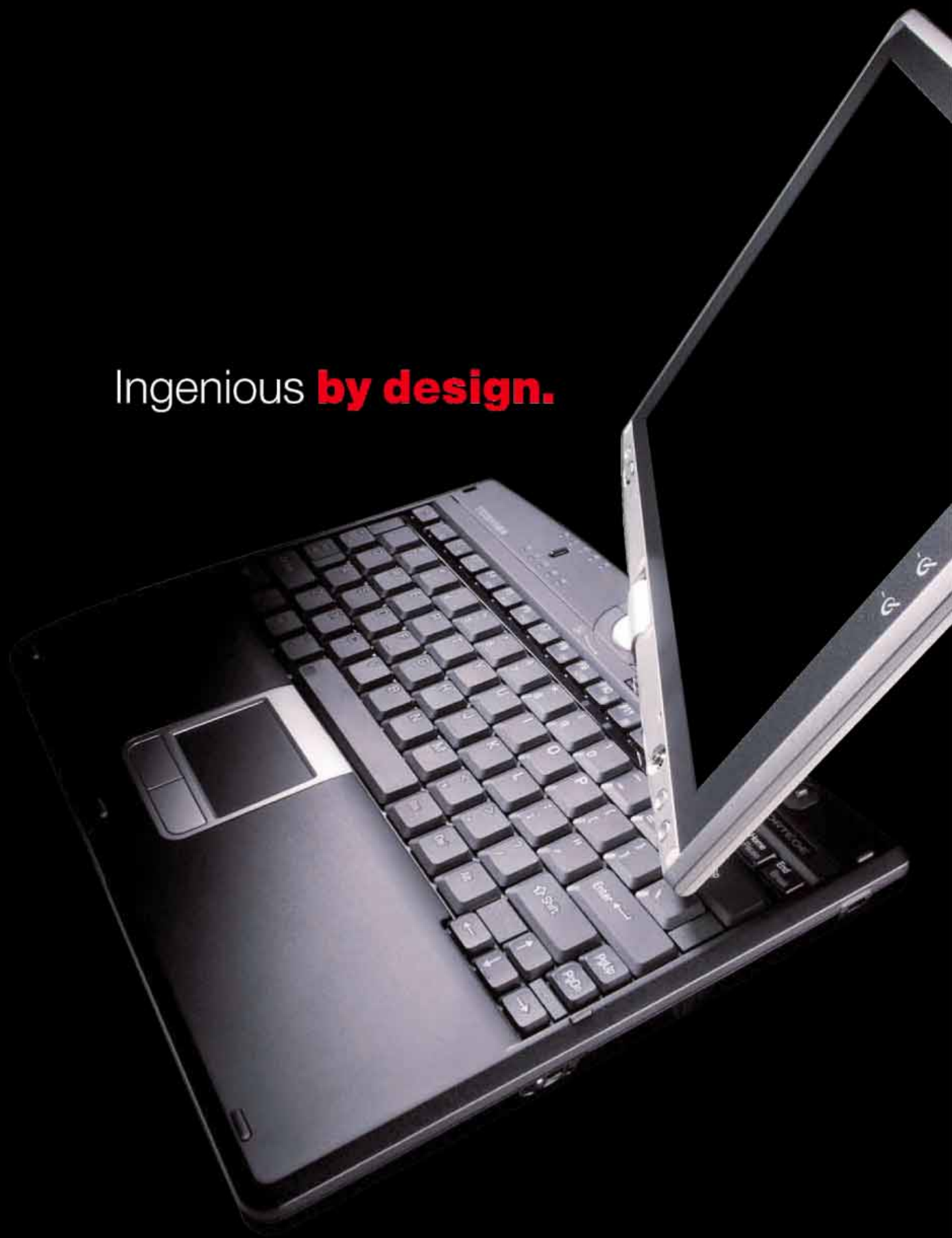
# TECH

# TECHNOLOGIES

# TO WATCH



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# Forward Thinking

## Visiting the Future

Every year at this time, we look forward to where technology is taking us. This year, the top technologies we picked to watch include a wide variety of innovative concepts that are moving from the drawing board to products on the store shelf. Some are improvements on existing technologies, like Voice over IP, high-density DVD, wireless USB, and service-oriented architecture. Others give us an idea of what might be possible further in the future: biomechatronics, which brings together robotics and biology; intelligent machine translation; and software that's almost smart enough to write itself.



It's fun to speculate about how these technologies will change the way we live and work, how technol-

ogy continues to improve, and how much we take it all for granted. But this year, we decided to dig deeper into the impact of technological change. In "The Virus Wars," best-selling author Alexandra Robbins goes behind the scenes of the battle to keep our machines safe. In "The New Geek," Steve Lohr explores how technology, politics, and innovation are changing computer programming. Alan Cohen looks at what advances in technology mean for our privacy. And Jim

Akin writes about how nanotechnology is transforming itself from hype to actual products.

As denizens of the 21st century, we can't just look at technology for its own sake. We need to understand how it affects society.

**How to balance security and privacy is one of the key issues that our government needs to face.**

## A Life—on the Record

One of the most important technology debates taking place today deals with privacy. We usually hear about it in the context of a government proposal, such as the Patriot Act or last year's Total Information Awareness plan. The criticism is loud, but we rarely hear concrete solutions for balancing security and privacy in a world where just about every piece of data is going to be stored somewhere.

I was disappointed a couple of weeks ago when some constructive thoughts on the subject came out and almost nobody paid attention. After Congress didn't fund the Total Information Awareness plan because of privacy concerns, the Defense Department created a Technology and Privacy Advisory Committee, headed by former FCC chair Newton Minow. The committee issued its report in May, concluding that TIA was "a flawed effort to achieve worthwhile ends." (To read the report, go to [www.sainc.com/tapac/finalreport.htm](http://www.sainc.com/tapac/finalreport.htm).)

The report argues that government data mining can threaten not just privacy interests but also basic civil liberties, and thus it needs safeguards. Privacy protections can become so bureaucratic, though, that they

can interfere with security: Because terrorists may use the Internet, the government needs tools to use technology as well. But the report also says that data mining should not become "the 21st-century equivalent of general searches, which the authors of the Bill of Rights were so concerned to protect against."

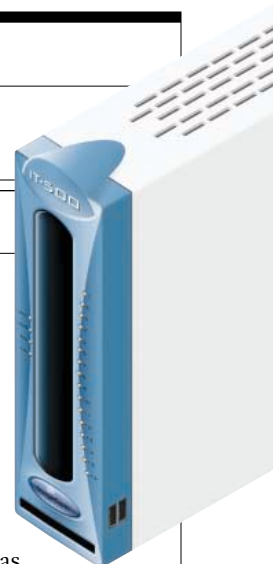
Among the committee's suggestions are new administrative oversight mechanisms and a legal framework that guarantees privacy. It proposes that Congress establish minimum technical requirements for the acquisition and use of data, including court authorization before the Defense Department does data mining with personally identifiable information on U.S. citizens. It also calls for a new policy-level privacy officer and Defense Department support of research for improving the effectiveness of data mining.

These are all reasonable ideas that deserve attention, but I've seen very little discussion. I worry that they'll just stay on the back burner until a crisis comes up.

Privacy is one of the key issues that our government needs to face, and I'd like to see politicians address the issue in the upcoming elections. Let's hope we hear some real debate in the months to come.

# Forward Thinking

MICHAEL J. MILLER



## Technology in Networking

I love new technology, which is one reason I enjoy attending industry trade shows. On this page are some of the highlights from two shows I went to in May.

NetWorld+Interop (N+I) was more energized than in recent years; showgoers saw a number of technologies that finally look ready for the mainstream. For instance, Gigabit Ethernet has been around for years but is only now poised to become much more commonplace. Managed Gigabit switches from companies like Netgear are dropping to under \$20 per port. And dozens of companies demonstrated Voice over IP (VoIP) solutions for everything from small companies to large organizations.

Wireless technology, which has been quite successful in the home, is positioned for even greater success in the business world. Lots of companies introduced wireless security and management products. Cisco was pushing wireless-management solutions for the installation of hundreds of wireless access points. Companies like Netgear and SMC were

showing off products for midsize operations. And many companies were trying to position their wireless products as being faster than others, even as the industry is waiting for yet another higher-speed standard.

Security remains a top priority for the wireless industry. One trend is the security appliance that combines multiple features, such as antispam, antivirus, and intrusion detection. Many of these products are aimed at the gateways of midmarket and larger companies. From companies such as EmergeCore, we also saw a number of small-office appliances that aim to provide everything from e-mail to Web servers.

Network infrastructure is changing rapidly, and we all depend on it more than ever for fast, reliable, and safe connections.

## Hollywood Meets Video Games



At this year's Electronic Entertainment Expo (E3), Hollywood and video games moved even closer together, with more games based on movies such as *The Matrix* and the Harry Potter series, and new games based on the upcoming animated films *The Incredibles* and *Shark Tale*. And of course there's the ever-expanding *Star Wars* universe. Also, this year's major games have a more cinematic feel than ever before, with more filmed scenes and better graphics.

For now, PCs have a massive advantage in graphics realism over console games. Improvements are most evident in games such as the long-awaited DOOM 3 and Half-Life 2, which are likely to hit stores this year, as well as in already shipping games such as Far Cry (re-

viewed on page 181) and Unreal Tournament 2004. The most impressive-looking game demo I saw was for *Brothers in Arms*, a team-based shooter in a D-Day setting, which combines graphics realism with a lot of research to give players a more authentic experience.

Massively multiplayer online games also grabbed a lot of attention, with the finely detailed and story-driven *EverQuest 2* and *World of Warcraft* planned for later this year. Using specific goals and missions,

the *Matrix Online* extends the story begun in the *Matrix* movies. And *Jump to Lightspeed* will expand the ongoing MMORPG *Star Wars Galaxies* by allowing you to own, build, and pilot a ship.

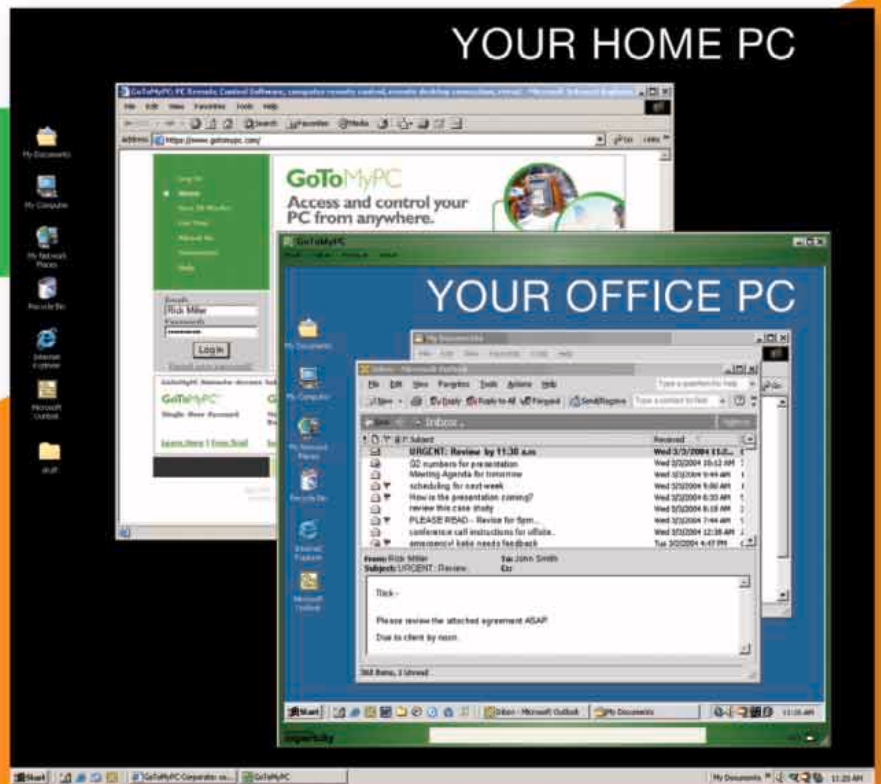
I was surprised by the popularity of handheld gaming. Everyone wants a piece of this market, now dominated by the Nintendo Game Boy Advance. Sony made the biggest splash with the PlayStation Portable, which won't ship in the U.S. until next year. Nokia showed its new version of the N:Gage. I also saw the Tapwave Zodiac, the Tiger Telematics Gizmondo (which has a GPS so you can see other nearby players), the Eve Mobile Gaming platform (which runs a version of Windows XP embedded and lets you play older PC games), and the dual-screen Nintendo DS, which will be compatible with both current Game Boy Advance games and those written specifically for the DS.

My personal taste runs to simulation games. I'm looking forward to *The Sims 2*, which will be much more interactive than the first version. You'll help your Sims reach their life goals and even create children, by combining elements of each parent. And taking the blending of movies and games to its logical conclusion is *The Movies*, in which you play as a movie studio head by building a studio, then filming and editing scenes to create your own movies.

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## 33 Editors' Choices

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

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- 47 Olympus Camedia C-60 Zoom
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## BUSINESS NOTEBOOKS

### 141 Road-Ready Notebooks

A business notebook is a must-have for any worker who travels frequently, endures a long commute, or bounces from meeting to meeting in the office. We give you the lowdown on 16 notebooks that offer both productivity and portability.



## NETWORKING

### 150 The Essential Buying Guide: Servers and Storage

Servers and storage are essential parts of a small-business network. Our buying guide walks you through the hardware choices available, the features to choose from, and the potential costs involved for these two types of hardware.

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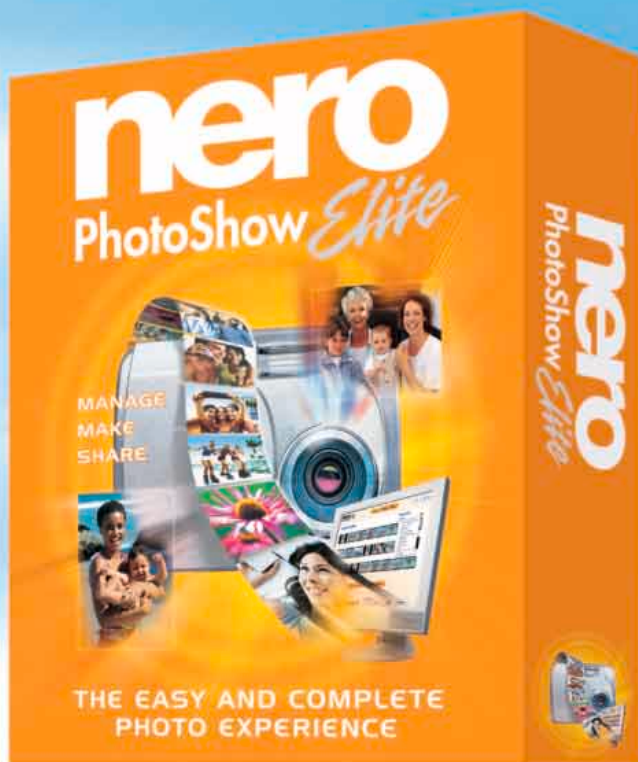
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COLOR Laser Printer CLP-500

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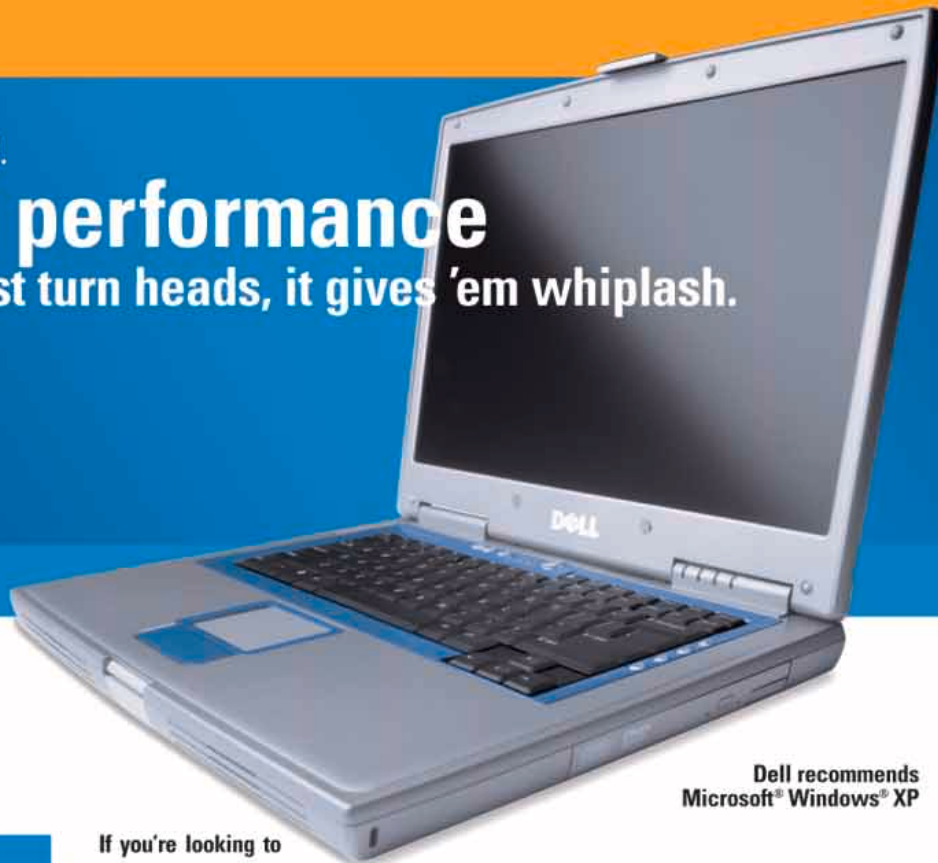
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Home

The Dell Inspiron 8600.

# Power and performance that doesn't just turn heads, it gives 'em whiplash.



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- Microsoft® Windows® XP Home Edition
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- 32MB DDR NVIDIA® GeForce™ FX Go5200 AGP 4X Graphics
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- Additional Modular Battery for Dual Battery Support, add \$99
- 3-Yr Limited Warranty\*, 3-Yr At-Home Service\*, add \$269

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# PIPELINE

## TECHNOLOGY TRENDS & NEWS ANALYSIS

### Windows Goes 3D

Microsoft's Longhorn operating system has a brand new look and feel.

BASED ON DEMONSTRATIONS of Microsoft's next-generation Longhorn operating system that the company held at the recent Windows Hardware Engineering Conference in Seattle, Windows is headed for a makeover. The demos focused on the new user interface, which we can sum up simply: 3D.

3D graphics on PCs have long been stuck in gaming territory, but Microsoft is leaning on 3D in Longhorn (see the photo). Avalon is the code name for a new graphics layer that software developers will use to build applications. It will be available in two flavors: Aero and Aero Glass. Microsoft revealed at the conference that DirectX 9 graphics will be required to run Avalon, and chips supporting this latest version of DirectX are just coming to market. Longhorn, though, won't arrive until at least 2007.

"Longhorn is a lot about visualization, using the latest graphics and new interaction techniques," said Microsoft chairman Bill Gates, who also noted that the operating system has an up-



dated file system. 3D effects, animations of icons, and dialog boxes that can vary from transparent to opaque deliver a livelier user interface than Windows XP has. Images and icons grow bigger when selected, similar to the way Apple's Mac OS X works.

Aero and Aero Glass will offer different user experiences, depending on what hardware they detect, with Aero Glass delivering the full 3D experience. Microsoft will also offer a Windows 2000-like Classic version of Longhorn for systems that don't meet minimum requirements.

There's more to Longhorn than just a new interface, and the new file system promises to make organizing things easier. But the most noticeable thing about Longhorn is that Microsoft appears to be taking cues from Apple, which has infused its operating systems with graphical muscle. It'll be a while before it makes its debut, but this OS already looks like a different breed of Windows.—Richard Fisco



### IBM Eyes Your Apps

Just when you thought the application wars were over, IBM has launched an ambitious initiative that competes with Microsoft. The company will offer business productivity applications, including word processing, e-mail, spreadsheet, database, and messaging applications accessible from a server, to be distributed to myriad devices and accessed via the Web.

IBM's Lotus Workspace will be priced low, according to Tim Kounadis, senior manager at IBM: \$2 per user per month for access, and \$1 per user per month for each application in the suite. Some organizations will have to pay up for server software and middleware, though, points out Dan Leach, product manager for Microsoft Office.

—Sebastian Rupley

**RADIO ROOM** In a move to increase the radio spectrum that wireless broadband services can use, the FCC wants to allow unlicensed devices to operate in unused parts of the broadcast television spectrum. The move is intended to allow new types of devices and services.

### REVISITING THE COPYRIGHT ACT

IN MAY, A HOUSE subcommittee convened to discuss amendments to the ever-controversial Digital Millennium Copyright Act (DMCA). Sponsored by Representatives Rick Boucher (D-VA.) and John T. Doolittle (R-CA.), the amendments would apply traditional "fair use" standards to digital media. Just as you can legally tape a television show for personal reasons, the proposed Digital Media Consumers' Rights Act (DMCRA) would let you circumvent the copy protection controls on a DVD for personal reasons such as making backup copies.

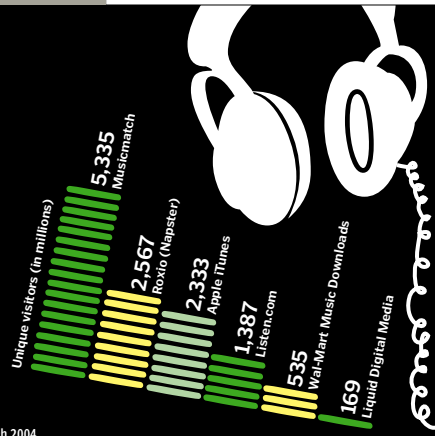
With the major movie studios in opposition, though, it may be some time before the DMCA is actually amended.—Cade Metz



### Online Music Sites: Drawing A Crowd

In March, more than 11 million U.S. Internet users visited six major online music sites. In a related survey from the Pew Internet and American Life Project on April 25, 2004, 58 percent of music downloaders said they do not care about the copyright on music files that they download.

Source: comScore Media Metrix, March 2004.



## Debugging for The Masses



Think programming is dry, complicated stuff? For some, maybe, but more and more nonprogrammers are doing it. Products from spreadsheets to Web authoring tools are chock-full of scripting features, formulas, and other programmatic instructions. The ease with which occasional neophyte programmers make mistakes has given rise to new National Science Foundation (NSF) grants to develop simpler debugging tools for everyone.

"It's a shame the tools used today for debugging are basically the same ones available in the 1940s," says Brad A. Myers, a professor at Carnegie Mellon University and member of the End Users Shaping Effective Software (EUSES) project. EUSES directors estimate the number of end user programmers in the U.S. will reach 55 million by 2005, compared with 2.75 million professionals.

Myers and graduate student Andrew Ko have developed a method to find bugs by asking "why did or didn't" an event happen. They took a programming environment called Alice and put a Why? button in it, which can allow a user creating, say, an animation to stop playback at any point where an event went wrong and provide analysis (see the photo). Microsoft and IBM are interested.—SR

## Games Get Smaller

NINTENDO HAS DOMINATED portable handheld games to date with its wildly popular Game Boy franchise but will soon face competition from the Sony PlayStation Portable (PSP) and the Nokia N-Gage QD, a mobile game deck.

Sony's PSP (shown) will offer 3D gaming on a 16:9 wide screen, plus a variety of digital media options including music clips, full-length movies, sports programs, and more via a Universal Media Drive (UMD)—Sony's new compact storage medium. Pricing is not set yet, but the PSP will ship in the U.S. by spring 2005. Meanwhile, Nintendo has upped the ante by announcing the Nintendo DS, a dual-screen handheld that will also play Game Boy Advance titles. The DS will ship in the U.S. by late 2004.

Nokia entered the handheld gaming arena last year with the N-Gage, an ambitious but poorly designed gaming device/phone hybrid. Nokia has addressed those design flaws with the N-Gage QD, available now for \$100 to \$200 (street). The QD offers an easy external game-loading slot (the first N-Gage required removing the battery to change games), along with a brighter screen and improved multiplayer accessibility.—Karen Jones



## THE NEW NET

Marking a milestone in efforts to retool the Internet to fight spam, Yahoo! has announced its DomainKeys specification for authenticating e-mail senders' messages before mail can be delivered. The specification is at <http://antispam.yahoo.com>. DomainKeys software will be provided to open-source developers and is designed to authenticate the domains of every outbound e-mail message using unique embedded keys within e-mail headers. The keys will be authenticated through comparison with public keys registered by the Internet's Domain Name System (DNS).

## POLICING TECH PEEPING TOMS

DIGITAL VOYEURISM is facing a backlash. The proliferation of digital cameras—especially in cell phones, which can be used surreptitiously to take pictures—has Congress considering a bill called the Video Voyeurism Prevention Act, designed to prevent people from using cameras for lewd purposes. The bill passed a voice vote in the Senate without dissent, and the House Judiciary Committee is to consider it before August.

Numerous Web sites have emerged that allow owners of cell phones with cameras to snap photos and e-mail them for immediate, automatic posting on freely available Web



pages—dubbed *moblogging*, or mobile blogging. A number of the Web sites, however, are not implementing censorship policies, and pictures of naked people and sex acts are proliferating on the sites. Some of

the photos are taken with the permission of those depicted, and some are not.

The Video Voyeurism bill goes after those who snap photographs anywhere where "a reasonable person would believe that he or she could disrobe in privacy."

"Previous state laws did not prohibit activities like taking a picture up a woman's skirt, when the woman was in a public place," says Cedric Laurant, policy counsel at the Electronic Privacy Information Center. "This bill will specifically target that kind of activity, though, which should mean people will have more privacy." Look out, tech voyeurs.—SR

**NEXT-GEN MUSIC** Top global music labels are preparing to debut a new dual-disc CD/DVD format this summer. The discs will have two sides: one for CD audio and one for DVD audio with the possibility of included video. The discs will work in both CD and DVD players.



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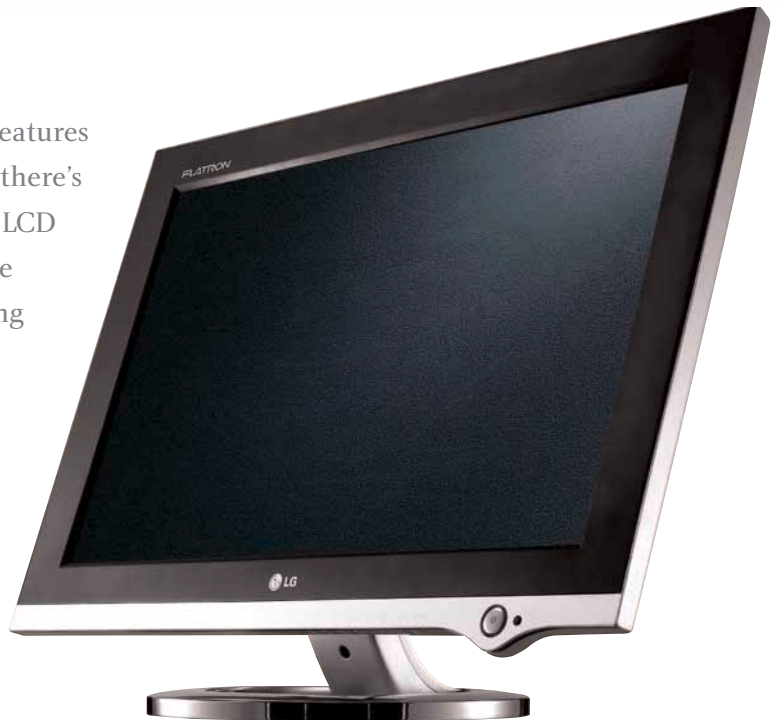
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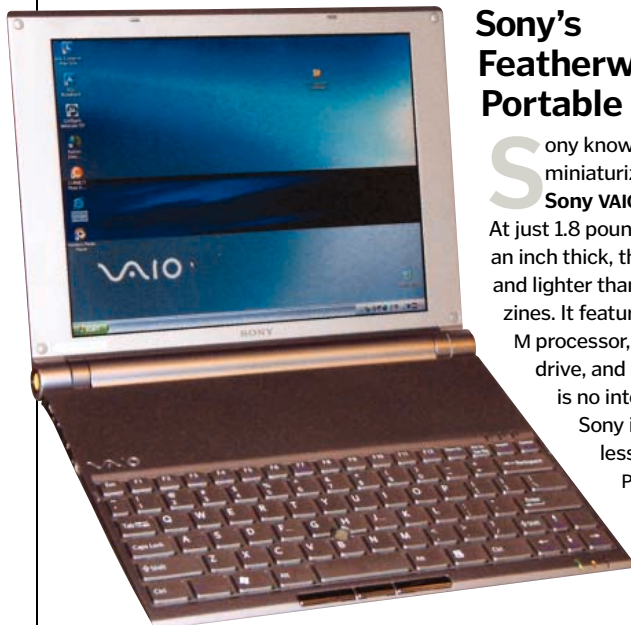
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# COMING ATTRACTIONS



## Sony's Featherweight Portable

**S**ony knows a thing or two about miniaturization, and it shows in the **Sony VAIO VGN-X505ZP** notebook. At just 1.8 pounds and three-quarters of an inch thick, the VGN-X505ZP is smaller and lighter than some fashion magazines. It features a 1.1-GHz Intel Pentium M processor, 512MB RAM, a 20GB hard drive, and a 10.4-inch screen. There is no integrated wireless, though Sony includes an 802.11g wireless card to use in the unit's PC Card slot.

—Jennifer M. Defeo

\$3,000 street.  
Sony Electronics Inc.,  
www.sonymstyle.com.

## Crossing into Consumer Displays

**L**ike Dell and Gateway before it, HP has entered the living-room display space with the 23-inch **HP f2304 HD LCD Monitor**. The sleek platinum-blue LCD TV is capable of displaying 16.7 million colors, has a 16-millisecond response time, and is HDTV-ready. A welcome addition to any Media Center PC system, the f2304 provides a native resolution 175 percent greater than your typical 23-inch HDTV, the company claims.—DSE

\$2,199 direct. HP Inc., www.hpshopping.com.



## Three-in-One Player

**T**he **KanguruMicro MP3 Pro** is a Swiss Army knife for the digital set: only 3 inches long but packed with features. It's not only an MP3 player but a USB flash storage device and digital voice recorder as well.—Daniel S. Evans

\$75 street and up. Kanguru Solutions,  
www.kanguru.com.



## Make Your Own Media Center

**T**he **nVidia Personal Cinema FX 5700** is designed to be a complete multimedia hardware and software solution. It lets you transform a desktop PC into a digital entertainment center to watch and record TV, capture and edit video, listen to and record FM radio, and (of course) play 3D games.—DSE

\$300 street. nVidia Corp., www.nvidia.com.

## All-in-One Projector/Player

The **Pixa All-in-One DLP Home Theater System** combines a DLP projector, TV tuner, and DVD player in one space-saving, portable 8.4-pound package. The unit also functions as digital

media player that supports the six major memory card formats. The optional wireless 2.1 speaker kit keeps cabling requirements to the bare minimum.—DSE

\$1,999 direct. Pixa Inc., www.pixainc.com.



## On-Screen Status Check

Despite its name, the **Karalon Screen Saver** isn't just pictures of fish or flying toasters.

Instead, the utility provides you with a host of system info, including all of your active applications, TCP/UDP socket status, packets being processed per second, and more.—DSE

\$19.99 direct, Karalon, www.karalon.com.



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# EDITORS' CHOICES

JUNE 22-JULY 12, 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](http://www.pcmag.com/editorschoice).**

## DESKTOP PCs & SERVERS

### GAMING DESKTOPS

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

### MULTIMEDIA DESKTOPS

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

### MEDIA CENTER PC

- Sony VAIO Digital Studio PCV-RZ46G

### VALUE PC

- eMachines T2865

### HOME PC

- Sony VAIO PCV-W500GN1

### SMALL-BUSINESS PC

- IBM ThinkCentre A50p

### CORPORATE PC

- IBM ThinkCentre S50

### ENTRY-LEVEL SERVER

- NEW** IBM eServer xSeries 306

### WORKGROUP SERVER

- Dell PowerEdge 1750

## PORTABLE PCs

### VALUE NOTEBOOKS

- Averatec AV3225HS
- HP Compaq Presario R3000Z

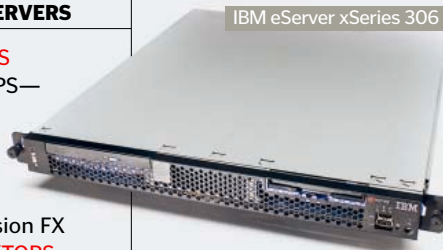
### BUSINESS NOTEBOOKS

- Acer Travelmate 8000
- NEW** HP Compaq nc6000

HP Compaq nc6000



IBM eServer xSeries 306



### GAMING NOTEBOOK

- Dell Inspiron XPS

### MULTIMEDIA NOTEBOOK

- HP Pavilion zd7000

### ULTRAPORTABLE

- IBM ThinkPad X40

### TABLET PCs

- Motion M1400
- Toshiba Portégé M205-S809

## MOBILE DEVICES

### PDAs

- HP iPaq Pocket PC h4350
- palmOne Zire 72

### PDA/PHONE COMBO

- Handspring Treo 600

### PHONE

- Motorola MPx200

### GPS DEVICE

- TomTom Bluetooth GPS Receiver

## HOME ENTERTAINMENT

### MEDIA HUBS

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

### DIGITAL VIDEO RECORDER

- SnapStream Beyond TV 3

### HDTV

- Sharp Aquos 37-inch LCD TV

## CAMERAS

### COMPACT CAMERAS

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

### MIDRANGE CAMERAS

- NEW** 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)
- NEW** Ulead VideoStudio 8 (consumer)

### CD/DVD-BURNING SUITE

- Roxio Easy Media Creator 7

### DVD AUTHORIZING

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

### PORTABLE AUDIO PLAYERS

- Apple iPod
- Apple iPod Mini
- iRiver iFP-390

### SOUND CARD

- Creative Labs Sound Blaster Audigy 2 ZS

### SPEAKERS

- Creative Labs Gigaworks S750

- Klipsch ProMedia GMX D-5.1

### PC JUKEBOX

- Musicmatch Jukebox 8.2

### MUSIC STORE

- Napster 2.0

### WEBCAM

- Logitech QuickCam Pro

## PRINTERS

### PERSONAL PRINTERS

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

### PERSONAL MFPs

- Brother MFC-8420 (laser)
- Canon MultiPass MP730 (ink jet)

- Dell A940 (ink jet)

### PHOTO PRINTERS

- Canon i9900 Photo Printer (pro)



Casio Exilim Pro EX-P600

- Epson Stylus Pro 4000 (pro)

- HP Photosmart 7960 (consumer)

### NETWORK PRINTERS

- HP LaserJet 9000dn (monochrome laser)
- Xerox Phaser 4500DT (monochrome laser)
- Xerox Phaser 7750DN (color laser)

## DISPLAYS & STORAGE

### BUSINESS DISPLAYS

- IBM ThinkVision C220p
- NEC MultiSync LCD1960NXi

- Samsung SyncMaster 171N

### BUSINESS PROJECTOR

- NEC VT460

### GAMING GRAPHICS CARD

- ATI Radeon 9800 XT

### 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

- NEW** Sony DRU-700A

## EDITORS' CHOICES

JUNE 22-JULY 12, 2004

Maxtor OneTouch



## EXTERNAL DRIVE

- Maxtor OneTouch

## 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 &amp; 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

**NEW** ZoneAlarm Pro 5

## SECURITY SUITES

- Norton Internet Security 2004

**NEW** ZoneAlarm Security Suite 5

## ANTISPYWARE

- SpySweeper 2.2

## ANTISPAM

- Norton AntiSpam 2004

- Qurb

## POP-UP BLOCKER

- PopUp Cop

## INSTANT MESSAGING

- MSN Messenger 6.1

## FILE COMPRESSION

- PKZip 8.0 for Windows

- StuffIt Deluxe 8.0

## BACKUP

- Retrospect Pro 6.5

## ONLINE BACKUP

- iBackup

## ROLLBACK

- Norton GoBack 3.0

## 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

## REGISTRY CLEANER

- RegistryFixer

## FILE MANAGER

- ExplorePlus 6.1

## MIGRATION

- Alohobob PC Relocator

- Ultra Control

- Desktop DNA Pro 4.7

## TOOLBARS

- Dogpile

- Google Toolbar

## KEYBOARD UTILITY

- Perfect Keyboard 6.15a

## DESKTOP CUSTOMIZATION

- Object Desktop 2004

## DOWNLOAD MANAGER

- DownloadStudio 1.0

## SCREEN CAPTURE

- SnagIt 7.0.3

## TEXT EDITOR

- UltraEdit-32 10.0

## FILE VIEWER

- IrfanView 3.85

## TRACE REMOVER

- Acronis Privacy Expert

- Suite 7.0

## VIRTUAL PC

- VMWare Workstation 5

## PASSWORD MANAGER

- AccountLogon 2.5

## ENTERPRISE SOFTWARE &amp; 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

**NEW** salesforce.com

- Enterprise Edition

## DATABASE

- Oracle 9i 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

- WebTrends Live Enterprise Edition

## VULNERABILITY SCANNER

- Retina Network Security Scanner

## NETWORKING

## SERVER OS

- Microsoft Windows Server 2003 Enterprise Edition

## WIRELESS INFRASTRUCTURE

- Linksys Wireless-G

- WRT54GS (802.11g)

- Netgear ProSafe-FWAG114

- (802.11a/g)

## SECURITY APPLIANCE

- ServGate EdgeForce (small-business)

## REMOTE-ACCESS APPLIANCE

- Neoteris Access 1000

## GAMES &amp; EDUCATIONAL SOFTWARE

## SIMULATION

- Microsoft Flight Simulator 2004

## ACTION/COMBAT

- Battlefield Vietnam

**NEW** Far Cry

- Halo: Combat Evolved

- Orbz 2

- Savage: The Battle for Newerth

## SPORTS

- Madden NFL 2003

## VIRTUAL WORLD

- Second Life

## ONLINE

- EverQuest: Evolution

## EDUCATION

- Math Mission:

The Race to Spectacle City Arcade, The Amazing Arcade Adventure

- Zoombinis Island Odyssey

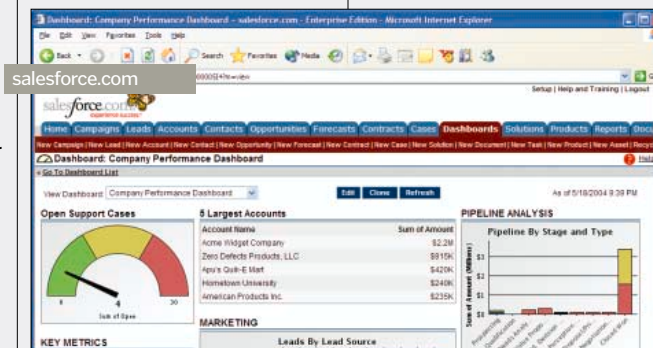
## MOBILE GAME

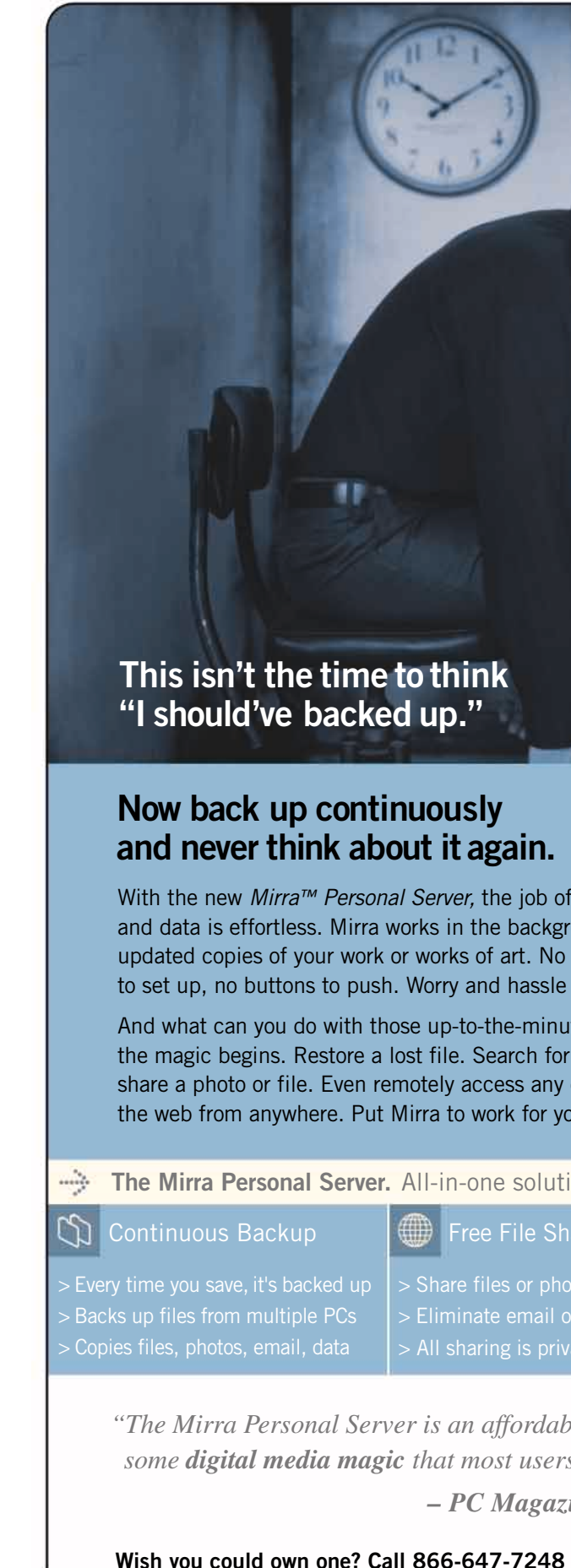
- Bejeweled

## REFERENCE

- Microsoft Encarta 2004

- Visual Thesaurus





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*– PC Magazine, January 20, 2004\**

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# FIRST

HANDS-ON TESTING OF NEW PRODUCTS • [www.pcmag.com/firstlooks](http://www.pcmag.com/firstlooks)

- 46 Casio Exilim Pro EX-P600
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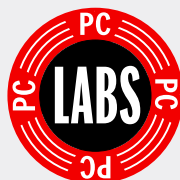
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## Power and Simplicity

THE MAGAZINE  
WORLD'S LARGEST  
COMPUTER-TESTING  
FACILITY

BY JAN OZER

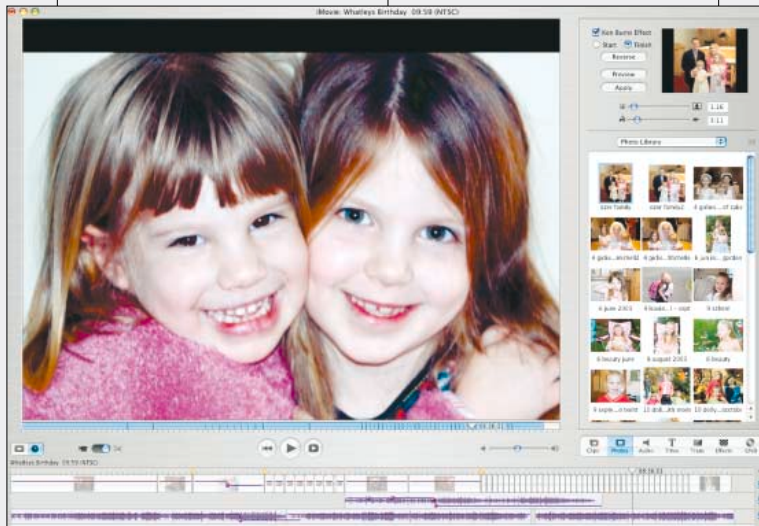


Well, you bought that new camcorder last holiday season, and if you're like us, the tapes are sitting in a closet, waiting to be edited. Graduation season has passed, perhaps adding to the collection, and your vacation is looming. • But now there's no excuse for not turning those tapes into entertaining—or at least watchable—DVD titles you'll want to see and share. Here we review the cream of the crop of entry-level video-editing and DVD-authoring packages. Each costs less

than \$100 and is designed for consumer use; unless your last name is Altman or Spielberg, that probably means you. Remember: You didn't buy a camcorder to stockpile video footage; you bought it so you could relive some memories. So pick a tool, invest some time, and start producing your DVDs.

### Apple iMovie, iDVD

iDVD's dazzling templates and iMovie's graceful usability enable novices to produce impressive results at a ridiculously inexpensive price: \$49 for the entire iLife '04 suite (First Looks, March 16), which includes the fine iPhoto, iTunes, and GarageBand apps in addition to the video-oriented titles we tested for this story. Although they're easy to use, both iDVD and iMovie contain potholes to avoid (or at least recognize).



**IMOVIE'S SIMPLICITY** and large preview make it easy to use and fun to work with.

From an interface perspective, iMovie is a model of simplicity. It features a huge preview window with a storyboard/timeline (with three tracks) below. All assets and effects are contained in libraries on the right, complete with all configuration options and other controls. With only

one video track, however, iMovie was the only editor that couldn't display a logo over the background video (third-party plug-ins for this function are available).

Though the interface design is streamlined and very accessible, we found ourselves missing niceties such as duration

markers on the timeline. Other quibbles include the inability to delete assets by pressing the Delete key and sluggish performance when using the new audio-scrubbing feature.

iMovie's capture function is one-click-simple. But you can't set a capture duration and walk away, so you have to stick around if you intend to capture less than an entire tape. In addition, iMovie can't capture files larger than 2GB (about 9 minutes), and it automatically breaks your footage into 2GB-size chunks. Happily, iMovie can automatically split clips at DV scene breaks, making the 2GB limit a nonissue for many tapes.

New in iMovie is direct trimming—the ability to trim the clip by dragging the edges to a new location. Be careful, though, because iMovie sends the deleted frames to the Trash; if you empty it, the frames are gone and you have to recapture. It's a good feature if you're limited in hard drive capacity, but take care: You may delete footage you need later on.

iMovie offers a good range of special effects, including lightning, lens flare, old film, fog, earthquake, and fairy dust—all with excellent configuration options, including the ability to set transition-in and -out durations. On the downside, iMovie renders each effect as applied, not during final production. Effect rendering was slow on our dual-G5 test system, which took 4 minute 32 seconds to apply a



# LOOKS

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

- 56 Gateway 30-inch HD-Ready LCD TV Display
- 58 Pinnacle ShowCenter 1.5
- 58 AverMedia UltraTV USB 300
- 60 Creo Six Degrees 2.0

- 60 BrowserBob 3 Professional
- 62 NetSuite 9.5.3
- 62 salesforce.com Enterprise Edition
- 63 Salesnet Extended Edition
- 64 ZoneAlarm Security Suite 5



- 66 Sony DRU-700A
- 68 Kyocera FS-3820N
- 68 Kyocera FS-3830N

Red type denotes Editors' Choice



**iDVD'S FEATURE SET** can be a bit limiting, but the templates are simply dazzling, helping your project make a great first impression.

soft filter to a 1-minute clip. (For details on how we tested, see the online version of this story at [www.pcmag.com](http://www.pcmag.com).) Though applying one filter didn't slow system performance noticeably, applying the same effect to multiple clips usually did. In addition, you can't apply multiple effects to a single clip simultaneously; you have to apply an effect, render, apply the next, and so on.

Titling in iMovie is a mixed bag. Animation options are extensive and amusing, though the program lacks font niceties like shadows and outlines. Probably most annoying are the maximum duration times set for each title. You can make the title stay longer, but you have to split the background clip and apply it multiple times.

On the other hand, producing slide shows is a real strength. You start in iPhoto, where you can crop, resize, brighten, and apply red-eye reduction to your pictures. Then you drag the stills to the iMovie timeline, where you can apply

the Ken Burns pan-and-zoom effects singly or en masse. You can also apply a transition to all of your photos and change slide duration as a group to match your background audio track.

Apple has improved iMovie's audio interface with new waveforms and rubber-band volume controls, and we like that songs ripped from CD in iTunes showed up in iMovie's audio album. Missing, however, is a real-time audio mixer.

On the DVD-authoring side, iDVD's 45 templates are best-of-breed—light years ahead of the other products here. Navigation options are also good, with sub-menus and chapter menus, and you can create slide shows in iDVD with transitions and match image duration to background audio.

Though we like the new Map view, which shows all menus and linked

content, it is frustrating not to be able to drag and drop menus and content in that view. You also can't create chapter markers in iDVD, only in iMovie, forcing a trip back to iMovie to add chapter points late in the process. More important, iDVD provides no guidance during the rendering process, simply presenting a spinning bar with no percentage complete or estimated duration till completion.

Performance on the dual-G5 was snappy, with iDVD producing our 10-minute test project in about 17 minutes 46 seconds, second only to VideoStudio's 15:53. So while iMovie and iDVD don't deliver the power and features of other consumer-level video products, they offer ease of use that the others can't match. And given the integration with the suite's other apps—not to mention its low price—casual videographers may be happy to forgo some flexibility for the friendliness found on the Mac platform.

Apple iLife '04

\$49 direct. Apple Computer Inc., [www.apple.com](http://www.apple.com). ●●●●○



**STUDIO'S TITLING** utility doubles as a DVD-menu creator, providing almost infinite design flexibility.

## Pinnacle Studio 9, v. 9.1

Pinnacle Studio 9, version 9.1, is simple, elegant, and user-friendly, with several unique features. Studio, however, is the only Windows editor missing an overlay track and still-image pan-and-zoom capabilities in the base version.

Studio does offer the best workflow of the group. You capture into an Album, where you can split and annotate your clips, simplifying complex projects. Then you drag your clips into the storyboard for sequencing and switch to the timeline view for further editing. The only frustration is the lack of a true bin for collecting project assets.

Studio's transitions are also top-notch, with all the basics, plus (for an additional fee) occasion-specific transitions (pouring from a bottle of champagne for weddings, balloons for a birthday party, and so on). New in version 9.1 is the ability to buy one themed group at a time (typically \$14.99 direct for 16 effects).

The highlights of Studio 9 when it was first released (First Looks, March 16) were new color-correction and motion-stabilization filters that produced excellent results on our tests. These are included in the basic version of Studio, and you can purchase other creative and curative filters available via upgrades.

Studio's audio capabilities are an

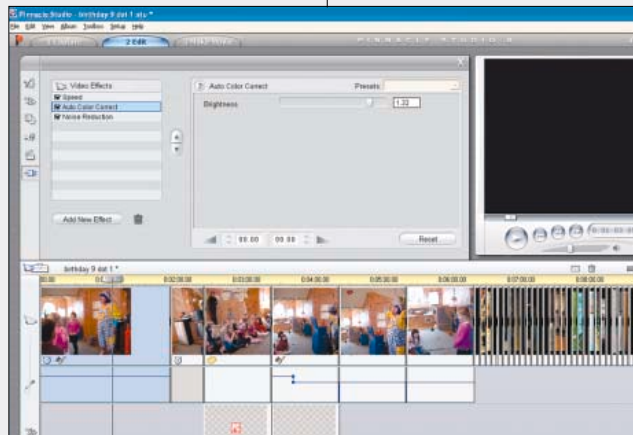
other strength, with real-time audio mixing for volume, panning, and front-to-back positioning. Studio's implementation of SmartSound, which can match any asset on the timeline or the entire project, is a touch more elegant than VideoStudio's, which forces you to enter a specific duration. Studio's audio filters for equalization and noise removal are the best in the group and, unlike VideoStudio's, can be applied directly to the audio associated with a video clip.

Studio also has an automated movie-making function that performed better than VideoStudio's on our tests, though not as well as VideoWave's Cinematic. Although Studio's titling function offers little animation, its styles, positioning controls, and drawing tools are exceptional.

Studio's DVD-authoring capabilities are by far the most comprehensive, offering true menu-to-menu branching and complete menu customizability. The only major disappointment is the lack of AC-3 audio compression, though Studio offers MPEG compression, which is only slightly less compatible. Pinnacle even improved overall performance in Version 9.1 compared with when we first tested it, with Studio trailing only VideoStudio in AVI output, MPEG output, and total DVD production time. If this sounds impressive, it is, and what Studio does, it tends to do quite well. Where does it fall short?

For one thing, Studio is the only Windows-based program here without picture-in-picture capabilities. But you can insert an overlay image or logo, which is sufficient for many users. You can also buy a plug-in that supplies both picture-in-picture and blue-screen capabilities from Ezedia for \$29, though you don't get the motion controls that Screenblast and VideoStudio supply.

In addition, Studio's slide



**PINNACLE STUDIO'S** most powerful features are filters available through the new plug-in architecture.

show functionality is limited, with no pan-and-zoom effects in the base package (though available as an upgrade) and no ability to match slide duration to background music or rotate or otherwise edit images. You can automatically insert transitions between a group of slides to save time, but that's the extent of the slide show-specific automation.

Otherwise, we're happy to report that all issues encountered during our previous experience with the product have been resolved in this latest build (available to version 9.0 buyers as a free upgrade via Pinnacle's Web site). This puts Studio back near the top of our list of consumer video-editing packages, and it is certainly worth a close look.

