

You're Reading the #1 Resource for **PURE PC POWER!**

MAXIMUM PC

MINIMUM BS • AUGUST 2009

Disaster-Proof Your PC!

9 Sure-fire ways to
prepare your rig for
any PC calamity

PLUS: How to recover instantly
when the unthinkable happens!

ULTRAPORTABLES!

3-pound notebooks:
Can they do it all?

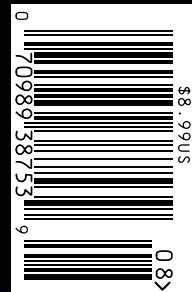


PRIMORDIAL PC POWER

The 25 most influential rigs
of the Jurassic PC Period



HOW TO KEEP ALL YOUR COMPUTERS SYNCHED WITH DROPBOX



Future
MEDIA WITH PASSION

Unleash your PC's Potential...

Try

MAXIMUM PC

Each issue of Maximum PC features:

- Brutally honest product reviews
- Hard-hitting editorials
- Tips to blast your machine's performance
- Insightful and innovative How-To's
- A CD loaded with new software, utility and game demos

2
FREE
Trial Issues

Reserve your **2 FREE** Trial Issues today!
There's no obligation.

To order, head to:

www.maximumpc.com/archive



AUGUST

FEATURES

22

38

48

DEPARTMENTS

08

14

60

61

63

73

92

96

LETTERS

16

94

◀ 38

Ethel the duck is awesome.



EDITORIAL

EDITOR IN CHIEF **Will Smith**
 DEPUTY EDITOR **Katherine Stevenson**
 SENIOR EDITOR **Gordon Mah Ung**
 ONLINE EDITOR **Norman Chan**
 ASSOCIATE EDITOR **Nathan Edwards**
 ASSOCIATE ONLINE EDITOR **Alex Castle**
 EDITOR AT LARGE **Michael Brown**
 EDITORIAL ASSISTANT **Florence Ion**
 CONTRIBUTING WRITERS **Tom Halfhill, Justin Kerr, Erik Klein, Paul Lilly, Thomas McDonald, Quinn Norton, Dan Stapleton**
 PODCAST PRODUCER **Andy Bauman**
 EDITOR EMERITUS **Andrew Sanchez**

ART

ART DIRECTOR **Natalie Jeday**
 CONTRIBUTING ART DIRECTOR **Katrin Auch**
 PHOTO EDITOR **Mark Madoe**
 ASSOCIATE PHOTOGRAPHER **Samantha Berg**
 CONTRIBUTING ARTIST **Neal Stillman**

BUSINESS

VP/PUBLISHING DIRECTOR **Stacey Levy**
650-238-2319, slevy@futureus.com
 GROUP SALES DIRECTOR **Gabe Rogol**
650-238-2409, grogol@futureus.com
 SENIOR REGIONAL SALES DIRECTOR **Dave Lynn**
949-360-4443, dlynn@futureus.com
 REGIONAL SALES DIRECTOR **David White**
650-238-2502, dwhite@futureus.com
 SALES MANAGER **Aida Rodriguez**
708-562-0686, arodriguez@futureus.com
 INTEGRATED SALES DIRECTOR **Joe Pomparelli**
323-342-1888, jpomparelli@futureus.com
 MARKETING MANAGER **Andrea Recio-Ang**
650-238-2548, andrea@futureus.com
 ADVERTISING COORDINATOR **Jose Urrutia**
650-238-2498, jurrutia@futureus.com

PRODUCTION

PRODUCTION DIRECTOR **Richie Lesovoy**
 PRODUCTION COORDINATOR **Dan Mallory**
 PRINT ORDER COORDINATOR **Jennifer Lim**

CONSUMER MARKETING

DIRECTOR CONSUMER MARKETING **Rich McCarthy**
 CIRCULATION DIRECTOR **Crystal Hudson**
 NEWSSTAND DIRECTOR **Bill Shevey**
 CONSUMER MARKETING OPERATIONS DIRECTOR **Lisa Radler**
 RENEWAL AND BILLING MANAGER **Mike Hill**
 BUSINESS MANAGER **Elliot Kiger**
 SR. ONLINE CONSUMER MARKETING DIRECTOR **Jennifer Trinker**
 CUSTOMER SERVICE MANAGER **Mike Frassica**

FUTURE US, INC

4000 Shoreline Court, Suite 400, South San Francisco, CA 94080
 www.futureus-inc.com

PRESIDENT **Jonathan Simpson-Bint**

VICE PRESIDENT/COO **John Sutton**
 INTERNET DEVELOPMENT **Tyson Daugherty**
 PUBLISHING DIRECTOR/BUSINESS DEVELOPMENT **Dave Barrow**
 EDITORIAL DIRECTOR **Jon Phillips**
 EDITORIAL DIRECTOR/MUSIC **Brad Tolinski**
 DIRECTOR OF HUMAN RESOURCES **Nancy DuBois**
 PRODUCTION DIRECTOR **Richie Lesovoy**



Future US, Inc. is part of Future plc. Future produces carefully targeted special-interest magazines, websites and events for people who share a passion. We aim to satisfy that passion by creating titles offering value for money, reliable information, smart buying advice and which are a pleasure to read or visit. Today we publish more than 150 magazines, 65 websites and a growing number of events in the US, UK, France, and Italy. Over 100 international editions of our magazines are also published in 30 other countries across the world.

Future plc is a public company quoted on the London Stock Exchange (symbol: FUTR).

FUTURE plc

30 Monmouth St., Bath, Avon, BA1 2BW, England
 www.futureplc.com
 Tel +44 1225 442244

NON-EXECUTIVE CHAIRMAN: **Roger Parry**
 CHIEF EXECUTIVE: **Stevie Spring**
 GROUP FINANCE DIRECTOR: **John Bowman**
 Tel +44 1225 442244
 www.futureplc.com

REPRINTS: For reprints, contact Marshall Boomer, Reprint Operations Specialist, 717.399.1900 ext. 123 or email: marshall.boomer@theygsgroup.com

SUBSCRIPTION QUERIES: Please email customerservice@maximumpc.com or call customer service toll-free at 800.274.3421

Maximum PC ISSN: 1522-4279



My 5 Favorite Apps & Utilities, the Early 2009 Edition

We computer nerds all have our favorite applications and utilities—you know, the software we absolutely cannot live without. You're certainly already familiar with many of my personal faves (I always install Firefox, Digsby, and Dropbox), but developers are constantly releasing new software, so my list is always evolving. And so, without further delay, I give you my favorite apps and utilities, as selected during the first half of 2009.