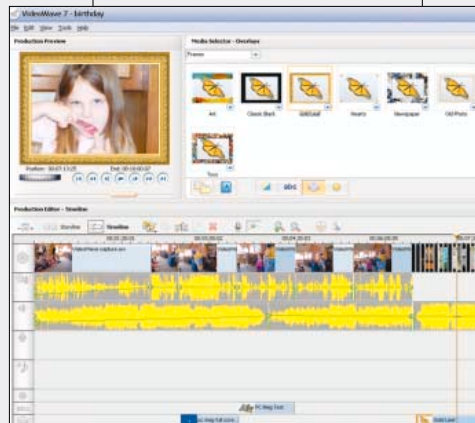
**Pinnacle Studio 9, version 9.1**

\$99 direct. Pinnacle Systems Inc., [www.pinnaclesys.com](http://www.pinnaclesys.com). ●●●●○

**Roxio VideoWave 7 Professional**

Roxio VideoWave 7 Professional has evolved into a powerful program with an extensive feature set. It's available as a standalone app (\$59.95 direct) or

as part of the excellent Roxio Easy Media Creator 7 suite (\$79.95; First Looks, April 6). Still, we found several feature gaps. Most important, Roxio eschewed the simplicity of VideoWave's previous single-window interface for multiple functional windows and window layers. This added



**VIDEOWAVE'S** authoring program felt like a first-generation tool (which it is), and the templates were uninspiring.

complexity—and a dearth of documentation—makes the program the most challenging to master in this roundup.

VideoWave offers three different editing modes: Cinematic, which automatically creates music video-like productions; Storybuilder, a theme-based "guided editing" program; and the Production Editor, a free-form video editor

with storyline and timeline views. Cinematic and Storybuilder can output files directly or output projects that you can edit further in the Production Editor.

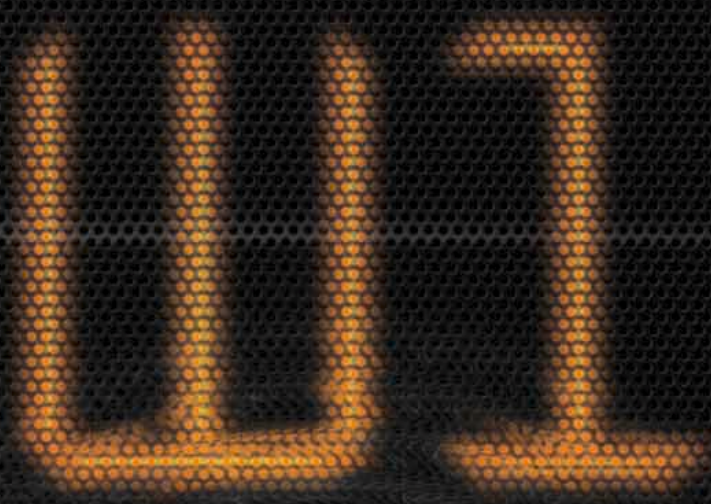
In all modes, you acquire your assets using the Capture tool. VideoWave is the only product here with Smart Scan, a feature that scans the DV tape at high speeds, presents a list of scenes with thumbnails for your perusal, and then captures the selected scenes. We also like the comprehensive view of all content sources, which include video on non-copy-protected DVDs and DivX content.

The Production Editor offers a multitiered timeline interface. The top tier looks like a standard timeline with seven tracks (four for audio, and three for video, overlay, and effects). Double-click on a video or still-image asset and you open the "internal tracks" timeline, with seven additional tracks. This architecture enables both project-wide and asset-specific editing. The smallish preview window sits in the upper left, above the tracks.

VideoWave's timeline simplifies the use of video- and still-image overlays, with good controls over size, border and border color, transparency, and location. As with most VideoWave features, you can customize all parameters for the start, middle, and end of the clip. Though VideoWave offers chromakey

capabilities, we found they worked best on computer-generated images and poorly on real-world videos shot against a blue screen. We were also disappointed that we couldn't apply more than one effect at a time to a video clip.

VideoWave's transitions include an amusing mix of 2D and 3D effects, with several thematic effects. Transition duration is



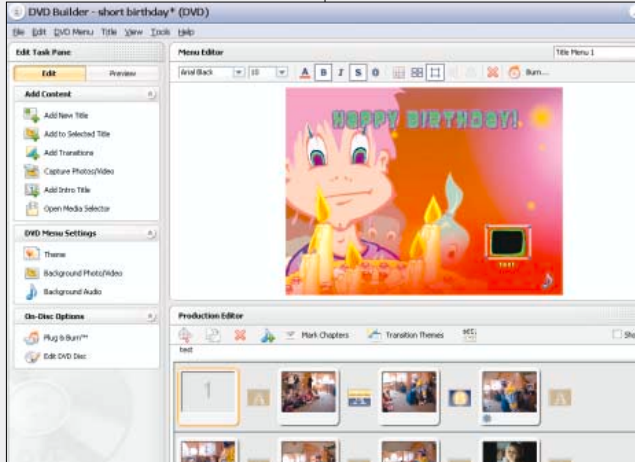
## Boom, boom! Take me to your room.



W1's minimalist, brushed aluminum design is modern enough to turn heads, yet classy enough to always be in style. The widescreen display and open workspace provide a distraction free environment. And when it's time to party the 4 channel surround sound and subwoofer fill the room with sound so rich, you won't believe it is coming from a notebook.

- \* Intel® Centrino™ Mobile Technology
- \* Microsoft® Windows® XP Professional
- \* ATI Mobility™ RADEON™ 9600 graphics processor
- \* 15.4" 1680x1050 widescreen display
- \* 4.1 surround sound stereo system with built-in subwoofer
- \* Built-in DVD±RW drive and 802.11g wireless
- \* 80GB 5400 RPM hard drive
- \* ASUS Power saving technology for up to 4.5 hours of battery life





**VIDEOWAVE'S DVD BUILDER** delivers more limited navigation options than the others, but it does include the basics.

typically the only configuration option, but VideoWave offers the useful ability to apply a new duration to all transitions in the production. You can also apply transition styles (like fast dissolves and page turns) to the entire production, another nice automation feature.

We also like the new graphical overlays, which provide fun effects like frames around your still pictures or a video camera-like view over your video—complete with a flashing Record light. Slide shows are also a strength, with image

cropping, rotating, and resizing and red-eye reduction, along with key-frameable pan-and-zoom effects you can customize (or allow VideoWave to apply automatically). You can also match image duration to the background audio, another great time-saver.

Cinemagic's automatic music-video generation offers 11 styles, including Family Memories, Hip-Hop, People and Places, and Impressionist. A wizard directs choices of video, background music, and style; the program then ana-

lyzes your audio and video and applies the style. Though results varied by style and taste, we found several that produced an entertaining mix of clips, with good tempo and effects usage. Our only complaints: You can't set the order in which clips should be played or determine whether to repeat certain clips.

We were less successful with the Storybuilder interface, which operates similarly and is intended to shape the inserted clips into a cohesive style with effects and background music. But the outcome proved somewhat plain; we produced superior results using the production editor without assistance.

VideoWave's titling utility offers a good mix of presets with configurable text, styles, frames, and motion paths. But you can enter only one text string per title. On the audio front, VideoWave clearly trails most rivals. Though there are sufficient tracks for most producers, the product lacks a real-time audio mixer, necessary to make them truly useful. VideoWave also lacks audio filters and cannot automatically create background music tracks.

DVD production occurs in another applet that provides ac-

cess to all project assets. You can perform minor edits, like adding transitions in the authoring applet, or easily shell back out to the production editor. Navigation options are limited to chapter menus and sequential menus, with no menu-to-menu links. The supplied styles are underwhelming in appearance, though customizable with background images and video, as well as video buttons.

Though you can create chapter points, you can't easily access the chapter menu to name each chapter, so you're limited to numerical descriptions. Several users have posted workarounds for this on the Roxio support site, but deficiencies like this, and the somewhat disjointed authoring interface, gave this module a distinct Version-1.0 feel.

Rendering performance was on the slow side, taking 17:35 to produce our 10-minute test project to DV and 21:26 to render it to MPEG-2. Total time to DVD was 23:47. Once rendering is done, you can burn a disc label, DVD case, booklet, or insert, using Roxio's polished Label Editor (the only print tool among the products in this review).

So while we applaud its

## Quick-and-Fun Home Videos

**M**uvee autoProducer 3 offers superior creative options for automatically converting video footage into music video-like productions. But the product's key new feature, magicMoments, proved awkward, and the product's interface needs rethinking overall. That said, it's a fun tool for your video arsenal.

muvee invented automatic movie production, now a feature in many video editors. All work similarly: You insert the original, unedited video, select background music, and choose a "style" that dictates the pace and types of effects applied. The products then divide the video into segments synchronized to the beat of the music and insert the effects dictated by the style.

What differentiates autoProducer is the number and diversity of styles: 24 are included—compared with 10 or fewer styles for other products—with extra styles available for purchase on muvee's Web site. muvee styles also apply a more diverse range of effects and match the video clips and effects to the music more closely than do other products. In our tests, autoProducer's final results were superior to others we tested, and the timing of scene changes and effects better matched the beat of the music.

**MUVEE AUTOPRODUCER** lets you make music video-style home movies with just a few clicks.

But you can't edit your results in autoProducer, which is why magicMoments proved so disappointing.

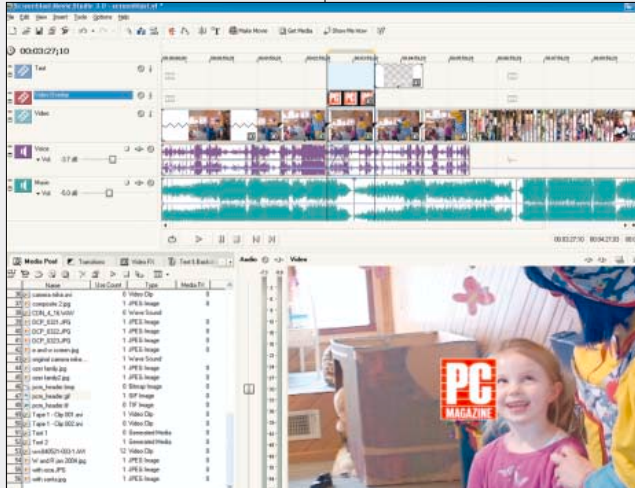
Briefly, most videos contain some scenes you want included (baby smiling) and some you want excluded (baby crying). magicMoments is a new feature that enables these designations. However, scene selection proved very slow and awkward and needs rethinking, as does the 800-by-625 interface and tiny 320-by-240 video-preview window.



muvee autoProducer 3 with magicMoments

\$69.95 direct. muvee Technologies Pte. Ltd., www.muvee.com. ●●●●●





**SCREENBLAST MOVIE STUDIO'S** embedded-window interface minimizes clutter while allowing you to maximize the preview pane.

power, we wish VideoWave were more approachable for novices. But it's a good program nonetheless—and a downright bargain if you get it as part of the Creator suite.

**Roxio VideoWave 7 Professional**

\$59.95 direct. Roxio Inc., [www.roxio.com](http://www.roxio.com). ●●●○○

**Screenblast Movie Studio 3.0**

Sony's Screenblast Movie Studio 3.0 comes with the Screenblast editing software and Sonic Solutions' MyDVD 5.0 for DVD authoring. Though the combination is capable, Screenblast lacks niceties like dedicated slide show-creation capabilities, automatic movie generation, or the background-music creation offered by category leaders.

Screenblast was formerly VideoFactory, the de-featured, consumer-oriented sibling of the highly regarded prosumer video editor Vegas (both originally developed by Sonic Foundry and sold to Sony last year). Screenblast shares the same basic interface as Vegas, but Sony limited the interface to five tracks: three for video (video, video overlay, and text) and two for audio. These are sufficient for most projects, and though plain, Screenblast's

embedded-window interface works well to minimize clutter while letting you maximize the size of the preview window.

Capture capabilities are sub-par, however. Though there is a shuttle control, you can't set capture duration and walk away, or select in and out points and batch capture. Timeline editing can be frustrating, especially if your designs require precision. For example, you can't set transition or title duration by entering a numeric duration. Instead, you have to drag these elements to the desired length, which usually requires zooming deeply into the timeline to see the per-second markers. Screenblast also lacks a storyboard, and you can't split assets in the media pool, so you have to arrange your content and trim on the timeline.

To its credit, Screenblast uses the overlay track to good effect, producing the best quality blue-screen overlay in this roundup. The product's highly flexible pan and crop controls also enable a wide variety of effects, such as picture-in-picture and pan-and-zoom for still images. Both have rough edges,

however, like the inability to insert a border around the picture-in-picture window to help distinguish it from the background video. Similarly, you must apply the pan-and-zoom effect individually to each image; we prefer the automated approaches used by iMovie and VideoWave.

Screenblast offers a good range of video effects, including lens flare, old film, and light rays, with the ability to apply multiple filters to any asset. Sony didn't leave in Vegas's excellent color-correction filter, however, which would have boosted overall usability significantly. Transitions are generally good but lack the thematic effects found in Studio and VideoWave.

Text effects are extensive, including backdrops, overlays, and scrolling credits. Sony provides good control over text attributes like scaling, leading, and kerning, with deformation

form, as with other products, you have to insert an audio volume "envelope," which is hardly intuitive. You need a similar envelope to adjust pan (left and right positioning), and you can't adjust either in real time while the audio is playing, as you can with Studio and VideoStudio.

Though we like MyDVD as an authoring solution, you have to render your project in Screenblast first, which breaks up the workflow, especially considering that Screenblast took 19:44 to render our 10-minute project file (the longest in this roundup). And at 32:17, the Screenblast/MyDVD package had the slowest total production time.

MyDVD itself offers a very solid mix of functionality and ease of use. In addition to chapter menus, you can create submenus, enabling menu-to-menu links, and the menu customization options are extensive. But because of the utility's arcane compression-control rules, DVDs exported from Screenblast are limited to 60 minutes of video, and even less with extensive use of the video and audio menus. MyDVD can handle longer projects, but you have to pre-encode videos to the necessary MPEG-2 data rates, which Screenblast's template-driven compression controls



**SCREENBLAST'S** DVD-authoring component, MyDVD, is easy to use and reasonably complete.

capabilities allowing curving, squeezing, and other similar effects. Missing are the style presets offered in Studio, and though you can enter multiple text strings into a single title, you control them as a group rather than individually, limiting design flexibility.

Audio functionality is limited and a touch cumbersome. Rather than simply adjusting volume by touching the wave-

form, as with other products, you have to insert an audio volume "envelope," which is hardly intuitive.

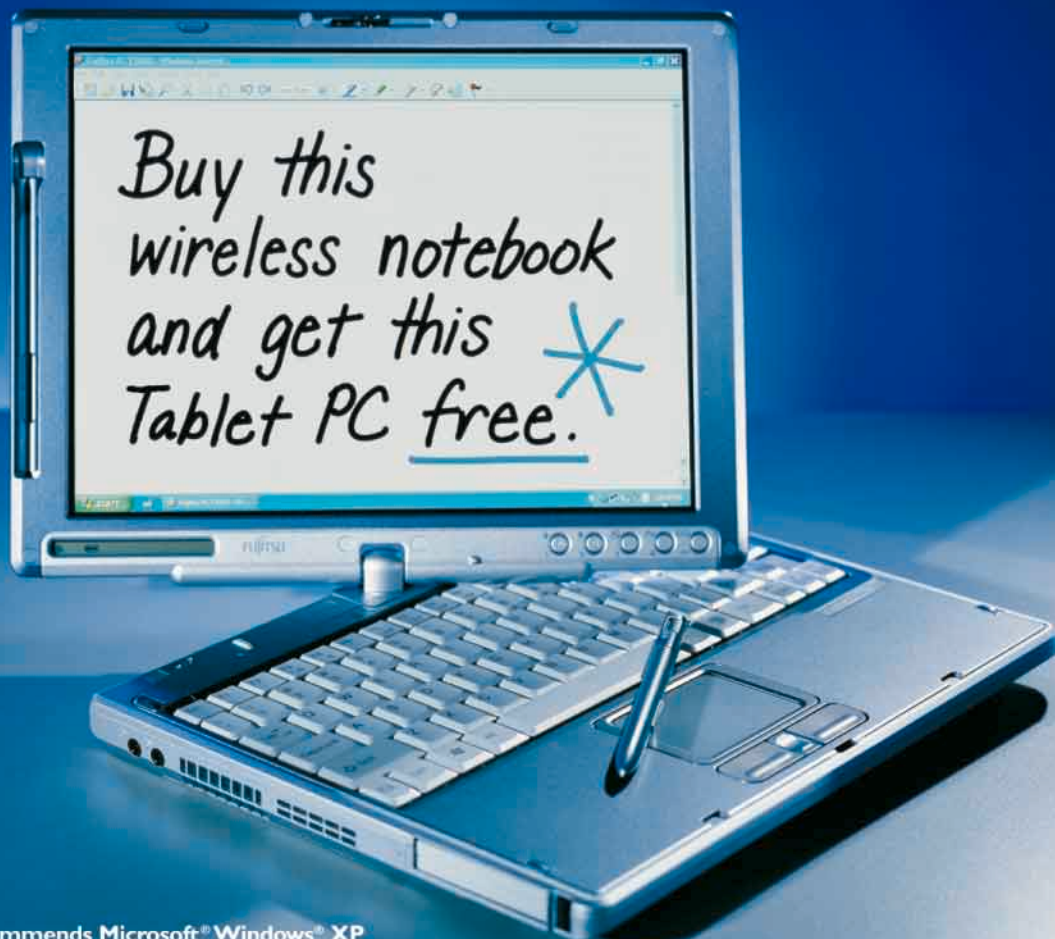
**Screenblast Movie Studio**

\$99.95 direct. Sony Pictures Digital Inc., <http://mediasoftware.sonypictures.com>. ●●●○○

**Ulead VideoStudio 8**



Ulead VideoStudio 8 is a mature, full-featured product that's highly usable, fast, and efficient. Though there's room for im-



Fujitsu recommends Microsoft® Windows® XP  
Tablet PC Edition for Mobile Computing.

**\* Now get Tablet PC and notebook functionality in one system—for one low price.**

Presenting the Fujitsu LifeBook® T3000 Tablet PC. A unique combination tablet and notebook that gives you the best of both worlds, all for the same price as a standard notebook. The LifeBook T3000 Tablet PC sets a new standard for mobile versatility and convenience. When you need a sleek, high-powered notebook, simply open it up and use its full-size keyboard. Or, when you want to sketch, write, or take notes, pivot and secure the screen and it instantly turns into a Tablet PC. Either way, it offers you built-in wireless access to information anywhere with the latest Intel® Centrino® mobile technology. So stop trying to decide on whether to get a new notebook or Tablet PC. Instead, get the functionality of both, for the price of only one. Go to [www.computers.us.fujitsu.com/2in1](http://www.computers.us.fujitsu.com/2in1) or call **1.877.372.3473** today for details.



**FUJITSU**

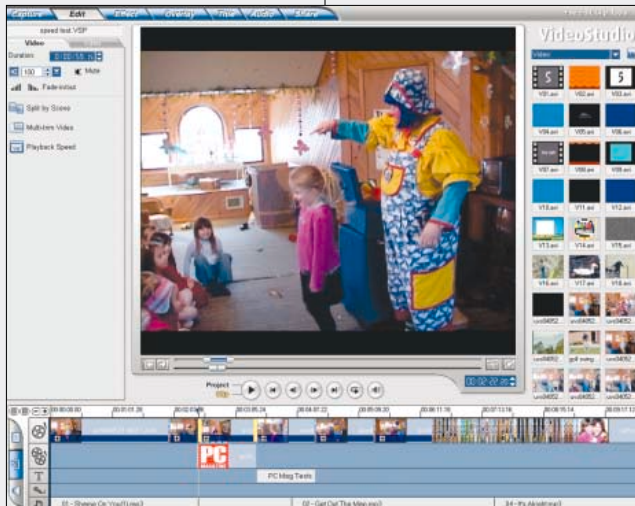
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MOBILE  
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provement in several areas (most notably DVD authoring and automatic movie generation), VideoStudio otherwise excels and is our Editors' Choice among consumer-level packages.

Ulead has updated VideoStudio's interface with new colors while retaining the large preview window and workflow (driven by tabs atop the interface). The program has two video tracks and four audio tracks, including audio from the two video tracks. In addition to the storyboard and timeline interfaces, Ulead added a third view of all audio tracks, with a real-time mixer and rubber-band volume controls. You can also expand the Storyboard window to full screen, providing a greater work area for sequencing your clips.



**ULEAD VIDEOSTUDIO 8** features an updated interface but also retains the large preview pane and tab-driven workflow.

VideoStudio's capture and import capabilities are impressive. You can batch-capture selected clips, using the new shuttle control to choose your scenes quickly, import video from non-copy-protected DVDs, and import DivX video. Once within the program, you can quickly trim away unwanted frames with VideoStudio's unique multitrack control. This tool lets you scan through the video file, mark-

ing scenes to include and exclude in the final production. It can be a real time-saver.

Ulead has improved VideoStudio's picture-in-picture feature with enhanced sizing and positioning controls, plus the ability to insert and customize borders and apply effects to the overlay track—a nice convenience. You can also use the track for video overlay, but the only keying method supported is alpha channel, primarily used for animations created in programs like sister product Cool3D.

VideoStudio includes 130 2D and 3D transitions, with good configurability. New in VS8 is an album transition that makes

scene changes look as if you were flipping pages in a photo album, which is a nice touch. Ulead also enhanced VideoStudio's slide show capabilities with pan-and-zoom controls that have three control points (start, middle, and end). But although you can rotate images to adjust those shot in landscape mode, there is no red-eye reduction, and you can't insert multiple transitions simultaneously or match image duration



**VIDEOSTUDIO'S DVD INTERFACE** is wizard-driven and less flexible than we would like.

to a background music track.

Ulead offers 38 special effects; primarily 2D, with the new duotone and diffuse-glow filters being welcome creative additions. Though you can adjust video color, there is no color-correction filter or analog noise filter to match Studio's offerings in this regard. VideoStudio, however, allows much more flexible key frame controls for precise customization of all effects.

Another change for the better is the program's titling interface, which for the first time offers direct manipulation of multiple titles over the background video, enabling greater placement precision than in the past. The new function also lets you insert colored backdrops to ease readability and text animation paths, with eight supplied paths, each with a range of presets.

In addition to the new audio-editing interface, VideoStudio also added normalization, noise removal, and several other filters—though strangely, you can't apply these filters to the audio portion of the video tracks. You can work around this by splitting the audio from the video, which places it on a separate track but feels unnecessarily awkward.

Although we achieved good results with the normalization filter, Ulead's noise removal function fared less well, inserting a dead silence during quiet periods in the audio that was

more noticeable than the background noise. We had more success with the new SmartSound feature, which adds custom background music tracks to your video projects or clips.

Probably the most disappointing new feature is the new Movie Wizard, which seems poorly focused. It's billed as a tool to create complete movies and operates similarly to VideoWave's Cinemagic, where you

input clips, select a style and background music, and press the magic button. But the background music and special effects proved repetitive, and the tool did a poor job of eliminating badly shot clips.

Our other disappointment is the minimal attention paid to VideoStudio's wizard-driven DVD-authoring capabilities. All productions are template-based, with chapter menus but no true branching, lacking even the submenu options found on iDVD and MyDVD. VideoStudio is one of the few programs unable to insert video menus, and text controls remain clunky.

As usual, VideoStudio led the pack in rendering, with the best times posted in AVI (6:35), MPEG (8:21), and DVD output (15:53). Also impressive is VideoStudio's unique ability for smart rendering, so if you make a minor modification after your first render, VideoStudio renders only the changed sections. Other products at this level rerender the entire project, which takes much longer.

So while the DVD-authoring module needs some polish, it should suffice for most home users. Given the product's other strengths, VideoStudio 8 is easy to recommend for home users looking to make more of their videos. ☰

**Ulead VideoStudio 8**  
\$99.95 direct. Ulead Systems Inc.,  
www.ulead.com. ●●●●●



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# 6-Megapixel Shooters: Easy and Affordable

BY SEAN CARROLL AND BEN GOTTESMAN

**S**o you thought you could not afford a 6-megapixel camera—or would not be able to operate one if you bought it? Think again. No longer the province of \$1,000 prosumer cameras aimed at photo enthusiasts, 6MP sensors have now come to user-friendly point-and-shoots—and for as little as \$500. Here we test three of the latest.

## Casio Exilim Pro EX-P600



The Casio Exilim Pro EX-P600's solid image quality, versatile lens, a sharp LCD, pleasing design, and impressive menus outweigh such negatives as mediocre recycle times and slightly dark exposures. This pocketable winner is the best of the 6MP



**THE CASIO EXILIM PRO EX-P600** combines pleasing design with fine image quality.

point-and-shoot cameras to come through our labs so far.

The EX-P600 has a Canon f/2.8 to f/4.0, 7.1- to 28.4-mm (35-mm equivalent: 33 mm to 132 mm) 4X optical zoom lens. It has not only a longer zoom than the other 6MP cameras reviewed here but also starts from a much wider angle, giving shooters more flexibility.

Users can frame shots with either the optical viewfinder or

the 2-inch LCD, which is by far the sharpest among these three cameras and has the least inclination to blur while tracking motion. The Casio is attractive and impressively solid. At \$649 (list), it costs more than the others here, but everything about it feels well made—all movements and buttons are smooth, and the zoom is responsive and quiet.

The EX-P600 has 25 very clearly explained and generally useful scene modes, all accessible via a set of scannable, easily navigable menus—some of the best we've seen. Beginners will appreciate the clear, concise on-screen help with both scene modes and even a manual assist mode that helps more ambitious newbies understand the relationship between aperture

and shutter speed to get great manual shots.

Hidden away from beginners but easily accessible by the more knowledgeable are features that will make pros smile, including exposure, white balance, focus bracketing, and more advanced multi-bracketing modes. It has several burst modes, including a high-speed mode of six images

in 2 seconds with the flash off, though you have to track your subject via the viewfinder, since this mode blacks out the LCD.

We were initially bewildered by the EX Finder, a view on the LCD that shows you everything from a histogram to the shutter speed, aperture, EV shift, target reticle, depth of field scale, and more, all in a display worthy of a jet fighter's heads-up display. But once you get the hang of it, the EX Finder is easy to read and a snap to adjust.

In labs testing, the EX-P600 produced 1,300 resolvable lines: not amazing for a 6MP camera, but acceptable. This, combined with good pixel transition results (2.1 percent average), gave us crisp clean images. Our daylight simulation still-life image was balanced with accurate colors and a good, even (if slightly dark) exposure. Our flash shots were well illuminated, if slightly cool. On our performance tests, we found the camera to have a reasonable boot-up time of 3 seconds and a less impressive 4-second recycle time.

Casio Exilim Pro EX-P600

\$649 list. Casio Inc., [www.casio.com](http://www.casio.com).



## Kodak EasyShare DX7630

The Kodak EasyShare DX7630 is a pleasure to use. Larger than the other two 6MP cameras reviewed here, it can still be tucked away in your jacket pocket. The camera can do the thinking for you, but it's easy to adjust the settings yourself if you prefer. We would have



**THE EASYSHARE DX7630** is an easy-to-use point-and-shoot.

liked this camera a lot more if it had done better on our labs tests. While our test shots were acceptable, the camera's performance was more in line with that of a 4MP model, yet you pay a premium in price and file size for the camera's higher pixel count.

The DX7630 uses a f/2.8 to f/4.8, 8-mm to 24-mm (35-mm equivalent: 39 mm to 117 mm) 3X zoom lens. We'd much rather have seen it start at a wider angle, like the Casio EX-P600's 33-mm lens. At 39 mm, you may have difficulty with group shots, landscapes, and shooting in tight quarters. And, at f4.8 on the telephoto end, it's a little slow.

So, it's not perfect, but pick up the DX7630 and you'll quickly be impressed by its intelligent design. The camera's plastic body feels solid, and your hand nicely fits the contoured, rubberized grip. There are 16 scene modes—one that we especially appreciated is the Manner/Museum mode that shuts the flash and sounds off to make the camera inconspicuous. Menu settings are clearly spelled out, although the graphics aren't as nice as on the Casio. Though large, the 2.2-inch LCD screen doesn't match the Casio's quality. But we like that the chosen focus point in

Kodak's 3-point auto-focus system is clearly displayed, so you don't have to guess which subject the camera is focusing on.

You can shoot videos at 24 frames per second to the capacity of your memory card, and the camera captures sound as well. The videos looked good, but you can't zoom while filming. We love that you can dedicate a portion of the 32MB of internal memory for storing your favorite pictures, letting the camera serve as a portable photo album. You can also designate specific pictures for later e-mailing.

We were a bit disappointed that Kodak didn't build an integrated lens cap like most cameras in its class. Instead, the DX7630 has a snap-on cap that attaches by a thin cord to the side of the camera.

The DX7630 averaged 1,150 lines per inch on our resolutions tests: Lower than we'd like for a 6MP camera, but it's coupled with a good pixel transition average of 2.1 percent.

between shots. For capturing the decisive moment in unpredictable situations, we really like the Last Burst mode. This mode lets you start shooting before the moment arrives and shoots at 2 fps continuously for up to 15 seconds, but it saves only the last four shots.

Kodak clearly understands what makes digital photography special. The EasyShare DX7630 is a very comfortable, well-designed camera that anybody should enjoy. We just wish the resolution were better and that the lens started at a wider angle.

**Kodak EasyShare DX7630**

\$499 list. Eastman Kodak Co., [www.kodak.com](http://www.kodak.com). ●●●○○

**Olympus Camedia C-60 Zoom**

The Olympus Camedia C-60 Zoom is a mixed bag. It produced very good images on our tests, but you'll need plenty of patience.

The 6.1-megapixel C-60 has a f/2.8 to f/4.8, 7.8- to 23.4-mm (35-mm equivalent: 38 to 114 mm) 3X optical zoom lens, which extends from

remove the battery.

The zoom controls are reasonably responsive, though the motor is loud. You can frame shots with the optical viewfinder or with the camera's 1.8-inch, 134,000-pixel LCD. The C-60 has the smallest LCD in this roundup, and though the LCD is far sharper than that of the Kodak DX7630 and brighter than the Casio EX-P600's, it blurred easily when moved.

Small, boxy, and well balanced, the C-60 has an uncluttered back (almost all controls are accessed through the four directional buttons and the dial). Unfortunately, the camera's menus aren't helpful: Some functions can't be easily reached via the menus, so you have to push one of the buttons repeatedly until the desired option appears. The camera does have a reasonable set of options, including six scene modes, semi-automatic and manual modes, and macro modes (for shooting at ranges down to 1.6 inches). The camera can capture either JPEGs or TIFFs, storing them on xD-Picture Cards.

On our tests, the C-60 had mixed results. As noted, boot time was painfully slow. Of course, you could leave the camera on, thanks to the lithium ion battery, but there's no avoiding the 4.6-second recycle time between shots—one of the slowest times we've seen recently.

On our resolution tests, the C-60 scored the best among the three 6MP cameras reviewed here, yielding 1,350 lines and a solid average pixel transition score of 2.4 percent. Our simulated daylight still life was sharp, clean, and bright. Colors were a bit on the warm side, with slightly blown-out whites. Our flash shot was decently illuminated, though we wish the flash were slightly more powerful.

**Olympus Camedia C-60 Zoom**

\$499 list. Olympus America Inc., [www.olympusamerica.com](http://www.olympusamerica.com). ●●●○○



**HP Photosmart R707**

**Pros:** Relatively easy to use. Pocketable body. Innovative and unique in-camera functions (post-red-eye, adaptive lighting). Good image quality, and does great with multi-image panoramics.

**Cons:** Short on dedicated controls. No recharger included. No shutter priority setting. More detailed explanations of features on-screen would have been nice for nonexperts.

**Bottom line:** A compact camera aimed at making digital photography easy for anyone, the 5-megapixel R707 mostly hits its mark.

\$349 list. Hewlett-Packard Development Co. L.P., [www.hp.com](http://www.hp.com). ●●●○○



**Sony Cyber-shot DSC-P100**

**Pros:** Small, stylish, and speedy. Takes crisp pictures. Very good battery life and rich feature set. Bright, 1.8-inch LCD performs well in direct sunlight. Impressive boot and recycle times. Good video quality.

**Cons:** Somewhat tricky menus may confuse newbies at first. Images can show some graininess in shadows.

**Bottom line:** This small, handy, smartly designed 5MP compact camera takes crisp, well-exposed pictures—and takes them quickly. It's a very good buy.

\$400 street. Sony Electronics Inc., [www.sonystyle.com](http://www.sonystyle.com). ●●●○○

[www.pcmag.com/cameras](http://www.pcmag.com/cameras)



**THE OLYMPUS CAMEDIA C-60** is a mixed bag of pros and cons.

Our still-life trial images were sharp and well detailed. The simulated daylight shots showed decent exposure and color, and the flash photos were strongly illuminated without "blowing out" any of the whites.

Our tests showed a blasé boot-up at 3.8 seconds, but the camera took only 1.6 seconds

to recover, we had to the body when you slide the clamshell lens cover open to turn the camera on. While it has a certain style, we weren't especially fond of the design, and we crashed the C-60 several times by attempting to close the cover before the camera had finished its lengthy boot-up process, which averaged 10 seconds. To recover, we had to

# Dell's Drive-Powered Edge

BY JOEL SANTO DOMINGO

**T**he Dell PowerEdge 750 is a server on a mission. If your needs call for hard drive horsepower rather than multi-CPU muscle, this configuration earns its \$3,544 (direct) price.

Built around a single Prescott-based 2.8-GHz Pentium 4 processor, the PowerEdge 750's 1U case can accommodate two hard drives. For this review, Dell sent a pair of 36GB 15,000-rpm SCSI U320 drives in a RAID Level 0 configuration. You can save a bundle by replacing these drives with SATA units, thanks to the two available SATA interfaces on the motherboard. But if your server requirements call for frequent disk access—such as in database, high-use Web cache, or

file-serving applications—the SCSI setup is the way to go.

The PowerEdge 750's near-enterprise-class performance on our NetBench test is eye-opening, hitting a peak throughput capacity of 1,084 Mbps (megabits per second) when



**HARD DRIVE HORSEPOWER** is this PowerEdge's calling card.

taxed by 20 virtual clients. On our WebBench static test, throughput ramped all the way

up to 144 million bytes per second at 32 clients.

The blue status indicator lights on the front and back panel are a nice touch we'd like to see on more IU servers. If there is a server fault (like an open-chassis detection or a fan failure), the blue LED lighting up on both the front and back panel will let you know which server to attend to in a rack. A linked button lets you either turn off the LEDs

after you've dealt with a problem or turn them on to help ID a server when you walk to the back of the rack. The light can also be activated by Dell's OpenManage systems management software, allowing, for example, a tech in Tulsa

to show a salesperson in DeWitt which of two servers to power down and ship to the home office.

The PowerEdge 750 is also available in a tower configuration as the PowerEdge 700. Both share the same motherboard and main internals, although the PowerEdge 700 has more expansion room. The PowerEdge 750 will make a fine local file server or a Web-caching server, and its 1U form factor is ideal for space-constrained areas.

#### Dell PowerEdge 750

With 2.8-GHz Intel Pentium 4 with SSE3 (Prescott), 1GB DDR400 SDRAM, two 36GB 15,000-rpm SCSI U320 hard drives (RAID 0 configuration), CD-ROM drive, Microsoft Windows Server 2003 Standard Edition, \$3,544 direct. Dell Inc., [www.dell.com](http://www.dell.com). ●●●●●

# A Pizza-Box Server that Delivers

BY JOEL SANTO DOMINGO



A small business or branch office often needs the power and dedicated use of a server. Tasks like front-end database development, intranet hosting, and domain/DNS serving, for instance, are not quite meant for a desktop PC. IBM makes it possible to get a suitable server at a desktop price (\$1,485 direct, without OS) with the IBM eServer xSeries 306.

The xSeries 306 is a 1U rack-mounted unit. Like most entry-level servers, the unit has only one CPU—in this case the Prescott 3.0-GHz Pentium 4. Further positioning this server in the market is its single 80GB 7,200-rpm SATA hard drive (no SCSI drive arrays here).

While the single hard drive is "simple swap," or on an easily removable sled, like all SATA drives it requires you to power down the server to make a

switch. Hot-swap SCSI drives and associated hardware do cost more, of course, and it's not just for their ease of replacement. For mission-critical data and data that needs

to be accessed constantly, 15,000-rpm SCSI drives in a RAID



#### IF YOU NEED

**AN AFFORDABLE SERVER** for a branch office or small office, the IBM eServer xSeries 306 is worth a look.

configuration are still the performance kings.

In terms of performance, the xSeries 306 is not a barn burner (nor is it meant to be, as configured). Still, the combination of dual on-board Gigabit NICs, P4 processor, and 512MB

DDR333 SDRAM handled our WebBench tests admirably, showing that under moderate load the unit can easily handle routine Web serving. At 20 clients during our static test,

the throughput was 112 million bytes per second. Our NetBench tests, however, show the limitations of the single-drive configuration. While the response time grew gradually up to 32 virtual clients, it rose steeply beyond that in further

testing. But xSeries 306 will prove more than robust enough for a simple file-sharing load.

What really impressed us, though, is the excellent IBM Director network management software that comes with the server. Director allows central IT to manage remote networks. The xSeries 306 can also be used along with the Remote Deployment manager to manage branch offices, including pushing new disk images to desktop and notebook clients, ensuring that remote offices are as up to date with software patches and current applications as the home office.

When you consider the ease of use that IBM's software provides, as well as the attractive price, the xSeries 306 is a good buy in an entry-level server.

#### IBM eServer xSeries 306

With 3.0-GHz Intel Pentium 4 with SSE3 (Prescott), 512MB DDR333 SDRAM, 80GB 7,200-rpm SATA hard drive, integrated ATI Radeon 7000 graphics, CD-ROM drive, integrated sound card, \$1,485 direct. IBM Corp., [www.ibm.com](http://www.ibm.com). ●●●●●

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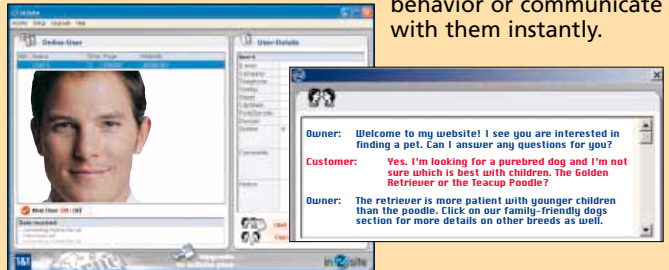
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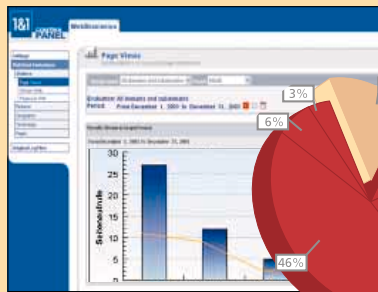
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 Mike

**Invitation to: Gallery Opening June 14, 2004**

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

Your Name: Stephen Bradshaw  
 Email Address: bradshaw@myhost.com  
 Will You Attend?  
 Yes - Usually  
 No - Unfortunately Not

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WEBSITE/CONNECTIVITY		
▪ Web space	500 MB	500 MB
▪ FTP accounts, unlimited access	1	1
▪ Included bandwidth/month	5 GB	5 GB
▪ Protected by up-to-date firewall	✓	✓
▪ Daily backups	✓	✓
APPLICATIONS		
▪ 1&1 Control Panel	✓	✓
▪ WebsiteCreator	12 pgs	12 pgs
▪ Full version software worth \$550	✓	✓
▪ Frontpage 2003	–	✓
E-MAIL		
▪ POP3 e-mail accounts	50	50
▪ Aliases, auto-responders, forwarding	✓	✓
▪ 1&1 WebMail	✓	✓
▪ Included virus scanner	1 POP3	1 POP3
WEBSITE FEATURES		
▪ Logfiles	✓	✓
▪ CGI library (counter, guestbook, etc...)	✓	✓
▪ FrontPage 2002 extensions	✓	✓
▪ Password protected directories	✓	✓
CRM/E-COMMERCE		
▪ 1&1 WebStatistics	✓	✓
▪ 1&1 Chat channel	1	–
EXPRESS SUPPORT		
▪ 24/7 support by phone and e-mail	✓	✓

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DOMAIN NAMES		
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▪ Point external domains to 1&1	100	100
▪ Subdomains	50	50
WEBSITE/CONNECTIVITY		
▪ Web space	1000 MB	1000 MB
▪ FTP accounts, unlimited access	5	5
▪ Included bandwidth/month	15 GB	15 GB
▪ Protected by up-to-date firewall	✓	✓
▪ Daily backups	✓	✓
APPLICATIONS		
▪ 1&1 Control Panel	✓	✓
▪ WebsiteCreator	18 pgs	18 pgs
▪ Full version software worth \$550	✓	✓
▪ Frontpage 2003	–	✓
E-MAIL		
▪ POP3 e-mail accounts	150	150
▪ Aliases, auto-responders, forwarding	✓	✓
▪ 1&1 WebMail	✓	✓
▪ Included virus scanner	3 POP3	3 POP3
WEBSITE FEATURES		
▪ Logfiles	✓	✓
▪ CGI library (counter, guestbook, etc...)	✓	✓
▪ FrontPage 2002 extensions	✓	✓
▪ Password protected directories	✓	✓
▪ Perl, PHP3 and PHP4	✓	–
▪ Database	1 MySQL	MS Access
▪ SSH shell access	✓	–
▪ SSI (Server side includes)	✓	–
▪ Cron Jobs / Scheduled Tasks	✓	✓
▪ Directory Protection	✓	✓
▪ Shared SSL	✓	✓
▪ Active Server Pages	–	✓
CRM/E-COMMERCE		
▪ 1&1 WebStatistics	✓	✓
▪ 1&1 Chat channels	5	–
▪ in2site Live Dialogue	✓	✓
▪ Newsletter Tool	✓	✓
▪ 1&1 WebDatabase	✓	✓
▪ 1&1 WebElements - Sophisticated Form Editor	✓	✓
EXPRESS SUPPORT		
▪ 24/7 support by phone and e-mail	✓	✓

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DOMAIN NAMES		
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▪ Manage unlimited domains with one account	✓	✓
▪ Point external domains to 1&1	200	200
▪ Subdomains	200	200
WEBSITE/CONNECTIVITY		
▪ Web space	2000 MB	2000 MB
▪ FTP accounts, unlimited access	25	25
▪ Included bandwidth/month	30 GB	30 GB
▪ Protected by up-to-date firewall	✓	✓
▪ Daily backups	✓	✓
APPLICATIONS		
▪ 1&1 Control Panel	✓	✓
▪ WebsiteCreator	25 pgs	25 pgs
▪ Full version software worth \$550	✓	✓
▪ Frontpage 2003	–	✓
E-MAIL		
▪ POP3 e-mail accounts	300	300
▪ Aliases, auto-responders, forwarding	✓	✓
▪ 1&1 WebMail	✓	✓
▪ Included virus scanner	6 POP3	6 POP3
WEBSITE FEATURES		
▪ Logfiles	✓	✓
▪ CGI library (counter, guestbook, etc...)	✓	✓
▪ FrontPage 2002 extensions	✓	✓
▪ Password protected directories	✓	✓
▪ Perl, PHP3 and PHP4	✓	–
▪ Database	3 MySQL	MS Access
▪ MS SQL	–	✓
▪ SSH shell access	✓	–
▪ SSI (Server side includes)	✓	✓
▪ Cron Jobs / Scheduled Tasks	✓	✓
▪ Advanced developer tools	✓	–
▪ Dedicated SSL Certificate	✓	✓
▪ ASP, ASP.NET, .NET Framework	–	✓
CRM/E-COMMERCE		
▪ 1&1 WebStatistics	✓	✓
▪ 1&1 Chat channels	10	–
▪ in2site Live Dialogue	✓	✓
▪ Newsletter Tool	✓	✓
▪ 1&1 WebDatabase	✓	✓
▪ 1&1 WebElements - Sophisticated Form Editor	✓	✓
EXPRESS SUPPORT		
▪ 24/7 support by phone and e-mail	✓	✓



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# Office 2004 for Mac: An Essential Upgrade

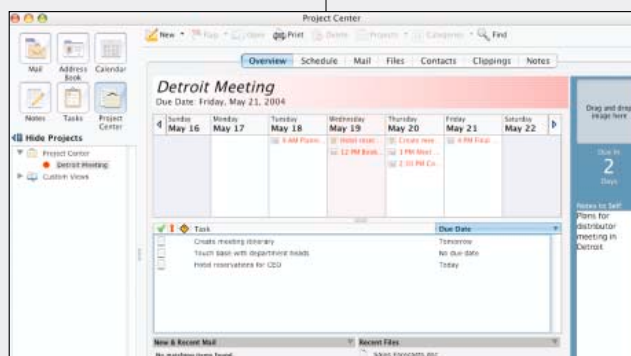
BY TROY DREIER

Now this is more like it. When the previous Mac version of Microsoft Office came out, we were happy to see that the entire suite had been rewritten to run under Mac OS X, but dismayed that beyond that there were no compelling reasons to upgrade. Thankfully, **Microsoft Office 2004 for Mac** has all the reasons we could ask for. It is loaded with far more new features than will fit in this review, some of which bring it to up to date with the Windows version and others of which are Mac firsts.

The centerpiece of the suite is the new Project Center, an exclusive (for now) feature that helps you organize both large and small projects. The Project Center resides in Entourage (the suite's e-mail and calendaring app) but is accessible from Word, Excel, and PowerPoint. Simply click the Project Center button and then click to create a new project. You can then name the project, assign a deadline, create tasks within it, and create links to all related notes, documents, and contacts.

When you're finished, everything relating to a project is stored in one central location. Projects can even be shared with coworkers. After weeks of using Project Center while we lived with the new suite, we think that it's a big advance—and enough to make users of Office for Windows jealous.

Entourage gains other useful improvements, such as better spam filtering, which works at least as well as Apple Mail's filtering, plus a simple archiving system for saving old messages or schedules. The app also gains a three-column view (as seen in Outlook 2003), with folders and shortcuts on the left, Inbox messages in the center, and the messages' contents on the right. We like the quick view and easy navigation this



**PROJECT CENTER** lets users gather all the notes, tasks, and contacts related to a project in one convenient location.

setup affords. The program's Exchange (2000 and later) support now uses WebDAV. All in all, Outlook 2003 still offers more features (such as the ability to place voting buttons in messages); Entourage offers the core Exchange functionality but not all the extras Outlook users get.

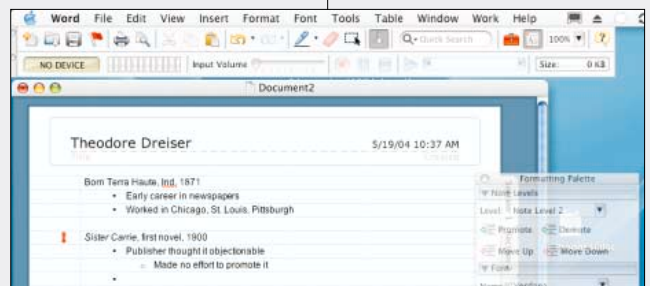
Entourage's main competition comes from Apple's own Mail, Address Book, and iCal apps, preloaded on every new Mac. Though the price of the Apple apps is right, Entourage's various utilities are so thorough and well integrated that they put Apple's efforts a distant second.

Word, the writer's staple, includes notable improvements this time around. Students and other note-takers will love the new notebook layout view (a Mac first), which mimics the look of lined notebook paper and makes it easy to type in well-organized notes and outlines. Notebook layout view has its own simplified toolbar and offers a quick way to record audio notes, which are linked to the original Word document but can also be detached.

It's the small usability improvements to Word that won us over, though. We love the way that the program now asks how it should format pasted-in content, so that you can instantly put additions in your text style of choice. Or the way

that the Formatting Palette becomes transparent when not in use but springs back to life when you mouse over it.

PowerPoint, the giant among presentation tools, suffered an attack last year when Apple introduced Keynote, its own presentation app. Keynote combined PowerPoint's efficiency with Apple's own slick graphics and effects to create presentations that were truly eye-catching. This is PowerPoint's first chance to respond to Keynote and reinvigorate its



**WORD'S NEW NOTEBOOK** layout view is ideal for students who want to jot down notes quickly.

tired business graphics, but it doesn't rise to the challenge. Although PowerPoint boasts over 100 new templates and over 200 new animations, they look bland and businesslike. Keynote makes a far richer presentation.

On the other hand, PowerPoint's new presenter tools are much appreciated. Using them, the person giving a presentation can easily see prepared

notes, thumbnails of the slides, and a clock counting the time. The presenter can also reorder and edit slides even while giving a presentation, without the audience knowing.

Two other suite-wide Mac firsts help make this version of Office even more useful. Compatibility reports let you know if your documents will display properly in other versions of Office, which is a huge concern for Mac users in this Windows-centric world. Also, a new Scrapbook feature lets you store frequently used items and grab them quickly. This version still isn't the business tool that the Windows Office is, though: There's no Mac version of the Access database, for example, and the suite lacks the SharePoint collaboration tools.

In compatibility testing, the new Office for Mac performed flawlessly, even when we sent various documents back and forth between the Mac and Windows versions of the apps to see how they would display. More important, it's a pleasure

to use. With a slew of useful improvements, this Office is a must-have for the vast majority of Mac owners and a must upgrade for current Office users.

Microsoft Office 2004 for Mac

\$400 street; upgrade, \$240; student and teacher edition, \$150. Requires: Apple Power Mac G3 or better, 256MB RAM, 450MB hard disk space (630MB for full installation), OS X 10.2.8 or later. Microsoft Corp., [www.microsoft.com](http://www.microsoft.com). ●●●●●

# Dell's PDA Packs a Lot for a Little

BY JONATHAN ROUBINI

**D**ell has done a very good job on its latest PDA, the **Dell Axim X30**. Its numerous and impressive features include the newest Intel processor, Bluetooth, 802.11b wireless, and the latest Pocket PC operating system. The best part? It all comes at the aggressive price of \$349 (direct).

In terms of design, Dell did not break any new ground: The X30 looks exactly like the Axim X3i. The flat stylus is reasonably comfortable to use (though we prefer weightier round ones), and there's a handy SD IO slot for expansion. At 4.6 by 3.0 by 0.6 inches (HWD) and 4.9 ounces, the X30 is just a bit larger than the 4.6-ounce HP iPAQ 4150.

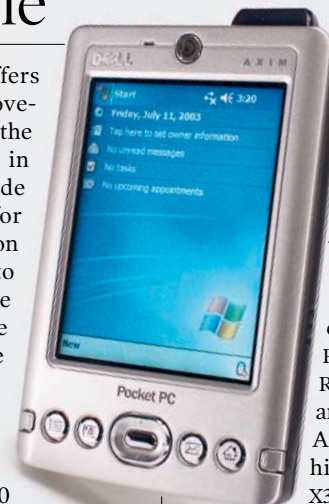
The X30 has 802.11b wireless connectivity and includes the

Dell WLAN utility, which lets you set up your 802.11b connection, find access points, enter WEP keys, and test the signal strength. In 802.11b testing, the X30 was impressive, maintaining a signal as far as 180 feet from the access point. By way of comparison, the iPAQ 4150 topped out at 100 feet. The device has a button located in the front that lets you toggle both Bluetooth and 802.11b on and off. Although this is a great idea, the feature could be better implemented; getting the combination of wireless that you want can be confusing.

The X30 uses the 624-MHz Intel PXA270 processor, which is designed for better handling of multimedia applications and wireless connectivity. The new Microsoft Windows Mobile 2003 Second Edition for Pocket

PC OS also offers several improvements, such as the ability to view in landscape mode and support for higher-resolution screens (up to 480-by-640). The X30 doesn't take advantage of the higher resolution, though; the screen is bright but delivers only 240-by-320 resolution.

The top-of-the-line X30 (which we tested) has 64MB of RAM, 64MB of ROM, and comes with a cradle. The midrange version (\$249) makes do with a slower processor (312 MHz) and does not have a cradle. The low-end model (\$199) is bare-



**THE DELL AXIM X30** delivers both Bluetooth and 802.11b wireless.

bones, with a 312-MHz processor, 32MB of RAM, 32MB of ROM, no cradle, and no wireless. All told, the high-end Axim X30 is rich on features. It's a little

larger than the competition, but in view of all you get, it's a very good buy.

**Dell Axim X30**

\$349 direct. Dell Inc., [www.dell.com](http://www.dell.com).  
OVERALL ●●●●○ Design ●●●●○  
Usability ●●●●○ Connectivity ●●●●○  
Entertainment ●●●●○

# Fujitsu's Go-Anywhere LifeBook

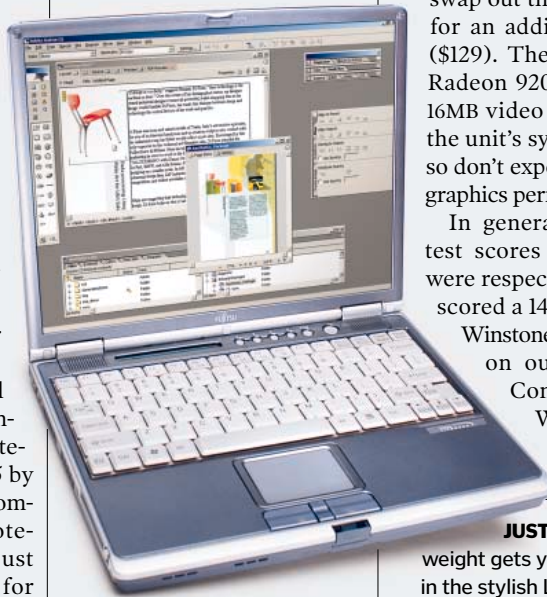
BY CISCO CHENG

**T**he **Fujitsu LifeBook S2020** has kept the thin-and-light profile of the company's S2000 family, while upping the horsepower with AMD's new low-voltage processor, the 1.6-GHz Mobile Athlon XP-M 2100+. But the real story lies in its wireless performance: It delivered some of the best results we've seen.

The 4.3-pound S2020 comes with a bright 13.3-inch screen that has a maximum resolution of 1,600-by-1,200. The keyboard is full size, except for the Period and Question Mark keys (75 percent of full size), which can be a bit bothersome for typists. The notebook measures 1.25 by 11.5 by 9.3 (HWD), which is very compact for a mainstream notebook, but still gives you just enough palm-rest space for

comfortable typing.

The unit we tested wasn't feature-rich, but it had the necessities. Connectivity ports are located in the back, including two USB ports, one FireWire



port, 100MB Ethernet, and a modem. The DVD/CD-RW combo drive is sufficient for burning CDs and playing DVDs. And since this system has a modular bay, you can opt to swap out the optical drive for an additional battery (\$129). The ATI Mobility Radeon 9200 borrows its 16MB video memory from the unit's system memory, so don't expect exceptional graphics performance.

In general, benchmark test scores for the S2020 were respectable. The unit scored a 14.6 on Business Winstone 2004 and a 15.3 on our Multimedia Content Creation Winstone 2004. The low-voltage Athlon

XP-M processor, with its PowerNow! Technology, helped the system's BatteryMark reach 2 hours 53 minutes, which is decent in view of the "weight saver" four-cell battery our configuration came with. Where the S2020 excelled was on wireless tests. With an Atheros 802.11g solution, the S2020 maintained connectivity at 160 feet with a throughput of 11.7 Mbps. That's nearly double what we typically see.

In the thin-and-light space, we still prefer the class-leading IBM ThinkPad T42 (First Looks, June 22, page 39). It weighs a bit more (5.0 pounds) but has a better keyboard and faster performance. It also costs several hundred dollars more, feature for feature. So if low price and low weight are on the top of your list, the S2020 is a good option.

**Fujitsu LifeBook S2020**

**JUST 4.3 POUNDS** of weight gets you all the basics in the stylish LifeBook S2020.

\$1,599 direct. Fujitsu Computer Systems Corp., [www.fujitsu.com](http://www.fujitsu.com).  
OVERALL ●●●●○ Music: 34 (out of 100); Photo: 34; Video: 27; Gaming: 43.

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seems obvious.**



**Treo 600**

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## Worth \$100 an Inch?

BY DAVE SALVATOR

Flat-panel HDTVs are hot, and Gateway seeks to capitalize on their popularity with the introduction of a new, extensive line. Its top LCD model is the **Gateway 30-inch HD-Ready LCD TV Display**, which checks in at \$3,000. The unit is thin (only 7.5 inches deep) with lots of input options, but its overall video performance is far from spectacular.

Weighing 36 pounds, the LCD TV was easy to position in our test space, and its 52-page manual made setup a breeze. On-screen display menus are easy to navigate and use, and the unit comes with a large universal remote whose buttons light up when pressed, making navigation in a dim environment much easier. But we found you have to point it almost directly at the television for commands to register. The bundle includes a pair of matching speakers that bracket the display nicely.

We tested the LCD TV at our new consumer display testing lab (for details on our testing, see the sidebar “How We Test TVs.”) We discovered that the

brightness control had no effect on the display’s black level until we dialed it up past 65 (on a scale of 100). At this point, the overall brightness increased and black levels began to get washed out. This means the brightness control effectively operates only on a 35-point scale. We found ourselves wanting to dial the black level down further, and our measurement test results confirmed what our eyes were seeing.

We tested via the DVI input at the panel’s native 1,280-by-768 resolution. The average contrast ratio was 518:1, which is quite good, and the ratio was consistent across the screen. But the LCD TV’s dark-tone levels were above target for the claimed 6,500 K (Kelvin) color temperature, and this was evident on our subjective tests.

While color saturation looked fine in 720p HD content, we found that the dark levels were not really dark enough and that there was a certain



amount of washout. DVD movie content also evidenced the same lack of detail in dark tones: Entire details in darker scenes from *Lord of the Rings: The Two Towers* were simply invisible. Conversely, banding appeared in brightly lit scenes. LCD panels still trail plasma displays in video playback quality, and this Gateway is no exception.

If you’re looking to make a major investment in your home entertainment system, Gateway’s LCD TV isn’t your best option, despite its convenient

**WE LIKE THE LOOKS** and size of the Gateway 30-inch HD-Ready LCD TV Display, but its image quality left us wanting.

size and weight. The panel works well as a PC display, but its response time isn’t fast enough for 3D games. Add to this poor dark-tone response and high price, and you wind up with a product we can’t recommend highly.

Gateway 30-inch HD-Ready LCD TV Displays

\$2,999.99 direct. Gateway Inc., [www.gateway.com](http://www.gateway.com). ●●●○○

## How We Test TVs



At PC Magazine Labs’ new consumer display testing lab in San Francisco (headed by Technical Director Loyd Case and manned by senior technology analyst Dave Salvator), we’ve devised a rigorous, repeatable, and objective test methodology, as well as a challenging set of relevant subjective inspection tests. We

would like to thank Konica-Minolta, Milori, Sencore, and Yamaha for equipment, software, and consultation.

We first place the television in a completely dark room to take a series of objective measurements. We use a Minolta CA-210 colorimeter to measure contrast, gray levels, and color saturation. We use Milori’s ColorFacts software to collect and analyze the data generated by the CA-210. Test signals are fed into the television from a control PC running the ColorFacts software via DVI, if the television has that input, or via VGA if no DVI input is present. Our control PC has a Radeon 9800 graphics card, where the DVI implementation is well within the DVI spec.

We take our color and gray-scale linearity measurements from

the center point of the TV’s screen. For contrast ratio, we take five measurements, one at the center point and one at each of the display’s four corners.

For our subjective inspection tests, we use a Sencore VP403 signal generator to look at a wide range of test patterns, including SMPTE bars; pure red, blue, and green screens; checkerboard; gray-scale gradient; and high-frequency patterns to assess image fidelity. We conduct these tests at HDTV resolutions of 720p and 1080i, as well as at a standard-definition TV resolution of 480i.

Next, we use the Sencore VOP920 to play back several high-quality HDTV video segments at 720p and 1080i resolutions. The images in these segments contain intense colors, fast-moving action, and detailed dark scenes. Here we’re gauging the television’s ability to deliver high-intensity action scenes accurately at HD resolutions, as well as looking for correct color and dark levels.

For DVD playback testing, we use a Yamaha DVD-S2300 Mark II, which features progressive scan and a 12-bit DAC. We view a number of especially challenging scenes from several DVD movies to evaluate dark-tone performance and to check for the presence of banding and other display artifacts.



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Hyatt Regency  
Tampa, FL

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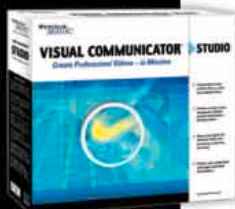
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# Pinnacle ShowCenter Not a Show Stopper

BY BILL HOWARD

In a world of immature and half-baked digital media receivers, the **Pinnacle ShowCenter** has the look and feel of a grown-up product. For the most part, the ShowCenter delivers, and it even has the ability to function as a DVR (digital video recorder). But the veneer of capability runs thin in too many places, especially in light of the optimistic \$300 street price.

The better media hubs handle photos as well as music, and the best ones even stream video. The ShowCenter raises the ante, interfacing with a Pinnacle TV tuner card (such as the PCTV Pro, \$90 direct) and the DVR software that comes with it. Once you've installed the ShowCenter (a relatively painless process) and scanned

your discs for media files, you can turn to the attractive TV display. Menu items run down the left third of the screen: Music, Movies, Photos, Settings, and New Media (a link to recently added files). Up to ten specifics for any menu choice are on the right. Music, for example, brings up playlists, Internet radio, genres, artists, albums, and songs.

This deep into the product, the ShowCenter is as polished as any device we've tested. But there are some oversights. For example, by default, the display doesn't show the time elapsed or remaining for a song, and there's no album art. The remote buttons are polished but in the wrong way:



**THE SHOWCENTER** is a good-looking and complete media hub. But some oversights and its high price hold it back.

They're highly reflective, and the fonts are small.

The ShowCenter does give you considerable flexibility in organizing media and adding keywords (to photos and video as well as music). If you are streaming video, you'll almost certainly need to use wired, 100-Mbps Ethernet (15- and 30-

foot cables are included). Wireless 802.11b is a \$40 option, but in our experience that standard is not fast enough for streaming video.

All told, the ShowCenter's features make it a fascinating product, and the unit is exceptionally good looking. But it's harder to use than a Media Center PC and not clearly superior to media hubs costing half as much. With an 802.11g option and a more readable remote—not to mention a lower price—the ShowCenter would be a stronger contender.

**Pinnacle ShowCenter 1.5**

\$300 street. Pinnacle Systems Inc., [www.pinnaclesys.com](http://www.pinnaclesys.com). ●●●○○

# Hollywood-to-Go, in a Box

BY BILL HOWARD

For just \$120 (street), you can turn any newer notebook or desktop PC into a TV-tuning multimedia machine with the **AVerMedia UltraTV USB 300**. This palm-size external module tunes and captures virtually anything, from home videos to broadcast TV.

The device's silvery case is smaller than a box of plastic bandages: 0.7 by 3.6 by 3.5 inches (HWD). It bristles with connectors, all of them industry standard: RCA and S-Video jacks for bringing in video, a USB 2.0 cable that connects to your notebook or desktop PC (and provides power—there's no separate power adapter), an audio-out jack for external speakers, and



**WATCH OR RECORD TV** on your laptop or desktop PC with the AVerMedia UltraTV USB 300.

an 1/8-inch antenna plug that links to an F-type connector.

The UltraTV's USB software links to the free TitanTV electronic programming guide ([www.titantv.com](http://www.titantv.com)), so you can use your PC as a digital video recorder (DVR), with content stored on your machine's hard

drive. (Road warriors take note: Now you'll never miss the latest episode of CSI.) Captured video is stored at a maximum resolution of 720-by-480, and quality from a good source is quite good on-screen. The bundle also includes Ulead's DVD MovieFactory and VideoStudio software for editing and authoring.

Disadvantages are relatively minor. Audio is mono only; MPEG capture is done in software, not hardware. Also, the unit lacks time-base correction, which synchronizes the halves of an interlaced video image for a more stable frame grab. A device without time-base correction, such as a cheap VCR, is jittery when you do a freeze frame. Here the degradation

was nevertheless slight. When we invoked the picture-in-picture feature (allowing you to watch TV and play back previously recorded video), the image was jittery at times.

You may find the UltraTV's bells and whistles useful. You can watch video in full screen or one-ninth size, or you can resize the window to suit your tastes. You can fill the screen with a looping four-by-four matrix of programs; the software plays each channel for 2 seconds, freezes the frame, and moves to the next channel. Double-clicking on any panel makes that channel active. You can also play video as a semitransparent Windows desktop while you work in the foreground.

Given the relatively low price, the UltraTV has no significant downside. If you're looking for a simple, on-the-go TV solution, you've found it.

**AVerMedia UltraTV USB 300**

\$120 street. AVerMedia Technologies Inc., [www.avermedia-usa.com](http://www.avermedia-usa.com). ●●●○○



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# Manage Projects Through E-Mail

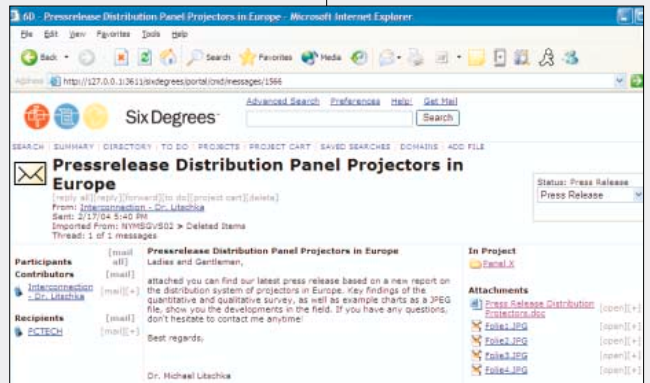
BY NEIL J. RUBENKING

**C**reo Six Degrees 2.0 makes e-mail more useful by leveraging existing connections in your mail. Messages found by its Google-style search interface are automatically linked to related correspondents, files, embedded links, and more.

Six Degrees will index any POP3 or IMAP e-mail account. We tested it on a Microsoft Exchange account via IMAP. The initial pass took over 3.5 hours to index about 8,000 messages. That's quicker than Outlook, but slower than XI Search 3.0 (reviewed in First Looks, May 18, page 45). Subsequent index updates went much faster. In addition to the index, the program created a local copy of the IMAP mailbox, requiring over 300MB of disk space.

The Six Degrees user interface is entirely browser-based, so it's familiar and easy to pick up. A handy Directory page links to predefined searches, such as frequent or recent correspondents, and a list of all distinct e-mail domains found. On the other hand, Six Degrees feels Web-slow, and the search doesn't always behave as expected. For example, without special syntax, message searches don't include the To and From fields.

In addition to navigating existing connections, you can create "projects," linking specific messages, correspondents, saved searches, and files. A project organizes related items without actually moving them, and each project has a bookmarkable local URL. Items such as new mes-



**SIX DEGREES OF SEPARATION** are all that stand between you and all the information stored in your e-mail. Six Degrees bridges that divide.

sages with matching subjects or new mail from included correspondents automatically appear in the project, which can be exported as an RSS feed.

If it's as important to you to find the context of messages as

it is to find the messages themselves, or if you need some hints to locate what you're looking for, Six Degrees is a good choice.

**Creo Six Degrees 2.0**  
\$99 direct. Creo Inc., www.creo.com.  
●●●○○

# Build Your Own Custom Browser

BY JAY MUNRO

**W**ith BrowserBob 3.0, you no longer have to be a programmer to create branded or custom multimedia browsers. With this easy but powerful program, beginners will get the basics of building a working browser in minutes (based on Microsoft's HTML control), and advanced users can add more interaction with behavior grouping, custom parameters, and powerful graphic features. Developers can even integrate JavaScript or VBScript code, and Flash, audio, video, or any media supported by Internet Explorer can be used in Bob applications.

The object-based drag-and-drop environment lets you easily create custom browsers,



**BROWSERBOB LETS YOU** create browser-based applications using free-form graphics.

which BrowserBob calls "weblications," using your own graphics for backgrounds, buttons, and actions. Photographs, cartoons, or clip art are all fair game for your free-form graphical interface. No coding is required to add buttons, text fields, labels, drop-downs, or pop-up windows.

Creative use of transparent images lets you liberate the

browser from its rectangular bounds. We used Macromedia Fireworks to build four-state buttons (up, touched, pressed, and disabled) in BrowserBob. We would have liked better integration between BrowserBob and our graphics editor.

BrowserBob's underpinnings are built into Windows, so no runtime libraries are required. Finished apps are compiled to single executables and will run on any system with Windows 98 or later. Windows 95 is supported, with Internet Explorer 5.5 or later.

BrowserBob can also let Webmasters create custom skins that automatically load when users visit their site. A small ActiveX control is downloaded so any Bob-enabled site will display properly on the

client. A special BrowserBob HTML Script extension language lets Webmasters create custom pages for Bob customers only. Users could then surf through to special pages without passwords, for example, just by using their Bob browser.

The Browser Bob tutorial-centric help system gets you started quickly but lacks search or index capability, which makes it difficult to find specific topics. An online forum, however, provides help from both other users and company representatives.

BrowserBob Professional is aimed at business users. There are no licensing fees required for finished applications, so developers can build, deploy, and sell any application built with Bob. The company also sells Developer (\$89 direct) and Light (\$29) versions. All versions create standalone executable applications.

**BrowserBob 3 Professional**  
\$336 list. BrowserBob Weblications, www.browserbob.com. ●●●○○





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# CRM on Demand: Have It Your Way

BY JOHN CLYMAN

Does the prospect of deploying a customer-relationship management (CRM) system give you pause? If so, an “on-demand” CRM application may be a smart alternative. The latest generation of these Web-based, hosted services brings expanded customization capabilities, new business-enhancing features, and improved interfaces to the table. For an all-inclusive monthly fee, on-demand CRM lets you avoid undertaking heavy-duty software development efforts, maintaining expensive in-house data centers, and worrying about rolling out upgrades.

Here we evaluate the latest offerings from NetSuite, salesforce.com, and Salesnet. Watch our upcoming issues for a review of another major player in this space, Siebel’s CRM OnDemand, which the company was busy integrating with the service it gained when it acquired Upshot.

## NETSUITE 9.5.3

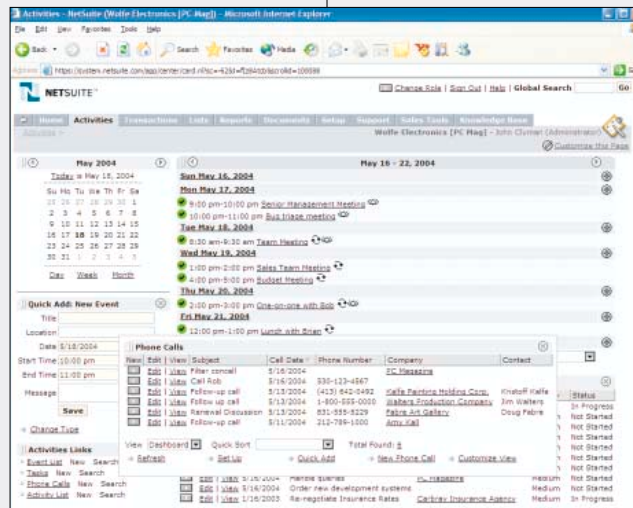
NetSuite isn’t just an on-demand CRM system. It’s a complete set of Web-based tools designed to handle all of a company’s financial and business needs, from building an e-commerce site where customers can place orders to handling back-office ERP (enterprise resource planning) tasks like payroll processing. Imagine complementing core CRM capabilities with a hosted version of Intuit’s QuickBooks, a database-driven Web-publishing system, and shipping and fulfillment capabilities, and you won’t be too far off the mark. The resulting application is comprehensive and powerful, and it provides a degree of integration that would otherwise be hard to achieve.

Log on to NetSuite and you’ll notice its rich, dynamic HTML

interface, which more closely approximates a native GUI-based application than almost any Web-based service we’ve tested. Neither salesforce.com nor Salesnet can match NetSuite’s interactivity in areas like editing field values within lists on the fly, pulling up context menus, and changing dashboard layouts by dragging and dropping modules. But for all that appeal, we also found Net-

paigns, support cases, and solutions, and you can publish Web portals for customer and employee use. NetSuite also has a document library—the only one we tested that allows hierarchical storage.

NetSuite contains extensive reporting capabilities and dozens of baked-in reports. You can customize columns, filter and sort data, and display results either in report



**NETSUITE'S SLICK** interface provides capabilities rare in Web-based applications, like the ability to reorganize modules easily.

Suite’s interface cluttered and sometimes counterintuitive. Users are likely to require training before they grow accustomed to its idiosyncrasies.

At the core of NetSuite’s CRM capabilities are the usual SFA (sales-force automation) functions for tracking leads, prospects, and customers. What’s most unusual about NetSuite is that it integrates information from sources most other CRM systems don’t, because NetSuite lets you build an e-commerce site around your product catalog, take orders online, and then follow up on fulfillment progress through integration with UPS.

Like salesforce.com (but not Salesnet), NetSuite also lets you manage marketing cam-

form or graphically. You can also create a summary, detail, or matrix-style report from scratch using NetSuite’s ad hoc reporting capability.

The dashboard that NetSuite provides can include a variety of key performance indicators, and you can instruct NetSuite to e-mail you snapshots of those key indicators up to three times a day—convenient for on-the-road executives who want a running update on what’s happening in their company.

Although salesforce.com’s streamlined interface and features for off-line users give it a slight edge in our ratings, NetSuite offers a strong suite of capabilities. For companies that want to extend their CRM life

cycle all the way from e-commerce through fulfillment and ERP, NetSuite is worth a look.

**NetSuite 9.5.3**  
For 2 users, \$4,800 direct; \$75 per additional user per month. NetSuite Inc., www.netsuite.com. ●●●●●

**SALESFORCE.COM ENTERPRISE EDITION**  
salesforce.com, which pioneered the model of delivering CRM applications as a hosted service, has pushed its offering even further with its latest refresh. Improved product and price-book management support for publishing solutions in a knowledge base and tools to detect and merge duplicate records are all pluses for an already strong product. We were particularly impressed with salesforce.com’s expanded customization capabilities and Sforce Studio, which lets administrators extend Salesforce’s capabilities without programming.

The hub of any CRM system is customers, and salesforce.com provides ample means for managing and tracking interactions with them. You can establish campaigns and track leads generated by campaigns, forms, imported files, or other channels. You then convert leads into contacts and active accounts when you’ve qualified them. Leads can be directed to a particular user or into a queue accessible by multiple users.

New in salesforce.com are some minor but helpful touches, such as the ability to track the roles of different contacts in an organization and to establish parent/child relationships for companies. The service also includes sophisticated capabilities for handling complex pricing structures for different customers, with support for multiple price books, pricing in different currencies, and pricing

# touch

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- 7 Reach customers in ways that are proven to deliver results quickly.** Face-to-face marketing is the fastest way to accelerate purchase intent.
- 8 Special programs and strategic alliances** will ensure your investment results in traffic at retail and demand for your products.
- 9 Reach an audience** of 35,000 customers face-to-face and secure another 30 million media impressions via DigitalLife's attendee marketing campaign.
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**SALESFORCE.COM'S** dashboards give you at-a-glance insight into the key metrics you define for your business.

based on installment schedules.

We especially liked salesforce.com's new tools for finding and merging duplicate data, which let us specify on a field-by-field basis which of up to three conflicting records contained the most current information. And the application's tools don't end with the sale. salesforce.com includes contract tracking with workflow capabilities and renewal reminders.

We found that the service's power emerged most clearly when we customized our installation. Using Sforce Studio, we added custom fields to contacts, accounts, and other CRM entities. A layout editor with DHTML drag-and-drop support made reorganizing input forms easy. We were able to create fully customized objects with their own attributes and relationships to other objects in the system, build forms around these objects, and even add a tab so that our assets behaved almost like native objects, such as leads. None of this required any programming. But if programming is what you want, salesforce.com also exposes its Sforce API and Web services interfaces so you can integrate salesforce.com with other applications.

With salesforce.com's off-line edition, we captured a Briefcase of information for use when disconnected from the Web. The off-line edition

uses an interface nearly identical to the one on the live service, except that it contains only accounts, contacts, and opportunities. You update your Briefcase before disconnecting, and when you return, you check back in and resolve any conflicts. This feature isn't as effective as the merge interface used elsewhere in the product, however. But salesforce.com does provide an Office Edition that plugs into Microsoft Outlook, Excel, and Word.

If you're looking for a comprehensive on-demand CRM tool that can streamline your sales and support processes, salesforce.com is an excellent choice.

**salesforce.com Enterprise Edition**

\$125 per user per month.  
salesforce.com inc.,  
www.salesforce.com. ●●●●●

**SALESNET EXTENDED EDITION**

Rather than trying to cover the entire CRM territory, Salesnet takes a more focused approach that targets just the sales stage in the CRM life cycle. With less breadth than competing products, Salesnet's major differentiator is its built-in support for sophisticated workflow logic. The company posits that providing sales reps with well-defined sales processes that automatically generate actionable tasks improves sales per-

formance, and key facets of its application are built around this principle.

Compared with the NetSuite and salesforce.com offerings, Salesnet's interface is visually uninspiring and sometimes lacking in usability. For example, date fields aren't always accompanied by a pop-up calendar. But the product's narrow scope makes it relatively easy to master.

Salesnet gives sales reps a baseline set of tools for managing leads, accounts, contacts, and deals, as well as appointments and tasks. Beyond that, it offers a limited document library (with five predefined folders, no additions or changes permitted) and a simple communications interface (but no full-blown campaign management like the other products). Like the other products, Salesnet lets you build forms to capture leads from your Web site.

Associating deals with specific sales process workflows is where Salesnet shows its strength. Salesnet workflows can be branching, multistep processes that automatically create tasks for users with each step. When a user logs on, he sees a list of tasks and due dates; upon completing a task, he can specify the result from a list of options. Based on that result, Salesnet moves the deal

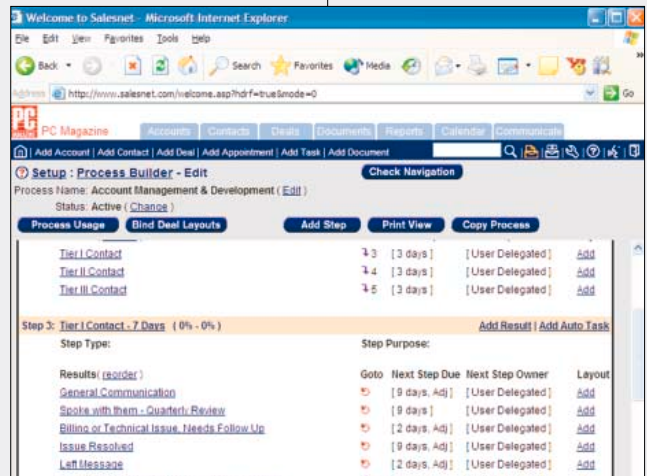
into an appropriate new state and triggers the relevant follow-up tasks and deadlines.

Salesnet has a standard interface for constructing and viewing reports (dozens of pre-built reports are included), and it offers graphical dashboards that don't lead just to underlying reports but actually drill into the detail data behind the clicked chart element.

When it's time to hit the road, you can take information with you and process it in Salesnet's off-line client, a GUI application that requires Microsoft's .NET framework. In the online application, you subscribe to selected records and then transfer them before you leave. When you sync again, Salesnet detects merge conflicts and gives you options for handling them. As an alternative method for staying in touch when you're not on the Web, Salesnet provides a Windows Messenger interface, so you can log on and retrieve information via an IM-capable cell phone. Developers can integrate with Salesnet functions via a Web services API.

If your CRM goals center on providing explicit task-based direction to salespeople, Salesnet should meet your needs.

**Salesnet Extended Edition**  
\$99 per user per month. Salesnet Inc.,  
www.salesnet.com. ●●●●●



**SALESNET'S INTERFACE** is spare, but its workflow capabilities for sales professionals are expansive.

# ZoneAlarm Security Suite: Total Security Solution

BY NEIL J. RUBENKING



With the release of **ZoneAlarm Security Suite 5**, the popular ZoneAlarm Pro has evolved into a one-stop total security solution. Building on the base of a powerful personal firewall with outbound program control, previous versions added features that improved e-mail and privacy protection and blocked the transmission of sensitive information. ZASuite adds an effective antivirus module, built-in security for instant messaging, and the ability to block undesirable Web sites.

Although the suite lacks anti-spam—a major component in competitor Norton Internet Security 2004—ZASuite matches and in some cases surpasses NIS as far as well-rounded security is concerned. It offers IM protection, outbound mail monitoring beyond that of Norton AV, and the ability to monitor non-ZA antivirus programs.

Rather than attempt to build an antivirus engine from the ground up, ZoneLabs licensed and integrated the Computer Associates antivirus engine, which in other incarnations was proved effective against known viruses by Virus Bulletin and ICISA Labs. The antivirus component scans your entire system on demand or on schedule and scans files whenever you access them, even within ZIP files. When an infected file is found, the utility can automatically repair it, if possible, or delete it, if not.

If a file can't be repaired, you can choose to rename it manually, though at present you don't have the option to move such files into a quarantine area. A *More info* link calls up detailed information about the threat. ZASuite monitors your antivirus program and alerts you if it becomes disabled or its definitions become out of date,

even if you use the consumer versions of McAfee, Norton, or Trend Micro antivirus. Do note that if you turn off the firewall to investigate a compatibility problem, the antivirus is also shut down. (And note that you can get ZoneAlarm Pro 5 without antivirus for \$49.95 direct.)



**WITH ITS STRAIGHTFORWARD INTERFACE** and host of advanced protection options, ZASuite 5 is the only security product you need.

ZoneLabs's existing IMsecure Pro product is now integrated into ZASuite. AOL Instant Messenger, ICQ, MSN Messenger, and Yahoo! Messenger conversations are automatically encrypted, as long as both ends are using ZASuite or any standalone version of IMsecure. IMsecure blocks IM spam (also called spam) and defends against IM-based worms and system exploits. It can also disable IM-based file sharing and streaming audio and video. Personal information defined for the IDLock feature (described below) is replaced with asterisks in outgoing IM—a handy way to keep IM-happy youngsters from sharing information they shouldn't.

If indeed you need to protect children (or employees) from going to inappropriate sites, ZASuite's Web-filtering feature can

block sites in over 30 distinct categories. There's even a category for blocking sites that could be used to circumvent the filter by, for example, translating a page. The filters reside on servers belonging to Cerberian, so they're always up to date, with no local updates required.

When this feature is active, the browser's request for a page triggers a simultaneous request to Cerberian's database for that page's rating. If the rating matches a blocked category, the user will see a warning explaining why the page was blocked. Unfortunately, filtering can't be set on a per-user basis, as it can be with NIS.

The most common gripe about ZoneAlarm has always been the confusing program alerts. If an alert says "Internet Explorer is trying to access the Internet," that's easy to understand. But what if the alert warns about "Generic Host Process for Win32 Services"? ZASuite introduces Automatic Program Configuration (APC) to combat this problem. This feature is similar to one in Norton Personal Firewall, though we find ZoneAlarm's more ef-

fective. ZoneAlarm matches the program's MD5 signature against a growing database of over 10,000 known files; it can automatically allow known good files and block known bad files. With APC active, alerts about unknown programs nearly disappear, and those that do pop up merit investigation.

Previous versions of ZoneAlarm Pro and IMsecure Pro included IDLock, but you had to enter personal information separately in each. ZASuite stores a single shared set of personal data in various categories. To add an item, you enter its description, pick a category such as "Credit card number," and type the data. ZASuite stores a one-way encrypted version of the data, not the data itself. So if you type that credit card number into a Web form that's not on a trusted site, ZASuite will alert you or block it, depending on settings.

ZoneLabs continues to enhance and strengthen existing features. The stealth firewall now loads earlier in the boot process, eliminating a minuscule window of possibility for hacking. The user interface is designed to thwart a malicious program's attempt to turn off protection by sending simulated keyboard or mouse events. The MailSafe feature blocks easy access to suspicious attachments, permitting it only after double confirmation. It also detects and blocks suspicious activity such as e-mails with too many recipients, or too many e-mails sent in a short time.

These and many other features make ZASuite very evenly matched with Norton Internet Security 2004, our other Editors' Choice in this area. Buyers should look closely at both to see which has the best mix of features for them.

ZoneAlarm Security Suite 5

\$69.95 direct. Zone Labs Inc.,  
www.zonelabs.com. ●●●●●

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# Dual-Layer DVD Recording

BY DON LABRIOLA



They said it couldn't be done. But dual-layer DVD recording is at last a reality, and the first product to offer it is the ground-breaking **Sony DRU-700A**. A dual-layer drive can store an entire Hollywood DVD-Video title, including menus and special features, on a single dual-layer disc. This pioneering DVD recorder can also burn 8X ±R and 4X ±RW media, includes what is arguably the most comprehensive software bundle we've seen with a DVD drive, and produced superior results on most of our performance tests. Dual-layer recording still suffers from a few growing pains, but the DRU-700A is a landmark product and represents a significant step forward for the DVD industry.

Dual-layer discs recorded by the DRU-700A conform to the DVD+RW Alliance's recently approved 2.4X DVD+R DL (double layer) specification. The DVD Forum is about to finalize its own dual-layer DVD-R format. Although the DVD industry has consistently used the term *dual layer* to describe two-layer media—reserving *double-sided* for discs that can be flipped over like LPs—the Alliance has unilaterally defined the term *double layer* to describe its DVD+R DL format.

DL media is expected to ship in quantity no earlier than the third quarter of 2004 and will initially sell for \$10 to \$14 per piece at retail. A DL disc can hold 8.5 billion bytes (or 7.95GB), nearly twice the capacity of single-layer media and an exact match for the replicated dual-layer discs used to distribute most commercial DVD-Video titles.

This last issue is crucial, since the killer application for DVD recorders has been the ability to back up Hollywood movies. But

most titles are too large to fit on a 4.37GB (4.7-billion-byte) single-layer platter, forcing larger backups to span two pieces of media. Aside from the inconvenience of recording and playing back two discs instead of one, splitting a DVD-Video title can disrupt its logic, preventing menus from locating



assets and even preventing some movies from being duplicated at all.

The limited capacity of single-layer media also constrains DVD authors, who need to burn their works in progress to disc for debugging purposes, to give to clients for feedback, or for short-run distribution. In the past, the alternatives were to compress large projects to fit onto one disc or to split them between two pieces of media—both solutions that make it impossible to preview the content in its final, unadulterated form. All these problems are solved by recordable dual-layer media.

One of the first applications to offer DL-recording is Ahead Software's flexible Nero digital-media suite, a version of which ships with the DRU-700A. Unlike Nero bundles that are packaged with other drives, Sony's version can be upgraded at no cost to add nearly all the

capabilities of the full retail Nero 6.3 product. (The only omissions are 5.1-channel Dolby Digital encoding and unlimited MP3 ripping.) The result is one of the most comprehensive and easy-to-use disc-layout, copying, and authoring suites currently available to the consumer market.

Strangely, Sony's

**WITH ITS DUAL-LAYER DVD** recording capabilities, the DRU-700A is a groundbreaking drive.

documentation does not mention the availability of this free online upgrade.

During our hands-on evaluation, disc-ripping performance was unexceptional, but the drive earned high marks on our MPEG-encoding and CD-burning tests. It did well on our single-layer DVD-burning benchmark tests, too, and recorded 7.75GB of DVD-Video content to a double-layer disc in about 40 minutes. On subsequent tests, DL burning times were not affected by the amount of source material being recorded, because unlike single-layer media, every bit on both layers of a DL disc must be burned before the disc can be finalized.

Our test unit couldn't record

at 8X on the Verbatim DVD+R media that we use as a standard, forcing us to use Sony discs for our DVD+R tests (a problem that Sony is currently investigating), but it had no problems burning any other single-layer DVD format or speed.

DL discs ripped and burned with Nero's Recode 2 module worked in all our test players, including even the most finicky notebook drives. But those containing content originally ripped by a third-party freeware application, such as SmartRipper or DVD43, played correctly in only about half of our players. We forwarded samples of these discs to the vendors for analysis and will keep you posted with any new information we uncover.

We were further dismayed to find that DL media can't be read by any DVD recorder that isn't also designed to burn Double-Layer discs. According to Sony, this anomaly is caused by the fact that pre-DL recorders don't recognize the on-disc media codes that identify recordable DL media; this is not a problem with read-only DVD-ROM drives or set-top players that lack recording capabilities. Manufacturers expect to release firmware upgrades that will resolve this problem eventually, but you may have to download and install them on affected single-layer recorders on a case-by-case basis.

The Sony DRU-700A is a solid product on a par with any recorder we've tested, although its DL-recording capabilities may have arrived before the format itself is fully mature. Nonetheless, an impressive combination of functionality, performance, and pricing makes its double-layer support icing on what is already a tasty package.

Sony DRU-700A

\$199 list. Sony Electronics Inc., [www.sony.com/dvdburners](http://www.sony.com/dvdburners). ●●●●●





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# The Best of Kyocera's Latest Printers

BY M. DAVID STONE

**T**he **Kyocera FS-3820N** (\$1,000 street) monochrome laser offers something every good printer should: a good balance of output quality, performance, and running costs. Like other Kyocera printers, it takes advantage of Ecosys technology, which (according to the company) keeps costs down. The claimed cost per page is about half a cent. And it's enough to make the FS-3820N a good choice, given its excellent text output and acceptable graphics output.

Although it's a network printer, the FS-3820N is compact enough to share a desk with if you need to (11.8 by 13.6 by 18.1 inches, HWD) and light enough for one person to handle, at 28.7 pounds. It doesn't offer automated network setup,

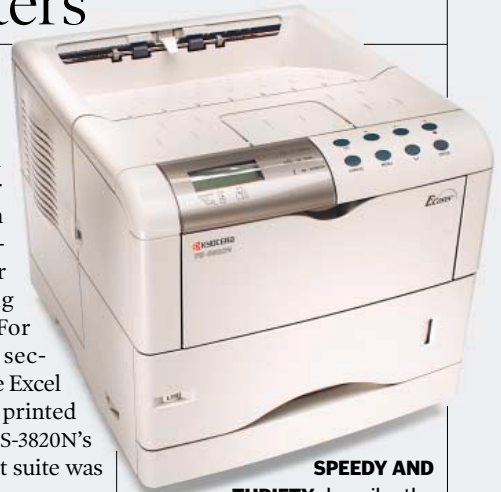
but Kyocera largely makes up for that with instructions that are easy to follow even if you don't know what an IP address is or how to create a new network port.

Unfortunately, we can't say the same for installing drivers and software. Kyocera uses the same setup program for dozens of printers and MFPs, but neither the documentation nor the on-screen instructions in the installation program tell you which choices apply to the FS-3820N. If you're setting up the printer alone and not thoroughly familiar with printer setup, set aside some time for calling Kyocera's toll-free support line.

Performance on our new test suite (using QualityLogic's testing software and equipment; [www.qualitylogic.com](http://www.qualitylogic.com)) was appropriate for the 29-page-per-minute engine. On tests that

overlap with our old suite, the 3820N was slightly slower than the 35-ppm Dell Workgroup Laser Printer M5200n in our network monochrome printer roundup ("Leading Lasers," April 20). For example, it took 22 seconds to print a 3-page Excel file that the M5200n printed in 17 seconds. The FS-3820N's total time for our test suite was 8 minutes 16 seconds.

Output quality rates as excellent for text, with over half the fonts we test with easily readable at 4 points. To our eyes, photos rate as good and graphics as somewhat better than fair. Despite the issues we have with installation, the FS-3820N is easy to recommend for its combination of perfor-



**SPEEDY AND THRIFTY** describe the Kyocera FS-3820N laser printer.

mance, output quality, price, and claimed running cost.

**Kyocera FS-3820N**  
 \$1,000 street. Kyocera Amita Corp., [www.kyoceramita.com](http://www.kyoceramita.com).  
 Overall Rating: ●●●●○  
 Text: ●●●●●; Graphics: ●●●○○○; Photo: ●●●○○

# Compact 35-ppm Laser Workhorse

BY M. DAVID STONE

**Y**ou won't find many monochrome laser network printers with a 35-page per minute (ppm) print engine that are small enough to fit on your desk. But that's what you get with the **Kyocera FS-3830N**, at 11.8 by 13.6 by 18.1 inches (HWD) and 28.7 pounds. You also get excellent text quality, a low claimed cost per page, and reasonable, albeit slower than expected, speed.

The FS-3830N is built with Kyocera's Ecosys technology, which the company says minimizes running costs. In the case of the FS-3830N, the claimed cost per page is just under half a penny. As with other Kyocera network printers we've tested, it lacks an automated network setup routine,

but comes with easy-to-follow instructions that will guide you through manual setup even if you've never set up a network printer before and don't know what an IP address is.



**IN REAL-WORLD USE**, the FS-3830N isn't any faster than the less-expensive FS-3820N.

Like other Kyocera printers, the FS-3830N shares its setup program with dozens of other models, and nothing tells you which setup choices to use. Odds are if you're shopping for a 35-ppm printer, someone in your office is familiar enough with printer setup for this not to be a problem. But if it is, be prepared to call your dealer or Kyocera for help.

Given the 35-ppm engine, we were more than a little surprised to find that on our tests, the FS-3830N's times were almost identical, test by test, to the 29-ppm FS-3820N's times (reviewed above). The FS-3830N's total time for our entire business application suite (using QualityLogic's testing software and equipment; [www.qualitylogic.com](http://www.qualitylogic.com)) was 8 minutes 1 second, compared

with 8:16 for the FS-3820N. And the only tests that showed a significant difference were the two 50-page text files printed from Word.

For output quality, the less expensive FS-3820N also has a slight edge over the FS-3830N. We rate both as excellent for text, but for graphics, the FS-3830N is only fair, compared with a bit better than fair for the FS-3820N. For photos, it scores a bit better than fair, compared with good for the FS-3820N. Finally, the FS-3820N offers the same low claimed cost per page as the FS-3830N. So although the Kyocera FS-3830N has no particular problems, we see no reasonable justification for getting it instead of the FS-3820N, which costs \$200 less.

**Kyocera FS-3830N**  
 \$1,200 street. Kyocera Amita Corp., [www.kyoceramita.com](http://www.kyoceramita.com).  
 Overall: ●●●●○  
 Text: ●●●●●; Graphics: ●●●○○○; Photo: ●●●○○



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# FEEDBACK

“The very *raison d’etre* of computers is to automate repetitive, mindless tasks—like backing up data.”

## USELESS UTILITIES

WITH THE 2004 UTILITY GUIDE (June 8, page 96), you are going to give me an aneurysm. You do not make your PC run faster or better by adding more registry entries, more services, more processes, more programs. I work in desktop support; people bring me their machines with so many “utilities” (and spyware) on them that it’s a miracle they can turn the things on.

For your PC to have as few problems as possible, get Windows XP and all critical updates. Only get the specific XP updates you need. Visit [blackviper.com](http://blackviper.com) to trim your services. The only “utilities” you need are AdAware or Spybot, and McAfee or Norton virus protection. Only update a driver if you are having a problem; then, only get it from the manufacturer. Only buy good-quality components. You’ll have a PC that runs just fine. I have had no errors, no crashes, no performance problems in the past year.

As for “utilities,” use your CD-RW or DVD-RW drive for backup (or migration). Windows has a defrager built in. You won’t need a registry cleaner if you limit your third-party software. If you must, rebuild your PC every 12 to 18 months; create your own partitions when you rebuild. Add nothing to your browsers, you lazy ^%(&t^)\*\$\$%( )\_s!!! The few seconds a utility may save you are likely to be thrown away in problems and crashes.

TIM FARRIS

## GETTING BACKUPS RIGHT

THANK YOU FOR RESTORING my confidence in your software reviews. This issue’s utility reviews match my experience with certain applications and do much to offset previous reviews of the same products that shook my faith. For example, Drive Image 7 merits the 3-point score you now give it. I couldn’t believe the perfect 5-point rating you originally gave it (without citing the requirement to download a 20MB .NET scheme from Microsoft). In that same story you gave Acronis TrueImage 6.0 a rating of 3 or 4 and mentioned some Linux problem, as if that would affect average users. TrueImage 7.0 well deserves its 5-point rating.

I myself refuse to back up, and I encourage everyone else not to. The very *raison d’etre* of computers is the ability to automate repetitive, mindless tasks—like backing up data. I don’t back up;



my computer does. In your review of backup software, you mention that users need not back up. Well, hallelujah! You are right on target, and I encourage you to go *much* further.

Articles on backing up should start from the *premise* that a user needn’t be concerned with it after setup. You need *not* apologize for suggesting more than one system. Simply explain that if Mother Nature sees redundancy as a master strategy for avoiding failure (two eyes, two kidneys, two lungs, and so forth), then let the average user take a hint.

CHRISTIAN HART

NO DOUBT SOME USERS have need of the backup programs you reviewed (June 8), but I have long used a method that relies only on Windows functions. It’s fast and sufficiently simple to keep me from putting off or forgetting to back up weekly or even daily. I have a Desktop folder I call *Backup*. In it are 12 Word folders of articles, letters, and the like; data files from scheduling, phone dialing, and other programs, and a few additional items. To back up, I simply drag the Desktop folder (about 600 megs) to a desktop CD icon and burn the material to a CD. This takes about 4 minutes.

STEVEN GOLDBERG

## THANK GOD FOR JOHN DVORAK

I AM FORTUNATE to have held on to a job. But I’ve watched the American Dream go bust for many because American companies have not had the courage to do the right thing. Thank God for the few, like Dvorak, with the guts to challenge the errant, disrespectful corporate policies that are the hallmark of recent years! American technical skill is the world’s best; how else did we champion the industry throughout its history? What do American workers get as thanks for the fortunes they built? Layoffs and discrimination!

STEVE GIANNINI

## Corrections and Amplifications

- In our May 18 cover story, “Wi-Fi Networking: Rated ‘G’ for Everyone,” we cited the name of the Netgear router in the 802.11g roundup incorrectly. The actual model name is the Netgear WGT624.
- In our June 8 First Looks story on value notebooks (page 30), we inadvertently printed the wrong rating for the eMachines M2105 notebook. It should have received 3 stars.
- In the Antivirus section of our 2004 Utility Guide (June 8, page 114), we reported that GFI MailSecurity includes licensed antivirus engines from Kaspersky Labs and McAfee Security and supports antivirus from BitDefender and Norman Virus Control. Actually, GFI supports all four but includes licenses only for BitDefender and Norman, not Kaspersky and McAfee.
- In our 2004 Utility Guide, StuffIt 8.5 was the version that was tested and that received our Editors’ Choice in the compression category (page 127).
- Contrary to what was stated in our review of Siber Systems’ RoboForm Pro 6 (June 8, page 130), the program does let users add their own fields to the database.

## How to Contact Us

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# Bill Machrone



## RFID: Dogs! Cats! Guitars?

**R**adio-frequency identity tags are all around us. We think of them mostly in terms of those annoying security tags that beep when they haven't been properly deactivated at the cash register, but they're invaluable in manufacturing and retail in cutting losses and managing inventory. I've also written about the potential abuse of RFID technology and ways in which it can invade our privacy. Any technology can and will be abused, but RFID is showing some real benefits.

One of its most heartwarming applications is the large-scale adoption of *microchipping*—implanting RFID tags under the skin of pets. Exotic animals and rare breeds can be worth thousands of dollars, and anything with legs, scales, or feathers and a mind of its own can decide to go missing. Or it can fall victim to avaricious humans, who might try to sell a valuable animal. Worse, a beloved pet can wind up in an animal shelter and, if unidentified, may be put to sleep.

Fortunately, veterinarians and animal shelters are rapidly adopting standard microchips and readers from companies such as Avid and HomeAgain. A simple wave of a reader wand over the animal brings up a unique registration code, which either is tied directly to the owner or can be traced online to the owner, veterinarian, or breeder.

The potential for reuniting animals with their happy humans is obvious. You can even order a \$63 kit from HomeAgain ([www.homeagainid.com](http://www.homeagainid.com)) to microchip your own pet, if you're not too nervous about using the injector to place the tag under its skin.

### NO STRINGS

The number of musical instruments stolen each year is staggering, and thieves often target specific models. Some custom-built or vintage guitars can cost more than \$50,000 each. Many better instruments cost over \$1,000, and they're a musician's bread and butter. But they're often sold or pawned for a fraction of their worth, and they're hard to recover, because so many popular models look alike.

Enter Snagg ([www.snagg.com](http://www.snagg.com)), a California company that specializes in RFID microchips for guitars and other musical instruments. The Snagg chip is no larger than a rice grain, and such chips can be embedded undetectably in instruments or amplifiers (which can also cost thousands of dollars). Fender has installed Snagg chips in 30,000 guitars, and Snagg is in discus-

sions with Gibson as well. Carvin, an instrument and amplifier manufacturer ([www.carvin.com](http://www.carvin.com)), is now offering free Snagg installation and registration (normally \$30 and \$20, respectively).

Snagg's database is available to law enforcement officials, dealers, repair shops, and luthiers. Registered owners can transfer their ownership for a small fee.

Ultimately, Snagg may reduce the number of bogus reproductions of vintage instruments in a market where collectors are willing to pay dizzying sums for a genuine 1959 Les Paul. Working a microchip and a unique registration number into the guitar's provenance would deter all but the most determined forgers. Even the most fervent collectors, who are somewhere between fanatical and insane about every aspect of the guitar being original, would have to agree that a retrofitted RFID chip would protect their investment and reduce the risk in future acquisitions.

Of course, I'd like to see the scanner become an inexpensive computer peripheral—perhaps a USB device that could communicate directly with the database and eliminate the current two-step process of reading the number and entering it via keyboard. Deploying scanners is an obstacle to wider RFID adoption at the moment; less cost and a universal platform—the PC—would lower the barriers.

### PARANOIA SPRINGS ETERNAL

An Internet-fueled story persists that the new \$20 bills have RFID tags in them, and that the government can use tags for tracking the movements of citizens. One Web site claims that if you microwave a \$20 bill, the tag, located in Andrew Jackson's right eye, explodes and sets the bill on fire. I've gotten e-mails suggesting that I microwave my colorful new bills for 3 seconds, which is ostensibly long enough to destroy the chips but not to ignite the paper. People have also taken to wrapping their twenties in aluminum foil to thwart the snoops.

Put down the \$20 bill, sir, and step away from the microwave. There's no tag behind his eye. Paper burns in the microwave, and the heat concentration is greatest in the center. The photographic "evidence" of charred twenties on the Web site? Most of them are old bills.

**MORE ON THE WEB:** You can contact Bill Machrone at [Bill\\_Machrone@ziffdavis.com](mailto:Bill_Machrone@ziffdavis.com). For more ExtremeTech columns, go to [www.pcmag.com/machrone](http://www.pcmag.com/machrone).

**Anything with legs, scales, or feathers and a mind of its own can decide to go missing.**

# Slow PC?

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

By Craig Jensen, Chairman and CEO, Executive Software International

### Why Computers Slow Down

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

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

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

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

### The Hidden, Built-In Bottleneck

In broad terms, the speed of your computer is determined by the speed of three components: CPU speed—a fraction of a billionth of a second (very fast), memory (or RAM) speed—one hundred-millionth of a second (also very fast) and Hard Disk speed—hundredths of a second (sloooow). The hard disk is factually a *million times slower* than the next fastest component. If your CPU and memory speed were cut in half, your



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

computer would still seem downright peppy so long as the hard disk is running at full speed. The disk is *the major bottleneck!* You can't afford to let fragmentation slow your hard disk down further. If the hard disk slows down, even a little, you notice it. If it slows down a lot, you really notice it. And when it continues to worsen, you start looking for a new PC. One person told me her computer takes so long to start up she turns it on before her shower so it's ready by the time she's dressed. She was amazed to see her computer boot-up in seconds after running *Diskeeper*.

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

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

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*“Diskeeper really works as advertised, and without any catch-22s, like hangs and blue screens.”*

—William Schenker



*“Diskeeper has more than lived up to my expectations. My computer is now ultra fast...”*

—Randy Derwenko



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

—Matt Harris

# John C. Dvorak



## The Dead-Media Bogeyman

**M**ost of today's long-term computer users have experienced dead media in the form of the 5.25-inch floppy disk. If you have an old disk to read, you probably no longer have a computer equipped to read it; the 5.25-inch drives are becoming collectible. But if you have one, you should know that a lot of plastic and rubber parts fail. Tape backup is worse. I have a number of backups on non-standard tape that are useless, their data essentially lost forever.

Dead-media issues are not confined to digital computers. For example, most of the vintage 1960s quad-head video gear for recording TV no longer works. The few big Ampex monsters that are left are being used to transfer old tapes onto a different format while they still can. There probably will not be enough time to move everything over, and plenty of quad tapes will remain in storage and become useless.

This brings us to the issue of digital photography and all the pictures we are taking. Will they end up on dead media and be lost forever? Probably not—and perhaps the opposite will happen. As anyone who has adopted digital photography knows, you end up with too many backup copies of your images. With digital imaging, we take more pictures and have more perfect copies than ever. During the film era you had one lone negative, and it was often scratched.

More images were lost because of scratched or lost negatives—which could never be perfectly backed up—than you lose today as a result of format changes. If the negatives or pictures got wet, they were ruined. The really old stuff, from the turn of the previous century, has faded for good, and there are no digital negatives to save it. Computers can sometimes pump the colors of old negatives to get close to what they once were, but old color negatives are fading faster than we can fix them.

That said, there has to be some concern over the long-term reliability of digital storage, with the recent overblown fears about disc rot—a perceived problem that harks back to the late 1970s and some bad pressings of laserdiscs. In fact, we are witnessing a consolidation process resulting in more and more backups. And because we tend to use music industry-type (CD and DVD) consumer standards, we will probably have playability for a hundred years

or longer. There is not as much dead media in the music industry; just consider that with the right equipment you can still play a 78-rpm record from 1904!

People back up their photos mostly onto CDs and DVDs, and they do it redundantly, moving forward from technology to technology. You back up on CD-ROM, then you move the CD-ROMs to DVD-ROMs, and then on to whatever format is next, leaving behind more and more backups. If one system fails, you've got multiple redundancy; nobody ever throws these discs out, because they take up very little space.

Still, it's easy to get tricked into a dead end that becomes a dead medium such as RCA's Selecta-Vision videodisc system, which used a vinyl recording-like technique to encode video. The number of odd VCR formats that came and went is astonishing, especially with pro gear. And let's not forget the 8-track tape player. But the CD/DVD formats look stable on into the future, with so much gear that it is highly unlikely they will become dead media before the year 2200. And if they do die, you can be certain that all the data will be moved forward onto something better.