5. THE MAGIC FOLDER This Vista and Windows 7 widget will keep a constant watch over any folder and automatically sort the files in it based on extension. It's an incredibly simple concept with a ton of killer uses. I set it to watch my Downloads folder and sort out media files, photos, and applications for maximum effect. <http://bit.ly/11bUMU>

4. ZUNE PLAYER I've been an iTunes user since it launched, but as the years have gone by, the Windows version has gotten slower and less responsive. Today, it takes roughly 16 weeks to launch iTunes, and starting playback of a single track can take a fortnight. Lucky for me, the Zune player (which requires neither a subscription to the Zune music service nor a Zune hardware device) is totally rad. Fast search, good browsing, killer visualizations, and it will watch my music folder and automatically add new tracks as I add them. That's awesome. www.zune.com

3. REMEMBER THE MILK As a person who's chronically disorganized, Remember the Milk gives me a universally accessible task list that helps me keep my priorities straight. RtM is web-based, so I can add to and update my task list from all my devices—laptop, desktop, and iPhone—without worrying about sync problems. www.rememberthemilk.com

2. ENSO Given the choice, I'd much rather start an application or run a command using the keyboard than the mouse. Moving your hand to the mouse takes time, and using the mouse increases the likelihood of developing repetitive stress injuries. Enso lets you do everything—opening apps or recent documents, performing simple calculations, or anything else you'd like (it's customizable)—at a convenient command line. www.humanized.com/enso

1. SYNERGY I have two computers on my desk, but only one keyboard and mouse. How do I manage it? Synergy. Synergy lets me share the keyboard and mouse with multiple PCs (or Macs, or Linux boxes) using the power of the network. It's a little bit of a hassle to set up, but once it's running, it's OK by me. <http://synergy2.sourceforge.net>

That's my current list. Let me know what your favorite apps are! Email me at will@maximumpc.com or shoot a message to [@willsmith](https://twitter.com/willsmith) on Twitter.

Will Smith

NUCLEAR HOT!

LIGHTWEIGHT LAPTOPS
page 38

HISTORY OF THE PC
page 48

HOW THE INTERNET WORKS
page 60



LETTERS POLICY Please send comments, questions, and bar-b-que to will@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Unfortunately, Will is unable to respond personally to all queries.

THE NEWS

Intel Slammed with \$1.45 Billion Fine

Company rebates were used to prevent PCs with AMD parts from coming to market, trade group says -GORDON MAH UNG

Intel hurt consumers' choices by paying PC builders to delay the production of PCs using AMD CPUs or to not produce them at all, a European antitrust agency has ruled.

Charged with enforcing antitrust regulations for the European Union, the European Commission fined Intel a record \$1.45 billion after a multi-year investigation into complaints made by AMD. The Commission, which has not yet released the complete details of its findings, seems to be hanging most of its fine on how Intel grants its rebates to retailers and PC builders.

The Commission says it's not that Intel pays rebates, it's what Intel forces companies to do to get them. In one case, the commission says, AMD offered one PC maker a million free CPUs. The PC maker accepted only 160,000 of the CPUs because it would have lost rebate payments from Intel for its remaining Intel CPUs and that would have cost more than taking the entire lot of AMD processors for free.

In another case, Intel paid rebates to a PC vendor to delay the launch of an AMD-based notebook for four months, according to the Commission. In yet another, Intel directed a PC maker to only sell AMD-based business desktops to small and medium companies, sell only directly (as opposed to through retail channels), and to move the launch of AMD products back six months, the Commission said.

The Commission said its ruling is based on evidence it received from various parties as well as email and documents it seized during unannounced inspections. The commission said it has evidence that Intel tried to cover up the rebate ties as well, but did not elaborate.

Intel, for its part, has denounced the fine.

"Intel takes strong exception to this decision. We believe the decision is wrong and ignores the reality of a highly competitive microprocessor marketplace—characterized by constant innovation, improved product



While Intel disputes the European Commission's ruling, the company isn't likely to forsake the considerable business it does overseas.

performance and lower prices. There has been absolutely zero harm to consumers. Intel will appeal," said Intel CEO Paul Otellini.

The company argues that in the eight years since AMD began bellyaching to regulatory bodies that it would go under because of Intel's actions, AMD has instead thrived with fast and efficient parts. Intel also argues that if consumers have been hurt by the rebates, why have PC prices plummeted while performance climbed? Finally, Intel says rebates and sales incentives are a fundamental sales practice that is required to compete in today's world. EU regulators argue that the damage may not be evident now but once AMD is eliminated, prices will certainly increase.

The decision isn't without controversy. Newspaper editorials are already accusing the Commission of trying to kneecap American tech companies to aid feeble European ones. In 2006, the Commission fined Microsoft

\$357 million and threatened the company with fines of \$3.8 million a day over antitrust issues, and it has set its sights on Apple, Qualcomm, and Rambus, as well.

Even if the Commission is acting unfairly to American companies, Intel is unlikely to walk away. About 30 percent of Intel's business is based on selling processors, chipsets, and the like to European companies. With the global CPU market valued at roughly \$33 billion, the \$1.45 billion fine is a drop in the bucket over the long term.

Intel's top European lawyer says the company will appeal although it doesn't expect the ruling to be overturned. Intel has three months to place the \$1.45 billion in a fund where it will sit while the appeals process plays out. The fine itself will not be paid out to the European consumers who were supposedly hurt by Intel's actions. Instead, the \$1.45 billion will go into the Commission's coffers.

Phenom II, Core i7 Upgrades

Faster and better CPUs hit the streets

If competition in the processor market has been hurt, you couldn't tell it by the new chips from AMD and Intel. Both companies have just released updated versions of their top CPUs.

Intel has officially unwrapped its Core i7-975 Extreme Edition chip. Ringing in at 3.3GHz, the chip replaces the \$1,000 3.2GHz Core i7-965EE. It's only a minor clock-speed bump, but the 975 uses the new "D-step" revision of the core, which will greatly enhance the chip's overclocking capabilities.

AMD, in its continued guerilla war against Intel, has released more AM3 chips. On top is the 3.2GHz Phenom II X4 955 Black Edition. This AM3 chip brings both DDR2 and DDR3 capabilities to AMD's fastest consumer CPU and also ups the HyperTransport bus to 4GHz versus the 3.6GHz that the Phenom II X4 940 was limited to. All for just \$245. —GV



The new Core i7-975 Extreme Edition features an updated core that enhances overclocking.

Nvidia Decries Atom Pricing

Intel isn't just playing unfair with AMD CPUs, it's also pricing its super-hot Atom chips to hurt Nvidia's Ion, the graphics company alleges. In an interview with Reuters, Nvidia CEO Jen-Hsun Huang said Intel sells individual Atom CPUs for \$45, but if OEMs also buy an Intel chipset with that CPU, the total price drops to \$25.