The last vestiges of photo-loss fear come from the silver-halide mavens, who talk about the 150-year lifespan of their prints, and how digital is somehow more delicate. This is nonsense. First of all, for the past 30 years of film photography, most people have shot color, which has dubious longevity. And the lifetime of a digital file, if you maintain it on fresh media and move it onto new media as improvements are made, is essentially infinite. How can you do this with a silver-halide print without scanning and digitizing it?

That said, I do think that many of our memories locked in photos will be lost to time, but not as a result of deterioration. It will be because of the sheer enormity of the photo load on humankind. Cameras on phones. Moblogs. Picture storage sites. Sixty million new digital cameras sold this year alone. Endless images taken by everyone. Duplicates, and duplicates of duplicates! The number of digital images will be in the trillions in no time. That is how they will be lost.

**Many of our memories locked in photos will be lost to time because of the sheer enormity of the photo load on humankind.**

**MORE ON THE WEB:** Read John C. Dvorak's column every Monday at [www.pcmag.com/dvorak](http://www.pcmag.com/dvorak). You can reach him directly at [pcmag@dvorak.org](mailto:pcmag@dvorak.org).

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# Inside Track

Not since the first chitchat about the PowerPC, which was a collaborative effort by Apple, DEC, IBM, and Motorola, has there been such a **serious buzz** over a new microprocessor. Set to appear in the Sony PlayStation 3, the Cell processor, jointly developed by IBM, Sony, and Toshiba, may be the **breakout chip** that becomes a new desktop platform, or at least some sort of new niche platform. The first uses for this chip will be for development systems coming out later this year. At that point, we can really examine the Cell processor, which is reported to deliver **supercomputer teraflop performance**. Teraflops?

An interesting tidbit appeared in *EE Times* regarding this chip: "IBM will develop the Cell-based workstations while the Sony group develops the operating environment." This is a subtle way of saying that **Sony will roll out an OS**. Will it go up against Apple, Windows, and Linux? Now that would be interesting.

**Now What Do We Do? Dept.:** The shake-up in India's government has to be reverberating around the boardrooms of American companies that are promoting the offshoring of U.S. jobs and technology to India. The new government thinks that we're corrupting India and doing nothing for the poor there while making some rich Indians richer. Many within the new coalition are outright communists who don't go for any of this stuff. This will be fun to watch, especially as the **Punjabification of America** continues.

City governments are continuing to take local taxpayer money and send it overseas into a different economy where no tax benefits are recovered. Ironies always abound. For example, Tempe, Chandler, and Peoria, Arizona have all chosen to outsource core IT functions to India. According to the press release issued by Mumbai/Bangalore-based Tata Infotech, Tempe will send \$1.5 million of taxpayer money to India for **tax-collecting software!** Is this a hoot or what? Tata will also handle the maintenance of these systems, a job that was previously done by Arizonans.

**Whither Longhorn Dept.:** More and more pressure is on Microsoft to rush Longhorn. Apparently, a number of Microsoft licensees will get some sort of **massive refund** if the product isn't delivered in 2006, and the word on the street is that the code keeps **breaking**. My guess is that at the last minute the company will **kludge together** a workable system missing a lot of features.

Meanwhile, news coming out of WinHEC indicates that Microsoft has some performance and laptop battery life hardware schemes under way that



**The Cell processor, set to appear in the Sony PlayStation 3, may be the breakout chip that becomes a new desktop platform.**

will require a **large memory cache on hard drives**. I've asked around about what this might mean, and one giveaway suggests that Longhorn may require a **giga-byte of main memory** to run fast and smoothly. This tells me that the OS itself is going to be a **bugger to boot**, and much of the kernel may have to reside in flash to boot within any reasonable amount of time. Booting might even be discouraged and hibernating advised whenever possible.

**The Good News Dept.:** Personally, I've **been here before**. Each time a major Microsoft OS is released, the same pattern occurs: lots of early hype, tempered by changes in the specifications; lots of good news about how great the OS will be, followed by carping skeptics. As reality sets in, people's expectations drop and you hear horror stories. When the OS finally comes out, it works better than anyone expected; then it falls apart a few years later. **This is the cycle**. Get used to it.

**Mobile Superphones Dept.:** I hate to dwell on mobile-phone technology, but it keeps getting weirder. First, NTT DoCoMo is trying to develop a phone that receives **TV signals** direct over the air. I always thought watching TV or video clips on a mobile phone hooked to a GSM or other network was a waste of money, but this idea makes a little more sense. The newer screens are pretty nice. Why not use them for TV? The other thing is that more and more digital cameras are being built into cell phones. By 2007 there will be **700 to 800 million phone cams** sold, according to some reports.

Not to be outdone by all the camera makers that want to put 1-megapixel cameras on cell phones, Samsung wants to drop **5 megapixels** into its phones. But the files are too big to send over the cell network, and you need a lot of memory to store these photos. Oh, wait, Samsung makes memory chips! It can leverage that business and promote the 5MP camera, forcing other phone makers to catch up and **buy memory** to do so. Who said that Koreans can't market?! **Wow**. Genius.

**Ethernet Wins Again Dept.:** What is there about Ethernet that makes it forever destroy emerging technologies and ideas and replace them with new versions of Ethernet? **The next victim** appears to be InfiniBand, the virtual-bus technology developed by Intel to get rid of the backplane in favor of simpler and faster extension cord kind of connection. Seems like a good idea, but now we have the emergence of the **remote DMA extension** of the 10-gigabit Ethernet specification, which does the same thing and maybe better. I have no idea where this is leading, but you can be sure that in five years it will be **cheap**, and it will be everywhere.

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# Bill Howard



## Showtime Follies

**T**he PowerPoint road show presentation lives on, despite maltreatment of the art form by occasionally clueless presenters. By comparison, an all-video presentation is too costly to create for all but a handful of high-value events. At the other extreme, winging it in public without any visuals could cost you a chance to underscore your important points.

A great presentation won't sell a terrible idea, but a good idea may never take flight if the audience dozes off because the presentation was nothing more than you droning on in a large, ill-lit room.

Here are some thoughts on using presentation technology to your benefit. (I've posted another ten tips online at [www.pcmag.com/presentationtips](http://www.pcmag.com/presentationtips).)

**When in doubt, use visuals.** Even in a room of a dozen people where you're just sitting around a conference table, putting your key points on-screen helps to reinforce them. The exception is when a group is so small and informal that it might seem pretentious to use a long slide show. If the conference is important to you and no LCD projector is available from your company, rent, borrow, or consider buying one. (Remember that it can double as a big-screen TV projector.)

**When in doubt, go low-key on the visuals.** Microsoft PowerPoint, the default standard for presentations, has dozens of transitions and sound effects for one noble reason: Darwinism. Fools abuse them and shortly thereafter die off—careerwise—or so we hope. In a 20-slide presentation with no other special effects, if your one key point simply flashes once or fades in, it's all the more effective. (There's no need for it to make a 360-degree loop first.)

**Know the technology.** You'll likely be the one disabling pop-ups, changing the resolution to match the projector (1,024-by-768 is safest), switching to an external display (usually a function key and one of the top-row keys), and starting the slide show (F5 or the lower-left-hand-corner projector screen icon). Some laptops allow you to put all this in a single Presentations button.

**Carry a presenter's remote.** Unless it's a small room (you're sitting around a table, perhaps), you want the audience to see you standing near the screen, not tethered to your notebook. If you get a radio remote control (not infrared), \$50 to \$200, from Interlink Electronics, Kensington, Keyspan, or Targus, you can be 50 feet away from your laptop. Most remotes are

preset for PowerPoint with Forward, Reverse, and Menu buttons and a laser pointer.

**Have a backup plan.** LCD projector doesn't fire up? Lots of notebooks output to TV as well, so carry a laptop-to-TV video cable with you. Most hotels can scare up a 27-inch TV on a cart in 10 minutes, and you can often daisy-chain TV sets.

Conference room doesn't have a pull-down screen and the hotel can't find one? Bedsheets are white. You would have known all this if you had checked out the conference room the night before. As a fallback, before you go, print all your slides on 11- by 17-inch paper and work next to an easel.

**Don't skimp on lighting.** The keynote speaker at a recent conference flew in from England. The audience couldn't see him in the dimly lit ballroom, because the nonprofit organization, which collected \$20,000 in registration fees, didn't want to spend the extra \$150 to have a couple of spotlights illuminating the podium. And the speaker couldn't read his notes, because the podium light was burned out, as it too often is. Good thing he could ad-lib.

**Try a little video.** Although a 30-minute video presentation could take 25 hours to put together, you can embed a video that lasts a couple of minutes showing the product in action or a customer testimonial (it better be good). You can click to that and when it's over resume the slide show.

**Personal preferences.** I use PowerPoint's highlighter feature with a remote mouse, rather than a jiggly laser pointer, to underscore key ideas. I don't use PowerPoint's presenter features (a slide show on an external monitor, speaker notes and upcoming slides on an LCD panel), because they're too small to read comfortably. I have a spare copy of the presentation burned onto a USB key in PPS (PowerPoint Show) format, which can run from any available notebook (PowerPoint not required), and a third copy with speaker notes removed that can be given to the audience. I have a small cue card with the name of the group, the president, the person who introduced me (Robin, not Roberta, right?), and the conference name: the things that would be mortifying to forget. And 20 minutes before I speak, I hit the restroom.

**A good idea may never get off the ground if the presentation is nothing more than you droning on in a large, ill-lit room.**

**MORE ON THE WEB:** You can contact Bill Howard directly at [bill\\_howard@ziffdavis.com](mailto:bill_howard@ziffdavis.com). For more On Technology columns, go to [www.pcmag.com/howard](http://www.pcmag.com/howard).

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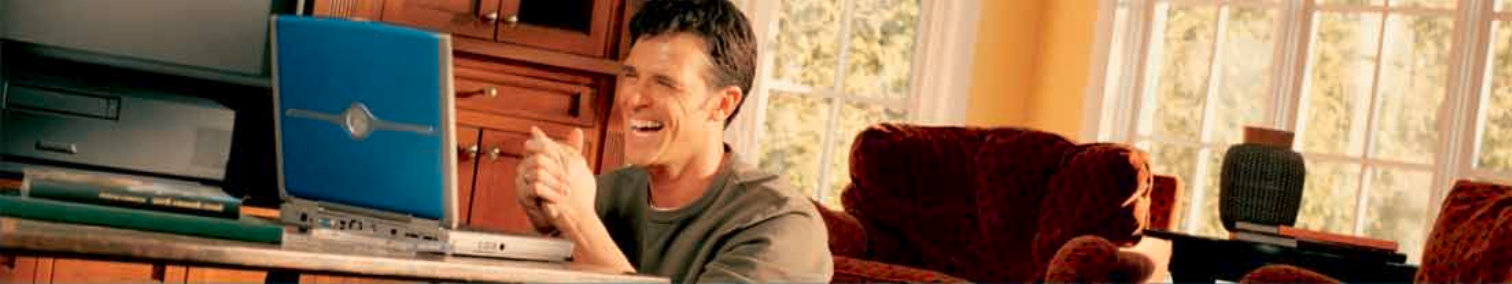
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# SOLUTIONS

MAKING TECHNOLOGY WORK FOR YOU

## Creating a Data Backup Server

Enlist an old PC to back up your files. **BY BILL HOWARD**

As more and more of your life's records and memories are stored in digital form, it makes sense to explore the best ways to keep them secure. All methods have drawbacks, some of them glaring. Floppy disks are all but dead as a format. ZIP disks are expensive for their capacity. CD/DVD backups are great—if you remember to make them. A lone hard disk will fail, sooner or later.

What's left? Backing up to another hard drive, either an external disk or one on a dedicated PC. In my June 22 *PC Magazine* column, I discussed the former option. Here we will tackle refurbishing an older PC for use as a backup data server (a computer devoted to storing backups from all your other computers).

As many users get new PCs every two to five years, it's likely that you have an older PC around that's available for duty. This may be your most cost-effective backup solution. We will steer a course midway between doing the job inexpensively and

ensuring that a hardware failure is unlikely. Bear in mind that you can get a whole new PC for \$400.

Any Pentium III, and probably Pentium II, PC should be fast enough for our purposes. PCs built since 2000 have the best chance of being converted to run Windows XP. Nearly all consumer PCs since fall 2001 come with Windows XP, which saves you the cost of upgrading. If the PC was built before 2000, it's probably not worth the effort. If you don't know its age, stick with Pentium III, Athlon, or newer models. Computers less than five years old probably have enough life left in their mechanical components to be worth reusing.

If your server-in-waiting has been in storage, boot it up before making any enhancements. (First, shake it gently to make sure there are no loose screws inside that could cause a short circuit.) If it doesn't boot, check for the obvious—an unseated CPU or memory card (check with the power line unplugged) or a bad power connection—and decide how much you're

willing to tinker with the system. Many computer stores have a minimum shop rate of \$100.

The cost of components can quickly add up, so shop around for the best prices. Make this a month-long project, and you'll find most of what you want on sale. Sites such as *Techbargains.com* can help direct you. The items you're most likely to need—hard drive, memory, network card—are among those most often on sale.

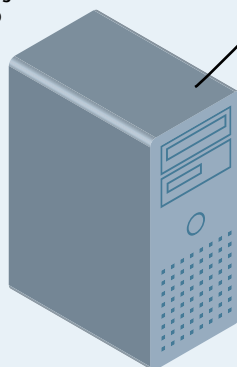
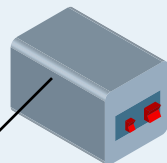
Nearly every PC has room for two hard drives; consider keeping the existing one to handle the OS, and store backup files only on the new drive. With hard drives so affordable, you should buy more capacity than you need. A huge hard disk will let you keep a complete image of your PC (created by Norton Ghost or similar program) just in case. For the greatest savings, look for products marked "refurbished."

For the most security, consider RAID, or *redundant array of inexpensive drives*. In this configuration, data is spread across two or more drives. To keep RAID affordable, you want RAID 1, where the same data is mirrored on each of two drives. The controller can be software or a hardware add-in card. Figure \$200 to \$500 for the controller and the pair of drives. You can buy either standard or serial ATA controllers (if SATA, make sure to buy power cable adapters). If you go with RAID, make sure the controller and drives work to-

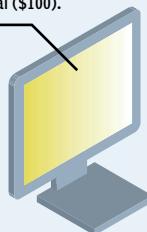
### Roll Your Own Home Backup Server

If you have a fairly recent PC, you have the makings of an affordable backup server. Limit upgrades to adding capacity (hard drive), functions (backup software), and integrity (UPS, possibly a newer OS). Otherwise, it's cheaper to buy a new PC or an Ethernet hard drive. Build your server over the course of a month or so, waiting for the best sale prices.

**UPS**  
500-VA or better uninterruptible power supply, \$50 to \$100. Don't back up without one.



**LCD**  
Optional, for tight spaces. Buy cheap. Image quality is not crucial (\$100).



**PC**  
A 2000 (Pentium III) model or newer, preferably with Windows XP (since fall 2001), is recent enough for several years of reliable service.

#### UPGRADE (with best prices)

##### RECOMMENDED:

- Second hard drive, 200GB, \$100.
- Windows XP (\$100) or Linux (free).
- Backup software (up to \$100).

##### OPTIONAL:

- 10/100 Ethernet card (\$15).
- 802.11g wireless network adapter (\$75).
- 256MB RAM (\$25).
- Replacement power supply, \$50.
- KVM switch (to use the main PC's keyboard and monitor with the server), \$30.

**86 OFFICE:**  
Create movie-like presentations.

**88 DESKTOP:**  
Connect Macs and PCs.

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Shared-hosting perils.

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The real-time business.

**97 USER TO USER:**  
Tips and tricks.

gether, and verify OS support. Though RAID costs more than a standard hard drive, it may be one of the best places to spend your money, for if you don't keep backups elsewhere, RAID will ensure that a single-disk failure doesn't wipe you out.

You might need a network card. Consider gigabit Ethernet adapters if you think the server will still be functional by the time your other devices (and switch) are upgraded. If yours is a wireless house, add a wireless PCI card. Spend a little more for 802.11g. You might want add a USB 2.0 adapter card (\$20) for direct transfers.

To get your PCs to see the new server, you'll have to run the Windows network setup wizard from each PC. Go to *Control Panel*, choose *Network and Internet Connections*, then *Set Up or Change Your Home or Small Office Network*. Mostly, you can accept default prompts. If you have broadband Internet access and your PCs are linked through a switch and router, generally check "residential gateway" as your Internet connection method. Give the same workgroup name to all PCs (MSHOME is a Microsoft default; GATEWAY is common, too; if a broadband provider set it up, it may be, for example, COMCAST). If the machines aren't all running Windows XP, you may need to create a setup disk to use on the others; otherwise, choose *Just Finish the Wizard* and go on to the next computer.

You'll need to enable shared access to folders on the PCs being backed up. Go to *My Computer*, click on the folders you want backed up, and drag them to *Shared Documents* (in *Other Places*). You may want to map your drives or folders, making drives or folders on other PCs appear as if they're one more local drive. If your backup method is to send files to the server, you'll need to make the server a local drive on each PC you're backing up. First, find the server in *My Network Places*, then find the drive you're backing up to. Right-click on the drive and choose *Map Network Drive*, pick a drive letter (S for server is good), and check the Reconnect at Logon box. (You can also find a Linux server this way.)

If the server is pulling files from your PCs, do the same thing, but from the server: Find each PC to be backed up in *My Net-*

*work Places*, then map the drives, but with a different letter for each PC. You can choose to make *My Documents*, rather than the whole C: drive, into a mapped drive.

Given the price of Windows XP, free Linux—say, Red Hat or Suse—is worth considering. Linux is definitely reliable. Make sure all your devices are supported, particularly wireless cards and drive controllers. Linux also offers free or low-cost backup utilities. It is easy to install; see our sister site, *extremetech.com*, and/or invite over a Linux-using friend.

While you can use Windows' own backup utility with its limited across-the-LAN backup abilities (it will back up to mapped network drives), you may prefer third-party software, which can do the job better. Look for software that does versioning (multiple iterations of the same file). Dantz and NTI offer some products affordable for individuals. For example, Dantz Retrospect Professional 6.5, (\$90 street)—a *PC Magazine* Editor's Choice; see our Utility Guide (June 8, page 96)—works on three PCs, one of which can be a server, and lets you use a single PC to schedule backups for all PCs.

Once you're up and running, figure out what you want backed up. By Windows

## MORE ON THE WEB

[www.pcmag.com/solutions](http://www.pcmag.com/solutions)

See Solutions online for an expanded version of this article.

convention, almost all your data files will be in My Documents, but you may have important files in c:\downloads, and you'll want to back up your system registry. It's possible to make incremental backups (of only the data that's been changed since the last backup) and compressed backups, but once a week you might want to do a full, uncompressed copy, so you have a drive full of up-to-date data that most any PC can read. Don't forget to maintain anti-virus software on your new server.

For insurance, use another method to take backups offsite. Use a CD or DVD recorder to make a one-time full backup, then make weekly or monthly incremental backups. For your most valuable data, consider online backup (free to \$50 a month).

An older PC can often be converted into a backup data server. Refurbishing costs, though, can quickly add up. Before proceeding, be sure to determine what needs updating, and whether it's worth the price.

## BUY, BUILD, OR RETROFIT?

Here's how you can back up data for your home or small office, with the approximate costs. Consider two methods: one that's frequent and hassle-free, another that lets you access data off-site in case of a disaster.

	DETAILS	PROS	CONS
<b>External hard drive</b> \$100-\$300	3.5-inch hard drive with USB or FireWire. May have automatic backup software.	Relatively cheap; fast enough to double as add-on storage. Can be carried from PC to PC.	Data remains on-site. You create a network share so other PCs can see the drive.
<b>Network hard drive</b> \$250-\$1,000	External hard drive with Ethernet.	Small; getting cheaper. May have USB, too.	A standalone PC may be cheaper. Data remains on-site. May require an applet on the PC.
<b>Optical drive</b> Up to \$250 plus discs	Write key files to CD or (preferably) DVD.	Affordable discs; easy to move backups off-site. Most users can fit key data on a few DVDs.	Requires discipline. The cheapest media may be unreliable.
<b>Online backup</b> Up to \$50 a month	Regularly send key files to an off-site service. ISPs typically include 5GB to 10GB free.	Data is safely off-site in case of fire or burglary. Can be done at night; fast with broadband.	Costly for big backup. Restoring big files is slow. The provider must stay solvent.
<b>PC-to-PC backup</b> Free	Store files from your PC on your spouse's PC—or laptop files on your desktop.	Zero cost. The odds of two PCs failing simultaneously are slim.	Easy to lose track of which data set is current. Other users might inadvertently trash files.
<b>Dedicated backup PC</b> \$300-\$1,000	Buy one more PC; dedicate it to backup.	New components are unlikely to fail; solid operating system.	Hard to find the cheapest PCs with the biggest drives.
<b>Home-built PC</b> \$300-\$1,000	Choose the components you need and build it yourself.	Known quality of builder. No money wasted on frills (like a fancy graphics adapter).	Hard to beat the cost of an assembly line, especially if you value your time.
<b>Repurposed PC</b> Up to \$500	Expand the drive capacity, add backup software, update the OS.	A good choice if you have an extra PC (it doesn't have to be fast).	Older components could fail. An old OS (Windows 98) would have to be upgraded.

## OFFICE

# Lights, Camera, Action

Microsoft Producer lets you create movie-like presentations that put boring old slide shows to shame. **BY HELEN BRADLEY**

PowerPoint has always been a good tool for creating presentations, from school and college projects to client proposals and product launches. Still, the typical presentation has gotten pretty formulaic, so that people are often turned off at the idea of viewing another one. But Microsoft Producer, available for PowerPoint 2002 and 2003, lets you add a whole new dimension to your presentations.

With Microsoft Producer, you can craft media-rich presentations by combining audio, video, text, slides, and images into a single production. Try it, and you'll never be happy with a simple bulleted list again! Best of all, Producer is free, and it's fun.

your PowerPoint slide show. Do the same for any video, audio, or still images you want to use. You're not committing to actually using anything right now; you're just gathering your resources together.

When importing video clips, click on the Create Clips for video files option, and Producer will split longer movies into smaller clips where scene changes are detected. If you don't choose this option when importing, you can right-click on a movie in the Producer window and choose Create

Clips to do so later on. You can also edit a clip on the timeline by setting start and end points for trimming the clip or by choosing Clip | Split to divide it in two.

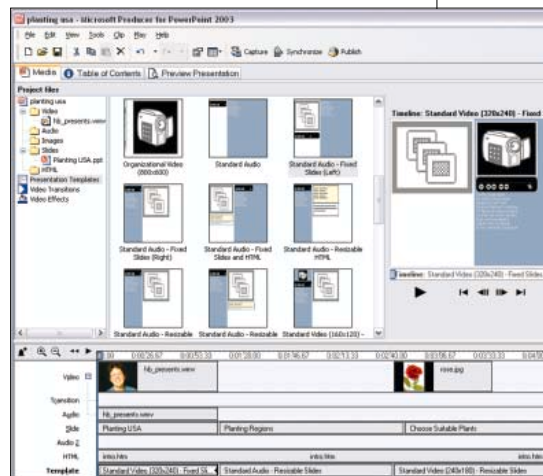
To add elements to your presentation, drag them from the collection area and drop them onto the relevant area of the timeline. Drop videos and still images onto the Video area, slides onto the Slides area, and audio onto the second of the two Audio tracks.

Click the Presentation templates option in the tree pane and choose one or more templates to control how the screen appears during the presentation. Some templates show only the video components of the timeline. Others show video and slides, or slides and HTML text. Choosing a combination of templates lets you focus in on the presenter for the introduction, for example, and then move the presenter off to one side as you bring in the slides.

You can also enhance your presentation with video effects and transitions that are selectable from the tree pane or menu. You simply drop effects onto the clip or image to attach them. To set the changeover from

one clip or image to the next one, drop the transition in between them.

If you have a Webcam or digital camcorder, you can use it to capture video content. You can also use a microphone to capture the audio as you narrate your presentation. If your presentation involves something done on the computer or browsing a Web site, you can record this as video content, using the Video Screen Capture with Audio option. To access all



**FIGURE 1:** Producer for PowerPoint uses templates to display multiple content streams at one time.

Producer uses an interface reminiscent of Windows Movie Maker, with a timeline across the bottom, collections of various media objects at the top of the screen, and a pane for previewing the objects.

The first step to creating the show is assembling the various elements. To see how it's done, download Producer at [www.microsoft.com/office/powerpoint/producer/prodinfo/default.aspx](http://www.microsoft.com/office/powerpoint/producer/prodinfo/default.aspx), then install and launch it. Click the Slides folder in the tree pane at the top left of the screen. Double-click on the Import Slides icon and import



**FIGURE 2:** Producer displays presentations in a Web browser. In this display, slides and a video stream appear together on the screen.

these options, choose Tools | Capture. Once the capture process is complete and the files saved, they'll appear in the relevant area of the tree pane, and you can drag and drop them onto the timeline.

To synchronize the narration or video and audio tracks to the actual slide presentation, use the Synchronize tool on the toolbar. This tool plays your audio and video tracks while displaying a small preview of the slide show. You control this preview. Click to move from slide to slide or through the various slide effects, and Synchronize then places each slide on the timeline in the correct position. Once you've done this, you can adjust the position of other elements in the timeline to match.

To test the presentation, choose the Preview Presentation pane and click Play. Use the Pack and Go Wizard from the File menu to pack up the presentation, either to move it to another computer or to hand the final fine-tuning of it over to someone else.

When you're ready, click the Publish button. You can publish to a CD, your own computer, a place on your network, or a Windows Media Services server. Once this is done, the presentation can be viewed using a Web browser.

*Helen Bradley is a contributing editor of PC Magazine.*

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## DESKTOP

# Working Together

Macs and Windows PCs can live happily together on the same home network. **BY TROY DREIER**

**T**he problem with home networking is there's no IT person to call when you hit a snag. If your house has both Macintosh and Windows PCs, chances are good that you will. Getting PCs and Macs to play well together has become easier, but can still be challenging.

We'll show you how to let Macs and PCs

the Windows machine sees the Mac.

To access the PC's files from your Mac, open a Finder window and click on Network. You should see the Windows volume listed as a folder, with a gray network icon inside. Select the icon and then click on its Connect button. Sign on with your Windows password and select which of the

available shared folders you would like to use. Once you've done that, you'll see a new volume in your Finder, and you can access that like any local folder.

To work from the Windows PC, go to My Network Places. If you're lucky, you'll see the Macintosh volume already mounted.

Otherwise, click on Add a Network Place from the Network Tasks menu on the left, and walk through the wizard for adding a new location. You'll need the network address for your Mac's shared folder, which you get from the previously mentioned Sharing system preferences panel.

Setting up printer sharing might be a snap—or it might not, especially if the printer is connected to the Mac.

To share a Mac-connected printer, open the Sharing system preference on your Mac and turn on Printer Sharing (and Windows Sharing, if you haven't already). Now go to your PC and open the Printers and Faxes control panel. If you're lucky, you'll see the Mac printer already available.

If it's not, select Add a Printer from the list of printer tasks on the left. A wizard will open, guiding you through the steps. On the first screen, click on the option to

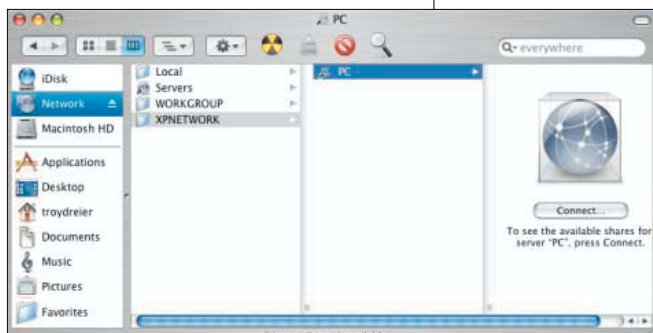
add a network printer. On the second, select the third option, to connect to a printer on the Internet or on a home-office network. You'll need to specify a URL for the printer. As of this writing, none of the support documents on the Apple site tell you how to form this URL, but we will. (The support docs should be updated soon, an Apple rep told us.)

Type in `http://(IP address):631/printers/(printer name)`. The IP address is the Mac's particular network address, which you can get from the TCP/IP tab of the Network system preference panel. (631 is the port for the Internet Printing Protocol.) To find your printer's name, open Printer Setup Utility in your Utilities folder. You'll see a list of all your available printers. (Don't type the parentheses when forming the address.)

Next, you'll have to specify your printer. If your model isn't listed, choose a similar one. The Windows PC will see any printer attached to the Mac as a PostScript printer, whereas the Mac will automatically convert documents so they'll print correctly.

Getting the Mac to use a printer attached to a Windows PC should be simpler. Open the Printer Setup utility and click on Add. From the next window, select Windows Printing from the top pop-up window. You'll get a list of available printers. A menu at the bottom of the window lets you select the right driver to use.

Soon, your Mac and your Windows PC

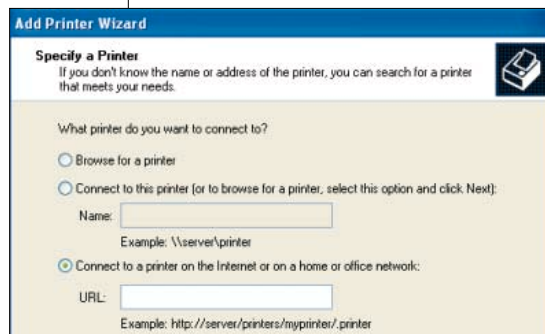


**FIGURE 1:** Open a Windows shared folder from your Macintosh by selecting Network in the Finder and choosing the Windows network.

share files and printers. We'll assume your Mac is running OS X 10.3 and the PC is running Windows XP, both connected to a wireless router. Download the latest OS updates for the Mac, because they contain network-browsing enhancements that help Macs easily connect with Windows PCs running NT, 2000, and XP.

Windows XP comes with one folder—the Shared Documents folder under Documents and Settings\All Users—designed to be shared with other users on a local network, though you may have to enable sharing of this folder. To share any other folders, right-click on them and select Sharing and Security from the pop-up menu. Click on the check box to share that folder on the network.

Sharing isn't on by default on Macs, so you'll need to open the System Preferences panel, then select Sharing. Click on the check box for Windows Sharing. When Windows Sharing is highlighted, you'll see an IP address for the Mac at the bottom of the window, which you may or may not need later, depending on whether



**FIGURE 2:** If the Windows Add Printer wizard doesn't automatically detect your shared printer, you'll need to enter a URL for it.

will be talking like old friends, and you'll discover that being the family IT person isn't as hard as you thought.

*Troy Dreier is a frequent contributor to PC Magazine.*

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## SECURITY WATCH

# Shared-Hosting Perils

Putting your Web or mail server on the same server as other sites to save money may have hidden costs. **BY LARRY SELTZER**

Shared hosting can be a cost-efficient solution for many Web sites, but you may end up paying a different sort of price. As always when sharing with strangers, there's a risk of the unknown. A well-designed and -managed operating system along with other system software may be able to protect applications and users from one another, but things do go wrong at times.

Consider what happens when an attacker goes after one of the other sites on your shared server. Vulnerabilities such as the MySQL Password Handler Buffer Overflow Vulnerability ([www.securityfocus.com/bid/8590](http://www.securityfocus.com/bid/8590)) or the PHP wordwrap() Heap Corruption Vulnerability ([www.securityfocus.com/bid/6488](http://www.securityfocus.com/bid/6488)) may occur. If the attacker gains control of the server or the database, you're all just as vulnerable.

And the attacker may not even be an outsider—it could be another customer.

Mike Prettejohn of the Internet research firm Netcraft Ltd. ([www.netcraft.com](http://www.netcraft.com)), which follows the hosting market carefully, said he thinks “strongly themed shared hosting—such as the Yahoo storefronts”—are the best type of shared hosting. They define a rigid but easy-to-use environment for the customer, limiting the damage the customer can do accidentally or otherwise,

and they scale brilliantly for the hosting company. Such hosts usually focus on product and service sites because they have better potential for sharing facilities, such as a shopping cart program and tax and shipping calculation. In a sense these features may make those sites bigger targets, because there will be customer records with credit card and other valuable data. But good management by the hosting service and restrictions on the customers can limit the exposure.

Generic shared-hosting accounts, on the other hand—the ones with access to Perl, PHP, and (shudder!) shell accounts—are potential disasters. It's very easy for one customer to impact all of the others with a badly written program. And you know how Linux vulnerabilities are often described as not such a big deal because only local—not remote—users can exploit them? Those shell accounts make the users local! Again, good management can prevent those users from uploading and executing arbitrary and exploitative code, but good management isn't built into the operating system.

Moreover, DoS attacks against hosting services seem to be increasing. If your sites are in the wrong IP range, you get to suffer along with everyone else.

## THE LOOKOUT

## VULNERABILITY THREATENS WIRELESS NETWORKS

AusCERT, Australia's national computer emergency response team, released an advisory in mid-May identifying a vulnerability in the 802.11 wireless specification that could open wireless networks to denial-of-service attacks ([www.auscert.org.au/render.html?it=4091](http://www.auscert.org.au/render.html?it=4091)).

The vulnerability involves a flaw in the 802.11 protocols and affects only Wi-Fi products that operate in the 2.4-GHz band and those operating at lower speeds (below 20 Mbps). Thus, 802.11b products are affected, but 802.11a products, which operate at 5 GHz, are not. 802.11g products are affected if they are operating at lower speeds. For details, see the article at [www.eweek.com/article2/0,1759,1591924,00.asp?kc=EWRSS03119TX1K0000594](http://www.eweek.com/article2/0,1759,1591924,00.asp?kc=EWRSS03119TX1K0000594).  
—Carol Ellison and Larry Seltzer

Mail servers aren't immune to death by association, either. If one of the major RBLs (Realtime Blackhole Lists), such as Mail Abuse Prevention System (<http://mail-abuse.org>) decides to block e-mail from the mail server you share, because some other domain on the same server had been spamming, it won't be your fault, but you'll pay the price all the same.

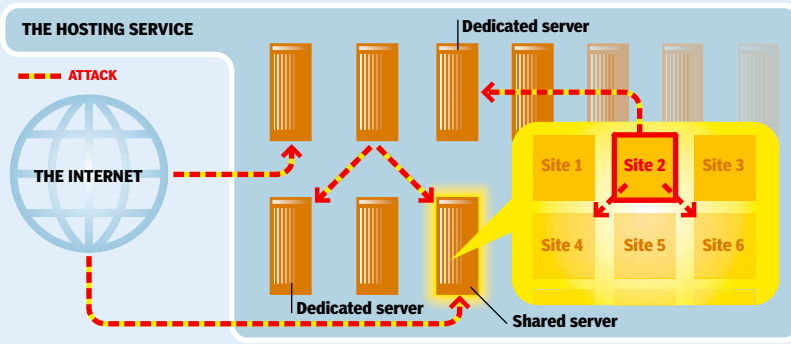
In general, you should consider your site more vulnerable to attacks from other sites in the same data center than from outside. You know how in the movies the bank robbers rent the basement next door and break in at night? If you want to attack an Internet site, maybe even an Internet bank, rent a logically nearby server.

There's nothing nearer than another site on a shared server. A dedicated server is a good solution, but even if security is a real concern, you may not be able to afford one. Shop around before you sign up. Look for a shared-hosting service that has some malware protection, like antivirus. If you're keeping personal user information, you should also look for one that supports SSL for your site, not shared with everyone else on your server. This means you'll need your own IP address, so it may cost more. But it's better to pay a little more up front to be sure you're safe.

Larry Seltzer has worked in and written about the computer industry since 1983. He is the editor of Ziff-Davis's Security Center (<http://security.eweek.com>).

## The Danger of Shared Hosting

A dedicated server is not invulnerable; it can be attacked by other servers in the same data center or from outside. But a site on a shared server is even more vulnerable: It can be attacked all the more easily by malicious programs on other sites using the same server.







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## ENTERPRISE

# Making Windows in Real Time

When every second counts, a real-time analytics system can speed things along. **BY ALAN COHEN**

Every time a window broke at Silver Line Building Products, it meant more than a job for the janitor. It meant a delayed sale. Often, it meant a lot of delayed sales. That's because glass isn't the only fragile object that Silver Line, one of the country's leading manufacturers of vinyl-frame windows, must deal with. Its customers—home improvement centers and the like—don't take well to incomplete orders.

So when one window broke, dozens of perfectly good ones were left on the loading dock until a replacement was made and the order was shipped in full. To make matters worse, the company's antiquated tracking system didn't alert anyone to start manufacturing that new window until it was too late to make the day's delivery runs. That took a toll on efficiency—and profits.

So if Silver Line couldn't design a better way to build windows, it would design a better way to track them. Using real-time analytics and reporting technology, the company now takes the same data it has traditionally collected on the manufacturing line and makes it available in a more timely and useful manner. Instead of managers having to hunt down missing windows when a truck is ready to load, they're alerted to problems hours before loading time. "It's reduced our back orders by 98 percent," says Dan Lyons, vice president of information systems at Silver Line, headquartered in North Brunswick, New Jersey.

On the manufacturing lines, it's business as usual. Whenever one of the 20,000-plus windows Silver Line makes each day is finished, the tracking system scans its label and passes the information to the IBM UniData relational database running on a Unix-based IBM RS6000.

The difference is in how Silver Line uses that data. Under the old system, company expeditors would have to check printed reports or call up database screens on their PCs to see if a window had been finished.

Now, a message goes out to their BlackBerry wireless devices two hours before loading time, telling them which windows have *not* been made. "The data chases the person instead of the other way around," says Lyons. "The expeditor can then call the manufacturing line and tell the people there to push that window through so we can get it on the truck in time."

What makes the improved monitoring possible is Iteration Real-Time Suite, the new software Silver Line has added to the mix. A Web services interface links the existing RS6000 box to Iteration's Web services receiver and passes along each transaction as the RS6000 picks it up. That gives the Iteration system the necessary information for monitoring the manufacturing process. By processing this message stream according to rules developed by Silver Line, the system—which runs on a Dell/Intel system running Windows 2000 Server on 4 CPUs with 4GB of memory—can spring into action in real time. It sends

out alerts, for example, when a window that needs to be shipped hasn't yet rolled off the assembly line.

Once the system was up and running, some tweaks were needed. Silver Line has settled on an alert system built around "hot orders," critical jobs that absolutely have to go out on the next truck. If the Iteration system recognizes that a truck has been closed without the hot order aboard, it sends instant messages telling shipping and sales staff to hold the truck.

The new system is already running in three of Silver Line's seven factories across the country, with the other four online shortly. The next step, says Lyons, is to get the real-time system to the company's truck drivers. By carrying BlackBerry devices integrated with Iteration's software, the drivers could immediately send replacement orders to the plant if windows break in transit. "It means that we don't have to wait for the driver to get back and file the paperwork, which can take up to four days on some of our runs," says Lyons.

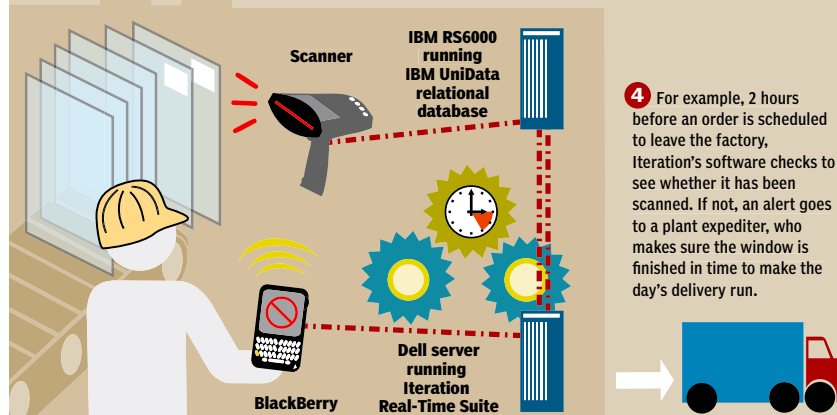
The system will expedite invoicing too if drivers record successful deliveries as they occur, triggering the billing process back at Silver Line's headquarters. "If a driver tells us he delivered nine of ten windows and the other one broke, we can bill for the nine and make a replacement for the tenth," says Lyons. "And we can do it right away." If all goes as planned, the only thing broken windows will be a drain on is patience.

## Inside the Window Factory

**1** When windows come off the manufacturing line, their labels are scanned so Silver Line knows that each one has been made.

**2** Once a label is scanned, information about the given window is passed to a database.

**3** By interfacing to Silver Line's existing database, Iteration Real-Time Suite can keep tabs on the manufacturing process and apply rules Silver Line has created.



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FileMaker Pro 7, the number-one easiest-to-use database software solves these problems by allowing you to create and grow applications with your business, department or virtual team. It's an irresistible upgrade for users of previous FileMaker versions and

an obvious choice for new users as well.

Building upon its renowned ease-of-use for powerful information management, the new FileMaker Pro 7 software adds a host of valuable new features not available in previous versions. Now you can:

With the release of the new FileMaker Server 7 software, businesses of all sizes now have an ideal information sharing system for teams from 2 to more than 250 members, who need to access and share all types of data.

When your workgroup grows beyond a few users, your team will benefit by simply deploying FileMaker Server 7 software. Immediately, you'll be able to share solutions with up to 250 simultaneous users on a network—so your teams can access business-critical information and work collaboratively, while leveraging the stability and faster network performance that FileMaker Server 7 can provide.



## Easy, Powerful Data Sharing

FileMaker Server 7 takes advantage of the power that today's robust hardware offers, including multiple processors, large amounts of system memory for high-speed data caching, and high-performance storage subsystems. Since all searches and calculations are processed on the server, performance is phenomenal. You also get tremendous capacity, as FileMaker Server 7 can store up to 125 different databases and lets you add more servers for even greater capacity as business needs grow. And virtual teams of diverse users can easily share data with FileMaker Server 7, because it can be accessed by clients running Windows or Mac OS X versions of FileMaker Pro 7.

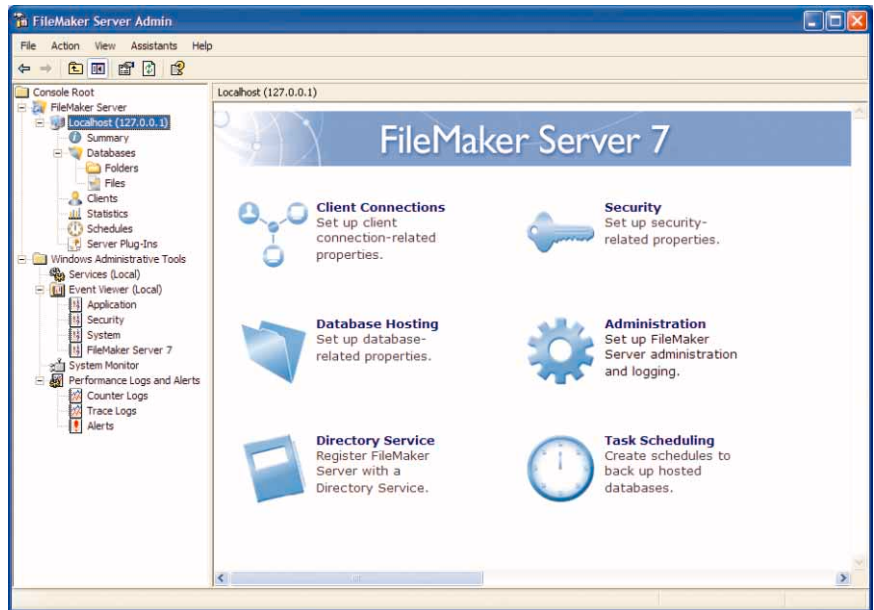
Yet with all the power FileMaker Server 7 offers, it has an incredibly intuitive management interface. Even the average user with little or no technical training will find it easy to configure and administer. And while they're easy to use, FileMaker Server 7's administration tools are powerful and flexible as well. Live backups and maintenance can be performed on servers even when files are in use, so you can allow access to business applications on a 24-by-7 basis. To ensure recovery from a disaster, you can schedule automatic unattended backups. Finally, servers may be configured and maintained remotely, which can help maximize the efficiency of database administration.

## Enterprise-Class Security

When you're working with flexible teams consisting of many different types of users, security becomes even more important. You must be absolutely sure each individual user can only access the data you want him or her to access.

With FileMaker Pro 7's new enterprise-class, unified, roll-based security model, it's easy to specify exactly what data each individual can see, edit, create and delete—all the way down to the field level. Further, you can combine accounts into groups—such as human resources or marketing—and easily assign privileges to the entire group. This level of functionality will help to ensure that confidential company information remains secure.

FileMaker Server 7 provides additional security features to help keep data safe. First, it supports SSL encryption, so you can enhance the level of security of FileMaker information that's transferred



**Share & share alike:** FileMaker Server 7 makes it easy to share databases with up to 250 users, while advanced security features work to protect your data.

between clients and hosted databases. Also, companies can reduce the overhead of managing user accounts and passwords using external authentication through industry standards provided by Apple Open Directory and Microsoft Active Directory.

## Effortless Web Publishing

FileMaker Pro software's one-step Web publishing has always made it incredibly easy to post faithful renditions of your FileMaker solutions to the Web simply by clicking on a single check box. FileMaker Pro 7's improved rendering and added controls give you one-step Web-enabled solutions delivering more of the FileMaker experience, in a browser, than ever before.

Web users are no longer restricted to a limited number of Web views. A new "View As" popup menu lets the Web user choose among Form, List and Table views of data. But perhaps the most important feature of FileMaker Pro 7's one-step publishing is that with a single click, you can extend your entire security model to the Web, including record locking. This is a great way to give the freelancer, partner or other outside members of your team access to the information they need seamlessly and securely.

When you want to share your intranet or extranet Web site with more than a few users, FileMaker Server 7 Advanced gives you all the capabilities of FileMaker Server

7, plus the ability to share your Web site with up to 100 simultaneous users, utilizing the same security model as your desktop database. All that's needed for access is a Web browser.

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<sup>\*</sup>Only licensed users of FileMaker Pro software are eligible for this promotion. For FileMaker Pro 2.1-5.x customers, this offer expires Sept. 17, 2004. After Sept. 17, 2004, only FileMaker Pro 6 customers will qualify for this offer.

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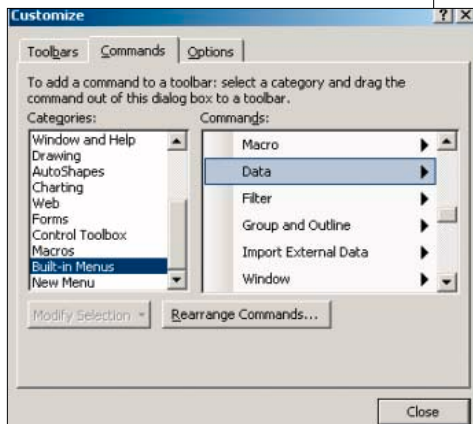
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## Update an Excel Menu

I am using Excel 2003, but I have no List option on my Data menu. Could the menu bar I use, which I customized years ago in Excel 2000, be the problem?

PAUL S. NATANSON

Yes, your customized Excel 2000 menu bar will contain only options that were included in that version. To add the new Excel 2003 List submenu, right-click on



**FIGURE 1:** Use the Customize dialog to add missing options to a menu or toolbar.

your menu bar, choose *Customize*, and then click the *Commands* tab. Choose *Built-in menus* from the *Categories* list and *Data* from the *Commands* list. Drag and drop this second, new version of the *Data* menu onto your menu bar. If you want to replace the old *Data* menu with the new one, discard the old version by dragging it off the menu bar and then closing the *Customize* dialog.

If you want to add the *List* option but retain any other customizations you've made, click the new *Data* menu to open it and locate the *List* submenu. Now hold Control as you drag and drop this *List* submenu into position on your original (older version) *Data* menu. When you're done, discard the newer *Data* menu.

You can use a similar process to reinstate any missing menu option or to customize menus and toolbars yourself.—*Helen Bradley*

## File System Causes Time Stamp Problem

When Windows XP changes from daylight savings time to standard time in the fall and back again in the spring, the time stamps of files saved on the local hard drive are no longer synchronized with exact copies on ZIP drives, floppy disk drives, and so forth. Instead, they show up with exactly an hour difference. I read or heard somewhere that this is because Windows now saves the date and time in a new format. Is there any way to shut this off so that I can again have my computer show the correct local time, instead of having to shut off automatic daylight savings time updating?

Raymond J. Noonan

The NTFS file system stores date and time info based on Greenwich Mean Time and adjusts the time displayed by the offset defined for your time zone. For example, if you're on the West Coast and daylight time is not active, it subtracts 8 hours. When the daylight time feature kicks in, this contributes to the adjustment, so the displayed time changes. Your disks and ZIP drives are not formatted with NTFS. Their date/time stamps simply record the local time with no adjustment. Hence they do not change.

Since the problem is caused by the nature of the file system, there is no actual solution short of reformatting the drive using FAT32. Windows XP includes a Convert utility that will convert a FAT32 partition to NTFS, but you can't go the other way. If you want to switch to FAT32 without destroying your data, consider either PartitionMagic ([www.symantec.com](http://www.symantec.com)) or Partition Commander ([www.v-com.com](http://www.v-com.com)).

Be aware, though, that moving from NTFS to FAT32 may not be the best idea. You'd be giving up some significant benefits, such as better file recovery, security, and support for large hard drives. Living with the time stamp discrepancy might be the lesser of the evils.—*Neil J. Rubenking*

## SSID Broadcast Question

In "Making the Best of WEP" ([www.pcmag.com/article2/0,1759,142990,5,00.asp](http://www.pcmag.com/article2/0,1759,142990,5,00.asp)), you recommend disabling the SSID broadcast for access points as a security measure for 802.11b networks. But Microsoft says, "Disabling SSID broadcasts on an access point is not considered a valid method for securing a wireless network" (<http://support.microsoft.com/default.aspx?scid=kb;en-us;811427>).

With the SSID broadcast disabled, if there is another access point within range that is broadcasting, systems will automatically switch to the access point that's broadcasting its SSID. This happens even if you didn't list that broadcasting system as a preferred network and you've listed the access point that's not broadcasting as preferred. It seems, then, that turning off the SSID broadcast is something you shouldn't do.

CAREY HOLZMAN

You're right about Microsoft's statement, but the access point manufacturers we've



**FIGURE 2:** You can make sure that Windows will connect to an access point defined as a preferred network, even if it isn't broadcasting its SSID.

talked to disagree. More important, the behavior you describe applies only if you are using Windows XP SP1, let Windows control the connection, and have Windows set to connect automatically to nonpreferred networks.

To ensure that Windows will connect to an access point that's defined as a preferred network but has broadcasting turned off,

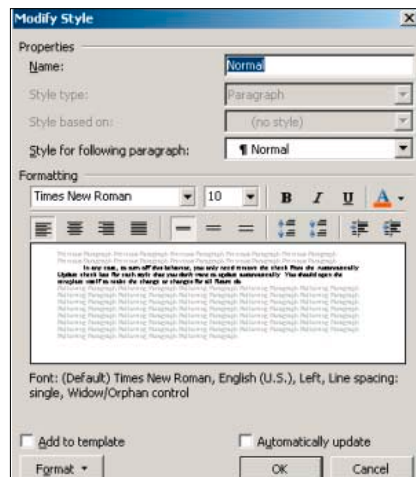
Moving from NTFS to FAT32 may not be the best idea.  
You'd be giving up some significant benefits.

# If you're truly seeing sites from previous days, you may have a corrupted Index.dat file in the History folder.

open the Control Panel and choose *Network Connections*, then *Wireless Network Connection*, and then the *Properties* button. Next, choose the *Wireless Networks* tab and then the *Advanced* button. Make sure that the *Automatically connect to nonpreferred networks* check box is not checked. Now you should be able to connect without problems to an access point that's not broadcasting its SSID, as described in our original tip.—*M. David Stone*

## Controlling Word Formats

I have one Word template, provided by a client, that has the truly annoying feature of propagating format changes throughout the entire document. If I format one



**FIGURE 3:** Uncheck the *Automatically Update* box to make format changes happen only where you want them.

sentence in a paragraph to, say, *italic*, only that sentence changes. But if it's a one-sentence paragraph, or if I format an entire larger paragraph, the whole document switches to italic. My client told me to just hit Ctrl-Z to return the rest of the document to its former state. That solution works, but it's still an annoying extra

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step. Is there a way that I can turn this behavior off?

DARLENE RISEMAN

The template you're unhappy with has one or more styles defined to update automatically when you change the format in your text. To see the option in Word 2002 or Word 2003, choose *Format* | *Styles and Formatting* to open the *Styles and Formatting* pane. Then right-click on any paragraph style name and choose *Modify* to open the *Modify Style* dialog box. If you look at the lower-right-hand corner of the dialog box, just above the *OK* and *Cancel* buttons, you'll see the *Automatically Update* check box.

If the option is checked, then every time you apply manual formatting to a paragraph in that style, the manual formatting will redefine that style for the document. Redefining the style, in turn, will change all the paragraphs using that style in your document to match the new definition.

In some situations, this can save a lot of work. For example, if you have bulleted lists throughout your document, you can change the formatting for all of the bulleted lists simply by changing one paragraph. But if you're depending on manual formatting rather than styles, and particularly if you're using Normal style for most paragraphs, it can be annoying. The *Undo* command (Ctrl-Z) is a useful workaround in that case, because the change happens in two steps. First you format the paragraph, and then Word changes the style. Hit Ctrl-Z once and you undo the second step.