"[The pricing] seems pretty unfair," Huang told the news service, but stopped just short of saying Nvidia would pursue the same anti-trust route AMD has taken against Intel. Intel officials declined to disclose the actual pricing, but dismissed Nvidia's complaints, saying customers who buy more product usually get better pricing—and adding that if Ion is so hot, the vendors would dump Intel's chipsets for Ion, but they haven't. —GV



TOM HALFHILL

Why Apple Designs Chips

Many people still think of Apple as a relatively small computer company, even though it's a large consumer-electronics company. Those folks were surprised by recent reports that Apple is hiring more chip designers. They question the wisdom of plunging deeper into the risky and costly venture of designing custom chips.

But Apple's moves are a logical response to current events. We are witnessing a fundamental shift in computing, as important as the debut of personal computers in the 1970s.

Desktop PCs—and to a lesser extent, notebook PCs—are the old wave. The new wave integrates mobile computing and communications with ubiquitous Internet access. Although notebook PCs can ride this wave, they are the largest species of new personal computers. Netbooks are better examples. Best of the new breed are the Apple iPhone, RIM BlackBerry, and Palm Pre. More are coming.

It's been two years since the wildly popular iPhone appeared, yet major cell-phone makers still haven't introduced similar models. They were caught flat-footed. The iPhone redefined the smartphone with innovative hardware and software, just as the Macintosh redefined desktop computers in 1984.

For 25 years, Apple's strategy has been consistent. Apple differentiates its products with custom hardware and software so it can charge higher prices and earn greater profits than commodity-minded competitors using off-the-shelf components.

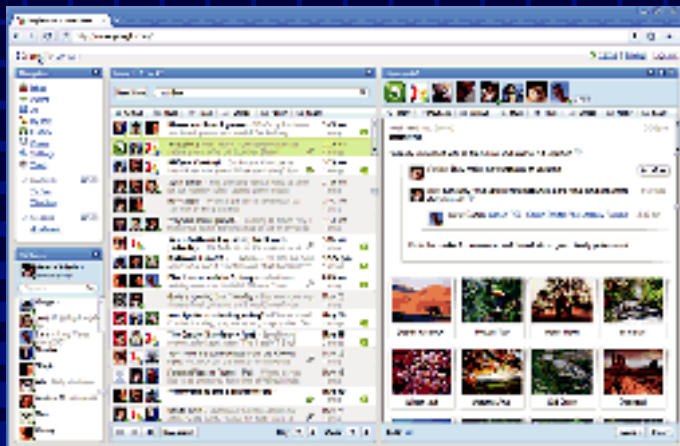
Small systems like the iPhone need custom chips optimized for specific tasks. These chips burn less power (lengthening battery life), occupy less space (improving portability), and deliver greater performance (enhancing the user experience). It's true that chip design is risky and expensive, but Apple has the experience, money, and talent required for these projects, and is accumulating more.

No one questions why consumer-electronics companies like Sony, Canon, Matsushita, Toshiba, and Samsung design custom chips. With products like the iPod and iPhone, Apple is joining that league. Apple has always been good at surfing waves—largely because it's a tidal force helping to make them.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

Tomorrow's Email, Today

Google Wave promises email, instant messaging, and social networking features in a single, sleek communications app



While still in its development stage, a preview shows how clicking a thread, aka a "wave," in your inbox will open a pane to the right that shows all the contributions, including pictures, to that thread. —KS

KICKER

What's up with Windows 7?

Specifics not already revealed by the public beta and release candidate are pretty thin, but here's what we know so far about the OS, due this year

- Versions:** There are six different versions of Windows 7. While Vista's many versions each had disparate and confusing feature sets, in Win7 each "upgraded" edition is a superset of the hobbled lower versions. The versions are, in order: Starter (for netbooks and emerging markets), Home Basic (for emerging markets and cheap PCs), Home Premium (for most home users; includes Aero), Professional (for most businesses), Enterprise (for large corporate clients), and Ultimate (for people who need Enterprise features but don't have a volume license with Microsoft). Pricing details aren't available yet.
- Upgrade Coupons:** Various sites around the Internet have reported that there will be an upgrade program for people who buy Windows Vista machines in the lead up to the Windows 7 launch, however, Microsoft hadn't confirmed existence of an upgrade program as we went to press.
- XP Mode:** Another feature new to Win 7 RC is XP Mode. XP Mode is a Virtual PC instance that allows you to run any incompatible app you want in a virtual machine, but it requires a modern CPU with chip-level virtualization sup-



port. You can find a complete list of supported CPUs here: <http://bit.ly/5g8nJ>.

- Upgrading:** Upgrading Vista will be relatively simple, as long as you upgrade to an edition of the OS similar or better than the one you're using. While XP users will be eligible for upgrade pricing, they'll have to do a clean install. There's no in-place upgrade option for XP users.
- RC Info:** We've been running the hell out of the RC since early May, and we're impressed with its performance and reliability so far. If you want to try it out, you can by going to www.microsoft.com/windows7 and following the appropriate links. Remember, though, the RC starts to expire on March 1, 2010, at which time you'll need to buy the full version or revert to your earlier OS. —ws

MS, INTEL TO LIMIT NETBOOK SIZE?

Windows 7 licensing rules could cease netbook growth

As netbooks continue to grow in size, you might be left wondering where netbooks end and traditional notebooks begin. The answer is 10.2 inches, assuming news and rumor site DigiTimes has been fed accurate information. Citing unnamed sources at Taiwan-based notebook makers, DigiTimes says Microsoft and Intel agreed to decrease the screen-size ceiling for netbooks running Windows 7 from 12.1 inches to 10.2 inches.

Should the restriction be put in place, it would spell the end for 11.6-inch Atom Zxx-based netbooks once Windows 7 launches, the sources said. It could also hamper VIA, who doesn't put any restrictions on how vendors use its CPUs and chipsets. VIA-based netbooks larger than 10.2 inches wouldn't qualify for the lower Windows 7 licensing rates, thereby potentially taking away any advantage VIA might have had in the 11-inch-and-above market. —PL

GAME THEORY



THOMAS MCDONALD

Experiencing the Army

I'd like to thank my local Army-hating, left-wing peace-creeps. If it wasn't for their shrill protest outside the Army Experience Center in Franklin Mills, Pennsylvania, I might never have known that one of the best gaming facilities in the region is only half an hour from my house. And completely free!

Among the hundreds of young people flocking to AEC are certainly many who first heard about the facility from the flood of local coverage that accompanied those activists' repellent bit of street theater. In all fairness, the protestors did have a noble goal: preventing people from playing Ghost Recon, America's Army, and dozens of other games in a comfortable, state-of-the-art facility, free of charge.