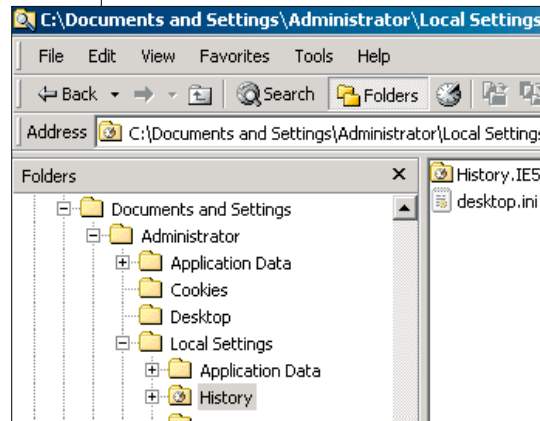
In any case, to turn off this behavior, you need only remove the check from the *Automatically Update* check box for each style that you don't want to update automatically. You should open the template itself to make the change or changes for all future documents. For already existing documents, you'll have to make the changes in each document individually.—*M. David Stone*

## Fixing History in Internet Explorer

In my Internet Explorer Options settings for History, I have *Days to keep pages in*

*history*: set to zero. When I select the drop-down list in IE's address bar, however, I routinely see links listed that I visited days or even weeks ago. If I click on *Clear History*, the links disappear. Why doesn't IE clear them automatically if I've set the retention to zero days?

DOUG JACOBSE



**FIGURE 4:** If IE is not clearing your History correctly, you can delete the History.IE5 folder.

IE's behavior is confusing. When *Days to keep pages in history*: is set to zero, IE still keeps today's pages in history. They're not deleted until the next day. The behavior is exactly the same if this value is set to 1. If you want to clear the History folder even before the next day, you'll have to open Internet Options and click on *Clear History*, as you've done.

On the other hand, if you're truly seeing sites from previous days, you may have a corrupted Index.dat file in the History folder. You can't delete that while you're logged on, so log on as Administrator or as a different user and then delete it. If your system isn't set to display hidden and system files, you'll need to enable that first. Select *Folder Options* from the *Tools* menu and click on the *View* tab. Check the item entitled *Show hidden files and folders* and uncheck *Hide protected operating system files*. Now navigate to *C:\Documents and Settings\username\Local Settings\History* and delete the History.IE5 folder. When you log back on to your own account, IE will recreate that folder.

—Neil J. Rubenking.

See more tips online at [www.pcmag.com/usertouser](http://www.pcmag.com/usertouser).





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- IBM Active Protection System – Helps protect your hard-drive from falls

#### System Features:

- Intel® Centrino™ Mobile Technology
  - Intel Pentium® M Processor 1.50GHz<sup>1</sup>
  - Intel PRO/Wireless Network Connection 802.11b/g<sup>2</sup>
- Microsoft Windows XP Professional<sup>3</sup>
- 14.1" XGA TFT display (1024x768)
- 256MB DDR SDRAM<sup>4</sup>
- 20GB hard drive<sup>4</sup>
- Ultrabay™ Enhanced CD-RW/DVD-ROM combo
- IBM UltraConnect™ Antenna for increased signal strength<sup>1</sup>
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NavCode 28832XU-M422

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ServicePac® Service Upgrade:<sup>7</sup>

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- IBM Active Protection System – Helps protect your hard-drive from falls
- NEW! IBM Rescue and Recovery™ with Rapid Restore™ – One-button recovery and restore solution

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  - Intel Pentium M Processor ULY 1GHz
  - Intel PRO/Wireless Network Connection 802.11b
- Microsoft Windows XP Professional
- 12.1" XGA TFT display (1024x768)
- 256MB DDR SDRAM
- 20GB hard drive
- Integrated Gigabit Ethernet and modem
- Legendary IBM full-size keyboard<sup>8</sup>
- Only .94" thin<sup>10</sup>
- 2.7-lb travel weight<sup>11</sup>
- 1-yr system/battery limited warranty<sup>6</sup>

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#### IBM Active Protection System:

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#### NEW! Rescue and Recovery with Rapid Restore:

Lost your data because of a software crash or virus? Recover previously saved data in minutes with our one-button solution.

#### Access Connections:

Switch between wired and wireless connections anytime.

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Get the help you need, when you need it. One button on your ThinkPad notebook brings you a world of resources and assistance.

### NEW! IBM ThinkPad R51

#### System Features:

- Intel® Centrino™ Mobile Technology
  - Intel Pentium® M Processor 1.50GHz<sup>2</sup>
  - Intel PRO/Wireless Network Connection 802.11b/g<sup>3</sup>
- Microsoft Windows XP Professional<sup>4</sup>
- 15" SXGA+ TFT display (1400x1050)
- 256MB DDR SDRAM<sup>5</sup>
- 40GB hard drive<sup>6</sup>
- Integrated Ethernet and modem
- IBM Ultrabay™ Enhanced CD-RW/DVD-ROM combo
- IBM UltraConnect™ Antenna for increased signal strength<sup>7</sup>
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**\$1,499\***

With Microsoft Office Small Business Edition 2003:<sup>9</sup> \$1,739



### NEW! IBM ThinkPad T42

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  - Intel PRO/Wireless Network Connection 802.11b/g
- Microsoft Windows XP Professional
- 14.1" XGA TFT display (1024x768)
- 32MB ATI Mobility RADEON 7500 graphics
- 256MB DDR SDRAM
- 30GB hard drive
- Integrated Gigabit Ethernet and modem
- IBM Ultrabay Slim DVD-ROM
- IBM UltraConnect Antenna for increased signal strength
- Only 1" thin<sup>1</sup>, 4.5-lb travel weight<sup>2</sup>
- 1-yr system/battery limited warranty<sup>3</sup>

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THINK EXPRESS MODEL  
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ServicePac® Service Upgrade:<sup>4</sup>  
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### NEW! IBM ThinkPad T42

#### System Features:

- Intel Centrino Mobile Technology
  - Intel Pentium M Processor 735 (1.70GHz, 400MHz FSB)
  - Intel PRO/Wireless Network Connection 802.11b/g
- Microsoft Windows XP Professional
- 15" SXGA+ TFT display (1400x1050)
- 512MB DDR SDRAM
- 64MB ATI Mobility RADEON 9600 graphics
- 60GB hard drive (7200 RPM)
- Integrated Gigabit Ethernet and modem
- IBM Ultrabay Slim CD-RW/DVD-ROM combo
- IBM UltraConnect Antenna for increased signal strength
- 3-yr system/1-yr battery limited warranty<sup>5</sup>

NavCode 2379DXU-M422

THINK EXPRESS MODEL  
PRICED AT:

**\$2,469**

With Microsoft Office Small Business Edition 2003: \$2,179

ServicePac Service Upgrade:  
4-yr Onsite Repair/9x5/Next Business Day Response #69P9198 **\$299**



### IBM ThinkPad X40

#### System Features:

- Intel Centrino Mobile Technology
  - Intel Pentium M Processor ULV 1GHz
  - Intel PRO/Wireless Network Connection 802.11b
- Microsoft Windows XP Professional
- 12.1" XGA TFT display (1024x768)
- Intel Extreme Graphics 2
- 256MB DDR SDRAM
- 20GB hard drive
- Integrated Gigabit Ethernet and modem
- Legendary IBM full-size keyboard<sup>1</sup>
- Only .94" thin, 2.7-lb travel weight
- 1-yr system/battery limited warranty<sup>2</sup>

NavCode 23861GU-M422

THINK EXPRESS MODEL  
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**\$1,499**

With Microsoft Office Small Business Edition 2003: \$1,739

ServicePac Service Upgrade:  
3-yr Depot Repair #30L9192 **\$132**

### IBM ThinkPad X40

#### Distinctive IBM Innovations:

- Longest standard battery life of any leading-brand notebook<sup>3</sup>

#### System Features:

- Intel Centrino Mobile Technology
  - Intel Pentium M Processor LV 1.20GHz
  - Intel PRO/Wireless Network Connection 802.11b
- Microsoft Windows XP Professional
- 12.1" XGA TFT display (1024x768)
- Intel Extreme Graphics 2
- 256MB DDR SDRAM
- 40GB hard drive
- Integrated Gigabit Ethernet and modem
- Legendary IBM full-size keyboard
- 7.5-hr Li-Ion battery<sup>4</sup>
- 1-yr system/battery limited warranty<sup>5</sup>

NavCode 23866GU-M422

THINK EXPRESS MODEL  
PRICED AT:

**\$1,749**

ServicePac Service Upgrade:  
3-yr Onsite Repair/9x5/Next Business Day Response #30L9195 **\$243**



### IBM ThinkPad X40 Solution Pack

#### System Features:

- Intel Centrino Mobile Technology
  - Intel Pentium M Processor ULV 1GHz
  - Intel PRO/Wireless Network Connection 802.11b
- Microsoft Windows XP Professional
- 12.1" XGA TFT display (1024x768)
- 256MB DDR SDRAM
- 20GB hard drive
- 2.7-lb travel weight
- 1-yr system/battery limited warranty<sup>1</sup>

#### Accessories Included:

- ThinkPad X4 UltraBase™ Dock
- IBM Ultrabay Slim CD-RW/DVD-ROM combo

NavCode 23861ZU-M422

THINK EXPRESS MODEL  
PRICED AT:

**\$1,799**

ServicePac Service Upgrade:  
3-yr Onsite Repair/9x5/Next Business Day Response #30L9195 **\$243**

### IBM ThinkPad X40 Solution Pack

#### Distinctive IBM Innovations:

- Longest standard battery life of any leading-brand notebook

#### System Features:

- Intel Centrino Mobile Technology
  - Intel Pentium M Processor LV 1.20GHz
  - Intel PRO/Wireless Network Connection 802.11b
- Microsoft Windows XP Professional
- 12.1" XGA TFT display (1024x768)
- 256MB DDR SDRAM
- 40GB hard drive
- Integrated Gigabit Ethernet and modem
- 7.5-hr Li-Ion battery
- 3-yr system/1-yr battery limited warranty<sup>1</sup>

#### Accessories Included:

- ThinkPad X4 UltraBase Dock
- IBM Ultrabay Slim CD-RW/DVD-ROM combo

NavCode 23826UU-M422

THINK EXPRESS MODEL  
PRICED AT:

**\$2,199**

ServicePac Service Upgrade:  
5-yr Onsite Repair/9x5/Next Business Day Response #69P9200 **\$449**

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(Monitor not included)



(Monitor not included)

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Only IBM offers these features to protect you, connect you, and keep you working. Each ThinkCentre™ desktop featured here can give you the efficiency, productivity and edge you need with the following ThinkVantage Technologies:

#### IBM Rapid Restore Ultra:

Lost your data because of a software crash or virus? Recover previously saved data in minutes with our one-button solution.

#### Access IBM:

Get the help you need, when you need it. One button on your ThinkCentre desktop brings you a world of resources and assistance.

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### IBM ThinkCentre A50p

#### System Features:

- Intel® Pentium® 4 Processor with HT Technology 2.80GHz
- Microsoft Windows XP Professional
- 256MB DDR SDRAM
- 40GB hard drive • CD-RW
- Intel Extreme Graphics 2
- Integrated 10/100 Ethernet
- Norton AntiVirus™ with 90 days of virus definition updates
- Lotus® SmartSuite® Millennium license
- 1-yr parts/1-yr limited onsite service limited warranty<sup>13</sup>

NavCode 843398U-M422

THINK EXPRESS MODEL  
PRICED AT:

**\$719**

With Microsoft Office Small Business Edition 2003: \$959

### IBM ThinkCentre A50

#### Distinctive IBM Innovations:

- The smallest IBM desktop without compromise: 62% smaller than a standard IBM desktop

#### System Features:

- Intel Pentium 4 Processor with HT Technology 2.80GHz
- Microsoft Windows XP Professional
- 256MB DDR SDRAM
- 40GB hard drive • CD-ROM
- Integrated 10/100 Ethernet
- Norton AntiVirus with 90 days of virus definition updates
- Lotus SmartSuite Millennium license
- 3-yr parts/1-yr limited onsite service limited warranty<sup>14</sup>

NavCode 841933U-M422

THINK EXPRESS MODEL  
PRICED AT:

**\$789**

With Microsoft Office Small Business Edition 2003: \$1,029

ServicePac Service Upgrade:  
4-yr Onsite Repair/9x5/Next Business Day Response #69P9158 **\$198**

### IBM ThinkCentre A50p

#### System Features:

- Intel Pentium 4 Processor with HT Technology 2.80GHz
- Microsoft Windows XP Professional
- 256MB DDR SDRAM
- 40GB hard drive • CD-RW
- Norton AntiVirus with 90 days of virus definition updates
- Integrated 10/100 Ethernet
- Lotus SmartSuite Millennium license
- 3-yr parts/1-yr limited onsite service limited warranty<sup>13</sup>

NavCode 843298U-M422

THINK EXPRESS MODEL  
PRICED AT:

**\$809**

With Microsoft Office Small Business Edition 2003: \$1,049

### IBM ThinkCentre S50

#### Distinctive IBM Innovations:

- The smallest IBM desktop without compromise: 62% smaller than a standard IBM desktop

#### System Features:

- Intel Pentium 4 Processor with HT Technology 2.80GHz
- Microsoft Windows XP Professional
- 512MB DDR SDRAM
- 40GB hard drive • CD-ROM
- Norton AntiVirus with 90 days of virus definition updates
- Gigabit Ethernet-integrated
- 3-yr limited warranty with limited onsite service<sup>13</sup>

NavCode 818336U-M422

**\$1,079**

With Microsoft Office Small Business Edition 2003: \$1,319

ServicePac Service Upgrade:  
4-yr Onsite/9x5/4-hr Response  
#69P9162 **\$250**

### IBM ThinkCentre M50

#### System Features:

- Intel Pentium 4 Processor with HT Technology 2.80GHz
- Microsoft Windows XP Professional
- 512MB DDR SDRAM
- 40GB hard drive • CD-ROM
- Intel Extreme Graphics 2
- Gigabit Ethernet-integrated
- 3-yr limited warranty with limited onsite service<sup>13</sup>

NavCode 8187EJU-M422

**\$1,049**

With Microsoft Office Small Business Edition 2003: \$1,288

ServicePac Service Upgrade:  
3-yr Onsite/9x5/4-hr Response  
#41L2734 **\$129**



IBM recommends Microsoft® Windows® XP Professional for Business.

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We've designed and priced many of our products specifically for small and medium businesses. And best of all, they're available direct from IBM or through your IBM Business Partner.

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- Belkin Components Universal Notebook Travel Surge Protector #22P7127 **\$20**
- Targus Deluxe Mobile Essentials Kit #22P7437 **\$60**
- ThinkPad Premiere Leather Carrying Case<sup>11</sup> #10K0209 **\$99**
- ThinkPad 72W AC/DC Combo Adapter #22P9010 **\$99**
- ThinkPad Port Replicator II #74P6733 **\$179**

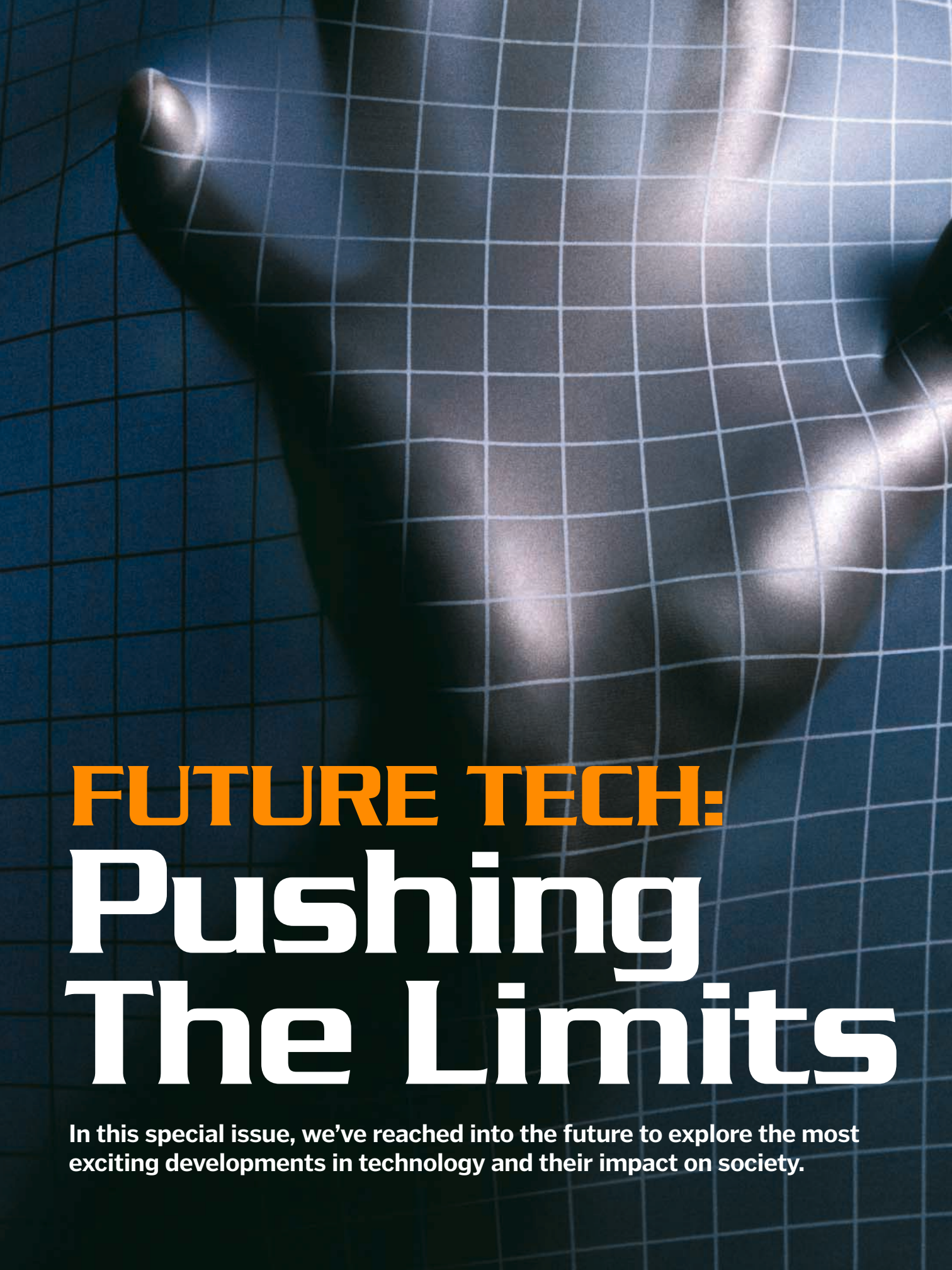
#### IBM ThinkCentre Accessories

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- IBM ThinkVision™ L170 17" Flat Panel Monitor with system purchase #WQSPAB0 **\$449**



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**FUTURE TECH:**  
**Pushing**  
**The Limits**

In this special issue, we've reached into the future to explore the most exciting developments in technology and their impact on society.



PHOTO ILLUSTRATION BY TIM FLACK/BETTONE

Does keeping up with the frenetic pace of technological innovation sometimes seem impossible? We know the feeling. As *PC Magazine* editors and analysts, we spend our days staying ahead of the curve so our readers can be the first to learn about the latest technology products for their homes and offices. But once a year, we turn our attention not to products you can buy today but to those technologies that are gathering momentum, poised to make an impact on the future. The past twelve months have delivered an ample assortment of candidates.

For our first story, “Top Ten Tech Trends,” we take you on a tour of what we think are the most promising technologies. You’ll read about tiny sensors that may one day help save the lives of newborns, and about new techniques that upcoming DVDs will use to pack outrageous amounts of backup data. (Okay, maybe a movie or two as well.)

Technological advancement and cultural change go hand in hand, so this year we explore the intersection of technology and society in four essays. In “Virus Wars,” best-selling author Alexandra Robbins explores the shadowy underworld of virus writing and the many efforts to combat the scourge. In “The New Geek,” Steve Lohr, a technology writer at *The New York Times*, speaks with several of the new-generation high-tech workers about computer science as the new liberal-arts degree. Along the way, he shows how technology’s impact on productivity is changing.

In “Nowhere to Hide,” business reporter Alan Cohen takes on the emerging collision between privacy and security. And in our final segment, “Nanotechnology: Size Matters,” technology writer Jim Akin explores some of the real products that are emerging from nanotechnology research.

One thing’s for sure: The researchers, scientists, engineers, and businesspeople in our industry are pushing the limits of what’s possible. In the following pages, you’ll see just what that means. —Carol Levin

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The BLEEX project: robotics enhancing human capability.

## Biomechatronic Man

Faster, better, stronger: It's not just for television anymore.

BY LANCE ULANOFF

**T**he 1970s television shows *The Six Million Dollar Man* and *The Bionic Woman* hold nearly equal positions in the pantheon of pop culture, but their premises have been little more than pipe dreams. That pipe is blowing more than smoke these days, as scientists across the country work on human augmentation robotics technology, also known as *biomechatronics*—in other words, the merging of body and machine.

Following in the footsteps of household robots like the iRobot Roomba and the Sony AIBO entertainment robots, as well as battlefield robots like the iRobot Packbot, robots are now starting to show up on the human body. At MIT's Media Lab in Cambridge, Massachusetts, assistant professor Hugh Herr and his biomechatronics team have spent the past five years developing the Active Ankle-Foot Orthosis (AAFO). Made of plastics, a motor, a microprocessor, and a power supply, this robot can reanimate a paralyzed ankle.

Unlike a prosthesis, an orthosis doesn't replace missing limbs. Instead, it attaches to a paralyzed limb and may eventually enhance healthy ones. The 3-pound AAFO covers the leg from below the knee to the toes and restores natural motion.

Across the country, a team at the University of California, Berkeley, Robotics and Human Engineering Laboratory is working on the Berkeley Lower Extremity Exoskeleton (BLEEX), which fits over the

wearer's legs and assists in carrying heavy loads over long distances. It uses sensors, actuators, a network, and complex algorithms to compute the exoskeleton's motion. It's designed to imitate the torque, speed, and motion of a 165-pound person walking.

Homayoon Kazerooni, a Berkeley professor who invented the concept in the early 1990s, says that the prototype can support about 80 pounds in a special backpack. "You simply walk, and it walks with you," he says. The device, funded by the Defense Advanced Research Project Agency (DARPA), has applications in defense, firefighting, and rescue and recovery operations.

Both devices are several years away from commercial use, and the AAFO will be costly to deploy. But as MIT's Herr sees it, human performance augmentation is the shape of the future:

"In the coming decade we will see body amplifiers that expand human endurance and strength. We will see novel transportation devices that do not rely on wheels, where our own limbs are augmented, where we can traverse very rough terrains with a very high metabolic economy or efficiency. I predict that people for certain situations will not want to use wheels anymore, because their legs, augmented by technology, far outperform wheeled vehicles."

Maybe Lee Majors and Lindsay Wagner were born just a little early.

## Wireless USB

Get ready for point-and-shoot video streaming.

BY SEBASTIAN RUPLEY

**W**i-Fi liberated your notebook from a tangle of cords, and now Wireless USB is poised to free your camcorder. Soon you will be able simply to point your camcorder at your PC and stream video to it—wirelessly.

Wireless USB is based on ultrawide-band radio technology, which operates in the 3.1- to 10.6-GHz slice of the radio spectrum; its success depends on the throughput it can achieve at various ranges. Unlike Bluetooth, a short-range technology with lower data-transfer rates, Wireless USB is designed to do the heavy lifting required to transmit multiple video data streams throughout a home.

Wireless USB could threaten Bluetooth, but Jeff Ravencraft, a technology strategist at Intel, stresses that too much has been made of the Bluetooth comparison. "The key here is that consumer electronics companies are clamoring for high-data-rate wireless technology."

Just how fast can Wireless USB get? Initially, speeds will reach 480 megabits per second at a range of 2 meters and 110 Mbps at 10 meters. A speed of 1 gigabit per second is slated to arrive by late 2007. Current wired USB connections reach about 480 Mbps; Bluetooth offers only about 12 Mbps, and Wi-Fi can technically reach 54 Mbps, but its actual speed is much slower.

When will the first products roll out? According to Ravencraft, they will start shipping around the end of 2005 or the beginning of 2006. The first products will be add-in cards for existing USB gadgets. Backward compatibility is a key priority for Wireless USB, since over 1.5 billion USB-equipped devices have shipped worldwide.

It won't be long before very few of the connections you make will be wired.

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## WiMAX: The Wireless Net Gets Extreme

Broadband wireless connections are right around the corner.

BY ALAN COHEN

Think wireless computing and you probably picture Wi-Fi, the short-range type of network found in seemingly every Starbucks and a whole lot of homes and offices. But there's another type of wireless technology making waves lately. If it lives up to its potential, it will change the way we access the Net.

At first glance, WiMAX (World-wide Interoperability for Microwave Access) seems like Wi-Fi on steroids, with a range of up to 31 miles, compared with Wi-Fi's 300 feet or so. But WiMAX isn't so much an alternative to Wi-Fi as an alternative to cable modems and DSL lines. It's a "last mile" technology that brings wireless broadband to office parks and neighborhoods.

Broadband wireless access isn't a new idea, but so far it's been an expensive one. That's because without any standards in place, manufacturers have been building proprietary gear. WiMAX brings a standard (known as 802.16) to broadband wireless, with the hope that interoperable products, expected to hit the market next year, will drive prices down. The prize for WiMAX service providers: a share in a broadband wireless market expected to reach \$1.2 billion by 2007, according to research firm In-Stat/MDR—more than double its size today.

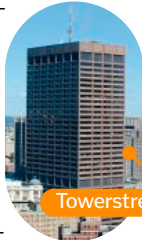
There's good reason for that optimism. For one thing, there's a



Towerstream's WiMAX network can deliver a 5- to 10-mile ring of high-speed Internet service.



A WiMAX hub handles signals at 5 Mbps.



Towerstream's network is up and running in Boston and New York City.

need for WiMAX. "You've got 20 percent of U.S. households that can't be reached by DSL or cable, because it's not cost-effective to get to them," says Daryl Schoolar, senior analyst at In-Stat/MDR. "Broadband wireless can be cheaper, because you don't have to lay the wire."

WiMAX, which uses base stations that resemble cellular towers to transmit signals to subscriber stations

located in homes and offices, will do more than bring broadband to rural areas. Because it's faster than cable or DSL, with speeds from 5 to 10 Mbps, it can offer a more efficient and cost-effective alternative to those technologies.

WiMAX has some powerful backers, too, most notably Intel and Nokia. Indeed, Intel is working on a WiMAX chipset and hopes to put the technology in laptops within the next couple of years.

But that's where things may get a little tricky. WiMAX was designed for fixed locations, and mobility has been an add-on, with an enhanced standard (802.16e) expected to be approved later this year.

A rival standard (802.20, or Mobile-Fi) was designed from the ground up for mobility, so it can handle mobile communications in fast-moving vehicles. But WiMAX

gear is expected to hit the market first. And with Intel pushing the technology, no one is quite ready to bet against it.

One standard that WiMAX is not looking to muscle out is Wi-Fi. Indeed, WiMAX's boosters are adamant that the new standard will complement the popular 802.11 networks.

"What you're going to see are laptops that have both Wi-Fi and WiMAX interfaces and automatically use whichever offers the best connection at a given moment," says Margaret LaBrecque, the former president of the WiMAX Forum. "When you're in a Wi-Fi hot spot, you may get better throughput via Wi-Fi than from a WiMAX base station, so you'll use that. What you'll have is more options." We can hardly wait.

## The Service-Oriented Nation

Middleware rides the next wave of corporate computing.

BY CAROL LEVIN

Mention *service-oriented architecture* at a cocktail party and you're unlikely to win new friends—or keep your old ones. But you'll be Mr. Popularity back at the office, where SOA, as it's known, is driving an evolutionary shift in how corporate America uses technology.

SOA is an infrastructure strategy that relies on middleware, the connective tissue that binds together different applications so companies get more mileage out of the software they've spent untold dollars and man-hours to develop and maintain. SOA essentially "wraps" existing applications in a way that lets them share data.

"Middleware is hot in the market, because the world runs trillions of dollars of infrastructure that is used over and over again," says Steven A. Mills, senior VP at IBM and chief architect of the company's on-demand computing initiative. "Middleware provides the linkage capabilities. It's a growth industry."

With businesses today spending 40 percent of their IT budgets on integration—mostly labor—the motivation to go the middleware route is powerful. "This is a huge pain point for businesses," says Mills. For decades, companies have been trying to tie their applications together, but the process has been

painstakingly manual and complex. With the emergence of the Internet, wireless networks, and a class of software known as Web services, SOA promises to automate integration.

Think of the way car manufacturing has evolved: Initially, Ford Motor Co. made every component of a car. Today, Ford assembles a car by integrating hundreds of components built by different companies, explains Dave West, group manager at IBM. In the SOA world, corporate applications are assembled from different components.

Perhaps the best example of SOA is the Web itself, according to Nick Gall, principal analyst at research firm META Group. It's composed of essentially three elements—the URL identifier, the HTML format, and the HTTP protocol. Yet the Web integrates countless applications and runs on all sorts of devices, from desktops to cell phones.

Just how wide an effect could SOA eventually have on business? "As an interoperability architecture," says Gall, "SOA is going to have a profound impact on corporate IT as well as computer development generally. I can't think of a major vendor who isn't waving the flag for SOA." IBM's West agrees: "SOA is not as visible as the Web revolution, but it's as important."

## Get Out the Mote

Sprinkled generously, “smart dust” wireless sensors get the message across.

BY CADE METZ

Think of it as pixie dust for practical situations. In 1994, Kris Pister, a professor of electrical engineering at the University of California, Berkeley, set out to build a network of tiny sensors capable of detecting the slightest changes in light, vibration, and air acceleration. Each so-called mote would communicate via wireless radio. Each would run on solar power. And each would fit inside a single cubic centimeter.

Supported by DARPA, the research organization run by the Department of Defense, Pister and his team didn't quite reach this lofty goal, but they came tantalizingly close. They built a working wireless sensor measuring less than 5 cubic centimeters—about the size of a grain of rice. “Each mote was totally autonomous,” says Pister. “It could do bidirectional communication, and it could transmit as far as 100 meters.” He called his tiny sensors “smart dust.”

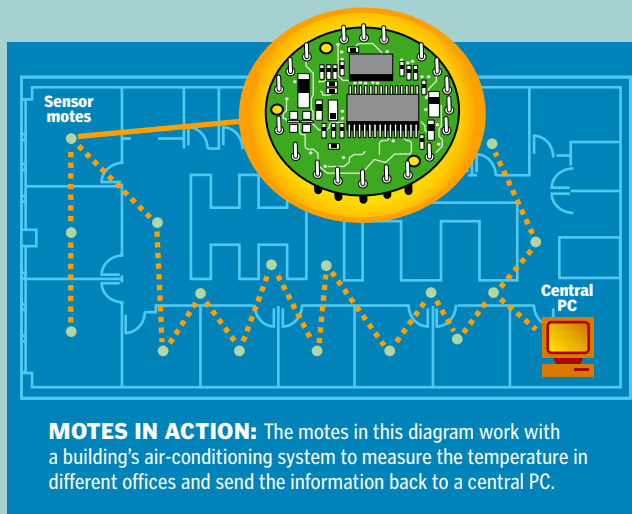
Sprinkled in the right places, smart dust could have magical effects. Equipped to monitor vital signs as well as movement, it could alert doctors and nurses to changes in a patient's condition. Equipped to read water and chemical levels, it could alert farmers to problems with growing crops. It could even improve a building's heat and air-conditioning systems, keeping an eye on temperatures and airflow.

Sensor technology is already used in many of the same situations. But in theory, smart dust is less obtrusive and far cheaper than today's wired devices. “At the moment, the cost of each sensor inside an air-conditioning system is in the \$500 to \$1,000 range, and most of that is related to all the wiring and the labor needed to put it into place,” says Pister. “With smart dust, you can install more sensors, have a more efficient ventilation system, and do it at a much lower cost.”

A form of the technology has already reached the marketplace. Currently on leave from Berkeley, Pister is also the CTO and cofounder of Dust Networks, a company that recently produced a smart-dust prototype suitable for manufacturing plants as well as heating and air-conditioning systems. And a second company, Crossbow Technologies, is selling industrial and agricultural smart dust based on TinyOS, the miniature operating system.

“TinyOS is Linux for very small devices, an open-source OS that's now used by over 500 different organizations,” says Crossbow CEO Mike Horton. “It includes a scheduler, a database, a wireless radio stack, mesh networking software, power management, even encryption technology so you don't have to worry about security.”

The only hitch is that today's commercially viable sensors aren't quite as dustlike as they could be. Dust Networks' sensors are each about the size of matchbook, and



Crossbow's are no smaller than a quarter. “They're more like dust bunnies,” says Pister. With solar technology still too expensive for everyday use, the size of these devices is limited by the size of their batteries. Pister's dust sensors can each run for up to five years on a pair of double-A batteries. Crossbow's quarter-sized mote is built around a single-cell coin battery.

Within the next few years, these sensors will be whittled down to the size of an aspirin. But even now you can put them almost anywhere. “Outdoors, all you have to do is protect them from wind, rain, sleet, and snow,” says Horton. “And in an ordinary indoor environment, you pretty much have free reign.” Need a sprinkle?

## Self-Writing Software

With intentional programming, everyone's a developer.

BY CADE METZ

Almost anyone can throw together a spreadsheet or presentation with the help of Microsoft Excel and PowerPoint. With very little training, you can add up a column full of numbers or create a bulleted list. But when it comes to building a complete application, most of us wouldn't know where to start.

Today's apps are so complex that even seasoned programmers have trouble putting them together. Each one comprises millions of lines of code, and no single person can fully understand what they're doing. That's why, no matter how many times it's tested, your favorite app crashes.

Help is on the way. Charles Simonyi—the Hungarian-born engineer who built the first WYSIWYG word processor at Xerox PARC and later oversaw the development of Excel and Word as one of the first employees at Microsoft—has founded his own company, hoping to reinvent the byzantine world of computer programming. His company, Intentional Software, aims to give almost everyone the means to build elaborate apps. You simply tell your computer what you intend to build, and the computer does the rest.

“It is clear that the precise recording and editing of human intentions in a machine-processable form is a necessary step to improvements in the building of software,” says Simonyi. He calls the idea self-writing software. In much the same way that Excel adds a column of numbers, Intentional's tools will fashion your free-form descriptions into a working app.

Is the software really writing itself? Not exactly. Let's say you have an idea for an app but very little programming experience. Today, you're forced to write up a detailed description of what you want, add a few diagrams, and hand your plan to a team of developers, who do their best to build an app that matches your specs. But they can't meet your

## High-Definition DVD

Blu-Ray and HD-DVD go head to head.

BY JEREMY A. KAPLAN

Just as DVD technology has taken hold in the market, with prices of players dipping as low as \$30, sales going through the roof, and DVD movies blanketing the earth, a new, improved DVD is already on the drawing board. What's the big rush?

As consumers move to high-definition plasma and LCD televisions, ordinary DVDs that pack a paltry 4.7GB just don't cut it. Sure, you can play a regular DVD on a high-definition display, but the disc won't take advantage of the display's extra resolution. DVD movies offer higher resolution than standard TV broadcasts (720-by-480 versus about 500-by-480), but they don't offer anything near the 1,920-by-1,080 resolution of a high-definition TV.

Fortunately, the companies that brought us the DVD are now putting the finishing touches on specifications for high-definition discs, with up to ten times the capacity of today's DVDs—potentially 50GB per disc. The drives will use blue lasers rather than red ones to burn discs. The blue lasers

needs without a great deal of back-and-forth. With intentional programming, developers create a set of *metatools* that let you build an app on your own. You input your initial descriptions and diagrams, and these tools create an app without further help from your development team.

Trained programmers are still part of the process, but everyone has the power to make their own changes. And programmers don't have to worry about damaging their existing code each time a change is needed. Simonyi elaborates: "For the programmer, the system effectively captures the process of their work—not just the results—so they won't ever have to do the same thing again, and they won't ever make the same mistake more than once." Apps will be not only easier to build but more reliable as well.

Simonyi points out that his vision is the next natural progression in the evolution of software design. Programming languages have gotten more and more abstract, moving farther from the ones and zeros that computer hardware understands and closer to the languages and images we humans use to communicate.

Many companies are already using the Unified Modeling Language, or UML, which takes a small step toward Simonyi's vision. With UML, programmers can model apps in easy-to-understand terms. "Both UML and Intentional are driving toward raising the level of abstraction in the world of software design," says IBM Fellow Grady Booch.

While UML works with existing programming languages, Intentional does away with today's arcane tools, providing a simple vocabulary powerful enough to build an app. "What Charles [Simonyi] is trying to do represents a state change in development processes," says Booch. "He's building a new programming world unto itself." How far off is this new world? According to Simonyi, not far at all. In a few years, you could be building far more than just a spreadsheet.

have a wavelength of 405 nanometers; red ones are 650. The shorter-wavelength laser can focus on a tighter spot on the disc and thus squeeze more data onto each DVD. (Most drives will also have red lasers to read today's DVDs.)

High-definition video demands vast amounts of storage space; the amount varies depending on the compression ratio and video quality but can reach about 200MB per minute. High-definition DVDs will each hold about 2 hours of HD video.

Thanks to the money-making potential of the new medium, companies are vying to get their own technologies into the stan-

dard, meaning—you guessed it—another format brawl. In one corner is Blu-Ray, supported by 13 companies including Dell, Hewlett-Packard, Hitachi, LG Electronics, Matsushita, Philips, Pioneer, and Sony. The first-generation discs will each have a capacity of 23GB.



Plans for copy protection are still up in the air but will undoubtedly be more secure than CSS, today's standard for DVD encryption. This year Sony shipped the first Blu-Ray drive, which sells for around \$3,000, for the Japanese market. Blu-Ray drives will likely hit the U.S. market in 2005.

In the other corner, NEC and Toshiba are finalizing a competing specification, known as HD-DVD, for the DVD Forum. An HD-DVD will have a capacity of 20GB. A variety of compression algorithms have been proposed to increase capacity, including the one from Microsoft that is used in the Windows Media 9 HD format.

With the probable support of Microsoft, HD-DVD could garner key support in Hollywood. And that could be the deciding factor in this format war. A second advantage of HD-DVD over Blu-Ray: Since the discs will have the same thickness as today's DVDs, companies will be able to manufacture the discs on existing equipment.

HD-DVD is still a jockeying for position in the meantime. The new DMD (Digital Multilayer Disc) format has six layers rather than two, for an initial capacity of 15GB; and the Asia-only EVD (Enhanced Versatile Disc) promises five times the resolution of a standard DVD. The DVD format wars have only just begun.

## Scaling the Language Barrier

Software gets much better at knowing what we mean.

**BY SEBASTIAN RUPLEY**

In the annals of computer comedy, one of the most famous anecdotes is about asking a speech recognition engine, "Recognize speech?" The translation comes back: "Wreck a nice beach."

Getting machines to understand both spoken and written language has been an elusive goal for the tech industry for many years. Now, thanks to a wave of government funding and technical breakthroughs, machine translation (and understanding) of written language is getting unfunnier by the minute.

Part of the reason accuracy rates for machine translation have crept along at a snail's pace until now is that translation software needs a very large database of text for training and for comparing similar phrases to extract meaning. Huge increases in storage capacity have greatly boosted the size of such databases.

"We're making use of terabytes of data now," says Steve Klein, chairman and CEO of Meaningful Machines, a developer of translation technologies. "That boosts accuracy enormously and is why we like to say that our technology is for machine understanding, not just for machine translation."

Klein and his start-up company have kept the software they will release later this year hush-hush, but Klein bills it as revolutionary. He says it could have a broad impact on everything from the U.S. gov-

A U.S. soldier in Iraq uses the VoxTec Phraselator P2 to communicate in Arabic.



ernment's machine translation of foreign documents to Internet search engines that recognize voice.

The one clue Meaningful Machines has given about its software is that it will use new methods of statistically ranking the likelihood of what entire phrases mean, rather than just translating one word at a time. That allows it to discern whether the word *base-*

*ball* in a given phrase refers to a ball or a game.

Phrase-based, statistically ranked translation is also the secret sauce in Language Weaver's machine translation software. The company recently got a gust of financing from In-Q-Tel, the venture capital arm of the CIA, which would



providers have been able to boost call quality, which often lagged when calls were sent over the public Internet. That's good news for callers but potentially bad news for small providers without private pipes.

The real growth of VoIP, both for consumers and businesses, lies in local calls. "We're at the tip of the iceberg now," says Bogen. VoIP's burgeoning popularity will fuel a whole new class of phones with "presence" features that let users specify how they can be contacted, by whom, and when.

The next big step for VoIP will likely be its integration with cellular and Wi-Fi technologies, resulting in a hybrid device that works as a cell phone when you're out of the office but can recognize a Wi-Fi network and transmit calls via VoIP. The first devices should launch in health care by 2006.

Much of VoIP's future will depend on what say regulators have in it. Traditional phone calls are taxed, but so far VoIP has been treated as an information service and spared the tax burden. That's a big reason

## VoIP: Getting Better All the Time

Your next gadget could be a hybrid cellular/Wi-Fi/VoIP phone.

**BY ALAN COHEN**

Voice over IP is the John Travolta of Internet technologies. It was big once, everyone laughed at it, and it faded away, only to come back bigger than ever.

To be sure, no one is laughing at VoIP anymore. In its second go-round, it has moved from a cut-rate consumer convenience to a full-fledged, money-saving business tool. You'll find it in more and more enterprises, and the quality (once ridiculed as somewhere between that of a walkie-talkie and a broken walkie-talkie) gives circuit-switched calls a run for their money. Somewhere along the way, VoIP went right. And it promises to

go a whole lot farther.

"The products are better now, there are more applications, and carriers are serious about deployment," says Norm Bogen, director of networking for market research firm In-Stat/MDR. VoIP—once the domain of cash-strapped start-ups—now counts some of the biggest names in telecom among its providers. In March, AT&T introduced residential VoIP service in New Jersey and Texas, and it expects to expand to 100 U.S. markets by the end of the year. Look for cable companies to start pushing VoIP big-time as well.

By sending voice traffic over private IP networks, the big carriers and cable

like to use the software not just for translating documents from numerous languages but for automating machine understanding of text to flag statements that might be dangerous or revealing.

Machine translation software could also make today's Internet search engines seem like relics from the distant past. "We're only a few years away from Internet search engines that can return high-quality results translated from nearly every language around the globe," says Daniel Marcu, founder of Language Weaver. Eventually, software will be able not only to understand spoken language but also to act upon it.

"DARPA [the Defense Advanced Research Projects Agency] is funding numerous research efforts doing cross-language information retrieval," adds Marcu. At the recent DARPAtech conference, the organization showered praise on a handheld machine translation gadget called the VoxTec Phraselator P2. Speak into the Phraselator and it instantly translates phrases into spoken Arabic.

Carnegie Mellon University, the University of Southern California, and Microsoft Research operate some of the largest programs for developing machine translation software. Microsoft is primarily focused on extracting meaning from documents in English.

"We don't have to reach perfect accuracy rates to get to very useful applications," Marcu points out. In machine translation, as in horseshoes and darts, "close enough" counts for valuable points.

VoIP calls are cheaper than regular calls. Wire-line providers have called this unfair, and states see VoIP taxes as a way to fill empty coffers. Legislation introduced in Congress would limit VoIP regulation, the fear being that taxes could stifle innovation.

VoIP faces other challenges as well. Because each phone number maps not to a physical location but to an IP address, phones can move from place to place. That takes a burden off system administrators but puts one on emergency services.

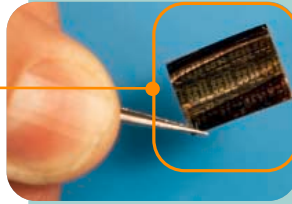
The government's new e911 mandate requires location data to be passed along with emergency calls. But a single IP phone can have many possible locations, including home, office, summer home, or sales branch. The nightmare scenario is having an ambulance show up at an office building when the caller—and his phone—stayed home that day.

Developers have released various solutions, but none are entirely seamless. Then again, VoIP's whole history is far from seamless—and it has never sounded better.

## Smart Skin

A sixth sense, and a seventh, and an eighth....

BY CADE METZ



One day, your baby monitor will alert you to a great deal more than a crying fit down the hall. Thanks to hundreds of tiny wireless sensors laced into your baby's clothing, you'll be alerted to the slightest changes in temperature, pulse, or movement. Whether your baby develops a fever or has trouble breathing, you'll know about it—in a matter of seconds.

At the University of Texas at Arlington, Zeynep Celik-Butler and Donald Butler are well on their way to creating that sort of all-knowing baby monitor. Just as other scientists are building flexible computer chips and displays, this husband-and-wife team is working to build flexible microsensors, tiny devices supple enough to sit inside a window curtain or an ordinary piece of clothing yet smart enough to detect changes in their immediate surroundings.

"We were watching all the work being done to build transistors and light-emitting diodes on flexible substrates," says Donald Butler, "and we thought, 'Why not put sensors on a flexible substrate as well?'"

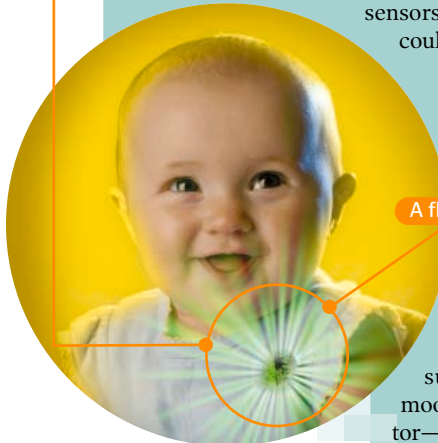
They call their project Smart Skin, and they've already demonstrated a prototype that monitors infrared radiation, which means it's also capable of tracking changes in body temperature. In the near future, they hope to build devices that respond to all sorts of other stimuli. "We plan to duplicate another sensing ability of the skin," says Zeynep Celik-Butler, "creating devices that detect touch and pressure." Her husband envisions sensors that monitor changes in air flow, alerting you to, say, an open window or a gas leak.

Their prototype begins with a flexible polymer substrate that can withstand temperatures as high as 752° Fahrenheit. The higher the temperature, the easier it is to deposit the sensing materials on the substrate. In this case, the microsensors are made of yttrium barium copper oxide, a material that responds to infrared radiation.

The project, funded by the National Science Foundation, still has another five years to run, so we may be well into the next decade before such devices are commercialized. There are any number of places these sensors could reside, and any number of things they could monitor.

Woven into the uniform of a combat soldier, the sensors might detect toxic chemicals or bacterial agents floating through the air. Worn by a diabetic—just under the skin—

A flexible sensor will be able to monitor vital signs.



they could track insulin and glucose levels. Donald Butler suggests they might soon find a home in the world of robotics. A NASA machine, for instance, could carefully track its surroundings as it moves across Mars or the moon. And then, of course, there's the baby monitor—with a capital M.

Our contributors: Alan Cohen is a freelance writer. Jeremy A. Kaplan is an associate editor, Cade Metz is a senior writer, and Sebastian Rupley is a senior editor of *PC Magazine*. Lance Ulanoff is executive editor of *PC Magazine Online*. Executive editor Carol Levin was in charge of this story.





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A man with extensive red and yellow alphanumeric tattoos on his torso and arms stands on the wreckage of a car. He holds a sword aloft in his right hand. The background is a dark, cloudy sky with debris flying through the air. The title 'THE Virus' is overlaid on the image.

# THE Virus

## Step inside the mind of a virus writer.

By Alexandra Robbins, Illustration by James Porto

**T**he future of viruses might lie in the hands of someone like BlueOwl, a 16-year-old in the Netherlands who started writing viruses when he was 14. BlueOwl isn't interested in destroying your hard drive; he just likes to experiment. A member of the Ready Rangers Liberation Front, he has written a Web site infector, a couple of genetic mass mailers, some polymorphic viruses, and a genetic polymorphic virus—some of which he posted, none of which he spread. In an instant message he writes:

*I do it for the pleasure of creating something, seeing that it works, and making something that could really survive, spread, and hold its own in the wild. A virus is something that lives. In real life you can't make a kind of animal. You can in the computer. It's like playing God.*

script kiddies is growing, because “a lot of programming languages have become incredibly easy—with just a few lines these kids can make viruses that spread incredibly well, for example ILOVEYOU [the e-mail worm]. There is no real need to spend hours and hours learning how to write viruses anymore.” Cyberterrorists, BlueOwl says, are steadily on the rise because of poorly protected networks and the low risk of getting caught.

Steven Sundermeier, vice president of products and services at security firm Central Command, adds another motivation to the mix: money. Because worm writers can install key loggers through backdoor portals to track passwords, credit card numbers, and other confidential information, the typical kid messing around with digital graffiti is giving way to the “professional” writing for profit.

Throw in some writer rivalry and the landscape gets even more complex. Since February, the Bagle and Net-

# Wwars

The virus wars continue to escalate, with output poised to exceed even that of 2003—Year of the Worm—if we can judge by the increasing frequency and complexity of attacks so far this year. In March, 2 percent of all traffic the security firm MessageLabs received contained viruses. “We’re still losing the battle,” says META Group program manager Peter Firstbrook. “The last two years have been the worst for virus outbreaks, and this year’s shaping up to be even worse.”

The future direction of the virus wars, however, is something of an unknown, because it depends on so many variables, including the shifting motivations for virus writing. BlueOwl classifies virus writers into four groups: *creators*, who write for the thrill (he places himself in this category); *students*, who write for research purposes; *script kiddies*, writing to impress, “who think they are cool [but] their viruses suck”; and *cyberterrorists*, who spread viruses for the joy of not creation but destruction.

The creators, BlueOwl says, are a dying breed, quitting the virus scene out of boredom and not bringing new creators in. The students are also fading as schools get stricter about virus handling. By contrast, the number of

sky authors have been engaged in an ongoing, sometimes daily cyberbattle, taking turns using huge pools of zombie machines—adapting exploits left by others like MyDoom and SoBig—to spread new variants with code containing direct taunts. While they duke it out with messages like “Bagle is a [expletive deleted] guy, he opens a backdoor, and he makes a lot of money” (Netsky.R) and “Hey, Netsky, [expletive deleted] off you bitch!” (Bagle.K), with other authors occasionally weighing in, each new variant requires security companies to develop new emergency updates.

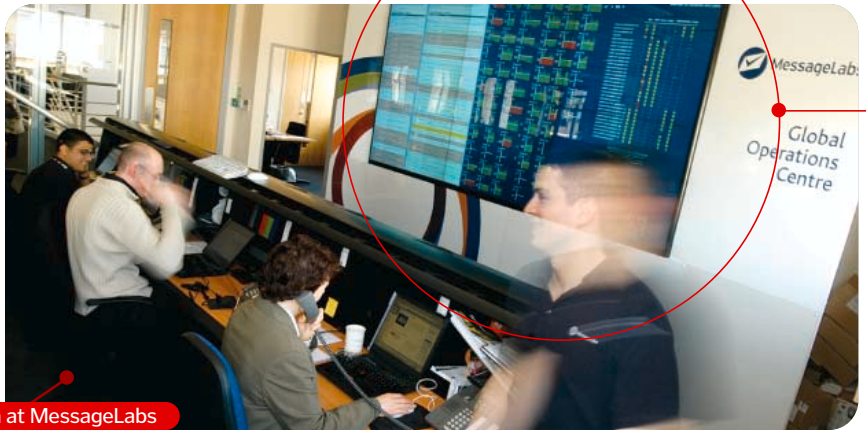
Central Command’s Sundermeier comments, “Typically we don’t see this tit-for-tat type of writing, because the motivation on the part of writers is usually a pride thing: You get a code out and start a career using those skills.” The taunts aren’t common between virus groups. In fact, according to Sundermeier, the writers may be working in collaboration, and the taunts may just be a distraction. “We’re seeing a cat-and-mouse game, but all these author groups are keeping a watchful eye on the antivirus groups as well.”

The virus writers are constantly trying to one-up each other by evolving their code with each new vari-

ant, but they're also trying to one-up the antivirus industry. Take Sundermeier's example of a recent back-and-forth: In the past, you might have found viruses on attachments boasting of nude celebrities, so businesses filtered executable extensions at the gateway. The virus authors then started zipping up their attachments.

In response, security firms had their scanning engines scan archives to block the ZIP files. Only days later, the authors fired back with password-protected ZIP files, which could bypass antivirus screening, as the software couldn't decrypt and take a guess at a password. As a result, Central Command learned to parse an e-mail message for the password and store it in memory so they could decrypt and virus-scan it. A week went by, says Sundermeier, and the authors "stopped including the password as a text file. It was a bitmap file, which completely screwed up our game plan."

Other current virus-writing trends include self-propagating codes with tie-ins to spammers, networks of bots created by members of organized crime to use in extortion, and codes shared with other writ-



The war room at MessageLabs

DVD-ROM drives. Advances in computing technology will inevitably extend the terrain for viruses; soon viruses could target instant messaging, peer-to-peer networks, voice-mail systems, handheld devices, Microsoft Xboxes and other consoles, and mobile phones (which will lead to cell-phone antivirus software).

BlueOwl believes the cyberbattles among authors will eventually breed worms that fight by trying to remove each other. What's more, he says, "virus authors

stance, is code that rewrites itself each time it mutates. As a result, signature-based scanners have to decrypt it and then scan it to find the underlying code.

"It doesn't seem like there are many [virus writers] of that caliber to take up that mantle as there used to be," says Hinojosa. "A lot of today's viruses aren't written in assembler; they're written in Visual Basic. You can't program something like the metamorphic virus in Visual Basic."

Hinojosa also points to the vulnerabili-

## Soon viruses could target IM, peer-to-peer networks, voice-mail systems, handhelds, game consoles, and mobile phones.

ers, leading to blended threats. When sharing codes, writers don't even need to be sophisticated programmers to wreak havoc, as long as they can weave together existing attacks from code available through community resources. Gene Spafford, a Purdue University computer science professor and security expert, explains:

*It's a "pay up or we'll disable your system" kind of thing. That's a very disturbing trend. Prior to a couple years ago, viruses were being written by loners, the majority of whom didn't intend for them to have wide-scale malicious impact. Perhaps some of those same authors are now doing it professionally and may be working in teams.*

**New breeding grounds.** To be sure, virus writers of the future will have many more tricks up their sleeves. In March, three variants of the Bagle virus spread twice as quickly as the 2003 MyDoom attack, with an added kink: The variants didn't have attachments. To spread the virus, all a user had to do was open an e-mail.

Writers speak of multiplatform viruses and viruses that will infect icons, cursors, or media files or damage CD-ROM and

have been inspired by real biological bacteria and evolution. So there have been thoughts about viruses which use genes when making new variants of themselves, and even female and male viruses that will be able to mate and have offspring resembling themselves." BlueOwl has seen only test runs so far, but he says, "If a mass mailer used it, it could really spread BIG."

Hence the million-dollar question: If virus writers are trending toward malice and developing new strategies to elude antivirus companies, why haven't we seen the Big One—a rapidly spreading virus that attempts to destroy data? roy g biv, a 25-year-old Austrian writer for the group 29A, says it's not that easy: A virus has to "get lucky" to spread far, or it needs a widespread hole to exploit so it can spread quickly. If it spreads quickly, however, it will be detected quickly. What's more, if the payload runs too soon, the virus will destroy itself, and if it runs too late, the antivirus companies will stop it.

Patrick Hinojosa, CTO of Panda Software, points to the increasing complexity necessary for viruses to elude antivirus software. The metamorphic virus, for in-

ties in Windows and the number of critical patches Microsoft has issued. "The reason they're critical is that people can take over the machine. Those are the most dangerous [viruses]. With that type of vulnerability somewhere near the network edge, you could write a virus or worm like Blaster with malicious payload."

**Targeted attacks.** In the increasingly contentious arena of global sociopolitics, it's possible that those payloads could be targeted at specific groups. "I wouldn't be surprised if in the next few years we saw political or ideological messages," Purdue's Spafford says. He explains that a virus or worm could spread but trigger damage only on machines with interfaces in a particular language. "More targeted attacks and more malicious attacks, particularly with ideological underpinnings, I think are just a matter of time."

The cycle looks to be never-ending, because the whole point of the process is to be constantly creating something new, no matter whether the virus writer is a script kiddie or a cyberterrorist. But on the other end, the antivirus companies are

optimistic. Experts agree that virus hunters are able to respond increasingly quickly, and antivirus companies now have more effective suites. The best suites combine programs that monitor spam with antivirus and antispymware capabilities, in addition to firewalls that can handle Blaster-type worms.

Scanning engines have also become more sophisticated. Five years ago, the scanning process was simple pattern matching. As Panda's Hinojosa puts it, "Advances in virus writing and polymorphic viruses have made pattern matching increasingly obsolete....Because these things spread so fast, there isn't necessarily time to get our signature file to the users. So heuristics started getting beefed up."

With more intelligent heuristics, scanners could interpret macro instructions and find them in specific parts of a file. They would look for files that were doing something suspicious and work on a point system. For example, if a file were searching for e-mail addresses, that would be one point. If it were trying to start up an SMTP engine, that would be another.

**A chilling effect.** Academics expect that in five years, viruses will still have a large-scale impact on businesses—but not because of direct virus attacks. A major reason the virus problem has become so widespread is the same reason it will get worse in the future: user apathy.

Individual users are the most susceptible to viruses, because they don't always install or update antivirus software and firewalls. They have platforms that are highly vulnerable to viruses. They naively click on attachments. And they don't necessarily have the training to know when

they've been infected.

It's those users whose machines become part of the networks of bots that harvest information. "As more of this goes on, it may actually have a chilling effect on people's willingness to go online," says Spafford, "so it'll have an indirect effect on businesses, many of which depend on online markets. If users are afraid to put their credit card numbers online because threats of viruses or spam get too much, they won't do it."

It's difficult to guess how the virus landscape will look ten years from now, when we don't know which operating systems will be primarily used. Ten years ago, Windows 95 hadn't been released, networks weren't used commercially, and Digital Equipment Corp. was the second-largest computer company in the world. If some experts' predictions hold true, in 2014 we may be using hundreds of specialized systems that are immune to viruses, like, say, a microwave. Then again, if the scale of viruses, spamming, and crime reaches the tipping point, governments might conceivably increase law enforcement efforts to reduce the impact and frequency.

It would make sense for ISPs to play a larger role in combating viruses. ISPs could offer services that scan all incoming and outgoing mail for viruses; if a machine were taken over, the ISP would block the traffic, notify the user, and perform an automatic disinfection. This kind of policy could allow ISPs to charge a fee and grow their business.

On the other hand, "ISPs are loath to take a drastic step forward as far as prescanning traffic before it hits the end user," Hinojosa says. "If you were doing a war scenario—no holds barred—the place you'd do it for con-

sumers isn't on their machines as much as it is at the ISP." But that takes money at the ISP, already a low-margin business. "You [also] have the privacy concerns, but you'd just have to go, 'The hell with all that, we're just locking it down and we're scanning everything at the ISP,' where you can have the server power to do so."

Meanwhile, as the antivirus companies continue to improve response times, the environment is going to grow more difficult for virus writers. Even the halting attempts that Microsoft is making with Service Pack 2 for Windows XP will make it more difficult to spread the types of worms that are happening now.

"Microsoft screwed up in the past with their paradigm on security," Hinojosa says. "But as slowly as they're doing it, they're making it tougher and tougher. As the top of the animal gets armored scales, virus writers have to find the soft underbelly, and that's probably going to be on the consumer front. So you're going to see [virus writers] having to trick people into stuff, say 10 to 15 years from now. The attacks will be more effective on the consumer than they are on the corporate network end."

**So-easy social engineering.** This kind of social engineering is "so easy," says roy g biv. "Bagle.A had a message body that said 'test,' and people still clicked the attachment. The password-protected attachment was a great idea, since people trust encrypted files."

Other writers aren't impressed by viruses that depend on duping the end user. Among them is Stephen Mathieson, a Detroit tenth-grader and already a veteran virus writer, who has provoked complaints about his work in the wild:

*I hope writers will stop relying on stupid users and start actually coding viruses that use exploits in software instead of a person's intelligence. Look at how Blaster spread: It had nothing to do with how gullible the user was but how poorly made Windows was. It's lame to trick someone into opening your program; the only users that will be infected are idiots. If [virus writers] use exploits, everyone will be infected.*

Virus writers expect to remain ahead of the game as long as the security community continues to make what the writers say are egregious mistakes. They cite, for instance, bulletins alerting users to gaps in security—bulletins that writers use as how-tos on exploits. DvL, a 19-year-old writer in Romania, says the security com-



MessageLabs' "Skeptic Radar" shows real-time data on virus outbreaks on the company's global network.

munity is lacking “smarter people. They will never think like us.”

BlueOwl adds that “stupid things programmers once programmed” are allowing writers to become cleverer with social engineering. He says:

*MyDoom shows fake error messages that [look like] the real thing. Netsky lets users believe the mail came from someone they know, by extracting e-mail addresses from files in a specific way. And it's possible when using SMTP to send an e-mail to anyone from any address. So, for instance, I could send a mail under your address to your girlfriend saying something horrible and she'd think you wrote it to her. (But I wouldn't.)*

Antivirus companies rely on signatures that are out of date by the time they ship, roy g biv says, “which means they are always behind and is a serious mistake.” Other virus writers say that the security community would do well to pay more attention to forums and chat groups to

proactive defense is both inevitable and necessary. Cisco and Panda have products on the horizon that will detect threats and close them down without interfering with the primary antivirus engine. Symantec has sensors worldwide that detect and automatically analyze new threats and then push the solutions to customers.

One strategy that hasn't yet panned out for the industry is *sandboxing*, which creates a virtual OS so sophisticated that when a piece of code comes in, it's fooled into operating on the virtual OS instead of on the actual one. The engine can then analyze what the code is trying to do and handle it without letting it ever reach the actual OS.

Experts say, however, that current sandboxing methods are too resource-intensive. “We can get better at coming up with ways of preventing viruses due to security problems,” META Group's Firstbrook says. “The other thing that needs to happen is that the antiviruses have to get

*The belief that one operating system, architecture, word processor, and language are good for everything is one of the reasons we have a problem. We don't do that in any other arena of technology. If you're having a house built, you don't see every craftsman—window guy, plumber—using the same Swiss Army knife.*

And third, the computing industry should take care not to pigeonhole victims of viruses. For instance, MyDoom spread mostly through propagation from users downloading content at P2P sites such as Kazaa—users who might be less likely to red-flag bad code because they were in the process of downloading something illegally. In Stafford's words:

*It's like venereal diseases, especially AIDS, because people tended to target a subculture they believed was immoral. So we have to look at this as a public-health issue and try to develop methods to protect against any kind of misbehavior without saying a par-*

## Virus writers say that the security community would do well to pay more attention to forums and chat groups to remain apprised of ‘underground’ developments.

remain apprised of “underground” developments. Mathieson says:

*If I were them, I would make contact with the virus writers themselves to ask how their things work. If I were asked by them, I would explain how and why my theories and/or code work, because I'm not against them. I just enjoy writing viruses. More power to them if they know what they're doing.*

Antivirus companies are well aware that the technical challenges of neutralizing viruses are shifting. Currently they have to analyze what the entry points could be— instant messaging, e-mail, Web servers in which Blaster-type attacks seek flaws—and the speed at which viruses are spreading. Hinojosa explains:

*So the challenge now becomes: How do you generically stop something through behavior-based phenomena? Because with something that gets spammed out to 10 million people, you don't necessarily have time to get it analyzed, a signature file deployed, and the users updated in 5 minutes worldwide. This moves us into having to detect malware at the network level before we know what it is. That is the wave of the future.*

**Proactive defense.** The move from reactive defense—the hallmark of the antivirus industry until now—toward networkwide

cheaper and easier, because consumer PCs with broadband connections are the Typhoid Marys out there.”

More feasible future strategies include packages of systems that can be largely immune without having continuously updated antivirus programs; all-in-one antivirus programs that address viruses, self-propagating e-mail worms, spyware, and adware; the use of antivirus technology to track down virus writers or quarantine poorly managed networks; intrusion prevention integrated into firewalls to block malware at the border; and systems that have security built-in from the beginning rather than added on.

Spafford has three recommendations for future antivirus strategies. One is that security firms should do a better job of addressing the changing nature of end users:

*We're pushing competing technology into the hands of more and more people with less and less training. So the controls, interfaces, and explanations of these problems need to be developed for individuals with limited or no reading skills for us to be able to protect those systems. That's a huge ongoing challenge for the IT arena— understanding that change.*

Another strategy should be to get out of the habit of creating monocultures:

*Particular group deserves it. The RIAA wanting to be allowed to hack into machines and send viruses to file sharers is an extremely bad idea. People with moral ambiguities believe it's okay to write viruses. If we open that up so different groups who believe they're being aggrieved in some way should have that ability, then you've removed that moral distinction.*

BlueOwl doesn't write viruses because of moral ambiguities; he writes because of a fascination with the “magical little creatures traveling through computers.” He says he can envision the landscape going either way—either toward a “massive rise” in viruses, proportional to the rise in communication methods, or toward a major decrease in viruses as the creators (his first category of virus writers) dwindle, reducing the number of tricks shared with other virus writers.

Steven Sundermeier describes the possibilities on the antivirus side another way. “You'd be kidding yourself if you said you were 100 percent foolproof—because you never know what's going to happen tomorrow.”

*Alexandra Robbins is a freelance writer and author of “Pledged: The Secret Life of Sororities.”*

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# THE New

The evolving breed of computationally minded yet broadly skilled workers holds the key to gains in productivity and economic growth.

By **Steve Lohr**  
Illustration by **James Porto**

**a**ndrew Davenport, a 36-year-old researcher at IBM, has a background that is both deeply technical and academically rigorous. His field of expertise is mathematical optimization, and his Ph.D. in computer science was in optimization constraint programming, followed by postdoctoral research. Yet he has spent much of the last year or so trudging around steel mills the size of football fields in Japan and Korea, learning the business and speaking the language of ingots instead of algorithms.

A steel mill isn't a computer, but it is an immensely complex system. And Davenport has found that his skills, once focused on optimizing the elaborate flow of bits through a computer, can be applied to fine-tuning the flow of raw materials and processes—procurement, scheduling, production, and inventory handling—in steel mills.

“No, I never thought I'd be doing this,” he says. “You have to be able to deal with people, and you have to develop a broader range of skills. The real payoff for me is that I can apply my math and computer science skills to solve their business problems. People with my background can make a real difference.”

Davenport is one of the New Geeks, people who are technically trained but also have the ability and inclination to work comfortably in other disciplines like business, the sciences, and the social sciences. They personify the future of computing as its impact spreads further. Computing has already helped transform everything from the way scientists plumb the

# G E E K

mysteries of biology, chemistry, and physics to the way Detroit designs cars and Hollywood makes movies. As it moves increasingly beyond traditional calculation, computer science is inevitably becoming more interdisciplinary, introducing the computing arts to a wider circle of people.

The labor of this evolving breed of computationally minded yet broadly skilled workers holds the key to new frontiers of technologically enabled gains in productivity, economic growth, and higher living standards. And the people are evolving in step with the tools, as has always happened in computing.

In the late 1950s, FORTRAN opened up computing to engineers and scientists by giving them a programming language that resembled the mathematical formulas familiar to them. They could work at a higher level instead of being mired in the

charge of new markets for Microsoft's information worker group. "Now we're moving into a world where software dramatically enhances team and organizational productivity. Collaboration is key."

**Networked collaboration.** Craig Samuel, Hewlett-Packard's chief knowledge officer, is a great believer in the potential of networked collaboration to lift corporations' productivity and efficiency. Since his home is on Scotland's remote Isle of Bute, and he constantly travels, Samuel lives the virtual life, using and experimenting with the latest technology. The unchecked flood of spam and the existence of online alternatives, he says, means that "the age of e-mail has reached its summit and is in decline. Important work will move to other collaborative spaces."

Samuel has pushed HP to embrace collaboration tools. The company's 142,000

employees are now licensed to use SharePoint (Microsoft's Web-based collaboration software), and about 10 percent of the workforce is licensed to use Groove Networks' peer-to-peer software for sharing work among distributed teams. Web-based software, Samuel says, will be the "virtual team space for the masses," while peer-to-peer will be the tool of choice for power users—especially itinerant managers and researchers like him—because it offers better security, full off-line access,

and current tasks to deliver appropriate information. "In the future, intelligent search and social networking could be transformational for cooperation in corporations," Samuel says. One path toward that future is what Tim Berners-Lee—the Oxford-educated physicist who created the basic software protocols behind the World Wide Web—calls the Semantic Web. According to Berners-Lee, who is now the director of the World Wide Web Consortium, the vision is "an extension of the current Web in which information is given well-defined meaning, better enabling computers and people to work in cooperation." Universities and corporate labs around the world are working on a new layer of software standards for discovery and data exchange, including an HP Labs project called Jena, an open-source Java framework for building Semantic Web applications.

**"Computer science will be seen as exactly the right jumping-off point for all kinds of fields and occupations."**

innards of the machine, in its memory registers and bit-thrashing quirks. That has been the general trend ever since. The tools have moved the meeting point between humans and computers—the line of communication, if you will—farther toward people and away from the machine, thus inviting wave after wave of new users.

Today, the tools are continuing their steady march not only *up* but also *out*, as technologists develop software to take advantage of the spread of high-speed networks and pervasive wireless connectivity. Indeed, the new tools that experts predict will open the door to big steps forward in productivity mirror, in their way, some of the multidisciplinary character of the New Geek technologists.

The most promising tools are similarly wide-ranging, in the sense that they are made for crossing institutional boundaries and slicing through conventional hierarchies to communicate, share information, and automate transactions. They include new forms of social networking, smarter search, improved speech recognition and natural-language programs, virtual-team software for collaboration, and intelligent agents to help simplify electronic commerce.

"Most innovation so far has helped individuals work more effectively, through a transition from analog to digital tools," says Peter Rinearson, the vice president in

employees are now licensed to use SharePoint (Microsoft's Web-based collaboration software), and about 10 percent of the workforce is licensed to use Groove Networks' peer-to-peer software for sharing work among distributed teams. Web-based software, Samuel says, will be the "virtual team space for the masses," while peer-to-peer will be the tool of choice for power users—especially itinerant managers and researchers like him—because it offers better security, full off-line access,

**Erik Brynjolfsson** professor, MIT Sloan School of Management

and more flexible connections (no corporate server or firewall hassles).

The real leap ahead in collaboration, Samuel predicts, awaits further advances in social networking and search software that will make those technologies far smarter. "Today, you find 5,000 connections in a network or mentions in a search," he says. "Who cares? How many of them are meaningful?"

Smart social networks would find the best people to help on a project, and smart searches would use knowledge about projects, docu-

At the IBM Almaden Research Center in San Jose, California, researchers are taking a somewhat different approach. They regard next-generation social-network technology as one aspect of "relationship-oriented computing." IBM's prototype project in the field is Web Fountain, a large supercomputer that digests most Web pages and other online information, including many private databases.

Using search, business intelligence, and



PHOTOGRAPH BY STEVE DUNWELL



Seema Ramchandani product manager, Microsoft Longhorn

but economists, management experts, anthropologists, biologists, and social scientists. Notably, the world's largest information technology company is broadening its field of vision in both strategy and hiring.

#### Interdisciplinary programming.

Something similar is occurring in the computer science departments at leading universities, where interdisciplinary programs are becoming the norm. A computer science degree now tends to be seen more like a liberal-arts major, as a solid grounding for all

kinds of future endeavors rather than as a warm-up round of job training that precedes going to work in the computer industry.

John Gutttag, head of the electrical engineering and computer

science department at Massachusetts Institute of Technology, regards the changing nature of his field as both inevitable and healthy. His own background suggests a New Geek lineage: He was an English major at Brown University who then became enamored of computing.

As an example of the new kind of computer science major, Gutttag cited one of his brightest recent students, Matthew Notowidigdo, a native of Columbus, Ohio. The 22-year-old received his master's degree this spring and, Gutttag says, would be welcomed by any computer science Ph.D. program in the country. But instead, Notowidigdo headed to Wall Street, where he plans to use his technical skills at Lehman Brothers to develop the sophisticated computer programs and models that the company uses to sniff out profit-making opportunities in financial markets.

While he may pursue a Ph.D. someday, Notowidigdo says it would be in economics instead of computer science. Regrets about his major? None whatsoever. "Understanding computational technology is going to be essential to almost any field," he explains. "Computer science has opened a lot of doors for me."

Gutttag sees Notowidigdo as an unqualified success story, even though he has chosen not to pursue a Ph.D. To Gutttag, computer science is becoming the ideal liberal education for anyone technically inclined. "We're trying to educate the right kind of computer scientist for the next gen-

eration," he says. "Computer science will be seen as exactly the right jumping-off point for all kinds of fields and occupations. It's a great time to be a computer scientist."

Such optimism, to be sure, is scarcely the universal sentiment these days. The pessimists predict that computing is inevitably maturing into a settled old age, like other industrial technologies from railroads to electricity.

There are surely elements of truth in the graying-of-IT thesis. Growth will come more slowly now that it is a \$1 trillion industry worldwide; layers of hardware and software are standardizing and commoditizing; competitive advantage based solely on technology will be more fleeting than

in the past. Some high-technology jobs have become more routine and thus more susceptible to being sent offshore to low-wage nations, most notably India.

But step back to view the larger picture and the engine of computing seems to be humming along at a healthy clip. Microprocessors, memory, hard drive storage, and communications speeds, most analysts say, are likely to remain on an exponential-growth course for the next ten years.

Hardware advances aren't the only engine of progress. The stored-program computer is a "universal tool" that can be programmed for all manner of tasks. This may be obvious but is worth repeating, because the programmable, general-purpose nature of computing makes it fundamentally different from an industrial technology like the railroad. Progress in software is less predictable than in hardware, partly because the imaginative breakthroughs come from the human intelligence, rendered in code, instead of the steady march of the physics of Moore's Law. Without low-cost, high-performance server clusters, Google could not exist, but the software algorithms are what produced a better brand of search.

"There is no evidence that this technology is really maturing or slowing down anytime soon," said Erik Brynjolfsson, a professor at MIT's Sloan School of Management. "To say the technology is mature is to totally miss the forest for the trees."

**The economic payoff.** While technology provides the opportunity, the human process of figuring out how to use the technology is what delivers gains in productivity. That seems to be the lesson of recent years when, in contrast with previous economic declines, productivity grew rapidly right through the recession, at nearly 4 percent a year since 2000. The

text analytics technology, IBM researchers can look for trends, buzz, and hints of shifting consumer attitudes, as deduced from Web postings. IBM is just beginning to sell this market intelligence as a service to companies. "It's the collective IQ of the Internet coming to your aid," says James Spohrer, director for services research at the Almaden labs.

Web Fountain is just one sign of the times at the Almaden labs, which is shifting its mission to supporting technology services instead of just hardware and software. The transition is partly a pragmatic business decision. Half of IBM's revenues and profits come from the company's big services group, so the research labs had better contribute to that side of the business. Yet the shift to services also reflects the company's belief in where value, and profits, will increasingly lie in the information technology business.

IBM's services business focuses on how the tools of technology are used to solve problems in business and society instead of focusing on the technology tools themselves. When Irving Wladawsky-Berger, one of IBM's leading strategists, defines this as an evolution toward a "post-technology era," he does not mean that technology matters less but that it is becoming much more a part of the fabric of everything. It represents a move up the technology food chain and out into new disciplines.

Many of the people being hired in IBM labs these days are not computer scientists

performance finally seems to have answered most of the longtime skeptics who doubted the economic payoff of technology—a skepticism dating back to the 1980s, when the Nobel Prize-winning economist Robert Solow famously observed that “you can see the computer age everywhere except in the productivity statistics.”

Recent studies of the technology/productivity link have been mostly at the microeco-

Andrew Davenport staff researcher, IBM

omic level, recognizing that it is the *people*, not the machines, who are more productive. These studies have focused on the adoption of technology, the culture of organizations, and the investment in the time and training needed to change work practices—all of which researchers sometimes call “organization capital.”

Investments in technology alone bring little or no benefit, according to MIT’s Brynjolfsson, a leading researcher in the study of technology and productivity. When blended with investments in technology, certain work practices yield the biggest gains. The companies that perform best, Brynjolfsson has found, use teams more often than their rivals. They decentralize work that requires local knowledge and interpersonal skills, like product design, sales, and on-the-fly adjustments on the factory floor. And they centralize and computerize work that is easily quantified, like running accounts payable systems and obtaining the lowest airline fares.

A striking conclusion from Brynjolfsson’s research is how large the investments in organization capital loom in most technological projects. One popular kind of technology-related investment at major companies in recent years has been installing an enterprise resource planning system, like SAP, to streamline and automate operations. Brynjolfsson estimates that in a \$20 million enterprise resource planning project, only 20 percent of the cost is for new hardware and software. The remaining 80 percent, or \$16 million, is spent on organization capital—re-designing work practices, retraining workers, and other such investments.

“The real unsung heroes behind the pro-



ductivity gains we’ve enjoyed in the economy are all those people doing quiet work inside companies,” Brynjolfsson observes.

The people best equipped to design and guide those technology-enabled improvements will be the broad-gauge technologists in the New Geek mold. The losers in the new economy will be workers whose jobs can be replaced by technology in the next decade or so, wherever they may be. Many customer service jobs could well be susceptible, once voice recognition software improves. “If you think call centers in India are cheap, wait until you see what software agents are willing to work for,” Brynjolfsson says.

The likely winners in the new global labor market, he adds, will be the people who can discover and invent new ways to use technology. And that extends even to technical jobs like software development. The jobs that can be described in a set of specifications are the ones being moved to India.

Routine coding is at risk, but the software designers and architects—who work with businesspeople or scientists to figure out how to use technology to solve problems—are very much in demand. That kind of work often requires technologists who can move and communicate graceful-

ly in more than one discipline.

Seema Ramchandani seems well prepared for that future. She grew up in Encino, California, and went to Brown University as a premed student. But after taking a computer science course in her sophomore year, she changed her mind and went on to get a master’s degree that combined computer science and neuroscience, which relies on computational tools to study the brain.

There are some intriguing analogies between biology and computing, and Ramchandani sees one discipline in the other. Some of her neuroscience research has involved patients with Parkinson’s disease, and she says, “A tremor is like an infinite loop in a computer.” And she sees similarities in genes and bits. Human beings, she explains, are “quatranary,” referring to the four letters A, G, C, and T, which identify the chemical units in DNA, while

computers are binary.

Ramchandani, who is 22, joined Microsoft last October. She regards her current work on the next version of Windows, code-named Longhorn, as an outgrowth of her fascination with both human cognition and engineering. Her interests are wide-ranging, and a discussion with her roams across social computing, neuroinformatics, computational vision, and her long-term goal in the field.

“How can I have the most impact on how people look at computing?” she says. “How can we make computing more accessible in every sense? Computing is still limited too much to people who understand the process with a capital P.”

Ramchandani speaks to one of the timeless frustrations in computing. Progress has certainly been made, yet her comments suggest the larger point: There is still no shortage of big opportunities out there in computing, waiting for people with original ideas and fresh perspectives. And they’re coming.

*Steve Lohr, a senior writer for The New York Times, has covered technology for more than a decade. He is the author of Go To: The Story of the Programmers Who Created the Software Revolution.*

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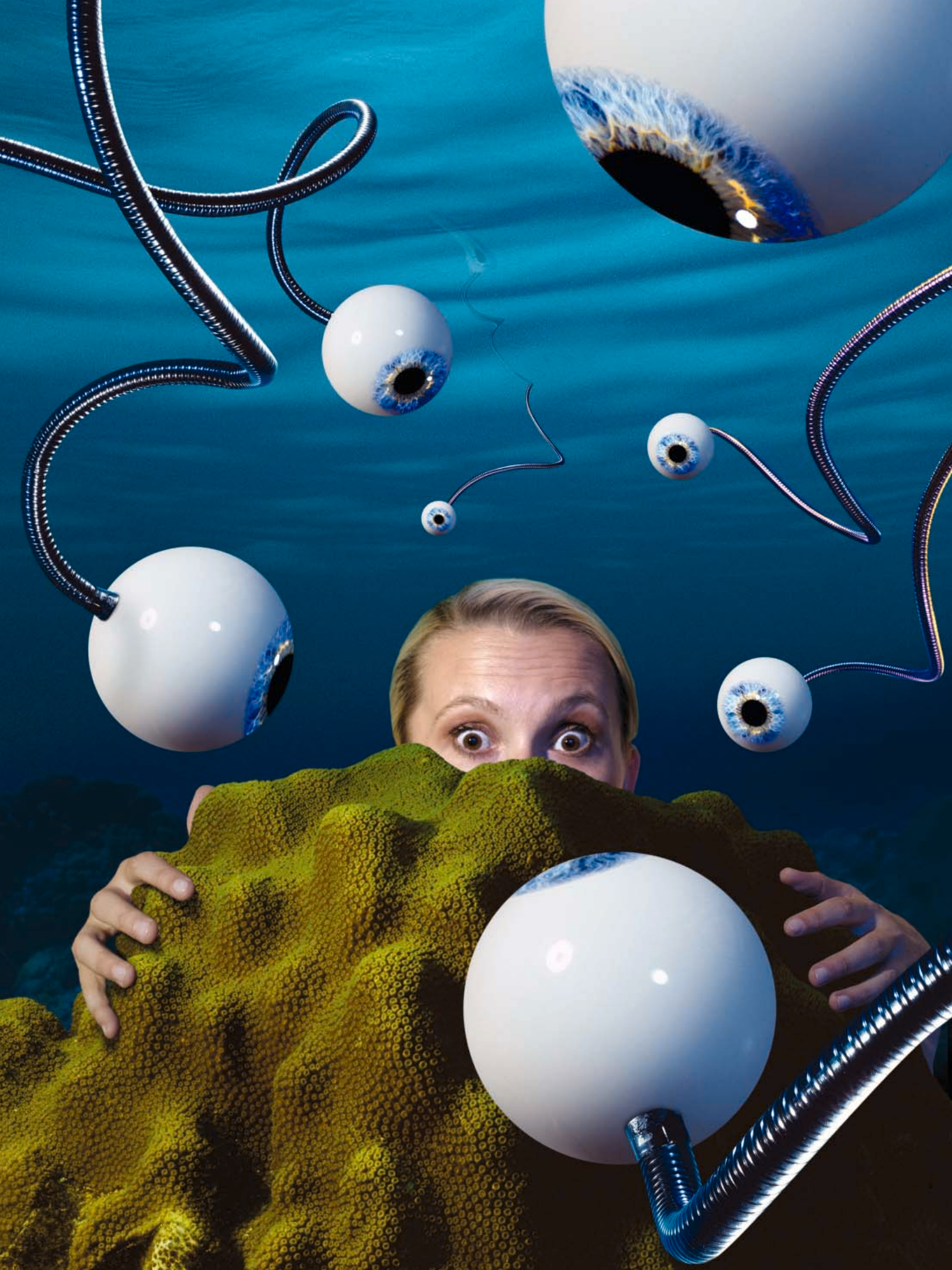


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# Nowhere to Hide

The average American is listed in at least 50 databases, and that's not counting government files. Do you know what's in your cyber dossier?

By Alan Cohen, Illustration by James Porto

**Y**our memory may not be what it used to be. You may be hazy on details. But don't worry. Scattered around the world—or maybe located in one convenient place—is the data of your life: which magazines you subscribe to, which credit cards you hold (and perhaps are late paying off), which highways you travel, which days you are late to work, and even how many cans of cat food you buy at Wal-Mart.

Your information is out there. And thanks to database technology that has become ever more pervasive, it can be aggregated and collated and turned into a startlingly comprehensive dossier on you in the blink of an eye. Okay, so maybe you should be a little worried.

One thing you should not be surprised.

After all, we asked for it. Indeed, many of the technologies that keep tabs on us are technologies that make our lives a whole lot more convenient than they used to be.

Who wants to wait in line to pay a toll when we can simply drive through an electronic toll lane and have the money collected automatically? Who wouldn't want to use GPS-enabled cell phones to track the kids on their way to school? Why remember a pass code for the office when we can simply swipe a plastic ID card at the front door instead?

These conveniences don't just capture data, though; they store it. Of course, all that saved data helps us too. When the boss says you're late, you can call up the records and prove that you weren't. When no one believes that you really ran the

marathon in 3 hours, you can pull up the running club's Web site and show the time recorded off the chip on your shoe.

Meanwhile, having so much data out there on so many people also raises questions. How is that information being used? Is it being shared? Are the toll collection people selling their data to the fast-food people, who then mail me coupons and maybe even call me? They know that I pass their restaurant every day.

More significant perhaps is the security of my data: Can someone find out enough about me to steal my identity and get me in all sorts of trouble? And most important of all, what privacy safeguards are out there to protect me?

Here's where you may be surprised: There are very few rules in place governing

how the data that is collected on you can be used. Privacy is often taken for granted as an inherent right of every citizen, but in fact the U.S. has one of the weakest privacy protection schemes in the developed world. The European Union, Canada, and Japan all trump us in terms of privacy.

"The U.S. is at the bottom of the heap," says Beth Givens, director of the Privacy Rights Clearinghouse in San Diego. "We're a patchwork of laws with gaping holes."

Yet while protections for private information lag, the technologies that can collect and sift through this data are getting more effective and cost-efficient. There's a huge business in data aggregation and analysis—collecting all the little chunks of personal data sitting in databases around the world and putting them in one big

um, and the security ID card for the office.

But RFID raises a host of privacy issues. What happens, for instance, after you start wearing that sweater with an embedded RFID tag? When you visit another store, couldn't another reader pick up the data in the chip, notice that you have on an extremely expensive sweater, and alert a salesperson to come by and hound you, on the assumption that you're the sort of affluent shopper who might spend a lot of money on clothes? What if the first store not only used the tag to record the sale but also tied your credit card information—and thus your identity—to the serial number in the tag?

Your sweater could then become a sort of homing beacon. Install enough readers and it wouldn't seem too hard to note

The irony is that technology itself can provide much of the answer to RFID privacy concerns, but technological solutions—at least in the short term—aren't terribly likely. More intelligence could be put on each tag: a password feature, for example, so that only readers with the right password could pick up the tag's data. Of course this would require more complex tags, which would only raise their price at a time when RFID makers are already under pressure to bring prices down.

Don't expect privacy laws to come to the rescue either. Technologies that could potentially track your every move—RFID and emerging technologies like location-enabled cell phones—would seem to warrant the strictest privacy protections (after all, what is more private than your com-

**"We can deploy these tools in a way that's respectful of privacy."**

database, which can then be accessed by anyone with any interest in your life: the government, prospective employers, landlords, insurers, and banks.

"There's something weird and creepy that these systems can build a better biography of me than I could myself," says Lee Tien, a senior staff attorney at the Electronic Frontier Foundation (EFF).

**The RFID revolution.** Privacy issues with respect to technology are particularly complex. Often the technology at hand is extremely useful, and we're loath to hold it back. Consider, for example, all the talk about radio-frequency identification (RFID). There's no denying that this is a very slick, very handy technology. At its core, RFID consists of two components: a small, inexpensive tag that contains an antenna and some data (typically, identifying information such as a product's serial number) and a larger, more expensive reader that beams radio waves at the tag and records its stored data.

Let's take a clothing store, for example. It puts RFID tags on all its sweaters. It then puts readers on the shelves, in the dressing rooms, by the cashiers, and at the door. The system lets the store automatically keep tabs on inventory, sales, and theft. You don't need much imagination to see why retailers—most notably Wal-Mart—are very keen on the technology.

And RFID isn't being used only in retail stores. It's the technology behind the automated-toll-collection tag in your car, the key fob that automatically records your snack purchases at the football stadi-

um, and the security ID card for the office. every political rally you've attended—or to find out whether you went to the movies the same day that you called in sick.

The bad news is that this is all entirely possible. The technology is readily available. Indeed, RFID was designed to be a pervasive system; that's part of the convenience. Readers in the factory and the warehouse need to read your sweater's tag just as much as readers in the store. Your toll collection tag is all the more useful if it can be read by readers on other roads in adjoining states.

The good news is that we're not quite at the Big Brother stage yet. RFID readers are not yet on every street corner. And even where they can read a tag, they need to under-

**Rob Atkinson** VP, Progressive Policy Institute

stand what the data means. To the reader, each entry is just a number. There has to be a mechanism for linking that number to individuals, which typically means access to a common database.

Unfortunately, the good news may not stay good for long. Tag and reader prices are dropping, which means you'll see more of them. And there are no rules in place regarding how RFID information is handled.

"It's a total free-for-all when it comes to privacy," says Kevin Bankston, an attorney with the EFF. "There's nothing to prevent a company from sharing data or using it how they see fit."

ings and goings?). But this is actually where your privacy protections are at their lowest.

"The privacy jurisprudence has not assigned any privacy value to what you do in public," says the EFF's Tien. "The way they see it, location-tracking technology is the equivalent of having a lot of innocent bystanders see what you're doing. The idea that there is privacy with respect to your movements is in embryonic form. It's an



PHOTOGRAPH BY KATHERINE LAMBERT

enormous loophole in privacy law.”

Every time you fill out a survey, send in a product registration form, buy a product online, or register a new car, that information is recorded somewhere in some database. Indeed, the average American is in at least 50 databases, according to the EFF, and that's just counting commercial databases—not all the ones that various branches of the government operate. As computing power increases, database technologies improve, and storage costs decrease, collecting all this information in one place and sifting through it become increasingly easy. Not only can you look for information about specific people, you can reverse the research method and identify people who fit specific criteria.

This technology, called *data mining*, has

data it wants to look through, nor what sort of patterns or profiles will set off alarms. That's part of the trade secret. But the idea has left a lot of people wary. This isn't a case of seeking information on a known person authorities have probable cause to suspect. This is a case of zeroing in on previously unknown individuals because the data on them fits a pattern. And there's concern that innocent people will suddenly be targets of investigation, solely on the basis of their data profiles.

So when word got out in 2003 that the Pentagon was developing a data-mining system called Total Information Awareness (TIA), the public outcry was so quick and loud that Congress took the extraordinary step of shutting down the project in September 2003. Still, one can make a

we want to insure our right to be left alone. Often, in the rush for the benefits, privacy suffers. Yet sometimes, attempts to protect our privacy cripple or even jettison a promising technology.

“It was a mistake to stop the research on TIA,” says Robert Atkinson, vice president and director of the Technology & New Economy Project at the Progressive Policy Institute in Washington, D.C. “People panicked. But we shouldn't panic. Part of the research going into TIA would include privacy tools.”

The obvious challenge is to figure out how to balance benefits and privacy. “We need this technology,” Atkinson says. “Terrorists have an advantage, the ability to act stealthily in small cells. It's a new type of threat to the U.S. Well, we have a new de-

“There's something weird and creepy that these systems can build a better biography of me than I could myself.”

been getting a lot of press lately. The federal government has been a key proponent of it, particularly after 9/11, viewing it as a potentially powerful way to identify terrorists. With a wealth of data in one place, software can scan through the information, looking for patterns and flagging suspects who fit a certain profile.

The government hasn't said what sort of

good case that Congress didn't solve the problem but just put it off for a later date.

There are good reasons to be wary of such systems. “With a dragnet approach like TIA, you dramatically increase the chances of innocent people being labeled as terrorists,” said Barry Steinhardt, director of the ACLU Technology and Liberty Project, in his testimony before a House subcommittee last year. But there are also good reasons to embrace such systems.

Admiral John M. Poindexter, former director of the Information Awareness Office at the Defense Advanced Research Projects

fense: information technology. Privacy groups are saying, ‘Let's kill the technology,’ but what we need are rules and procedures. We can deploy these tools in a way that's respectful of privacy.”

**The Megadatabases:** For now, the rules and procedures are proving awfully hard to come by. TIA may be dead, but federal and state governments are still pushing the megadatabase concept. Even if they're not actively looking for patterns, just having so much information in one place—criminal records, motor vehicle records, credit information, and so on—is an enormous tool for law enforcement. Had such a tool existed prior to 9/11, perhaps someone

would have homed in on a hijacker with all those pieces of information in one big database, presenting a fuller picture and raising a red flag.

We can easily see why there is a rush to put such tools in place. But in its haste, the government is putting privacy rules on the back burner. Consider, for example, the new system being proposed to screen high-risk airline passengers.

To be sure, CAPPS II, as the system is called, is no TIA. Instead of mining data for patterns, CAPPS II would take a more traditional query-based approach. Type in a passenger's name and the system will look at information about that person in various government and commercial databases to assign a security risk. The risk level will determine the level of scrutiny that passenger receives at the airport, from

PHOTOGRAPH BY ROBERT CARLIN



**Lee Tien** Senior staff attorney, Electronic Frontier Foundation

Agency (DARPA), wrote an op-ed piece for *The New York Times* just before Congress canceled financing for the program. “The amount of data available to the federal government far exceeds the human capacity to analyze it,” Poindexter wrote. “This has long been the case, but since 9/11 the need for better tools to help America fight the war against terror has become even more urgent.”

TIA demonstrated the fundamental conflict that often arises between technology and privacy: We want the benefits of convenience and safety that new tools can bring us, but at the same time

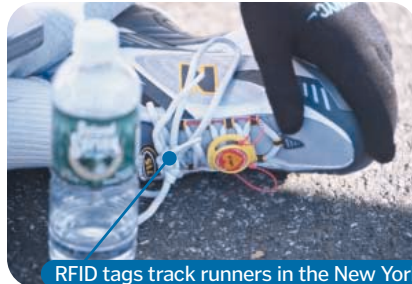
normal checkpoint screening to in-depth questioning to outright detention.

The benefit is clear: using megadatabases full of information to weed out security risks. But again, important privacy issues are at hand. What happens, for example, if one bit of information CAPPS II has on you is flat-out wrong? What if you're suddenly a red-flagged security risk? Good luck flying to Grandma's ninetieth-birthday party.

Privacy protections are in place to let you fix certain kinds of data errors. For example, the Fair Credit Reporting Act provides a mechanism for correcting mistakes on your credit report. But those protections don't apply to CAPPS II. Indeed, you won't even know what sources the government is using to obtain its data. That again is part of the trade secret. When the General Accounting Office, the investigatory arm of Congress, released its analysis of CAPPS II in February, it criticized the system for having "no redress process for those who believe they

court records, bankruptcy filings, corporation filings, and state sexual offender lists. The data, Seisint notes, is made up of "public records and commercially available information from reputable sources."

Advanced technology means that all this information can be collected, stored, and sifted with ease. Harder, however, is fixing your data profile if one of those billions of data records turns out to be incorrect—especially if you don't know where that data is coming from or with whom it



RFID tags track runners in the New York City Marathon.

politicians go for sweeping laws, they get beaten up by everyone," says Tien at the EFF. "It's easier to make compromises when dealing with a single industry."

Ironically, the technology industry—not legislation—may prove the best bet for privacy protections in emerging technologies. Not that the industry is suddenly putting privacy ahead of profits. With a public that's becoming increasingly savvy and protective about its privacy—witness the TIA controversy—sharing this concern is in the industry's own best interest. "If they don't build privacy in and they get found out, they look bad," Schwartz remarks. "Their name gets tarnished."

Optimistic signs are emerging, as organizations that create technical standards are starting to factor in privacy. The Internet Engineering Task Force's Geopriv group has mandated that any new standards dealing with location tracking must incorporate privacy safeguards. Retailers are

promising to deactivate the RFID tags they put on clothes. State governments are discovering the PR value in privacy too. Once the public found out about a fledgling law enforcement data-mining project called Matrix (operated by Seisint), 11 of the 16 states in the project opted out, and no new states have signed on.

But this sort of self-regulation requires that the public actually find out about what's going on. "It's scary, because we don't always find out," says Schwartz.

Sometimes, our biggest threat to privacy is ourselves. The technology is so slick and the benefit so real that we're willing to take a self-inflicted hit on privacy. One recent example: Google's upcoming Gmail service, which will offer one gigabyte of storage, will scan all incoming messages and serve up ads based on the content—which, of course, is sometimes very personal. Gmail will save messages on Google's servers even after we've deleted them, for reasons untold. Already 30 civil-liberties groups and other organizations have written to Google, saying that Gmail is a bad idea. So far, Google has no plans to change the service. (Google was unable to comment because of SEC 'quiet period' regulations covering its upcoming IPO.)

Maybe if we're talking just a few megabytes of storage, the company would change its policy. But a gigabyte is awfully cool.

*Alan Cohen is a frequent contributor to Fortune Small Business and The American Lawyer, as well as PC Magazine.*

GPS-enabled cell phones can keep track of the kids.

are erroneously labeled as an unknown or unacceptable risk."

Already, systems like CAPPS II are all around us, at least in the commercial arena. In Boca Raton, Florida, a company called Seisint has spent \$100 million to develop its Data Supercomputer, a multiprocessor behemoth that can access and analyze billions of records in seconds. And Seisint has billions of records. Its Web site calls the company "a master code repository of current information on people and businesses comprised of tens of billions of records from thousands of sources."

Over 2,500 federal, state, and local law enforcement agencies access this data. So, too, do employers screening job applicants, insurance companies investigating prospective policy holders, lawyers wanting info for an investigation or for jury selection, landlords looking to avoid deadbeat tenants.

Accessing this information is easy via the convenient Web-based interface. It's not expensive to do, either. Seisint's ad for one of its data services reads: "With Accurint you can instantly find people, their assets, their relatives, their associates, and more. You can search the entire country for less than the cost of a phone call—a quarter."

Where is this information coming from? That's yet another trade secret, but Seisint's data use policy serves up a few examples, including FAA pilot licenses, property ownership records, state and county



is being shared. What if all the landlords in the country now have you down as a risky tenant because they've all obtained the same report from Seisint, which is based on a court record that in fact didn't involve you but someone who shares your name?

"The key to privacy is that users need to be in control of their data," says Ari Schwartz, associate director of The Center for Democracy and Technology in Washington, D.C. "If the key point of a technology is to find out about a user, it's difficult to put the user in control."

**Law and order.** Privacy laws in the U.S. are a notoriously piecemeal affair. Unlike the European Union, we have no comprehensive privacy law. Instead, we have a collection of individual laws covering—to various degrees—specific areas, such as credit reports and medical and financial records. The results can seem arbitrary, even bizarre. No laws cover RFID or location-tracking cell phones, yet your video rentals are protected information. In short, the whole world can know that you crossed the George Washington Bridge at 7:04 P.M. last March 23, but no one can ever legally find out that you rented *Happy Gilmore*.

While privacy laws have been beefed up recently in some areas (most notably with respect to medical records), attempts to introduce EU-like all-in-one privacy protections have gone nowhere. "When



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# Nanotechnology: SIZE MATTERS

Incubating inside this tiny world are some big ideas that could improve everything from manufacturing to health care.

BY JIM AKIN

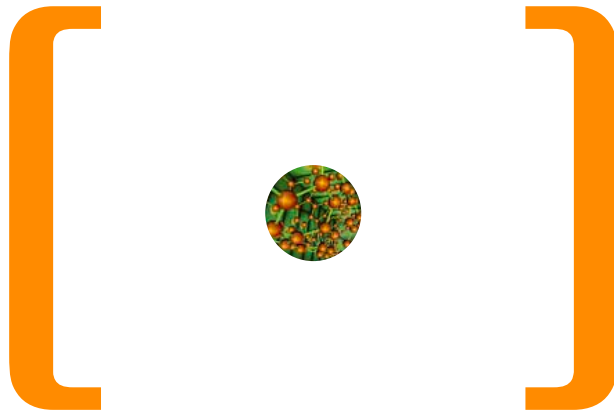
**n**ews that a colleague's baby has taken some first tentative steps usually merits little more than polite congratulations or an obligatory glance at some e-mailed images. When Nadrian ("Ned") C. Seeman and William B. Sherman of New York University recently made such an announcement, however, it earned coverage in several scientific journals.

The attention had to do with the new walker's size, which is very small for its age—or any age. A pair of legs and feet constructed from DNA strands, the walker stands just 10 nanometers tall—or roughly  $\frac{1}{25,000}$  the diameter of the period that concludes this sentence. Seeman says the walker's stroll along a DNA sidewalk is "a natural outgrowth of work that's been done before."

Seeman and Sherman, who christened their pride and joy A Precisely Controlled DNA Biped Walking Device, make clear that the walker has no practical application. And even though he calls it "the robot," Seeman seems wary of characterizing it as a harbinger of submicroscopic automation. He does, however, see the possibility of some practical uses.

"We're going to look at longer sidewalks," he says. "Eventually we might have it try to carry a load. We'll probably also look into using it for polymer deformation—maybe using circular sidewalks and have them holding strands and twisting or braiding them."

Bragging rights and applications aside, Seeman sees the walker as one more event in an accelerating series that is transforming nanotechnology from science fiction to science fact—developments that are making nanotechnology a very exciting field to be in right now.



"I figured out this was going to be fun in 1980," Seeman says. "Now that I've been working in this area for nearly a quarter of a century, it's really starting to snowball."

**Radical breakthroughs.** *Nanotechnology*—engineering at the molecular level to create useful substances and devices—is no longer just the stuff of rumor and futuristic visions. It has begun to spawn viable businesses and useful products, and it's already touching our lives in many ways. Nanotech products may be found in the car you drive and in the paint on your walls. They are enhancing medical diagnostics, improving the composition of building materials and plastics, and paving the way for radical breakthroughs in electronics and computer technology. Make no mistake: Engineering on very small scales is a very big deal.

the unit of measure that gave nanotechnology its name—is one-billionth of a meter. A hydrogen atom, which is the smallest elemental particle in nature, has a diameter of about  $1/10$  nm; a human hair is about 75,000 nm in diameter. A typical molecule of the complexity required for nanotech development might comprise 100 atoms and measure 1 to 10 nanometers in diameter.

Nanotech is also misunderstood because of baggage from its purely theoretical past: It has been touted as the key to ending disease and pollution, to enabling desktop factories where invisible robots build anything imaginable, and even to conferring virtual immortality. It has simultaneously been tagged as a potential scourge, capable of loosing armies of nanobots that could elbow humans aside or blanket the earth in a gray goo of molecular byproducts. Not

scribe a then-theoretical molecular manufacturing process involving parts or devices with dimensions of 1 to 100 nm, a size range he dubbed *nanoscale*. Today, Drexler laments that his word has become practically meaningless, and he leads a crusade to limit the scope of nanotechnology to nanoscale objects built from the bottom up with molecular building blocks, as opposed to devices created from the top down through miniaturization.

The bottom-up distinction focuses on the strange influence of quantum effects on structures built at the molecular scale. In nature, quantum forces are normally confined to the insides of atoms and the bonds between them. But when molecules are assembled in new ways from the bottom up, quantum effects can give them bizarre but very useful physical properties. Examples include an excep-

## Nanotech reality lives up to neither the hype nor the horror.

The NanoBusiness Alliance, an industry trade organization, predicts a global market for nanotech products and services of \$1 trillion by 2010. The National Science Foundation forecasts that the market in the U.S. alone will reach \$1 trillion by 2016. Most U.S. states have established programs or agencies to encourage nanotechnology research and business development. And the federal government, characterizing nanotech as nothing less than a matter of national security, has increased funding from \$422 million in 2000 to a total of \$3.8 billion earmarked for research from 2005 to 2008. Federal nanotech funds are distributed through numerous agencies, including the Department of Defense, the Department of Energy, NASA, and the National Nanotechnology Initiative, a program that promotes and funds projects around the country.

Despite this tangibility, nanotech can be hard to pin down. In this story, we brush off the hype and explore the real promise of nanotech in each of its forms.

**Let's get really small.** One reason for nanotech's slippery nature is that nanotech happens on a scale that's almost inconceivably small. A *nanometer*—

surprisingly, nanotech reality lives up to neither the hype nor the horror.

The final and most significant source of nanotech confusion is semantic. To a certain extent, its definition depends on whom you ask.

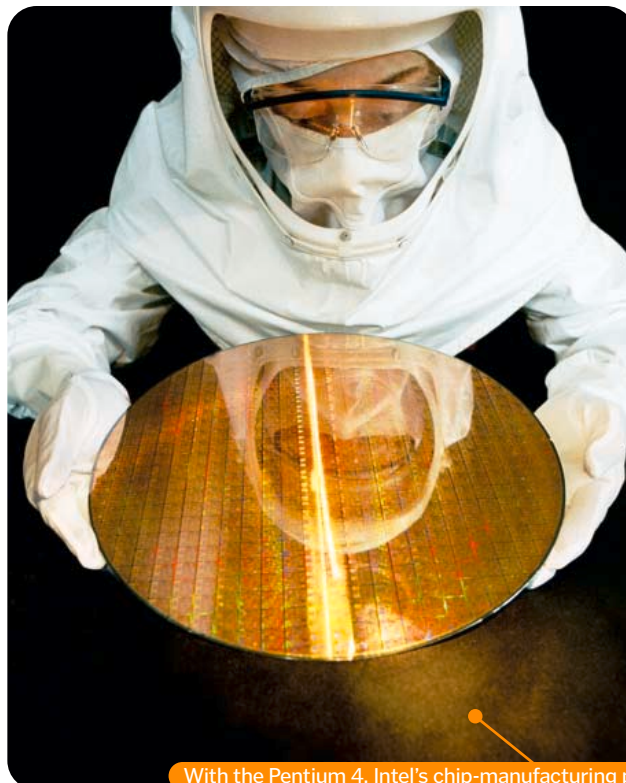
Theorist K. Eric Drexler invented the word *nanotechnology* in the 1980s to de-

scribe a then-theoretical molecular manufacturing process involving parts or devices with dimensions of 1 to 100 nm, a size range he dubbed *nanoscale*. Today, Drexler laments that his word has become practically meaningless, and he leads a crusade to limit the scope of nanotechnology to nanoscale objects built from the bottom up with molecular building blocks, as opposed to devices created from the top down through miniaturization.

The top-down/bottom-up distinction is important; much of nanotech's promise lies in the exploitation of quantum properties. But Drexler and fellow purists have already lost the battle. For better

or worse, marketers have extended nanotechnology to include any product or process with a dimension under 100 nm, and common usage even stretches the term to include MEMS (microelectrical mechanical systems)—a class of microscopic devices machined using techniques borrowed from microchip production, including motors, gear systems, gyroscopes, and accelerometers that deploy car airbags. Dwarfed by dust mites, MEMS are ultrasmall by almost any standard, but they loom as much as 1,000 times as large as nanoscale objects.