Imagine it: Sixty Alienware Aurora PCs networked and running the Army's own first-person shooter, as well as the Call of Duty and Tom Clancy games and many others. Dozens of Xbox 360s hosting a diverse assortment of sports, strategy, and action titles, complete with Xbox Live accounts and comfy chairs. Three full-size custom simulators: a two-seat Apache helicopter, a Humvee with five M4 rifles, and a Blackhawk helicopter with four gunner positions. The rifles use compressed air for recoil and lasers for registering hits on a giant screen.

Built at a cost of \$12 million and occupying more than 14,000 square feet, the AEC is part community outreach, part high-tech recruitment center. Since the facility is largely empty during the day, the Army uses it as an alternative high school for 100 students, and frequently hosts school and local groups in a spacious, networked conference room.

For folks who are afraid they might pop in for a bit of Rainbow Six Vegas and find themselves, a week later, doing pushups in the rain for Sergeant Hulka, relax: There's no recruitment pitch unless you ask for one. This is not some kind of high-tech spider web designed to lure the young, dazzle them with World at War, and make them sign up for a tour of duty. It's exactly what the Army claims it is: a way to introduce the values, duties, and opportunities of the U.S. Army to the community. And to kick a lot of ass while doing so.

Thomas L. McDonald has been covering games for 17 years. He is an editor at large for *Games* magazine.



SanDisk Ultra Backup 16GB

The SanDisk Ultra Backup, available in sizes from 8GB–64GB (\$49–\$277, www.sandisk.com), is a flash drive with hardware encryption and a backup button. The Ultra Backup software runs from the U3 launcher, and once you've set it up, it proceeds automatically when you press the button. It backs up and restores folder hierarchies, so your data stays organized. It's not the fastest or the biggest backup drive, but for portable backups of your most important data, it's a worthwhile product, especially as it's no more expensive than other similarly sized flash drives. —NE

HP Recalls Notebook Batteries

Approximately 70,000 units affected

Owners of HP and Compaq notebooks purchased between August 2007 and March 2008 will want to verify that their machine is not one of those containing a defective lithium-ion battery. A report published by the U.S. Consumer Product Safety Commission says the batteries can overheat, causing a fire and burn hazard to consumers.

The following models may contain a recalled battery: HP Pavilion dv2000, dv2500, dv2700, dv6000, dv6500, dv6700, dv9000, dv9500, dv9700; Compaq Presario A900, C700, F700, V3000, V3500, V3700, V6000, V6500, V6700; HP G6000, G7000; and Compaq 6720s. If you own one of these models, go to www.hp.com/support/BatteryReplacement or call 1-800-889-2031 to determine whether your battery is being recalled. HP will provide a free replacement battery to affected consumers. —KS



Several different HP and Compaq notebook models could contain a defective battery.

Bill Pushes Fiber Conduit in New Roads

Depending on where you check your stats, the United States ranks anywhere from 15th to 22nd in broadband speeds, falling way behind other countries. The problem is compounded as you move out into the rural areas, where some communities have the choice of dial-up or, if they have a ton of money to burn, super-high-latency satellite. These issues won't be solved overnight, but a new bill proposed in Congress by Democratic Representative Anna Eshoo might be the long-term solution everyone is looking for.

The bill would require that fiber conduit be installed in the sides of all new Federal road projects, laying the groundwork, so to speak, for countrywide high-speed broadband deployment. The costs are expected to be relatively low since the biggest expense is in digging up and burying the cables. The cost of the fiber optic cables themselves will be paid for by private companies.

Although Eshoo is pushing the proposal forward in Congress, the concept was initially proposed last year in the New America Foundation's playbook, a guide published by Ben Lennett and Sascha Meinrath, who were advisors to the Obama campaign on tech issues. —JK

BYTE RIGHTS



QUINN NORTON

Kindling Our Desires

The Kindle is pretty, and sleek, and invitingly Linux-based. But underneath that alluring exterior, right alongside that hackable code, is a body of laws: terms of service, DMCA, and DRM, saying "Oh no, don't touch me!"

To keep providers like the Author's Guild happy, Amazon has restricted features and talked about uses being prohibited, as with its famous update taking away much text-to-speech functionality. But in a world where everything gets hacked, Amazon doesn't have to do much more than make a reasonable effort at DRM—the legal burden is on the user. The Kindle is not very well-locked-down, and often hackers take that as winking permission.

Jesse Vincent is among the Kindle customers to create a "user-generated update." His native ebook converter for the Kindle, called Savory, lets you convert ebooks from open formats (EPUB and PDF) to the Kindle's format. He did it because, he says, "I'm in love with my Kindle."

He wanted to make his beloved Kindle more useful, and he has. Law students have mailed him to say they read briefs using Savory; D&D players use it to read their manuals.

He doesn't know if he's allowed to do it, and he was never able to get any kind of permission from Amazon. This leaves the company free to shut down Savory at any time. "Amazon has taken a very strong pro-publisher stance," says Vincent, but he later notes that "the actual Kindle platform is very tinkerer-friendly."

According to Library Journal.com, the Howe Library called up Amazon to ask about lending the Kindle to patrons and was told, "Sure, go for it." But when the LJ spoke to someone official, they said Amazon's policy bars lending the Kindle. Howe and other libraries have been happily lending them out since then, with nary a peep from Amazon. A crackdown on libraries seems as likely as an Amazon puppy-kicking division, but the fact that it's even remotely possible is disturbing enough.

Devices like the Kindle and the iPhone are honey pots for hackers who love them. It's safer to demand open formats, where no one can take away what you've bought or invested in.

Quinn Norton writes about copyright for *Wired News* and other publications. Her work has ranged from legal journalism to the inner life of pirate organizations.



THE LIST

8 Awesome Firefox Add-ons You've Never Heard Of

8 BROWSER BACKGROUNDS ADORN YOUR NEW TABS

AND WINDOWS WITH RANDOM BACKGROUND IMAGES.

<http://bit.ly/exK1U>

7 RESIZEIMG

DOWNSIZE WEB IMAGES FOR BUDDY ICONS OR FORUM AVATARS.

<http://bit.ly/DCuHS>

6

CAPTURE FOX
CREATE KILLER
VIDEO TUTORIALS.

<http://bit.ly/Rjl7>



5 FINDLIST

Keep track of recent searches by adding a drop-down history list to Firefox's Find box. Brilliant!

<http://bit.ly/10VfyQ>

4 PDFIT

Turn parts of a webpage into an image or PDF file, and then tweak with included image filters.

<http://bit.ly/2m2wNM>



3 LAZARUS: FORM RECOVERY

Back up web forms and WYSIWYG editors in real time—so you never lose any twitters if Firefox crashes.

<http://bit.ly/40BFt>

2 CLOSE'N FORGET

Scrub away any cookie remnants of embarrassing sites on a tab-by-tab basis.

<http://bit.ly/MBrvP>



#1 JUICE

This tasty extension scours the web for more information whenever you search for highlighted text, and serves double-duty as a media storage shed!

<http://bit.ly/1kLH>

This month the Doctor tackles...

▶ **USB Headsets**
 ▶ **Startup Woes**
 ▶ **Disappearing Keyboard**

Sound Blaster vs. Headset

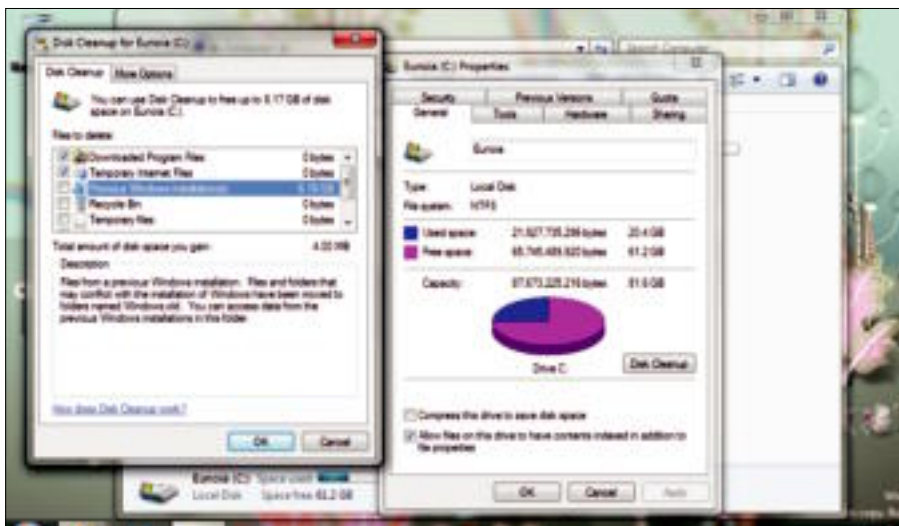
I feel silly asking such a simple question—I can build a computer blindfolded, but from time to time I shock myself at the little things I haven't learned: If I buy a USB-powered headset and install a Sound Blaster card on my motherboard, will my headset take advantage of the soundcard even though it's plugged into a USB port (and not directly into the card)?

—Sean

Sean, your USB headset includes its own sound decoders and will not take advantage of your Sound Blaster card. The best way to reap the benefit of your soundcard is to buy an analog gaming headset. We really like the Astro a40, but it's pricey: \$200 without the Dolby-decoding mixamp. We also like Steel Series' 5H v2, which is \$100.

USB Keyboard Woes

I have a problem booting from my Windows XP installation disc. When I installed Windows XP for the first time, I didn't have any problems. I could see "press any button to boot from CD," and pressing the button would start the installation process. As soon as Windows XP is installed, I reboot and I see "press any button to start from CD," but nothing happens when I press a button, and it loads Windows from the hard drive, not the instal-



After you have the documents you need from your Windows.old folder, you can delete it to free up room on your hard drive.

lation CD. It looks like the keyboard isn't recognized.

I have a Gigabyte GA-K8NXP-SLI motherboard and a Sapphire Radeon HD 4850 videocard. My processor is an AMD 64 X2 4800.

—Vitaliy Kakorin

We've run into this problem with Gigabyte motherboards before. The keyboard isn't recognized because some motherboards disable their USB support by default. You'll need to go into the BIOS to fix it.

First, you will need a PS/2 keyboard or PS/2 keyboard adapter. Now, if you want, you can just use the PS/2 keyboard instead of the USB keyboard, but you probably like your USB keyboard and want to keep it. So here's how.

Turn off your computer,

unplug the USB keyboard and plug in a PS/2 keyboard. Turn on your computer and press the Delete key to enter the BIOS. Go to the Integrated Peripherals menu and make sure both Onboard USB Controller and USB Keyboard Support are enabled. Also try Legacy USB Support if that option appears. Exit the BIOS, saving your changes, and turn off your computer. Swap in your USB keyboard and see if that fixes it.

BSOD of Duty

Over the last four months, I have noticed a drastic drop in my computer's ability to run games. I have Call of Duty 4 and Call of Duty: World at War, both of which ran perfectly at 1400x900 with all settings at max or medium. But when I go to play them

now, I experience momentary freezes, which I can "fix" with Ctrl-Alt-Del and then hitting Cancel (32-bit Vista Ultimate). But eventually, while playing the game, there will come a point where it just freezes the entire computer and blue screens. There are also many artifacts within the game, as well as other rendering problems. Now I have to play the games on the absolute lowest settings to delay the inevitable crash, which helps a little. Once rebooted, Vista will report either a fault from my graphics card—an Nvidia 7900 GT—or an unknown error. I have updated all my drivers, defragmented my hard drives, and re-installed the game. What's going on here?

—Brian White

Brian, it sounds like you're overheating. Either your GPU isn't getting sufficient cooling or your PSU isn't giving you the voltage you require. It wouldn't hurt to power down and unplug your computer, then open it up, and make sure it's free of dust and that the fans are unobstructed. Fresh, cool airflow through your case is essential. To clean your case, use short bursts of compressed air from a can held upright. Don't let the fan blades spin while you're cleaning, that can damage them. Be sure to monitor the temperature of your GPU using either the Nvidia Control Panel or a third-party app like SpeedFan

have DIMMs in four slots, with 4GB or 8GB RAM. The same machine can run as tri-channel with DIMMs in three slots for a total of 3GB, or in six slots for a total of 6GB or 12GB (though I don't know who needs 12GB of RAM.)

Could the same 2GB sticks be used in dual- or tri-channel machines depending only on how they are placed in the slots?

—Harry Thorn

Harry, there is no difference between dual-channel and tri-channel DDR3 DIMMs. The same RAM will work in dual-channel Core 2 boards and triple-channel Core i7

since all the bugs and such should be gone by now.

Everything went fine until I attempted to install a wireless adapter in the PCI slot. Much to my surprise, I can't find an adapter that's compatible with the 64-bit version. I've found many sites that claim to sell 64-bit wireless adapters, but when I check the details of the specs they all say 32-bit compatible. Am I missing something or do they not exist? Any help would be greatly appreciated.

—Jeff Davison

Jeff, PCI wireless adapters have been a notorious tricky spot for adopters of 64-bit Windows. Browsing web forums will throw up a few posts from people claiming varying amounts of success using wireless cards from Belkin, Linksys, and D-link, but to say that 64-bit support by any vendor is spotty is to put it mildly.