The broad definition of nanotech has the practical advantage of focusing attention on the borderland between the smallest products of miniaturization and the largest products of molecular construction. In the next



With the Pentium 4, Intel's chip-manufacturing process moved into the nano-range.

PHOTOGRAPH COURTESY OF INTEL



few years, hybridization of top-down and bottom-up components and technologies will make this middle ground the site of important if incremental technological advances. Those strides in turn will pave the way for more radical technical shifts in the future.

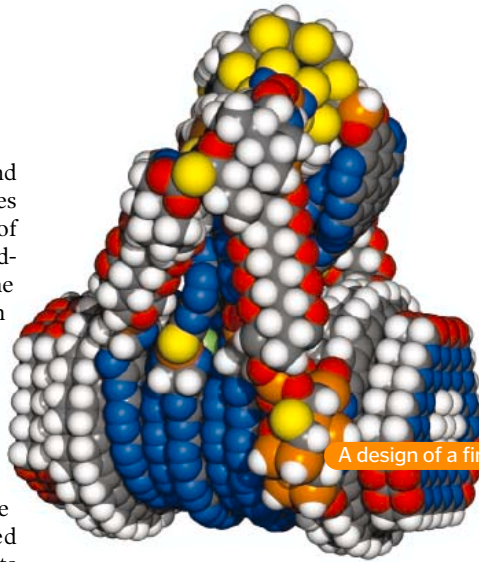
**Circuit training.** At Intel, the processor development road map for the next decade calls for the continued miniaturization of current chip architectures, with provisions for the coexistence with new nanotech-based computing technologies. Intel expects its standard production processes to reach their limits around 2011, when 22-nm equipment will reduce chip transistor size to 10 nm, down from the 50 nm possible with the 90-nm process used on the Pentium 4.

For transistor sizes below 10 nm, Intel says it is “open-minded about options.” The company is exploring the possibility of scaling its CMOS chip designs even smaller, using new production techniques. Intel is also researching and planning to integrate its hardware with alternative technologies that nanotech makes possible. These include quantum processing that promises to go beyond binary, replacing the bit with the *qbit*. In the *qbit*, an individual electron can signify 1, 0, or a third intermediate position, enabling new approaches to logical operations.

Complex nanomolecules called *dendrimers* can be used to map circuits. Developed at the Michigan Molecular Institute (MMI) and sold commercially through its affiliate company Dendritech, dendrimers are nested molecular spheres. Each layer has a unique composition, depending on the dendrimer’s function, and—most critically for circuit design purposes—dendrimers are produced in discrete sizes. “They come in sizes from 1 to 10 nm in diameter, and the sizes are very precise,” says Petar R. Dvornic, senior research scientist at MMI.

With an instrument capable of moving nanoparticles, such as an atomic-force microscope, a researcher can build a 2D circuit by placing dendrimers in an array. “You can design whatever you need as an arrangement of little balls that are all the same size,” Dvornic says. “If you want a conductor, you can use a little ball filled with copper. If you want an insulator, use a ball filled with material you can burn off with a laser to create an air space.”

Mass production with dendrimers isn’t possible today. But Dvornic points out that



A design of a fine-motion controller for molecular assembly

it’s not too great a leap to envision such a process as similar to current printing or etching: A 2D dendrimer array is essentially a dot matrix, and dendrimers with different functions can be thought of as inks.

Meanwhile, at ZettaCore headquarters in Denver, engineers are harnessing nanotech to build computer memory technologies that promise giant increases in storage density. They have devised a way of storing information in molecules that mimics the energy storage process of living cells. ZettaCore’s manufacturing approach includes the use of enzymes and metabolic processes that enable self-assembly of molecular components. ZettaCore is pursuing *hybrid memory technology* that would use standard memory fabrication techniques to layer its molecular storage media with conventional chip substrates.

**Totally tubular nanotubes.** Nantero, a start-up in Woburn, Massachusetts, is working on a competing memory technology that could also double as a data storage medium. The method stores data by flipping electrons in structures called *carbon nanotubes*—a class of nanotech products that is likely to play a big role in any nanocomputing architecture.

Nanotubes are carbon cylinders 1 or 2 nanometers in diameter and structurally similar to seamless rolls of chicken wire. They are prime examples of the weird properties quantum effects can produce in nanoscale structures. Carbon nanotubes (CNS) can serve as nanowires in molecular computers, thanks to a quantum property called *electron tunneling*, which lets them propagate electrical signals at scales where ordinary current flow is impossible. A research team from Hewlett-Packard, Caltech, and UCLA pioneered the now-common use of nanowires to connect separate molecular computing components.

Even weirder quantum properties of

nanotubes are the basis for research into the possibility of carbon-based integrated circuits. Variations in nanotube geometry—such as wrapping the chicken wire spirally like a paper-towel tube, at different pitches and diameters—make CNS act as semiconductors. Researchers at IBM have created nanowire switches, transistors, and other components by testing

the inputs and outputs of CNS in bulk. Along with others, IBM is pursuing the resulting possibility of processors in which the logic is literally in the wiring.

Custom production of carbon nanotubes with specific attributes is still a distant dream. But nanotubes that are produced in bulk—via processes that yield all variety of tube lengths, diameters, and geometries—are one of nanotech’s hottest products and are fast becoming a mini-industry in themselves.

Carbon nanotubes’ unique electrical characteristics are not their only useful properties. CNS are stronger than Kevlar and more durable than diamonds; adding them in even small fractions can enhance fibers and composite materials significantly. CNS don’t corrode, and they won’t burn under normal conditions. They can be used to make plastics electrically conductive. These attributes have made CNS popular with all sorts of manufacturers.

Toyota, for example, adds a CN-based composite to its plastic car bumpers and door panels. Besides making these parts stronger and reducing their weight, the resin makes the plastic electrically conductive, allowing it to be coated with the same electrical-bonding paints used on metal parts.

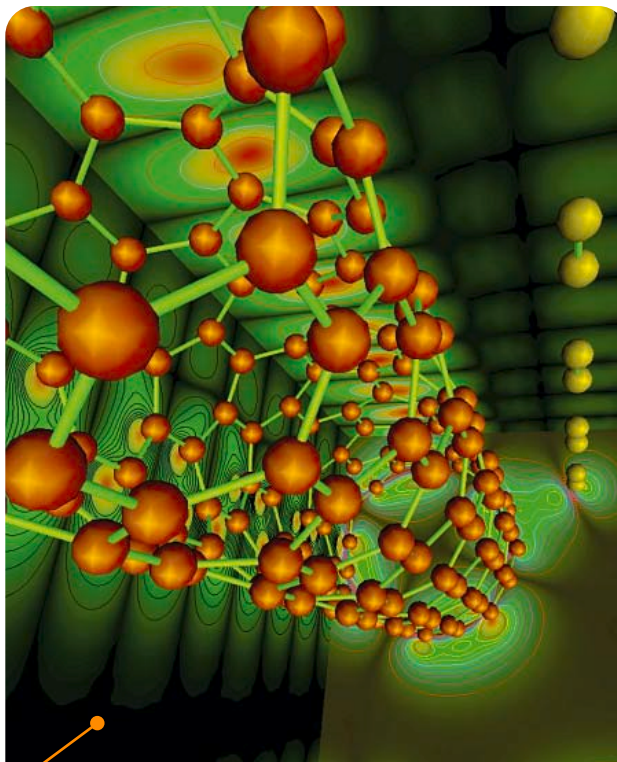
Another application for bulk CNS takes advantage of yet another funky quantum property: Thanks to electron tunneling, a film of CN composite layered on a conductive surface produces an array of highly focused electric fields that can light the phosphors in a video display. Samsung and others have used CNS in this way for low-power displays and HDTV screens.

Meanwhile, NEC and Sony are jointly developing a laptop battery that draws on carbon nanotubes’ capacity for storing chemical energy. The companies claim that the battery will last weeks between charges. Mitsubishi and Motorola are also pursuing CN-based batteries, which offer the potential of assuming any shape or even being embedded in a device’s plastic casing.

**Consumer nanoproducts.** Eric Drexler's visions of subatomic robo-factories still qualify as smart science fiction, but the age of nanotech-based consumer products is well upon us. (Some argue that it began long before there was a name for it: Charcoal, for instance, was a key additive to auto tires long before anyone knew it provides nanoparticles that stabilize rubber polymers.)

The era of intentional nanotech-based consumer products is generally considered to have begun in the sun: Nanoscale zinc oxide flakes developed by Nanophase Technologies make invisible sunscreens possible. The tiny nanoflakes reflect harmful ultraviolet rays. But unlike larger flakes, they are too small to scatter visible light—and therefore don't appear white, like a life-guard's nose. More recently, Nanophase has begun producing nanoparticle additives that keep the surfaces of floor tiles shiny.

Japanese industrial giant Nippon has found a variety of uses for nanoparticles composed of titanium dioxide, a com-



The carbon nanotube shown here is one of nanotech's most exciting developments.

green, another red, and so on. Regardless of their bulk color, nanoscale crystals of any LED can fluoresce in any color of the rainbow. The shade varies with each crystal's diameter. (Smaller crystals glow blue; larger ones glow red.)

Engineers at Quantum Dot design nanocrystals of precise size and color and

effective if not quite elegant. "Once the dendrimer gets to the target," says Dvornic, "you explode it with a laser, and the pieces of the dendrimer are all absorbed safely into the body. Capsule layers that change structure at different pH levels also show promise." These could prove effective in organs such as the stomach or kidneys, which differ in acidity from other parts of the body.

At iMEDD in Columbus, Ohio, nanotech research focuses on yet another approach to high-precision drug delivery. iMEDD has developed under-the-skin implants that store drugs and deliver them through porous membranes. iMEDD custom-matches the pores in an implant to the molecules of the drugs it delivers, thus regulating dosages and delivery rates very precisely.

**Dream small.** Whether we realize it or not, nanotechnology is already making an impact on our lives. Nanotech products have already made significant contributions to materials science and to applications from makeup to medical imaging. But nanotech

## Nanotech is already improving disease detection and diagnosis.

pound that interferes with biological processes when stimulated by light. Nanoparticles added to glass are invisible (like Nanophase's sunscreen) but make it dirt-resistant. Added to paint, Nanoparticles can kill bacteria in hospitals and other sterile environments.

Nanotech has a more direct role to play in health care too, and it is already bringing significant improvements to disease detection and diagnosis. A large category of commercial nanotech products is semiconductor nanocrystals, also known as *Q dots*—nanoscale chunks of semiconductor material that tag disease indicators, such as cancer cells or HIV antibodies. Q dots, produced by Quantum Dot, harness a quantum effect that makes nanoscale particles of light-emitting semiconductors (such as LEDs) behave differently from their macro-size counterparts.

Macro-scale (also known as bulk) semiconductors, such as LEDs, owe their characteristic colors to their chemical composition—one formulation glows

attach them to "seeker" molecules, such as antibodies or DNA strands, that bind specifically to test substances. Injected into patients' bloodstreams or combined with lab samples, the carriers bind to their targets, which can then be revealed by shining light on the nanocrystals; this is possible even through several inches of skin and tissue.

Dendrimers, the class of nested-sphere molecules that can be used for circuit design, have also proved useful in medical diagnostics, and therapeutic techniques that use them are now under development, according to MMF's Dvornic. He explains that a specialized drug delivery dendrimer might consist of a center sphere of medicine, a surrounding container layer to prevent the drug's escape, and a sticky outer surface to which seeker agents can be attached. The seekers carry the sphere to its target, where the drug is released.

The release mechanism is still a work in progress, but one method has proved

is still in its infancy, analogous at best to a souped-up abacus in a world of computers.

Expect more development to come fast in the next decade: Aggressive research and commercial and industrial investment will propel nanotech forward. Competing approaches to nanocomputing will begin sorting themselves out; the gadgets we use will contain components based on molecular technology. Cheap, plentiful carbon nanotubes used in indestructible plastic will make auto body shops endangered businesses—and recycling a new imperative.

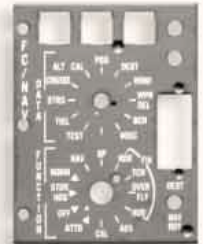
Nanobot research will continue, presumably at a pace considerably brisker than Seeman's nanowalker manages today. Infinitesimal factory workers and smart agents will still be science fiction, but who knows? Bipedal bots might find work weaving microfilaments or doing more sophisticated chores. And in between jobs, maybe they'll dance.

*Jim Akin is a technology writer.*

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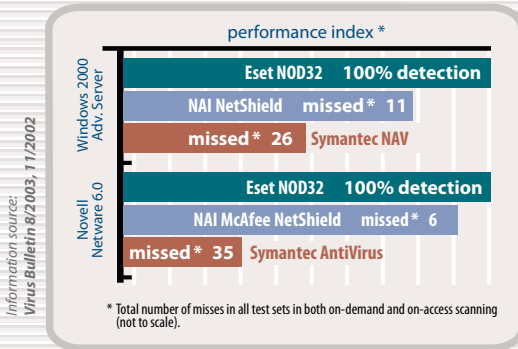


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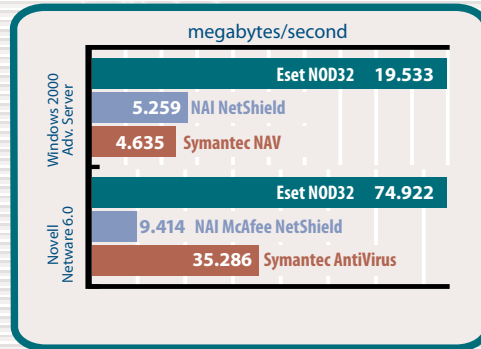
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For professionals on the go, here are 16 business notebooks that offer both power and productivity.

# road-ready notebooks

By Konstantinos Karagiannis > Photography by Bill Westheimer

**N**ot long ago, having a notebook assigned to you at work depended on how much traveling you did. Buying trends have shifted, however, as more companies are choosing notebooks for everyone—both travelers and the desk-bound. No matter which group you fall into, work is no longer just for the office. More people are multitasking on their commutes home, after dinner, and on weekends.

Deciding on which portable will fill such an important role is no easy task. First, there's a difference between corporate notebooks and business notebooks. Both kinds typically have the same hardware, but *corporate notebooks* appeal to big companies that buy fleets of notebooks, because they come with special software that helps admins manage them (discussed in "Better Corporate PCs," April 6). Equally important is compatibility: Ideally, docking

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stations and AC adapters should work with old and new notebooks. Corporate notebooks come from the likes of Dell, Gateway, HP, IBM, MPC, and Toshiba.

*Business notebooks*, the focus of this story, have less refined compatibility and no management software and are typically aimed at individual buyers and smaller businesses. Manufacturers here include the aforementioned companies and Acer, Fujitsu, Velocity Micro, and WinBook.

Buyers can choose between mainstream machines and ultraportables. Mainstream models are often more robust, while the main goal of ultraportables is to lighten the load in your briefcase significantly.

We've seen the Pentium M prevail and a quick adoption of wireless 802.11g solutions in both notebook types. In late 2004, we can expect more significant improvements. The forthcoming Intel Alviso chipset will take even better advantage of the latest Pentium M chips, with support for faster DDR2 memory, the PCI Express bus (which is faster than PCI), Serial ATA drive interfaces, and better graphics and audio. Also, the Centrino platform will finally support 802.11a/g.

With these technological advances, especially the increase in wireless usage, security is a growing concern. Smart cards,

## Mainstream: HP Compaq nc6000 Ultraportable: IBM ThinkPad X40



Selecting an Editors' Choice in the business mainstream category was a difficult task, but at the end of the day (literally), we chose the HP Compaq nc6000. Aside from its good design, the nc6000's components, like a 1.8-GHz Pentium M processor and an eight-cell battery, helped it garner excellent performance test scores and show outstanding battery life—two things every road warrior craves. Honorable mention goes to the IBM

ThinkPad T42, also a sturdy system with solid components. It is less expensive than the nc6000 but lacks some of the components that place the HP model above the other notebooks in our roundup. We'd be remiss not to mention IBM's five-star management utilities. As we recently reported ("Better Corporate PCs," April 6), IBM continues to go the extra step in providing tools to ease IT pain.

In the ultraportable category, there was no contest. The IBM ThinkPad X40 receives Editors' Choice for its light weight, sturdy yet elegant design, and comfortable full-size keyboard. The X40 also had impressive test scores and a battery life of over 6 hours.

already popular in Europe, are slowly beginning to catch on in the U.S. Companies like Fujitsu, HP, and IBM have also added the Trusted Platform Module (TPM) chip to their notebooks. Built into the motherboard, this part creates an authentication key that is stored in silicon. Running algorithms within itself, the TPM chip off-loads encryption and authentication tasks from the CPU, enabling powerful ways of veri-

fying your machine's identity to networks and protected resources, particularly when used in tandem with fingerprint sensors and smart cards.

TPM and smart cards are already available in business notebooks, though some buyers may be waiting for the Alviso chipset to receive all the new features. But for those who can't wait, here are 16 road-ready notebooks on the market now.

PHOTOGRAPHY BY THOM O'CONNOR

### SUMMARY OF FEATURES

## Business Notebooks

■ YES □ NO	MAINSTREAM							
	Acer TravelMate 8000	Apple PowerBook G4 (15-inch)	Dell Latitude D600	Fujitsu LifeBook S7010	Gateway 450XL	HP Compaq nc6000	IBM ThinkPad T42	
Price (tested configuration)	\$2,499 list	\$2,499 direct	\$2,377 direct	\$2,259 direct	\$2,312 direct	\$2,299 direct	\$2,029 direct	
Processor	Pentium M 745 (1.8 GHz)	PowerPC G4 (1.5 GHz)	Pentium M 745 (1.8 GHz)	Pentium M 735 (1.7 GHz)	Pentium M 745 (1.8 GHz)	Pentium M 745 (1.8 GHz)	Pentium M 735 (1.7 GHz)	
Installed RAM	512MB	512MB	512MB	512MB	512MB	512MB	512MB	
System/travel weight (lbs.)	6.6 / 7.5	5.7 / 6.5	5.4 / 6.3	4.3 / 5.1	6.3 / 7.5	5.7 / 6.6	5.0 / 5.8	
Screen (measured diagonally)	15-inch UXGA	15.2-inch WXGA	14.1-inch SXGA+	14.1-inch XGA	15-inch UXGA	14.1-inch XGA	14.1-inch SXGA+	
Key pitch (mm)	19	19	19	19	19	19	19	
Pointing device	Touch pad	Touch pad	Pointing stick, touch pad	Pointing stick, touch pad	Touch pad	Pointing stick, touch pad	Pointing stick, touch pad	
Graphics chip set	ATI Mobility Radeon 9700	ATI Mobility Radeon 9700	ATI Mobility Radeon 9000	Intel 855GME	ATI Mobility Radeon 9600	ATI Mobility Radeon 9600	ATI Mobility Radeon 9600	
Hard drive capacity	60GB	80GB	80GB	80GB	60GB	60GB	40GB	
Optical drive	DVD±RW	SuperDrive (DVD-R/CD-RW)	DVD+RW	DVD±RW	DVD-RW	DVD/CD-RW	DVD/CD-RW	
Built-in wireless type	802.11g	802.11g	802.11g	802.11g	802.11b	802.11a/g	802.11g	
Parallel/serial/VGA ports	■ ■ ■	□ □ ■	■ ■ ■	□ □ ■	■ ■ ■	■ ■ ■	■ □ ■	
USB/FireWire ports	4 / 1	2 / 2	2 / 0	3 / 1	2 / 1	2 / 0	2 / 0	
Memory card types accepted	Memory Stick, MultiMediaCard, Secure Digital, SmartMedia	None	SmartMedia	None	None	Secure Digital	None	
Standard lithium ion battery	4.8 Ah	4.6 Ah	4.7 Ah	4.8 Ah	4.2 Ah	4.4 Ah	4.4 Ah	
Fingerprint/smart-card/TPM security	□ ■ □	□ □ □	□ ■ □	□ ■ ■	■ □ □	□ □ ■	□ □ ■	
Warranty on parts and labor	1 year	1 year	3 years	1 year	1 year	3 years	1 year	

RED denotes Editors' Choice. \* IBM and Sharp each offer an optional external optical drive.

# mainstream

Road warriors demand fast, reliable systems that have full-size keyboards, crisp screens, and embedded wireless capabilities. Mainstream business notebooks are up for the challenge, offering an appealing balance of power, productivity, and portability. >>>

## >> Acer TravelMate 8000

1.8-GHz Pentium M 745, 512MB DDR SDRAM, 60GB hard drive, 15-inch UXGA display, 802.11g wireless, \$2,499 list. Acer America Corp., www.acer.com.

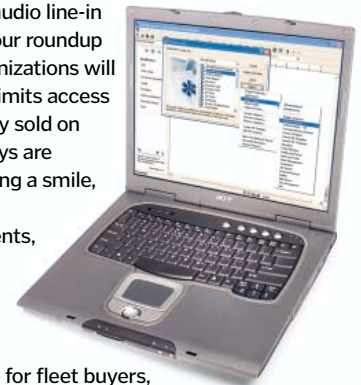
The Acer TravelMate 8000 is a little heavy, but if you don't travel often, it's hard to beat this 6.6-pound portable. It comes loaded with a 15-inch display; an ATI Mobility Radeon 9700 graphics chip; a fast 60GB, 7,200-rpm hard drive; Bluetooth connectivity; 802.11g wireless; and even a dual-format DVD±RW burner.

The TravelMate has a full set of ports: four USB 2.0, one FireWire, one VGA, and one S-Video, plus an audio line-in jack. It's also the only notebook in our roundup with DVI-I. Security-conscious organizations will like the smart-card feature, which limits access to the system. We're not completely sold on Acer's ergonomic keyboard: The keys are arranged in a slight curve, resembling a smile, and it takes some getting used to.

Thanks to its high-end components, the TravelMate turned in the best Business Winstone score (22.2). Its BatteryMark score was also impressive, at 5 hours 12 minutes.

Acer doesn't have many options for fleet buyers, but it does offer a port replicator (\$99) that works with most of the TravelMate line, including the tablet. The AC adapter is compatible with fewer models in the line. Acer also offers the same OS image across all its products.

The TravelMate may not be ideal for some big IT programs that want lots of choices, but for small businesses and individuals, it's a robust bargain.—Cisco Cheng

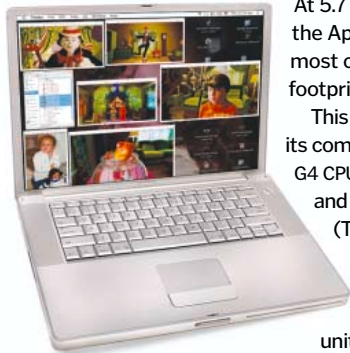


### ULTRAPORTABLE

MPC TransPort T2200	Toshiba Tecra M2	Velocity Micro NoteMagix B50 Ultra	WinBook W360	Apple PowerBook G4 (12-inch)	Dell Latitude X300	IBM ThinkPad X40	Sharp Actius MM20	Toshiba Portégé R100
\$2,521 direct	\$1,899 direct	\$2,615 direct	\$2,578 direct	\$1,799 direct	\$2,533 direct	\$2,299 direct	\$1,499 list	\$2,069 direct
Pentium M (1.7 GHz)	Pentium M (1.7 GHz)	Pentium M 755 (2.0 GHz)	Pentium M 735 (1.7 GHz)	PowerPC G4 (1.3 GHz)	Pentium M LV (1.2 GHz)	Pentium M (1.2 GHz)	Transmeta Efficeon TM8600 (1.0 GHz)	Pentium M (1.0 GHz)
512MB	512MB	1GB	512MB	256MB	640MB	512MB	512MB	256MB
5.9 / 6.9	4.9 / 5.8	6.3 / 7.1	6.3 / 7.1	4.6 / 5.1	3.0 / 3.9	3.2 / 3.8	2.0 / 2.6	2.4 / 3.0
15-inch SXGA	14.1-inch XGA	15.1-inch SXGA+	15.4-inch WUXGA	12.1-inch XGA	12.1-inch XGA	12.1-inch XGA	10.4-inch XGA	12.1-inch UXGA
19	19	18	19	19	18	19	17	19
Touch pad	Pointing stick, touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Pointing stick	Touch pad	Touch pad
ATI Mobility Radeon 9000	nVidia GeForce FX Go5200	ATI Mobility Radeon 9700	ATI Mobility Radeon 9600	nVidia GeForce FX Go5200	Intel 855GME	Intel 855GME	ATI Mobility Radeon M6	Trident XP4m32LP
40GB	60GB	60GB	80GB	60GB	40GB	40GB	20GB	40GB
DVD/CD-RW	DVD/CD-RW	DVD/CD-RW	DVD-RW	SuperDrive (DVD-R/CD-RW)	External DVD+RW	None*	None*	External PC Card DVD
802.11g	802.11g	802.11g	802.11g	802.11g	802.11a/g	802.11g	802.11g	802.11b
■■■	■■■	■□■	□□■	□□■	□□■	■■■	□□■	□□■
2 / 1	2 / 1	3 / 1	3 / 1	2 / 1	2 / 1	2 / 0	2 / 0	2 / 0
Memory Stick, MultiMediaCard, Secure Digital	Secure Digital	Secure Digital	Memory Stick, Secure Digital, SmartMedia	None	Secure Digital	Secure Digital	None	Secure Digital
4.4 Ah	4.4 Ah	4.3 Ah	4.4 Ah	4.6 Ah	1.9 Ah	4.3 Ah	1.8 Ah	1.6 Ah
■□□	□□□	□□□	□□□	□□□	□□□	□□■	□□□	□□□
3 years	3 years	1 year	1 year	1 year	3 years	1 year	1 year	3 years

## >> Apple PowerBook G4 (15-inch)

1.5-GHz PowerPC G4, 512MB DDR SDRAM, 80GB hard drive, 15.2-inch WXGA display, 802.11g wireless, \$2,499 direct. Apple Computer Inc., www.apple.com. ●●●○○



At 5.7 pounds and with a 15.2-inch screen, the Apple PowerBook G4 is a good size for most commuters. Though it has a large footprint, it's very thin.

This is Apple's most powerful notebook; its components include a 1.5-GHz PowerPC G4 CPU, an 80GB hard drive, 512MB of RAM, and the ATI Mobility Radeon 9700 GPU.

(The 17-inch model can also have the same powerful specs.) Apple's AirPort Extreme gives you 802.11g wireless and Bluetooth connectivity. Our test unit came with a SuperDrive, which can burn DVD-R but unfortunately not DVD-RW media.

Apple's software has been upgraded to Mac OS X Panther v.10.3, which makes network setups a breeze for corporate users. Even setting up a wireless network with WEP enabled is easy.

The PowerBook's auto-sensor light control works well, using a sensor to dim your screen and fiber optics to backlight your keyboard. The grills on the sides of the keyboard hide three impressive speakers. Though the aluminum case looks sleek, it has a drawback: It conducts heat. Apparently the design uses the bottom of the case to dissipate the CPU's heat—not ideal when the unit is on your lap.

This 15-inch model will appeal to the bulk of PowerBook buyers. The added CPU speed and Panther OS offer a good balance of power and usability. If Apple could just solve the heat problem, this model would be ideal for Mac lovers.—*Richard Fisco*

## >> Dell Latitude D600

1.8-GHz Pentium M 745, 512MB DDR SDRAM, 80GB hard drive, 14.1-inch SXGA+ display, 802.11g wireless, \$2,377 direct. Dell Inc., www.dell.com. ●●●○○

The Dell Latitude D600 is a solid business system with good features and components: a 1.8-GHz Pentium M 745, 512MB of RAM, 802.11g wireless, a DVD burner, and an 80GB hard drive.

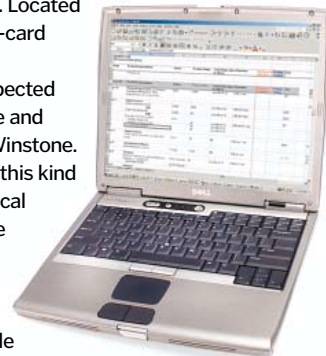
But when we matched it up against the competition, we found that other notebooks here offer more performance for less money.

The 5.4-pound D600 has a clean design with a comfortable full-size keyboard, both a pointing stick and a touch pad, and a crisp 14.1-inch SXGA+ display. It also includes two USB ports, a PC Card slot, and, surprisingly, a DVD+RW drive. Located right below the PC Card slot is a smart-card reader for added security.

The D600 performed worse than expected on our tests: 17.6 on Business Winstone and 21.3 on Multimedia Content Creation Winstone. Though these scores are below par for this kind of notebook, they are adequate for typical users. What's more disappointing is the D600's score of 3:03 on BatteryMark—second to last in this category.

Dell offers several docking stations and port replicators that are compatible across the entire D line, as is the AC adapter. The OS image is not common across the D line, though many of the drivers (like modem and wireless) are common.

As a corporate notebook, the Dell Latitude D600 has the features to please. But to get better bang for the buck—and double the battery life—look to the HP Compaq nc6000.—*Roy Goodwin*



## >> Fujitsu LifeBook S7010

1.7-GHz Pentium M 735, 512MB DDR SDRAM, 80GB hard drive, 14.1-inch XGA display, 802.11g wireless, \$2,259 direct. Fujitsu PC Corp., www.fujitsu.com. ●●●○○

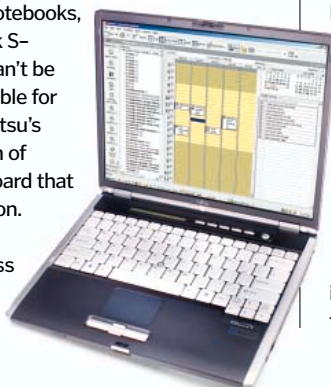
Targeted at frequent travelers, the sleek 4.3-pound Fujitsu LifeBook S7010 is the lightest mainstream notebook in this roundup. To hit that weight, though, you have to give up some niceties (a memory card reader and legacy I/O ports).

The full-size keyboard feels a bit flimsy, and the single set of mouse buttons, located below the touch pad, is hard to reach when using the pointing stick. Though it lacks parallel and serial ports, the S7010 has three USB 2.0 ports. The Intel 855GME graphics solution is mediocre, and the 14.1-inch XGA screen has a low resolution compared with other models. Surprisingly, the unit has a DVD±RW drive.

The S7010 received middle-of-the-road scores on Business Winstone (19.5) and Multimedia Content Creation Winstone (21.6), but it did better on BatteryMark, yielding 3 hours 44 minutes. Its 802.11g wireless throughput was a little below average for the group.

The S7010 has a port replicator (\$199) which, like the AC adapter, will be compatible with some future notebooks, but it can't be used with older LifeBook S-series notebooks. The OS image also can't be used on other models, but it will be stable for one year. In addition, the S7010 has Fujitsu's Trusted Platform Module (TPM), a form of security built into a system's motherboard that enables simple file and folder encryption.

If you value the balance between features and portability and won't miss the legacy ports, the S7010 is an option.—*CC*



## >> Gateway 450XL

1.8-GHz Pentium M 745, 512MB DDR SDRAM, 60GB hard drive, 15-inch UXGA display, 802.11b wireless, \$2,312 direct. Gateway Inc., www.gateway.com. ●●●○○

The Gateway 450XL accomplishes the typical mobile tasks business users require. But for the price, we would have liked to see more in overall performance and features.

The 6.3-pound system holds a 15-inch display, bigger than the typical 14.1 inches, but images on it seemed washed out. We did like the solid feel of the full-size keyboard and the added security of the built-in fingerprint reader.

The 450XL has two USB ports, a FireWire port, and a PC Card slot. It also has VGA, S-Video, and composite video ports. The 60GB hard drive is adequate for a mainstream system, and the DVD-RW drive is a plus. Connectivity is via either Gigabit Ethernet or 802.11b wireless—not the stronger 802.11g (which is a \$59 upgrade).

Performance on Business Winstone 2004 and Multimedia Content Creation Winstone 2004 was toward the bottom of our test group (19.2 and 20.1, respectively). But the 450XL's battery life was very good, at 4 hours 37 minutes.

Gateway offers an optional docking station (\$139) compatible with the M405 and previous 450 and 600 models. The AC adapter works with the M405, the M305, and the M275. OS image stability is 10 to 12 months.

In the end, the 450XL doesn't compare well with other notebooks in this price class. For the same money or even a little less, you can find a better-equipped model, such as the HP Compaq nc6000.—*CC*



>> HP Compaq nc6000

1.8-GHz Pentium M 745, 512MB DDR SDRAM, 60GB hard drive, 14.1-inch XGA display, 802.11a/g wireless, \$2,299 direct. Hewlett-Packard Co., www.hp.com. ●●●●○



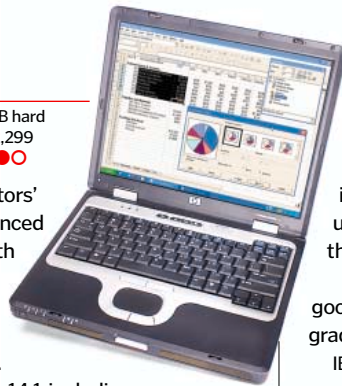
The HP Compaq nc6000, our Editors' Choice, is a wonderfully well-balanced system that melds portability with great features, like a 1.8-GHz Pentium M processor for power, 802.11a/g for wireless connectivity, TPM for security, and outstanding battery life.

The solid, 5.7-pound nc6000 houses a 14.1-inch display, a full-size keyboard, and both a pointing stick and a touch pad. There's a hardware on/off switch for the Bluetooth and 802.11a/g connections. I/O ports include a Secure Digital media slot, two USB 2.0 ports, and an S-Video port. HP has chosen to increase security by adding TPM, which will please many IT managers.

In terms of performance, the nc6000 did not disappoint: It placed second on Business Winstone 2004 (scoring 21.4) and came in third on Multimedia Content Creation Winstone 2004 (22.4). Its 802.11g throughput was strong, and its battery life was most impressive, at 6 hours 37 minutes—the best in this roundup.

Two types of port replicators are available. Both, like the AC adapter, are compatible with previous nc6000 models, as well as others in the nc and nx lines. The OS image is stable for 12 to 18 months and is compatible with all models except the nw8000.

The nc6000 gives you a strong balance of portability, performance, security, and features. It is an excellent choice for individuals and corporations alike.—Joseph A. Guilbeau IV



>> IBM ThinkPad T42

1.7-GHz Pentium M 735, 512MB DDR SDRAM, 40GB hard drive, 14.1-inch SXGA+ display, 802.11g wireless, \$2,029 direct. IBM Corp., www.ibm.com. ●●●●○

The IBM ThinkPad family has always been highly regarded for its reliability and manageability, and its keyboard has long been unmatched by its peers. The IBM ThinkPad T42 keeps up with those traditions while starting one of its own—a low price.

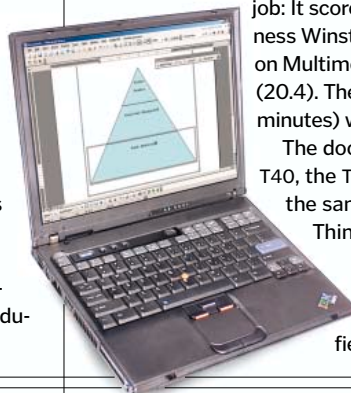
The T42's thin profile and system weight of 5 pounds make it a good choice for travel. The one thing we would change is to upgrade its 40GB hard drive—which can fill up fast.

IBM has for a long time added self-help touches to increase users' satisfaction and ease the pain of busy IT staff. One such feature is the Access IBM collection of utilities. The blue button on the keyboard launches a self-serve help wizard, which assists you in downloading OS updates, drivers, and more. Like Fujitsu and HP, IBM has TPM security on all its motherboards.

Though it's not a performance standout, the T42 does a decent job: It scored in the middle of the pack on Business Winstone 2004 (19.7) and near the bottom on Multimedia Content Creation Winstone 2004 (20.4). The T42's BatteryMark score (3 hours 59 minutes) was good.

The docking station is the same used on the T40, the T41 and the R series, and IBM places the same OS image across the entire ThinkPad family.

The T42 comes with all the basics business users need. Both end users and corporate buyers will be satisfied with such a purchase.—CC



>> MPC TransPort T2200

1.7-GHz Pentium M, 512MB DDR SDRAM, 40GB hard drive, 15-inch SXGA display, 802.11g wireless, \$2,521 direct. MPC Computers LLC, www.buympc.com. ●●○○○

The MPC TransPort T2200 is a competent system for business use, and if it were priced about \$1,000 less, we might recommend it. But for the price, its performance was disappointing, as were some of the components.

The 5.9-pound T2200 has a 15-inch screen and a comfortable full-size keyboard. A two-button touch pad with a two-way scroll button is included, but there's no pointing stick. It also has a fingerprint reader, similar to that of the Gateway 450XL, for extra security.

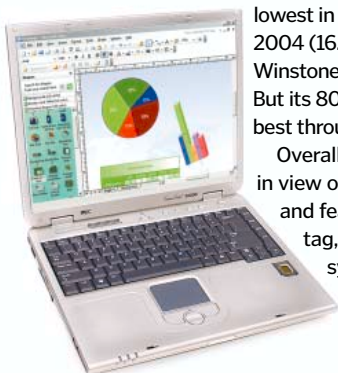
For ports, the T2200 has two USB 2.0, one FireWire, one VGA, and one S-Video. It has a three-in-one memory card reader (for Memory Stick, MMC, and Secure Digital) and a DVD/CD-RW combo drive.

The T2200 has a useful modular hot-swappable expansion bay. Unfortunately, the AC adapter can be used only with this system, and the OS image can't be applied to other models in this line.

Performance is not the T2200's strong suit. Its scores were the lowest in the group on Business Winstone 2004 (16.8), Multimedia Content Creation Winstone 2004 (19.6), and BatteryMark (2:42). But its 802.11g solution surprised us, giving the best throughput in the roundup at 160 feet.

Overall, the T2200 is a decent notebook, but in view of its shortcomings in performance and features and its steep price tag, it simply can't compete against systems like the HP Compaq nc6000 or the IBM ThinkPad T42.

—Charles Rodriguez



>> Toshiba Tecra M2

1.7-GHz Pentium M, 512MB RAM, 60GB hard drive, 14.1-inch XGA display, 802.11g wireless, \$1,899 direct. Toshiba America Inc., www.toshiba.com. ●●●●○

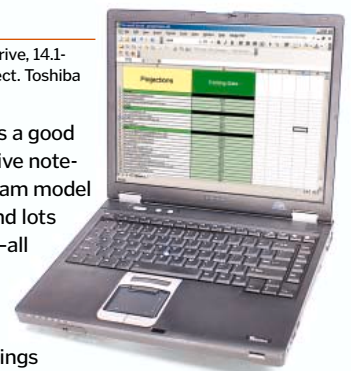
The well-rounded Toshiba Tecra M2 is a good choice if you need a versatile two-drive notebook for business use. This mainstream model delivers good wireless throughput and lots of battery and optical drive options—all in the least expensive mainstream model in our roundup.

Weighing 4.9 pounds, the unit is easy to tote. The Tecra M2's I/O offerings are average: two USB ports, a FireWire port, a parallel port, wired and wireless Ethernet, Bluetooth, two PC Card slots, and a Secure Digital slot.

The Tecra M2's performance (20.2 on Business Winstone 2004 and 22.3 on Multimedia Content Creation Winstone 2004) was reasonable for a business-class portable. Its battery life of 3 hours 32 minutes was toward the lower end of the spectrum. Wireless performance was good for both 802.11b and 802.11g, maintaining a consistent signal.

The notebook is suitable for businesses of all sizes, with a port replicator available (\$199) that is compatible with many models in the Tecra line and the Satellite Pro line, and a few in the Portégé line. The AC adapter is also compatible across those lines. The OS image on the Tecra M2 will be stable for one year.

For a business-class portable, the low-priced Tecra M2 is a solid, well-rounded system that can compete well with systems from Dell, HP, and IBM.—Bill Howard





# Business-Ready Notebooks

We tested 16 corporate notebooks: 11 mainstream thin-and-light models and 5 ultraportables. Our only requirements were that the notebooks had to have built-in wireless connectivity and Windows XP Professional (except for the Apple systems). The rest of the configuration was left to each vendor's discretion.

Many of the notebooks came with the new Intel Pentium M

(Dothan), which, unlike the Banias core, has processor speeds of up to 2 GHz, doubles the L2 cache to 2MB, and has a smaller die size (87 square millimeters) as well as a lower thermal envelope, thanks to its 90-nm manufacturing process.

To gauge performance, we used *PC Magazine's* Business Winstone 2004 and Multimedia Content Creation Winstone 2004. These are application-based **benchmark test** suites that

reflect tasks users perform every day. On Business Winstone, the Acer TravelMate 8000 was the strongest notebook, thanks to its fast 7,200-rpm hard drive. In the ultraportable category, the Dell Latitude X300, armed with 640MB of RAM and a faster hard drive, beat the rest on both test suites.

On Content Creation, the Velocity Micro system was able to dominate the field, thanks to a combination of 1GB of RAM, a 7,200-rpm hard drive, and the fastest Pentium M processor (2 GHz).

Performance on Business Winstone 2004 BatteryMark 1.0 was as expected. The mainstream HP Compaq nc6000, with its eight-cell battery, scored 6:37 on battery life. The IBM ThinkPad X40 ultraportable, like the HP, chose to bundle an eight-cell battery instead of a smaller four-cell power source, giving it a whopping 6:16 of battery life.

Though the size of the battery helps, power-saving features can also boost such scores. For example, the battery life of the Sharp Actius MM20 was disappointing, despite its much-heralded energy-saving Transmeta Efficeon CPU; its score was a meager 2:07. The MM20 had the same score as the Toshiba Portégé R100, although the Sharp machine had a 1.8-Ah battery, which should have done better than the Toshiba's lower 1.6-Ah battery.

We ran all **wireless tests** using a Linksys 802.11g access point to measure the throughput and range of each notebook's built-in wireless connection. We ran our throughput tests with NetIQ's Chariot program and a turntable provided by Intersil, which rotated each notebook at 20 rpm. We generated throughput scores (in Mbps) based on the Chariot software in both 802.11b and 802.11g modes.

We set the access point to either 802.11b-only mode or 802.11g-only mode, depending on the wireless solution of the notebook being tested. In real-world usage, most access points will be set to auto mode, meaning that any "b" notebooks would be able to connect to "g" access points. But we set the access point to 802.11g-only mode to avoid interference and get a fair reading for the "g" notebooks. Both the IBM ThinkPad T42 and the X40 performed extremely well, achieving throughputs of over 21 Mbps at close range and maintaining a steady 5-Mbps stream at 160 feet.

—Analysis written by Cisco Cheng

## BENCHMARK TESTS

High scores are best. Bold type denotes first place within each category.

Processor	Business Winstone 2004	Multimedia Content Creation Winstone 2004	Business Winstone 2004 BatteryMark (hr:min)	
<b>MAINSTREAM</b>				
Acer TravelMate 8000	Pentium M 745 (1.8 GHz)	<b>22.2</b>	22.3	5:12
Dell Latitude D600	Pentium M 745 (1.8 GHz)	17.6	21.3	3:03
Fujitsu LifeBook S7010	Pentium M 735 (1.7 GHz)	19.5	21.6	3:44
Gateway 450XL	Pentium M 745 (1.8 GHz)	19.2	20.1	4:37
<b>HP Compaq nc6000</b>	Pentium M 745 (1.8 GHz)	21.4	22.4	<b>6:37</b>
IBM ThinkPad T42	Pentium M 735 (1.7 GHz)	19.7	20.4	3:59
MPC TransPort T2200	Pentium M (1.7 GHz)	16.8	19.6	2:42
Toshiba Tecra M2	Pentium M (1.7 GHz)	20.2	22.3	3:32
Velocity Micro NoteMagix B50 Ultra	Pentium M 755 (2.0 GHz)	21.0	<b>25.1</b>	3:54
WinBook W360	Pentium M 735 (1.7 GHz)	18.7	23.3	3:22

<b>ULTRAPORTABLE</b>				
Dell Latitude X300	Pentium M LV (1.2 GHz)	<b>15.5</b>	<b>15.9</b>	2:31
<b>IBM ThinkPad X40</b>	Pentium M (1.2 GHz)	12.5	15.0	<b>6:16</b>
Sharp Actius MM20	Transmeta Efficeon TM8600 (1.0 GHz)	8.3	10.0	2:07
Toshiba Portégé R100	Pentium M (1.0 GHz)	10.6	11.1	2:07

RED denotes Editors' Choice. The Apple PowerBook notebooks are not compatible with our Windows-based tests.

## WIRELESS TESTS

High scores are best. Bold type denotes first place within each category.

Distance (feet) ▶	802.11 ACCESS POINT				Average throughput (Mbps)			
	"b"-only mode				"g"-only mode			
	1	60	120	160	1	60	120	160
<b>MAINSTREAM</b>								
Acer TravelMate 8000	5.5	5.5	5.4	<b>5.4</b>	21.0	19.3	11.7	5.2
Dell Latitude D600	<b>5.7</b>	<b>5.7</b>	5.3	4.2	17.8	15.1	8.4	3.3
Fujitsu LifeBook S7010	5.5	5.2	4.8	1.8	18.3	15.5	3.5	1.3
Gateway 450XL	5.1	5.2	2.9	1.2	N/A	N/A	N/A	N/A
<b>HP Compaq nc6000</b>	5.5	5.5	5.2	4.8	20.6	20.0	11.7	6.4
IBM ThinkPad T42	5.4	5.5	<b>5.6</b>	5.2	<b>22.7</b>	<b>22.4</b>	<b>14.3</b>	5.8
MPC TransPort T2200	5.5	5.5	5.4	<b>5.4</b>	21.2	18.8	13.1	<b>9.3</b>
Toshiba Tecra M2	5.5	5.5	5.5	5.1	18.6	18.8	6.5	3.6
Velocity Micro B50 Ultra	3.0	5.4	4.9	2.1	18.6	16.7	6.6	2.0
WinBook W360	5.2	5.2	4.3	1.7	12.8	10.9	3.3	0.8
<b>ULTRAPORTABLE</b>								
Dell Latitude X300	5.3	5.3	4.6	<b>4.6</b>	20.2	16.0	<b>12.0</b>	5.1
<b>IBM ThinkPad X40</b>	5.5	5.5	<b>5.4</b>	4.5	<b>21.1</b>	<b>20.5</b>	<b>12.0</b>	<b>5.2</b>
Sharp Actius MM20	<b>5.9</b>	<b>5.7</b>	2.7	—	18.6	15.7	2.6	—
Toshiba Portégé R100	4.2	3.5	2.7	1.9	N/A	N/A	N/A	N/A

RED denotes Editors' Choice. The Apple PowerBook notebooks are not compatible with the Chariot testing software. A dash indicates that no signal was received at this range. N/A—Not applicable: The Gateway and Toshiba systems are 802.11b notebooks and cannot receive signals when the AP is in 802.11g mode.

>> Velocity Micro NoteMagix B50 Ultra

2.0-GHz Pentium M 755, 1GB DDR SDRAM, 60GB hard drive, 15.1-inch SXGA+ display, 802.11g wireless, \$2,615 direct. Velocity Micro Inc., www.velocitymicro.com. ●●●●○

The Velocity Micro NoteMagix B50 Ultra is sleek, powerful, and perfect for those who work mostly with multimedia. But for straightforward Excel and e-mail business types, this is way too much machine.

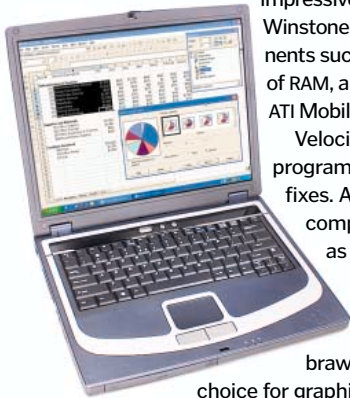
For entertainment-minded users, there's a DVD/CD-RW drive, bundled DVD player software, and Ulead DVD MovieFactory 3 Suite. Unfortunately, our test unit didn't include a DVD burner (a \$165 option) to complete the package. There are three USB ports and a Secure Digital slot.

The B50 Ultra's 802.11g performance was not stellar. The system fared much better on Business Winstone 2004 (21.0) and was impressive on Multimedia Content Creation Winstone 2004 (25.1), thanks to top components such as a 2-GHz Pentium M, a hefty 1GB of RAM, a speedy 7,200-rpm hard drive, and an ATI Mobility Radeon 9700 graphics card.

Velocity Micro has a unique warranty program that includes custom upgrades and fixes. A port replicator, available for \$139, is compatible with other models in the line, as is the AC adapter.

The B50 Ultra notebook is not for your buttoned-up business types. But its bundled software and

brawny components make it a good choice for graphics professionals.—Omar Cintron



>> WinBook W360

1.7-GHz Pentium M 735, 512MB DDR SDRAM, 80GB hard drive, 15.4-inch WUXGA display, 802.11g wireless, \$2,578 direct. WinBook Computer Corp., www.winbook.com. ●●●●○

The best thing about the WinBook W360 is its gorgeous 15.4-inch WUXGA (2,048-by-1,536) wide-screen display. Many of the components, however, are mediocre, making the W360's price seem a bit steep.

In spite of the large wide-screen display, the 6.3-pound system is reasonably light. The polished silver chassis looks decidedly like an Apple PowerBook. And though the keyboard is comfortable, we found the touch pad a bit unresponsive at first.

The display had a crisp image, and we liked the DVD-RW drive and the 80GB hard drive. The W360 has FireWire, VGA, S-Video, and three USB ports but no parallel or serial ports.

As expected, the unit's 1.7-GHz Pentium M 735 didn't deliver the best Business Winstone 2004 score (it scored 18.7), but it re-deemed itself on our Multimedia Content Creation Winstone 2004 tests, scoring second-best in the group (23.3).

The W360's wireless 802.11g performance was poor; it finished dead last. As for battery life, its score of 3 hours 22 minutes was not stellar but decent for a large-screen notebook.

WinBook offers a port replicator for \$99 that is universal across the W line, as are the AC adapter and the OS image.

Though the W360 is not an ideal notebook for business, those who want a notebook with a high-resolution wide-screen display and good multimedia performance might consider this a decent choice.—CC



ultraportable

Ultraportable business notebooks answer the demand for ever-lighter systems. Although typically sacrifices are made to keep the weight down, ultraportables continue to impress us by adding features and increasing performance, all in such small cases. >>>

>> Apple PowerBook G4 (12-inch)

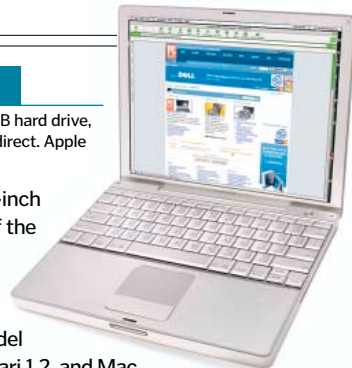
1.3-GHz PowerPC G4, 256MB DDR SDRAM, 60GB hard drive, 12.1-inch XGA display, 802.11g wireless, \$1,799 direct. Apple Computer Inc., www.apple.com. ●●●●○

In a slick, shiny aluminum case, the 12-inch Apple PowerBook G4 is the smallest of the PowerBook trio. Though only 4.6 pounds, it can hold its own with other Apples or competing notebooks.

Apple has beefed up the 12-inch model to include Mac OS X Panther v.10.3, Safari 1.2, and Mac OS X Mail, as well as a 1.3-GHz G4 processor. The hard drive, now at a comfortable 60GB, is the largest in our ultraportable group. And in DVD playback the battery lasted almost 3 hours, the most we've seen in a PowerBook. Our test unit was a little short on memory, though: We recommend 512MB of RAM for a performance boost.

The optional SuperDrive, a DVD-R/CD-RW combo, is a nice inclusion, if you consider that so many ultraportables sacrifice the optical drive to save space. About the only thing missing is a PC Card slot. The PowerBook's built-in wireless solution is 802.11g.

Though it's heavier than other ultraportables, the G4 is also less expensive, and it doesn't scrimp on features.—RF



**OUR CONTRIBUTORS:** Omar Cintron, Roy Goodwin, and Joseph A. Guilbeau IV are technical analysts, Charles Rodriguez is a product testing manager, and Richard Fisco is technical director of PC Magazine Labs. Konstantinos Karagiannis is a senior editor and Bill Howard is a contributing editor of PC Magazine. Associate editor Jenn DeFeo and PC Magazine Labs lead analyst Cisco Cheng were in charge of this story.

>> Dell Latitude X300

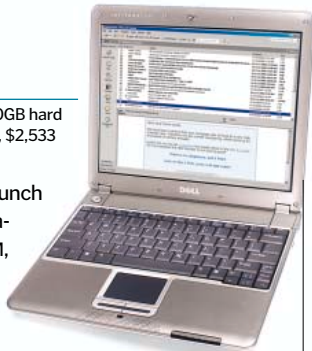
1.2-GHz Pentium M LV, 640MB DDR SDRAM, 40GB hard drive, 12.1-inch XGA display, 802.11a/g wireless, \$2,533 direct. Dell Inc., www.dell.com. ●●●●○

The Dell Latitude X300 packs quite a punch in a 3-pound system. It is the only ultraportable here to include 640MB of RAM, a 5,400-rpm hard drive, and a dual-band 802.11a/g wireless solution. Unfortunately, it lacks a full-size keyboard—a must-have for hard-working travelers.

Still, the X300 is a well-equipped system overall, with a respectable 1.2-GHz Pentium M LV (low-voltage) CPU and a 12.1-inch XGA display that is bright and clear. As for I/O ports, it has two USB, one FireWire, and one VGA, plus Gigabit Ethernet and a modem. A Secure Digital slot provides a viable option for removable media. Our test system included a MediaBase with a DVD+RW drive (\$449), which accounts for the high price. There are several MediaBase options starting at \$199; they are compatible with all D-line Latitude systems, as is the AC adapter.

The X300 outperformed all others in the ultraportable group on Business Winstone 2004 (15.5) and Multimedia Content Creation Winstone 2004 (15.9). And its battery lasted 2 hours 31 minutes, using a four-cell (1.9-Ah) pack. An extended-life battery (\$129) added an extra 5:56.

We have no hesitation in labeling the Dell Latitude X300 a very capable notebook. Its components and performance are top-notch. Still, we can't minimize the importance of a full-size keyboard for road warriors.—CC



>> IBM ThinkPad X40

1.2-GHz Pentium M, 512MB DDR SDRAM, 40GB hard drive, 12.1-inch XGA display, 802.11g wireless, \$2,299 direct. IBM Corp., www.ibm.com. ●●●●●

The IBM ThinkPad X40 has the feature set, battery life, and light weight that most corporate travelers need. This combination keeps it our Editors' Choice among ultraportables.

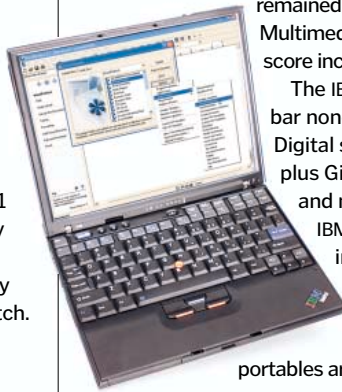
Since our previous X40 review (February 5), this system has gone through minor changes: It's been upgraded to a 1.2-GHz Pentium M (from 1.0 GHz) and from 802.11b to 802.11g wireless. Our test unit also had an eight-cell battery instead of the previously used six-cell.

The X40, which weighs only 3.2 pounds (with the eight-cell battery), managed an impressive 6 hours 16 minutes on our Battery-Mark test. And by switching to 802.11g, the X40 has improved its wireless throughput. Its Business Winstone 2004 score (12.5) remained in the middle of the pack, and its Multimedia Content Creation Winstone 2004 score increased from 12.2 to 15.

The IBM keyboard is the best we've seen, bar none. Standard ports include a Secure Digital slot, two USB ports, and a VGA port, plus Gigabit Ethernet, a modem, headphone and microphone jacks, and a PC Card slot.

IBM has the most versatile array of docking stations and port replicators (including the IBM UltraBase), priced from \$179 to \$529.

The X40 is a class act that other ultraportables are finding tough to follow.—CC



>> Sharp Actius MM20

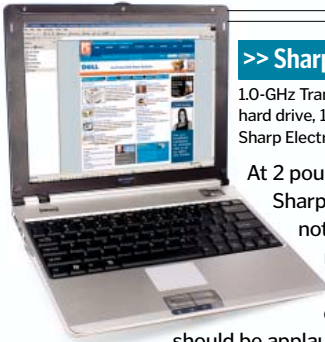
1.0-GHz Transmeta Efficeon TM8600, 512MB SDRAM, 20GB hard drive, 10.4-inch XGA display, 802.11g wireless, \$1,499 list. Sharp Electronics Corp., www.sharpsystems.com. ●●●●○

At 2 pounds and just over half an inch thick, the Sharp Actius MM20 is a remarkably portable notebook. But its cramped 17-mm keyboard makes it best for frequent fliers who do more content browsing than content creating. It's not a high performer, but it should be applauded for its innovative features.

For those who want to use the MM20 primarily while traveling, it can double as an external drive while parked in the office, thanks to Sharp's unique cradle solution and easy-to-use syncing software. And when you plug your AC adapter into the cradle, it recharges the system, while docked. (IT managers, note: The AC adapter is compatible across the UM and TN series, though the OS image is not.)

Using the Transmeta Efficeon TM8600, the MM20 finished last in our roundup on Business Winstone and Multimedia Content Creation Winstone (scoring 8.3 and 10, respectively). Its 802.11g wireless performance was also disappointing, dropping to 2.6 Mbps at 120 feet, and receiving no signal at 160 feet. Its battery life, at 2 hours 7 minutes, tied for last with the Toshiba Portégé R100.

The MM20 is suited for road warriors who want to keep their bags light and who do more scrolling and clicking than typing.—CC



>> Toshiba Portégé R100

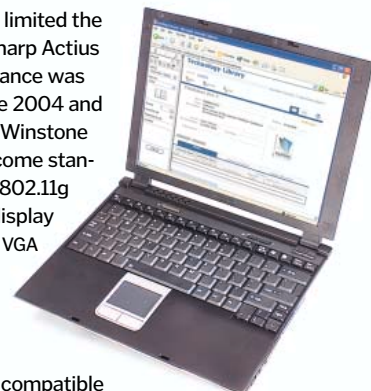
1.0-GHz Pentium M, 256MB DDR SDRAM, 40GB hard drive, 12.1-inch UXGA display, 802.11b wireless, \$2,069 direct. Toshiba America Inc., www.toshiba.com. ●●●●○

The svelte Toshiba Portégé R100 is just 0.7 inches thick and weighs 2.4 pounds, yet it still has a 12.1-inch display and a full-size keyboard. We applaud its slim design but don't recommend it for heavy-duty performance.

To keep the weight down, Toshiba limited the battery size, tying for last with the Sharp Actius MM20 at 2 hours 7 minutes. Performance was mediocre: 10.6 on Business Winstone 2004 and 11.1 on Multimedia Content Creation Winstone 2004. For its price, the R100 should come standard with 512MB of RAM and include 802.11g wireless, not 802.11b. The 12.1-inch display is sharp and bright. Two USB ports, a VGA port, Ethernet, and a modem come standard. You'll also find Secure Digital and PC Card slots, as well as headphone and microphone jacks.

The R100 port replicator (\$299) is compatible across the Portégé line; the AC adapter extends beyond that. The OS image can be applied to others and is stable for a year.

Overall, the R100 has a great design, but its components just can't compete with those of the Dell Latitude X300 or the IBM ThinkPad X40.—CC



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# Servers and

By John R. Delaney & Robert P. Lipschutz  
Illustrations by Stephen Schildbach

## READ ON TO LEARN:

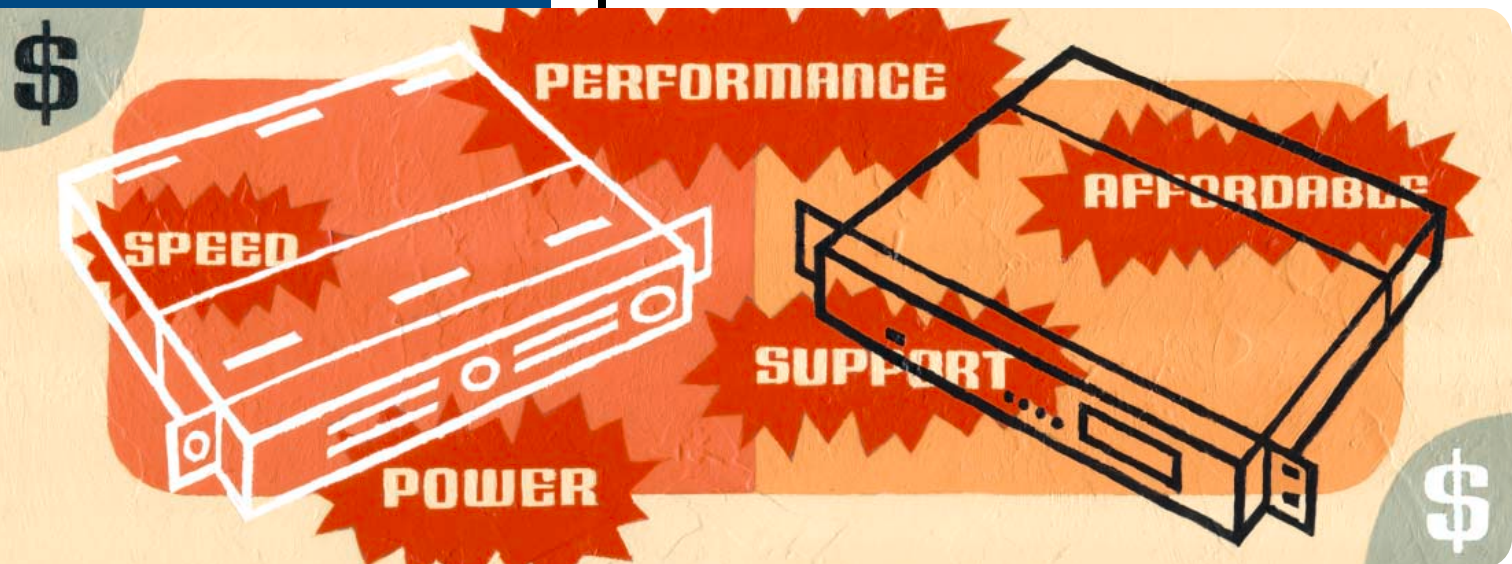
- How to choose the right server for your business by assessing performance, cost, space, and other concerns.
- The differences among DAS, NAS, SAN, and SCSI storage devices, and which one is right for you.
- Who the major storage vendors are, including product lines and contact information.

**J**ust about every small business can benefit from having its own servers and dedicated storage for those servers. But deciding what to buy can be a challenge. The key is to assess your needs accurately. Consider current and future applications your business will run, whether you will host your own e-mail system or Web site, and how fast you anticipate your business growing.

Unless you're extremely tech-savvy, we recommend having a designated network administrator to help you assess and plan or hiring a consultant or value-added reseller. On the following pages, we offer an overview of the technologies and equipment available and guide you through the right questions to ask.

## Servers

The term *server* covers a lot of ground. From a hardware perspective, a server is a box with one or more processors, lots of memory, and a large hard drive that receives requests from clients over a network and sends—or *serves*—data back to those clients. From a software perspective, a server is classified by the role it plays on a network, such as a mail server, Web server, or application server.



For most small businesses, servers and storage are essential parts of a network. But how do you choose the right hardware? We show you the way.

# Storage Small **for** Business

## 10 TOP Server TIPS Buying

### CHOICES

The best way to choose a server without spending too much or getting less than you need is to match hardware requirements carefully to the task. An inexpensive desktop PC can provide all the power you need for a small-office print server, but a multiprocessor workhorse can serve dozens of users with database management apps or handle high-volume e-business transactions.

Many server applications perform very well on servers without the fastest CPUs, relying on a combination of efficient processors, lots of memory and on-board cache, disk arrays, and special software. If you think you'll be adding clients down the road, make sure your server can take additional processors and has lots of free drive bays and expansion slots.

**Value (entry-level) servers.** A value server normally costs between \$300 and \$1,000 and has a single processor. These systems can handle file-sharing, e-mail, and print-sharing tasks for a ten-user workgroup. Typically, they come in tower or 1U rack-mounted forms with one processor, a minimum of 128MB of memory (though we recommend at least 512MB) that's expandable to 4GB, and up to three IDE or SCSI hard drives.

Look for three or four free drive bays, 10/100/1,000-Mbps Ethernet, and five PCI slots, at least two of which can take 64-bit PCI-X RAID controllers or other high-speed adapters.

For about \$300, you can get an entry-level system with a single Celeron processor, 128MB of ECC (error-correction code) SDRAM, and a single 40GB IDE or SCSI hard drive. A Pentium 4 or Athlon MP server with more memory and a larger hard drive (or additional hard drives on board) will cost over \$1,000. The OS will add about \$800 more. Such a server typically includes a standard one-year parts and next-day on-site labor warranty.

Value servers don't offer extras like integrated RAID and may use a typical PC motherboard. Some machines in this class, however, have server-specific chipsets that balance CPU, memory, and I/O subsystem usage to optimize performance and data throughput. Most value servers also include basic hardware management utilities for monitoring system health.

**Midrange (general-purpose) servers.** Midrange servers normally cost between \$1,000 and \$10,000 and come as towers or 1U to 4U rack-mounted models. They can handle multiple functions—such as small databases and file, print, and application services—for small businesses or large workgroups. They may be set up in a cluster configuration, with two or more servers sharing application duties or fail-over responsibilities.

Midrange servers typically come with four to eight processors, up to 32GB of RAM, and ten or more SCSI drives in a RAID array, and can be configured for external storage, Fibre Channel SAN hardware, or other devices.

**1 Plan for future growth.** Look for a server that can be scaled up as your requirements grow.

**2 Look for a system** with server-specific features, such as specialized server chipsets, I/O performance, and high-speed SCSI drive arrays.

**3 If your business** is likely to suffer financially from a server outage, buy a server that includes readily available components and software, to minimize downtime.

**4 Choose a manufacturer** that bundles a comprehensive, easy-to-use management suite as part of the server package.

**5 Don't forget to include** operating-system costs when pricing servers. Unlike desktop systems, most servers do not include a preinstalled OS. This can add another \$800 or more to the price tag.

**6 If your organization** has little or no IT staff, consider a value-added reseller (VAR) that will do a free on-site assessment of your infrastructure to help determine which server best fits your business requirements.

**7 Determine how much room** you want to devote to your network infrastructure now and in the future. Tower systems are fine, but if you have serious space constraints, a rack-optimized server may be a better choice.

**8 If you go with a rack-mounted configuration,** remember to factor in the costs for racks and accessories such as cabling trays and power supplies (including rack-mounted UPS devices).

**9 Buy from established manufacturers or VARs.** In going with a lesser-known manufacturer or reseller, you run the risk of having nowhere to turn for warranty service or support.

**10 Warranty service** should be three years with next-day, on-site service (except for value models, which usually come with one-year warranties).—JD

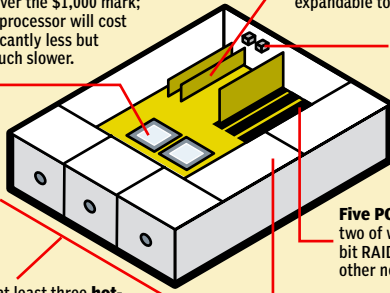
## SERVER COMPONENTS

Value and midrange servers are available as either tower models or rack-mountable devices (anywhere from 1U to 4U in height). Look for a combination of efficient processors, lots of memory, and on-board cache. If you want to ensure future scalability, make sure the device you select has extra drive bays (for use in RAID configurations), as well as extra expansion slots and PCI slots. Here's an overview of the key components you should look for in a value-class server.

**One or two processors.** An Athlon MP or Pentium 4 will take you over the \$1,000 mark; a Celeron processor will cost you significantly less but will run much slower.

**At least 512MB of dual in-line memory modules (DIMMs),** expandable to 4GB.

**10/100/1000-Mbps Ethernet connections.**



**Five PCI slots,** at least two of which can take 64-bit RAID controllers or other network adapters.

**Room for at least three hot-swappable IDE or SCSI hard drives.**

**Dual hot-swappable, redundant power supplies.**

Look for at least 512K of Level 2 cache, 2GB of RAM, a server-specific chipset, a dual-channel SCSI adapter or RAID controller, and a three-year parts-and-labor warranty with same-day service. Midrange servers should come with redundant, hot-pluggable hard drives, fans, and power, so you can remove and replace parts without taking down the server.

A general-purpose server that sells for \$3,000 and up should come with a 2-GHz to 3.2-GHz AMD Athlon MP or Intel Xeon processor and support a second processor. Keep an eye out for servers with faster AMD Opteron processors, which are becoming widely available at comparable prices.

## FEATURES

The features you need depend on the type of data you serve. Physical size, storage capacity, and availability are very important, but you should also look at scalability and price.

**Microprocessor.** Small and medium-size business servers typically run Windows and use 32-bit AMD or Intel processors. Many business-critical enterprise servers run Unix and rely on 64-bit AMD Opteron, Intel Itanium, or RISC processors from IBM, HP, Sun, and others. 64-bit processors can address huge amounts of memory and give fast performance.

Most entry-level, general-purpose servers come with AMD Athlon XP or MP, Intel Pentium 4, or in some cases, lower-power Celeron processors. Xeon processors are usually found

in midrange systems. Like more recent Pentium 4s, Xeon processors get a performance boost from Intel Hyper-Threading technology, which allows a chip to execute two threads (sets of program instructions) simultaneously.

When you enter the 64-bit arena, AMD Opteron and Intel Itanium processors come into play. The AMD Opteron builds on existing x86 architecture, supporting both 64-bit and 32-bit apps natively.

The Itanium processor family is built on Intel's IA-64 architecture and features the company's EPIC (Explicitly Parallel Instruction Computing) technology, letting a chip execute up to six instructions at a time. Itanium chips don't support 32-bit apps natively but can run them using emulation.

**Memory.** The right balance of processing power and memory depends on user load and the types of applications running. ECC memory, which contains special circuitry to detect and correct single-bit errors without halting the system, is the most common type of memory found in servers. Entry-level servers typically support up to 4GB of memory, while larger servers usually ship with 1GB to 2GB, expandable to 32GB.

**Connectivity.** Most entry-level servers now come configured with at least one Gigabit Ethernet port. More robust servers offer two Gigabit adapters as standard or optional. Such adapters are typically backward-compatible with Fast Ethernet; you can use them now and keep a slot open for upgrades.

**Hard drives.** Value-class servers typically offer a single IDE hard drive in their base configurations, but for maximum performance, we recommend SCSI or SATA (Serial ATA). SCSI drives can spin at speeds of 15,000 rpm, while IDE drives max out at 7,200 rpm. Some SATA drives now available run at 10,000 rpm and are made specifically for servers and workstations.

High-availability servers use hot-pluggable drives that connect to RAID controllers, which either are integrated into the motherboard or occupy a PCI slot, or both. Common RAID configurations include mirroring (RAID 1), which copies data to a second drive in real time; striping (RAID 0), which spreads data across several drives; and various combinations of both. RAID 5 combines striping with parity information that can be used to rebuild corrupted data or a failed drive. A mirrored RAID configuration provides the best protection against data loss.

**Availability.** Hot-pluggable hard drives and PCI slots, RAID storage, redundant fans and power supplies keep your server running. Fault-

## Pros'n Cons

Pros	Cons
All-in-one server appliances can be a good choice for the smallest businesses, because they come preconfigured and are easy to deploy in most existing networks.	Many appliance servers offer limited scalability. Should your requirements change, you may have to add new server segments rather than upgrading your existing server.
Both rack-mounted and pedestal servers contain multiple cooling fans to prevent internal components from overheating.	Fan noise can be a distraction; if you plan to have a server in a small office, you should place it as far away from the office population as possible.
Server blades consume less power and take up less space than traditional rack-mounted or pedestal servers.	You can end up buying more servers than you want to manage. And slow-growing businesses may find their chassis systems are obsolete before being filled.
The fastest processors allow CPU-intensive applications (such as high-volume mail servers or a heavily used CRM system) to attain the fastest possible performance.	The fastest processors cost more. If you know your server will be used for less CPU-intensive applications, don't rule out slower, less expensive processors.
Most servers ship with setup and management utilities that can make life easier for IT.	Management utilities and packages are not created equal. Discuss with your consultant or VAR which hardware manufacturer's system will best fit your network.

Our contributors: **John Delaney** and **Robert P. Lipschutz** are freelance writers. Associate editor **Davis D. Janowski** and freelance writer and consultant **Leon Erlanger** were in charge of this story.



tolerant servers maximize uptime with redundant components, including identical processors running in lockstep. Clustering—using two connected servers (one primary and one for mirrored backup)—costs more but takes fault tolerance up a notch.

**Management and serviceability.** The management software of value servers is fairly basic. On midrange servers, the bundled software lets you access the server from a remote location to examine event logs, perform BIOS and software upgrades, and initiate planned server shutdowns. Other management features let you configure and manage storage devices, monitor processor and disk usage, set parameters for failure predictions, diagnose problems, and set up event alerts using e-mail, pager, or telephone.

Serviceability is important to organizations of all sizes. The servers that are easiest to work on will have a tool-free chassis, which means that you can open the case and swap components without needing any tools.

**Physical size/scalability.** Physical size can be a key consideration in choosing a server. Towers are quickly losing ground to rack-mounted configurations, which stack servers. Rack servers come in a variety of heights, from 1U to 8U (14 inches high), with a standard width of 19 inches. A mounting rack's typical capacity is 22U or 42U. Besides saving space, rack servers are easy to maintain, with features such as front-loading drive bays and rear-access expansion slots. They slide in and out of the rack fairly easily and let IT staff keep the data center's cabling neat and organized.

## Storage

Do you think of storage as just another line item in your server purchase? If so, there are two good reasons to give it some more thought: pain and gain. If you analyze your present and future storage needs carefully, you can avoid the pain of a time-consuming, costly upgrade for a long time. You can also consolidate your file servers, simplify your workgroup or remote-office storage, and give users data protection and fast performance at a low price. Serial ATA (SATA) storage, network attached storage (NAS), and even iSCSI storage area networks (SANs) are all within your grasp. In what follows, we'll lay out some of the considerations for choosing the right components for your system.

### CHOICES

The worst mistakes you can make when purchasing storage are not buying enough and not buying a scalable system. Buying too little storage leaves applications and services strapped for resources. If you later want to upgrade your server's internal hard drives, the additional money you will have to spend backing up data, adding new hard drives, and restoring data in order to upgrade your storage will far exceed any initial savings.

Most small and many midsize businesses don't have the skills or desire to expand the built-in storage on existing servers. In fact, storage is so cheap and the labor cost of storage management so high that it often doesn't make sense to upgrade storage inside an older server at all. Our advice for small businesses is to keep it simple and let the relatively low price of storage work for you. If you think you need 80GB of file storage, purchase 240GB for a few hundred dollars more. IDE and SATA drive prices are low and even SCSI prices are affordable when compared with the labor cost of an in-server upgrade.

**Direct-attached storage (DAS).** This is dedicated external storage that you'd buy to attach directly to your server. It has been criticized by those who advocate networked storage as the way of the future. Though direct-attached storage does have some limitations—it can only be allocated to a single server, and expansion is often difficult—most small businesses purchase it because it requires less forethought than NAS and SAN.

In the past, it made sense to limit user files stored on servers, but today server storage is comparatively cheap, and user files stored on a server are much easier to protect than files stored on desktop PCs and notebooks. In ad-

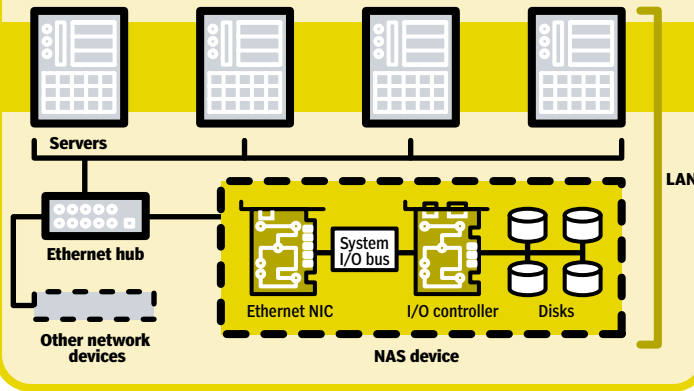


## Know Your Storage Technologies

- **Direct-attached storage (DAS)** Storage connected directly to a server.
- **Fibre Channel** An expensive short-distance networking technology used for building SANs.
- **ATA (AT attachment) or IDE (Integrated Device Electronics)** Traditional desktop and low-end server storage technology that includes the controlling circuitry for mass-storage devices as part of the devices. This technology is one of the standard ways of connecting hard drives, CD-ROM drives, and tape drives to a system.
- **iSCSI** A low-cost way to create SANs over IP networks.
- **IP SAN** A SAN built around the iSCSI protocol.
- **Network-attached storage (NAS)** A storage appliance that connects to the Ethernet network and provides file-level storage access.
- **RAID (Redundant Array of Inexpensive Disks)** The name for a number of different fault-tolerance schemes that use drive arrays.
- **SCSI (Small Computer System Interface)** The de facto standard for midrange and high-end server direct-attached storage.
- **Serial ATA (SATA)** A new low-cost storage standard with faster transfer speeds than IDE/ATA.
- **Serial-attached SCSI** A new high-performance SCSI standard. Products will appear late this year.
- **Storage area network (SAN)** Typically a Fibre Channel subnetwork of storage devices that can be shared by several servers.

### TYPICAL NAS ARCHITECTURE

A network-attached storage device can be thought of as an inexpensive file server. NAS devices are attached directly to the LAN and are typically assigned IP addresses.



dition, businesses that store files on multiple servers should consider consolidating the data from those servers onto fewer, more powerful servers with larger hard drives, for easier management and backup. With software such as Microsoft Volume Shadow Copy, found in Windows Storage Server 2003 (NAS devices have similar capabilities), users can easily restore their own files if they delete or overwrite them accidentally, and administrators can perform centralized backup. Pricing for direct-attached storage varies greatly depending on the type of storage technology you choose (IDE, SATA, or SCSI).

**IDE and SATA.** For file and entry-level application services, small businesses can realize significant savings by buying IDE drives, which are the same types of drives found on most desktop PCs, or by using SATA controllers and drives in their servers rather than traditional SCSI drives. Though IDE and SATA solutions can't match the fast transfer rates, rotation speeds, and overall performance of SCSI storage (SCSI can reach a rotation speed of 15,000 rpm, while IDE drives generally max out at 7,200 rpm and

current high-end SATA drives hit 10,000 rpm), they are certainly fast enough for file services and can be had for one-half to one-third the cost of a SCSI system. A 250GB IDE or SATA drive costs about \$400; a SCSI drive *half* that size will be \$600 to \$900.

Since IDE and SATA drives are available in capacities of up to 400GB, companies can get a huge amount of storage with just a couple of drives. IDE allows two drives per channel and SATA just one, but special RAID cards are available from server and storage manufacturers that let you run IDE on multiple channels. Even with just two IDE or SATA drives, a server can use RAID 1 mirroring, which writes all data to a second drive in real time, to achieve 400GB of internal fault-tolerant storage. Small businesses should also consider network-attached storage servers as solutions for running file services.

**SCSI RAID.** Some applications demand the high performance and fault tolerance found in SCSI RAID solutions. These technologies have their own jargon and sound complicated, but you don't have to go back to school to choose the right high-end direct-attached storage solution that incorporates both technologies. Here are the salient buying points.

First, get ready to spend more money. There is a quantum leap between the single- or dual-spindle IDE or SATA arrangements discussed earlier and a high-performance multidrive RAID 1 or RAID 5 setup. Typical RAID scenarios spread data across multiple drives, a process called *striping*, and then add error correction, such as RAID 1 mirroring or RAID 5 distributed parity information, which can be used to rebuild lost or corrupted data and drives.

Everything about a SCSI RAID configuration costs more. You'll have to purchase a more expensive disk controller—typically a SCSI RAID controller with on-board cache and hardware acceleration, which runs \$300 to \$600. The drives have smaller capacities and cost much more than IDE or SATA drives. And to achieve fault tolerance, you'll have to add more drives—at least one extra to accommodate parity information for RAID 5, and twice as many as you currently have if you're running RAID 1 mirroring. You'll also need a server with lots of internal drive bays or an external enclosure, which will generally add a couple thousand dollars to the total cost.

When you buy SCSI, you pay for faster and more robust controllers and drives. SCSI offers faster transfer rates (up to 300 MBps with Ultra320 SCSI, compared with a maximum of 133 MBps for current IDE drives and 150 MBps for SATA drives), the ability to attach up to 15 devices per channel to create very fast spanned drive sets, and a much longer mean time between failures than IDE, which you'll appreciate for applications that run 24 hours a day.

We suggest a dedicated SCSI adapter and a backplane-based SCSI system with hot-swappable drives, so it's easy to replace drives when they fail or mal-

## Leading Storage Manufacturers

	Product lines	Contact information
<b>Adaptec Inc.</b>	iSCSI controllers, RAID controllers, DAS, NAS, IP SAN hardware	800-442-7274 <a href="http://www.adaptec.com">www.adaptec.com</a>
<b>Applied Micro Circuits Corp.</b>	IDE and SATA RAID controllers	877-883-9273 <a href="http://www.3ware.com">www.3ware.com</a>
<b>Dell Inc.</b>	DAS, NAS, Fibre Channel SAN hardware	800-999-3355 <a href="http://www.dell.com">www.dell.com</a>
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<b>Microsoft Corp.</b>	Windows Storage Server 2003	800-426-9400 <a href="http://www.microsoft.com">www.microsoft.com</a>
<b>Promise Technology Inc.</b>	IDE and SATA RAID controllers	408-228-6300 <a href="http://www.promise.com">www.promise.com</a>
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# 10 TOP Storage Buying TIPS

- 1 Buy more DAS** (direct-attached storage) than you think you need.
- 2 Take advantage** of low-priced IDE or SATA storage for entry-level servers.
- 3 For file servers**, consider inexpensive RAID 1 (mirroring) options that use IDE or SATA drives. They provide the protection of RAID but cost less than SCSI RAID solutions.
- 4 Use SCSI RAID 1** or SCSI RAID 5 arrays with hot-swappable drives for all critical application services and databases.
- 5 Consider network-attached storage (NAS)** appliances for remote office file and print services. In many cases, they can obviate the need for a server.
- 6 Use NAS** as an alternative to tape backup for easy-access data protection and archiving.
- 7 Conserve space** in the data closet by purchasing rack-mount servers, storage devices, or NAS appliances. Even small companies often have racks for patch panels and network switches.
- 8 Consider your data** protection and backup strategy before you buy. Backing up multiple desktops, servers, and volumes can get complex. If possible, consolidate and simplify storage to ensure that your data is protected.
- 9 It often doesn't pay** to upgrade an older server with more storage. Purchase a new server with abundant memory and storage.
- 10 Keep it simple.** Don't create complex storage subsystems that you can't fix without outside intervention.—RL

function. Make sure that the server you choose has enough room for the storage capacity and number of drives you want, keeping in mind that the largest SCSI drives are 73GB drives running at 15,000 rpm or 147GB drives running at 10,000 rpm. The first new serial-attached SCSI controllers and drives, which will deliver much faster data transfer rates at similar prices, should be out later this year.

**Network-attached storage (NAS).** The appeal of NAS is in its simplicity. If you're looking to add some storage to your main network or a remote site, a NAS device slips in more easily than a full-fledged file server. NAS devices have a much simpler operating system or hide complexities behind a simple Web-based administrator interface. HP and Dell both use Windows Storage Server 2003 as the basis for their NAS appliances; other vendors, such as Snap Appliance, use Linux or Unix variants. It really doesn't matter which operating system lies underneath. Look for appliances that come installed with antivirus software and backup software that can accommodate user-directed restores.

Make sure that the NAS device you choose fits into your existing network. For very small offices, this means that it must have the SMB/CIFS protocol support needed for a peer-to-peer Windows network. Sites with existing servers will need a NAS that integrates with the existing directory, whether it's Windows domain services, Active Directory, or Novell eDirectory. Some medium-size businesses will want support for NFS file sharing common in Unix or Linux environments. In addition, some NAS devices let users access files using FTP or a Web-based interface.

Make sure the device has Gigabit Ethernet connectivity, and look for expandability, so you can add more storage when you need it. Entry-level NAS starts as low as \$500 for 80GB of bare-bones storage and a Fast Ethernet connector. Faster and more flexible NAS devices will cost \$2,000 to \$5,000 for 80GB to 1TB of storage.

**iSCSI SANs.** Large enterprises have been using Fibre Channel storage area networks (SANs)—networks dedicated to storage only—for some time. Fibre Channel SANs separate storage from the server and let you allocate it among any and all servers throughout the network. Centralized SAN data protection is much easier than backing up multiple servers running direct-attached storage.

Small businesses can now get the benefits of SANs using a technology called iSCSI, without having to deal with the cost and complexity of Fibre Channel. iSCSI offers SAN features with less expensive Ethernet networks. It allows servers to use centralized storage as if that storage were directly attached, a key requirement for applications and databases that assume fast local storage. With iSCSI, a drive can be located thousands of miles away across a wide-area network, but it can still behave as if it were part of the server. The best performance, of course, comes from running iSCSI over a local Gigabit Ethernet connection. Prices for iSCSI solutions in the 1TB range are currently between \$10,000 and \$15,000, but we expect them to fall more in line with comparable NAS products within the next one to two years.

Microsoft recently released iSCSI drivers for its Windows Server and Windows XP operating systems.

When iSCSI becomes as easy as NAS to implement, we expect to see many small businesses using iSCSI SANs for virtual desktop and server storage.

The new options for untethered storage give small businesses more flexibility than ever before in planning their purchases. And direct-attached storage capacities have never been higher, nor prices lower. It's a good time to buy storage. ☐

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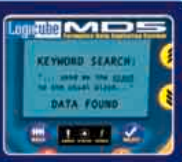
USB Write Protect for Fast and secure access to Suspect PC or Laptop.

**3GB/Min.**  
Acquisition  
& MD5  
Authentication  
(128 bit)

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- Even more reliable than CRC32
- Many times faster than software-based systems
- Capable of capturing from a Suspect's SCSI/IDE Drive to the Evidence Drive with USB adapter



Keyword Search Search for 100's of words concurrently on a hard drive while capturing or later.



Fully Integrated QWERTY Keypad: For easy entry of file names, users credentials, keywords searches...

Removable Compact Flash: Stores keyword lists, software updates, debug traces...



(Inside is the Evidence Drive)

DD Image Capture Mode: Capture a Suspect's Hard Drive to multiple DD Image Files. Archive to CD-R's, Jaz & DVD-R's.

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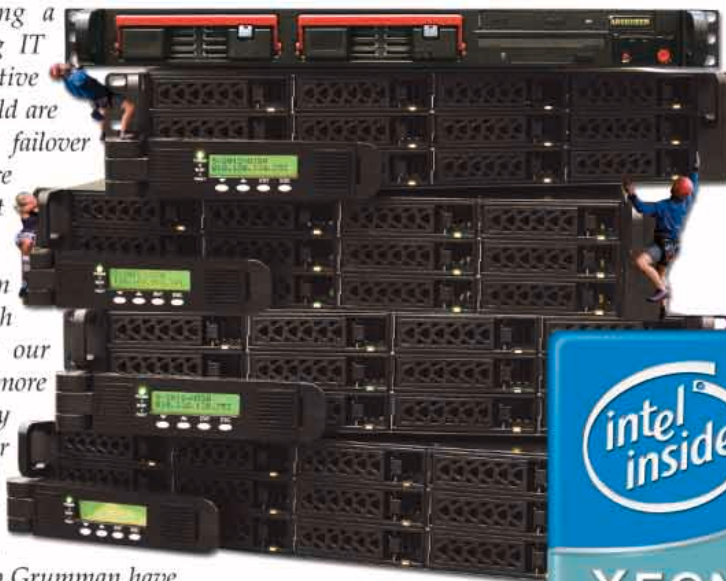
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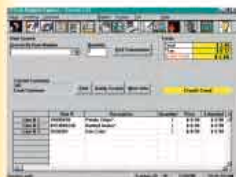
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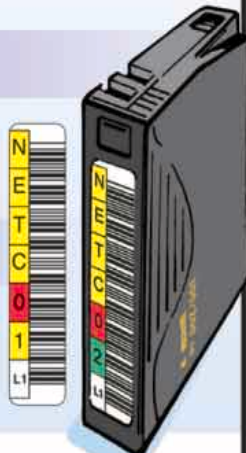
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## Collectors Pay Thousands \$\$\$\$

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.

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1868	Steinhausen masterpiece is created	1st Automatic movement in a wrist watch	1953	Girard-Perregaux introduces the Swiss quartz watch	2003
Patek Philippe makes first wrist watch	1923	Lips produced the first battery powered watch	1966	Steinhausen masterpiece is reproduced for first time	

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Portable speakers can free you to enjoy your digital music in a hotel room, in your office, or at a party. But too often, you have to put up with tinny sound that makes you want to slap your headphones back on. We checked out seven sets of portable speakers with prices from \$40 to \$200 to find out which ones were worth listening to. • We tested these speakers with nine musical tracks ranging from classical to heavy metal; we also subjected them to a frequency analyzer to test their range of response. The differences were stark. The Altec Lansing inMotion gives crystal-clear sound and elegant portability to iPod owners, so it's our Editors' Choice. The other speakers varied from sounding like a big boombox to sounding like an old telephone. You do get what you pay for.



Altec Lansing  
inMotion

### Altec Lansing inMotion

**PC** MAGAZINE EDITORS' CHOICE  
Ghost-white, feather-light, and eminently portable, the Altec Lansing inMotion lets an Apple iPod fill a small room with gorgeously transparent sound. The only thing you lose is bass, which is understandable in a system so small (8 inches wide by 5.4 inches deep) and light (15 ounces).

The inMotion had the best frequency response of any of the speakers we tested, with an even sound from 90 Hz all the way up to 20 kHz. That translates to perfectly precise sound; in a song by Garbage (a band known for dense production) we could pick out several separate tracks. Acoustic guitar sounded delicious,

with the sound of fingers and picks coming through clearly. Bass was slight: We'd call the sound bright, not harsh, but these speakers aren't for hip-hop.

The inMotion runs for more than 20 hours on four double-A batteries, or it can power and charge your iPod with its AC adapter. If you want your iPod to sing you to sleep in a hotel room or keep you chugging along at work, you couldn't do better than this.

\$149.95 list. Altec Lansing Technologies Inc., [www.alteclansing.com](http://www.alteclansing.com). ●●●●●

### Cambridge SoundWorks PlayDock PD200

The PlayDock PD200's strength and weakness lie in its 14-pound heft. This handsome fireplug of sound is the only speaker system on our list that's beefy enough to power a beach party, and it gave by far the biggest bass feel. But you won't want to carry it much farther than the car.

The PlayDock packs a central bass speaker in between its two tweeters. After the inMotion, the PlayDock had the widest frequency response of our bunch, delivering usable response between 60 Hz and 10 kHz, with a massive boost in the mid-bass. Voices sound full, heavy metal blasts the way it should, and classical woodwinds sound very warm. The PlayDock can also get really loud without distortion—great for parties. It runs for

about 10 hours on its rechargeable battery.

The PlayDock is made to work with the Creative Nomad Jukebox 2 and 3 and the Nomad Jukebox Zen lines. Any of these players will fit into a snug rubber glove in the top of the unit and get power from the PlayDock. You can also plug another type of player into the PlayDock, but it won't receive power.

If you're looking to turn your Creative Nomad jukebox into a powerful, somewhat portable home stereo—and you're a big fan of bass—the PlayDock is well worth its hefty size and price.



Cambridge  
SoundWorks  
PlayDock PD200

\$199.99 list. Creative Technology Ltd., [www.cambridgesoundworks.com](http://www.cambridgesoundworks.com). ●●●●●

### RCA FSP200

These speakers sound awful: It's that simple. Silence is infinitely more pleasurable than the tortured tones that emanate from this clamshell of cacophony. The FSP200 system lacks bass and high treble, delivering what music it can in a muddy midrange and sounding a lot like a speakerphone.

Sure, the speakers have some good aspects: They are durable and come with a neat retractable audio cable. But in the end, these are speakers you just don't want to listen to. That's not a bargain at any price.

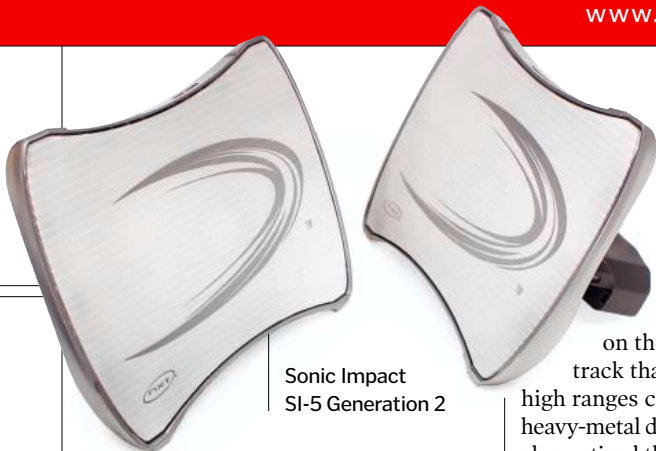
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RCA FSP200

#### WHAT THE RATINGS MEAN

- EXCELLENT
- VERY GOOD
- GOOD
- FAIR
- POOR



Sonic Impact  
SI-5 Generation 2

### Sonic Impact SI-5 Generation 2

Based on the same flat-panel speaker technology as the Wharfedale LoudMan, the Sonic Impact SI-5 Generation 2 speakers snap together for travel and come apart for listening. Separated, they're a pair of fiberboard panels propped up on a stand; you use loose cables to connect the panels to each other and to your portable device.

Sonic Impact adds a bass booster to its speakers, and the sound is a little richer than that of the LoudMan system. Bass guitar sounded terrific, and the mixes on our electronic and heavy-metal tracks were well balanced. The Generation 2's audio range, from roughly 170 to 5,000 Hz, was about the same as the Wharfedale's, given the imprecision of our tests, but the low end was pumped up a bit. Expect 20 hours of use on 4 triple-A batteries.

The Sonic Impact SI-5 Generation 2 makes a fine pair of budget speakers for

barely tolerable sound—the kind you'd expect from a clock radio. True lows and highs are missing entirely.

Classical music and classic rock (we tested with Pink Floyd) fared best on these speakers. An electronic track that relied heavily on low and

high ranges came out utterly wrong, and heavy-metal drums sounded distorted. We also noticed that these speakers top out at a lower volume than others, making them best for a desk or a bedside.

If the SRS-T88 didn't cost quite so much, we'd like it better. Spend the money only if you need your speakers to be hardy.

\$89.99 list. Sony Electronics Corporation of America, www.sonymstyle.com. ●●●○○

### SoundKase Soundsak Sonic

The Soundsak Sonic is made of two meaty speakers and a separate amplifier built into a backpack, which also has a handy carrying case for CD players. In theory, you'd open up this rugged system after a long hike and unwind.

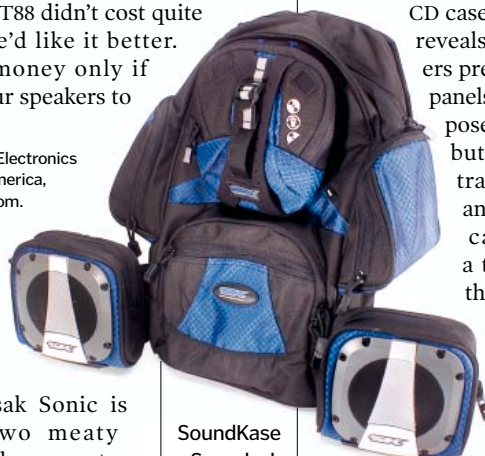
It's a great idea that's poorly executed.

The speakers can't be removed, so you're stuck lugging them around whether you want them or not. The controls on the amplifier

are awkward to get to, and the sound is seriously muddy. Though we got a pretty wide frequency response out of the speakers, they were boosted in the vocal ranges, pulling singers out of their mixes. The sound quality isn't bad at all; it just does not justify the extra bulk the speakers add to this bag.

SoundKase sells other, cheaper bags with CD pods but no speakers; mixing one of those packs with a Sonic Impact SI-5 Generation 2 would be a lighter-weight alternative.

\$129.99 list. Scosche Industries, www.soundkase.com. ●●●○○



SoundKase  
Soundsak  
Sonic

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### Wharfedale LoudMan

Providing the best bang for the buck of any product we tested for this story, the Wharfedale LoudMan speakers are as beautiful and fragile as butterflies. That limits their usefulness outdoors, but inside, they're handy little sounding boards.

Coming in a wide range of vivid colors, the LoudMan looks exactly like a double CD case. Opening up the "case" reveals two exposed transducers pressed against fiberboard panels. That's how you're supposed to play the LoudMan, but doing so exposes the transducers to rain, wind and dust; twice, our audio cable brushed against a transducer, distorting the sound.

Be gentle with them, though, and you've got a terrific pair of \$40 speakers. We got useful audio response down to 200 Hz and some treble up to 6 kHz, with a peak at 250 Hz, giving the sound a bit of weight. The LoudMan played all our test tracks decently, though it bungled the mix of an electronic track that leaned too heavily on low bass. Unfortunately, it runs for only 4 hours on four double-A batteries.

The LoudMan is light, portable, cheap, and friendly. As long as you don't expect a very rich sound, you'll probably be satisfied with this colorful contender.

\$39.99 list. Wharfedale International Ltd., www.iagameric.com/wharfedale/loudman.htm. ●●●○○



Sony SRS-T88

a small to medium-size room. Although they don't sound quite as good as the inMotion system, they cost only half as much—and that's a compelling feature.

\$59.00 list. Sonic Impact Technologies LLC, www.si-5.com. ●●●○○

### Sony SRS-T88

Sony's rugged little SRS-T88 is a great \$40 speaker system. Unfortunately, it costs \$90. Light, portable, and tough, this is a true take-anywhere set of speakers. Load it with four double-A batteries or plug in the included AC adapter, and you get just



Wharfedale  
LoudMan

# GEAR & GAMES



## The Matrix Mouse

Microsoft has rolled out three new special-edition mice—meaning they'll be produced for months, not years. The Night Vision Wireless IntelliMouse Explorer, with its green-over-black finish, reminds us of the falling digits on the black background seen in *The Matrix*. The Immersion model features a deep-blue and purple grid that looks like the rippling surface of a pool. The third, the Groovy Wireless Optical Mouse, is finished in flowing oranges and reds, a tribute to the shagadelic colors of the Sixties.

All are wireless and have a tilt wheel that lets you scroll vertically or horizontally. The Wireless IntelliMouse Explorer is shaped to conform to a right-handed user, whereas the Wireless Optical Mouse works for lefties too. On the side are small Internet Back and Forward buttons. Battery life is rated at triple that of earlier models.—*Bill Howard*

\$45 street (Wireless Optical Mouse, \$35). Microsoft Corp.  
[www.microsoft.com/hardware](http://www.microsoft.com/hardware). ●●●●○

## Pocket PC FM Radio

The AmbiCom FM Radio CompactFlash Card is a slick way to add function to a Pocket PC: It turns your PDA into an FM tuner, with stereo output via an included earset and a complete, easy-to-use interface with 18 station presets. Your PDA must have a Type II CompactFlash slot (an expansion jacket slot works fine) and must be compatible with Pocket PC 2000, Pocket PC 2002, or Windows Media 2003. When we tested the FM Radio card in a Toshiba Pocket PC e805, it installed easily and worked just as promised.—*Bruce Brown*

\$40 street. AmbiCom Inc., [www.ambicom.com](http://www.ambicom.com). ●●●●○



## Prevent Lapburn

Ever thought *laptops* was a misnomer? They can quickly grow far too hot to use comfortably in anyone's lap. Using the LapLogic protective pads, though, you can work happily for hours without overheating. The Norte is a thin, foldable, portable pad that comes in four colors; the less expensive Bora is a basic rigid pad. Check the company's Web site for more models.—*Carol A. Mangis*

Norte, \$29.95 direct; Bora, \$24.95. LapLogic Inc., [www.laplogic.com](http://www.laplogic.com). ●●●●○



# Hot New Console Games

BY MATTHEW D. SARREL AND JOEL SANTO DOMINGO



FINAL FANTASY XI

## Final Fantasy XI

Sony and Square Enix have joined forces—much as you will in this MMORPG—to present the most ambitious PlayStation 2 title yet. Vana'diel is a seemingly limitless persistent world that includes players on PCs and PlayStation 2s in North America and Japan. Choose from myriad options for character development—with 5 races, 15 job classes, and specialized jobs and crafts—and start earning experience. Animations and backgrounds are stunning, and sound effects are accurate and engaging.

FFXI is not for everyone, because of its high price, the tedium of registration, and the dearth of action elements: In combat, you target an enemy, choose your attack type from a menu, and then sit and watch. But it will appeal mightily to hardcore RPG players.—MDS

For Sony PlayStation 2 (reviewed), PC. \$99.99 list (includes a PS2 internal hard drive), \$12.95 a month. Sony Computer Entertainment America Inc., [www.us.playstation.com](http://www.us.playstation.com). ●●●●●

## WarioWare, Inc.: Mega Party Game\$

Move over, beer pong: There's a new king of party games in town. Building on the success of the Game Boy Advance WarioWare franchise, this game lets up to 16 players compete in a series of simple and frantically paced microgames. Half the fun is fig-



MEGA PARTY GAME\$

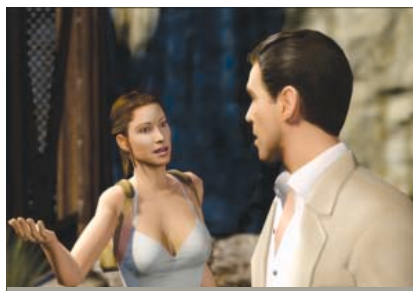
uring out what to do and then quickly doing it. In single-player mode, you can unlock an additional 200 microgames, movies, and music videos. You and your friends will never spend another party sitting and staring at one another again.—MDS

For Nintendo GameCube. \$29.99 list. Nintendo, [www.nintendo.com](http://www.nintendo.com). ●●●●○

## James Bond 007: Everything or Nothing

This game really feels like a Bond film. It gets help from the movie's actors: Pierce Brosnan, Willem Dafoe, Judi Dench, and John Cleese all lend their likenesses and voices to the game. Pacing is spot on, and game play is like a cross between Syphon Filter and Splinter Cell: stealth spiced up with the outlandish action James Bond fans expect. The opening theme song by Mya, silhouetted girls and rows of tanks, and lots of other familiar Bond elements help pull you into the world of the suave superspy.—JSD

For Microsoft Xbox (reviewed), Nintendo GameCube, Sony PlayStation 2. \$49.95 list. Electronic Arts Inc., [www.ea.com](http://www.ea.com). ●●●●●



007: EVERYTHING OR NOTHING

## Syphon Filter: The Omega Strain

Create your own agent and become a fresh recruit—a poorly equipped one, too, since the first thing you need to do is steal a terrorist's gun. You can unlock over 100 weapons as you accomplish various objectives and progress through a very deep story continued from earlier versions, combating international bioterrorists. Online and cooperative play round out solid game play that can become tedious on later levels (there are 17 in all) as you repeat tasks dozens of times until getting them right. Overall, noteworthy graphics, the right mix of stealth and frenetic combat, and a fantastic weapons system make this game worth playing.—MDS

For Sony PlayStation 2. \$49.99 list. Sony Computer Entertainment America Inc., [www.us.playstation.com](http://www.us.playstation.com). ●●●●●

## QUICK CLIPS



### Far Cry

For Jack Carver, what starts out as a quick trip to a secluded island paradise quickly becomes the adventure of a lifetime. An army of mercenaries attacks with unending fury, and Jack fights for his survival while trying to uncover the army's hidden agenda. Incredible view distances help convey the epic size of this game's stunningly beautiful environment.

Clearly, the shooter genre has escaped from repetitive, dank corridors for good.—Peter Suci  
\$39.99 list. Ubisoft Entertainment, [www.ubisoft.com](http://www.ubisoft.com). ●●●●●



### Syberia II

Harking back to grand adventure games, Syberia II is almost like going home again. But like character Kate Walker, who has forsaken her career for a seemingly impossible quest, this game proves you can't return so easily. The story picks up from the original and sends you to imaginative realms in glorious 3D. Unfortunately, Syberia II has an old-fashioned interface and dated mechanics, and offers too little reward for Kate's extreme efforts.—Peter Suci

\$29.99 list. MC2-Microids, [www.syberia2.info](http://www.syberia2.info). ●●●●○



### Painkiller

This first-person shooter is set in a gothic world where good and evil are on a path to war. As an agent of God, your mission is to stop the war before it begins. The game world and monsters are very detailed, game play is fast and furious, and weapons and ammo are everywhere. Who knew demons could be exorcised with a chain gun?—John Blazevic

\$39.99 list. Dreamcatcher Interactive Inc., [www.dreamcatchergames.com](http://www.dreamcatchergames.com). ●●●●○

# BACKSPACE

## PONDERING THE ETERNAL MYSTERY OF BAD SPELLING

By Don Willmott



«Precocious, isn't he?  
(Gateway Professional ad)

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Abdu Taguri  
Sr. Director of IS  
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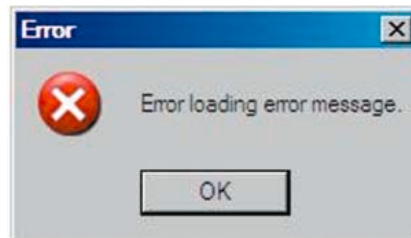
INTERACTIVE MENU RESULTS	Nutritional Information	
	Serving Size	Calories
1/3 lb Thickburger	317.02000000000004	660.7
French Fries (large)	193.34999999999999	605.2
French Fries (medium)	166.13	520.0
Total Meal	676.5	1785.88

»We're not sure what the folks at Hardee's are counting here, but they're certainly precise about it.  
(www.hardees.com)

	Files	Boot Records
Scanned	16734	1
Infected	3336	0
Cleaned	0	0
Quarantined	0	N/A
Deleted	3336	N/A

«That's one sick computer! Probably better just to hurl it out a window.  
(McAfee VirusScan)

»Heavy sigh.  
(pcAnywhere screen)



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