It may be best to just buy a long Ethernet cord. Although setting them up can be a pain, especially if your PC is far from your router, wired connections are faster, more secure, and more stable than wireless. Another option is a wireless bridge, which connects to your computer via Ethernet cable and doesn't require drivers. We still prefer wired connections over wireless bridges, which frequently get mixed reviews, but if your PC is truly inaccessible via Ethernet, a wireless bridge is probably your best bet. We've heard good things about Linksys's WGA600N.

FRESH, COOL AIRFLOW THROUGH YOUR CASE IS ESSENTIAL

(www.almico.com). If temps stay high, consider adding more cooling to your case or swapping out the stock GPU cooler for an aftermarket one. If your temps aren't unreasonable (say, 50 C at full load), your PSU might be failing. You can get a power supply tester for less than \$20 online.

DIMM Sum

What determines whether the RAM on an i7 motherboard runs as dual- or tri-channel memory? Is there a difference between RAM sticks, or is the only difference in how they are placed in the motherboard slots?

The Dell XPS desktops that have Core i7 can run as dual-channel when they

boards. If you have enough DDR3 DIMMs to run tri-channel, the Core i7 board will run them that way. If you put them into just two channels, the board will run them in dual-channel mode.

If you run in dual-channel mode and later want to add RAM, make sure the additional DDR3 DIMMs you buy have the same clock speed, voltages, and timings as the ones you already have. When possible, in fact, get the same model number from the same vendor as the DIMMs you already have.

64-bit Wireless Adapters?

I'm building a new rig using Windows Vista. I thought I'd try the 64-bit version



SUBMIT YOUR QUESTION Are flames shooting out of the back of your rig? First, grab a fire extinguisher and douse the flames. Once the pyrotechnic display has fizzled, email the doctor at doctor@maximumpc.com for advice on how to solve your technological woes.

Out with the Windows.old

I tried to install a Philips webcam made for XP on my Dell Inspiron 640m running Vista Home Premium. It corrupted one of my boot files. I had to get a replacement Vista disc sent from Microsoft after I discovered that using a friend's Vista disc gave me only 30 days of use (Microsoft customer service was awesome—no joke!). Anyway, I thought all my programs and files had been wiped, but a month or so later I noticed that the hard drive was almost full. I checked the C: drive and, low and behold, all my old files and programs were in a folder called "Old Windows." How do I get those reinstalled to their rightful place?

—Darius Amjadi

Darius, Microsoft recommends that you reinstall your old programs, but in our experience many will run if you just open them from C:\Windows.old\Program Files. As for your files, it's a simple matter of copying the ones you want into your current Documents folder. You can find more information on Microsoft's Knowledge Base: KB933209 (<http://bit.ly/wqSqc>) and KB932912 (<http://bit.ly/T2w8Z>).

Once you have everything you need, right-click your C: drive and select Properties. Hit Disc Cleanup on the first tab, then Clean up System Files, and you'll see an option to remove previous Windows installations. That will free up space by deleting your Windows.old file and its contents, so only do it when you've got everything you need from your old install.

Startup Takes Forever

I have 32-bit Vista installed on my system and have had it since it was released back in '07. Each day when I start up, I sit and watch the cursor spin and watch the task bar fill. Every time I think it's ready to go, it loads more programs. Is there some sort of graphical bar or gauge that can be loaded onto the desktop at logon that will show all of my background services loading, so I can tell at a glance whether my computer is actually ready to go? Windows 7 beta still offers NO progress bar/gauge to indicate when all background services are finished loading. I have used Sabayon Linux in the past and it did have a progress bar before the desktop had even appeared. This has really been a pain in my "mouse click," so if you can

help with this I would really appreciate it.

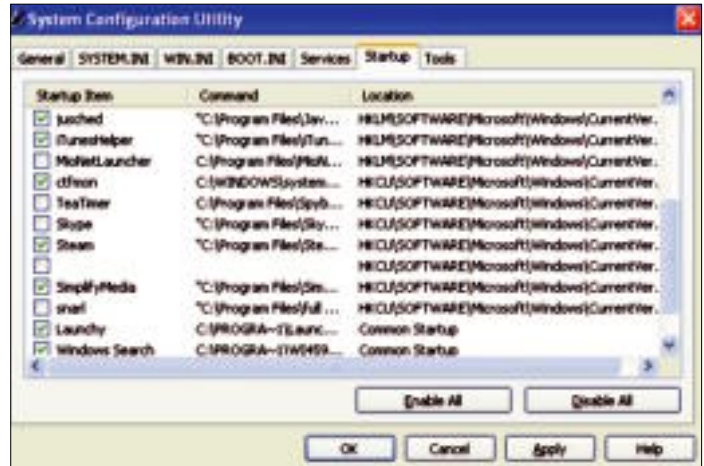
—Ray S.

Ray, we haven't found anything that will show your startup services' progress. However, if your computer really takes that long to be usable when you log in to Vista, there are a few easy steps you can consider. First, hit Windows+R and type msconfig. Go through your startup programs and disable any you don't need. Google the process

names if you're not sure what they do.

Once you've trimmed down that list, install r2 Studios Startup Delayer (<http://bit.ly/SY5e>). That will let you stagger your startup programs so they don't all try to load at once, which will let you start using your computer sooner.

Readers, know of any program like the one Ray describes? Write in and tell us about it! ☺



Computer chugging when you first boot? Disable startup apps so you can get working faster.

SECOND OPINION

Pluggin' the Analog Hole

In April, you advised reader Suleman that there was no easy way for him to use his soundcard to record music from the Internet in Vista ("Plugging the Analog Hole"). Ask him if he has an old PC that can still access the Internet. I use one with a 600MHz CPU, 256KB of RAM, and an 8GB hard drive with Windows XP home. This is quite adequate for listening to music and surfing the net using DSL.

Connect the line-out jack from the Internet computer to the line-in jack of the machine running Audacity. Windows can't tell whether the analog signal arriving at the line-in jack comes from the Internet, a radio, or an old vinyl LP.

—FRANK

9 Ways to DISASTER-PROOF YOUR PC

A little preparation goes a long way. We show you how to avoid the most common tragedy to befall a PC user—guaranteed!

BY PAUL LILLY

Stop whatever it is you're doing. We know your time is valuable, and what you're about to read could save you hours, if not days, of damage control. What could be so important? Your work documents, for one thing. And then there's your entire digital collection of family photos cataloguing every birthday, vacation, and other special occasion over the past several years. Common PC pitfalls don't just affect your digital files, either. Should disaster strike—say a power surge or a hacker attack—you could be looking at hundreds, or even thousands, of dollars of damaged hardware—or even worse, damage to your good name and credit if someone manages to steal your identity.

Are you thoroughly spooked yet? You needn't be, not if you follow our nine-step guide to disaster-proofing your PC. On the following pages, we show you how to prepare for everything from acts of God to hacker attacks, and every other mishap you're likely to encounter as a power user. And if you're an old pro who already knows how to disaster-proof your PC, then treat this as a checklist of things you know you should be doing, but probably aren't.



Back up Your Data

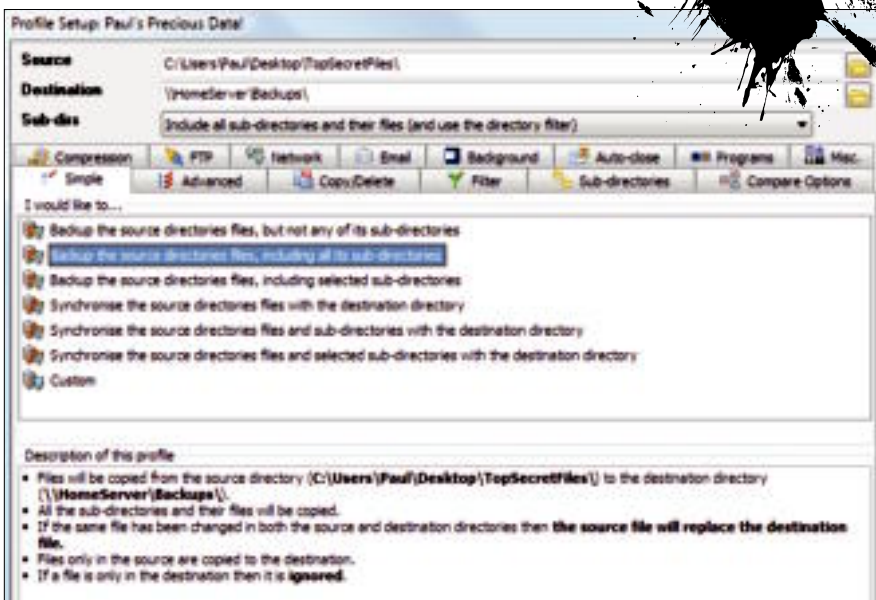
With a modicum of effort you can save yourself a whole lot of heartache

You hear it being preached all the time, but most of us wait until it's too late before learning the value of maintaining a backup solution. Yet the longer you go without one, the more likely it is your hard drive will give up the ghost at the most inopportune time. Unlike solid state drives (SSDs), which are still too expensive to serve as a high-capacity storage solution, hard disk drives (HDDs) rely on the pinpoint precision of moving parts. Over time, wear and tear can take a toll on an HDD's motor, but that's not all that can go wrong. To prevent the read and write heads from damaging a drive's platters, a thin layer of lubricant about 1nm thick is applied to the surface. Once it wears off, things can quickly come to a screeching halt, sometimes without warning. In addition, faulty firmware, a busted controller, accidental bumps, sudden power loss, and just plain bad luck can spell doom for your delicate drive.

Without a backup system in place, recovering data becomes tricky at best. Some users have reported temporarily bringing a hard drive back to life by sticking it in the freezer for 15 minutes, but this is a long shot. Replacing the controller board might also do the trick; however, that won't do you any good if the platters are scratched or the read/write heads are worn. The only option left is to ship your drive off to a costly data recovery service, and that can set you back thousands of dollars—ouch!

To prevent being caught with your pants down, you need a backup solution. A common misconception is that a RAID 1 setup negates the need to back up your data, but nothing could be further from the truth. RAID 1 mirrors your data across multiple drives, which is good for drive failures. But if files are deleted, whether accidentally or as the result of a malware infection, they're deleted from all drives.

The best strategy for backing up your data involves a secondary hard drive, either in your PC or in a USB enclosure, and an automated software solution. Most hard drive makers offer some kind of all-in-one solution, like Western Digital's My Book and Seagate's FreeAgent series, but you can accomplish the same thing with any ordinary hard drive and the right software. We've had great results with True Image 2009 (\$50, www.acronis.com), which allows us to schedule full or incremental backups, or to take a snapshot of an entire partition through a user-friendly GUI.



SyncBack offers a boat-load of configuration options, most of which are unlocked by choosing Expert mode. Best of all, the program's free!

There aren't any complicated steps here—just click the Back Up icon and follow the prompts. Feeling frugal? SyncBack (<http://bit.ly/o0bQ>) will accomplish the same thing for free, minus the ability to image your entire drive. You can choose to duplicate your data on another drive, through a network, or even to an FTP server.



Acronis's True Image sports a slick interface that makes it easy to create an image of your entire system, or just the data you specify.

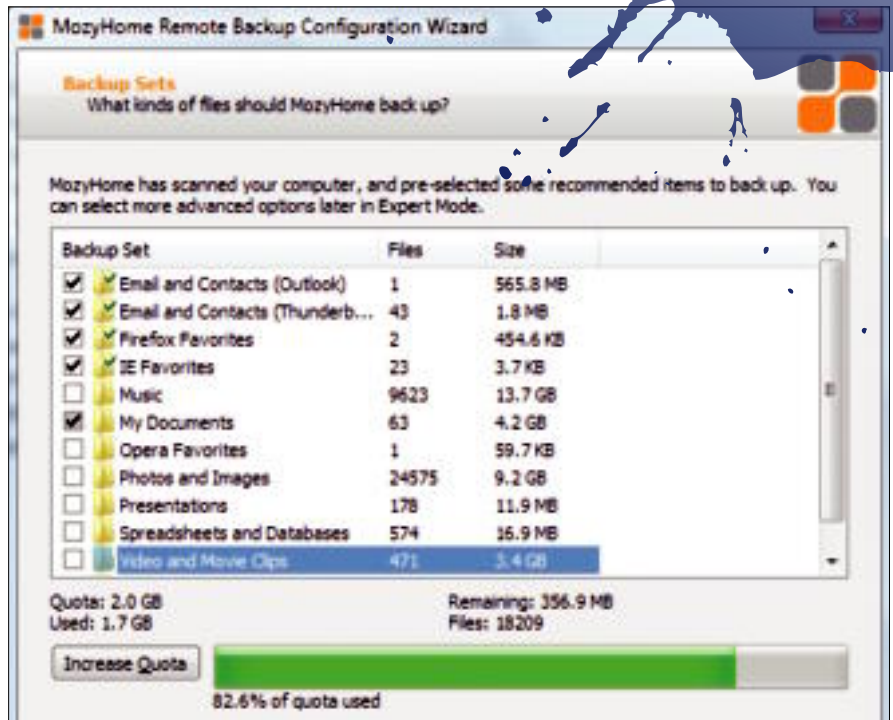
Take Your Data Off-Site

A backup plan for your backup plan

No one likes to sit around and think about life-altering catastrophes such as fires, floods, or earthquakes—and far be it from us to be harbingers of doom. We hope it never happens, but the cold reality is, no matter where you live in the world, bad things happen to good people. Should you be one of them, the least of your worries will be the saved games you've lost, but there's no need to compound the stress of disaster with the loss of all your family photos, email contacts, engineering blueprints, and whatever else you never anticipated losing (after all, you were backing up to a secondary hard drive, right?).

Anticipate it now by supplementing your routine backup solution with an off-site backup contingency plan. There are a couple of ways you can approach this. The first is to put your data in the "cloud," which is really just a metaphor for the Internet. In this case, we're suggesting that you upload your data to a server hosted in another location. The upshot is twofold: By having your files backed up to a remote location, you can rest easy knowing they will be safe even if your home isn't, and you can access your files whether you're at work, home, or elsewhere.

To get started, register an account with Mozy (free, <http://mozy.com/home>) and download the executable. Mozy is free for home use and provides 2GB of online storage, which should be more than enough to store your mission-critical documents, various email contacts, and other odds and ends. The idea here isn't to back up your entire movie collection to the cloud—that could take



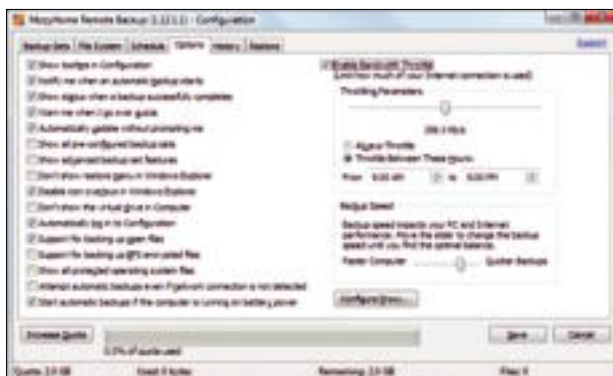
Can't figure out where Outlook stores your emails and contacts? Mozy knows right where to look, and will even back up your browser bookmarks.

days, or even weeks, on a typical upstream connection—so be selective and treat this as a virtual safe deposit box for your most valuable files. If 2GB still won't cut it (and it may not if you upload a bevy of high-resolution photos), then you can subscribe to Mozy's unlimited plan for \$5/month.

Mozy's installation wizard holds your hand through the initial setup. The first few steps ask you what types of files the program should zero in on, as well as what type of encryption method to use. The recommended 448-bit Blowfish is overkill for most users, but it doesn't hurt to stick with the default option. Switching to expert mode gives you fine-tune control over how Mozy operates, such

as the ability to throttle bandwidth during specified time periods, set up a schedule, and plenty more.

The second approach to off-site backups simply involves physically storing your backup drive somewhere safe, like a bank safe deposit box. This requires a bit more work because you'll need to retrieve your drive any time you want to add to or update your files, but you're also not relying on someone else's hardware to keep your top-secret documents both safe and secret. You'll have to decide for yourself if the added security is worth the additional hassle.



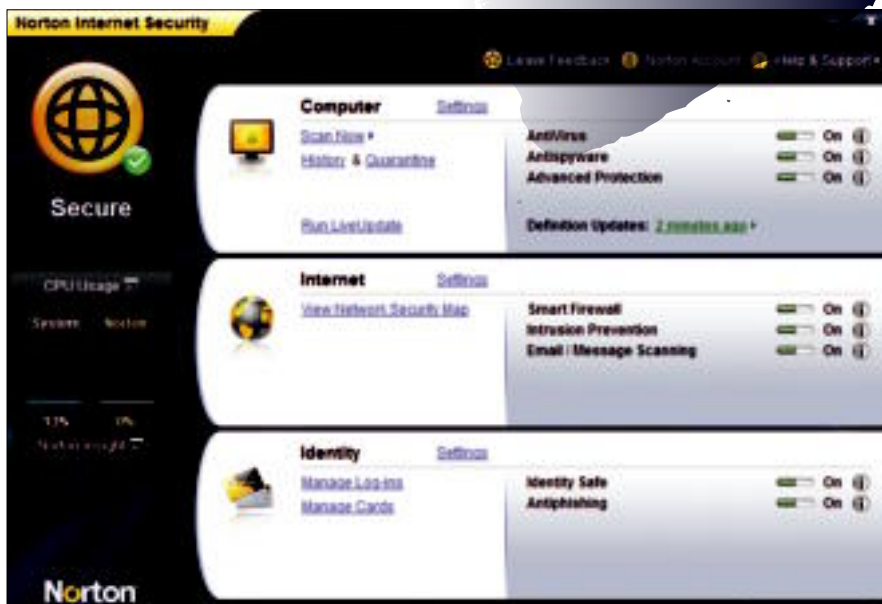
Saturating your Internet connection's upstream can bring things to a crawl. Counter this by throttling Mozy's upload bandwidth during times when you're most likely to be accessing the web.

Keep Malware at Bay

Trojans and dialers and worms, oh my!

The next time you park your car, why don't you roll down the windows, leave the keys in the ignition, and toss your wallet on the dashboard? Go about your business, and if everything's as you left it when you return, then keep repeating this routine. Sounds ludicrous, doesn't it? It is, and if you're surfing the Internet without any form of malware protection, then you're taking the same risks with your PC. Hackers continue to develop increasingly sophisticated code designed to harvest your personal information (e.g., your bank login credentials and credit card numbers), which they then turn around and sell to the highest bidder. In less-severe cases, performance-hampering malware can drag your PC to a crawl, inundate you with pop-ups and redirected searches, corrupt your files, and inflict all kinds of other annoyances. To prevent any of these scenarios from playing out, you should install an antivirus program.

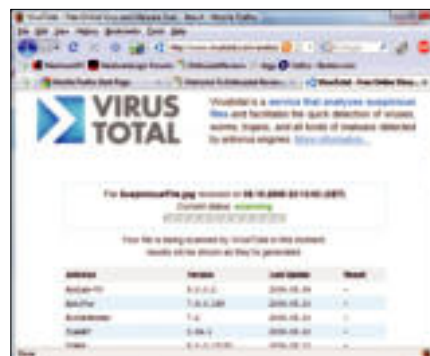
Whether you opt for an all-in-one paid security suite or prefer to roll your own free security package is entirely up to you. In our most recent antivirus roundup (<http://bit.ly/1aCJKr>), we examined 10 of the most popular AV apps from both camps to help you weigh the pros and cons of each. To summarize, we found Symantec's Norton Internet Security 2009 (\$70 3/PCs, www.symantec.com) and ESET Smart Security (\$60, www.eset.com) to work best for comprehensive protection, and we favored Avira's AntiVir (free, www.free-av.com) for a cost-saving, bare-bones approach, although Avira has since added antispymware scanning to its free AV app. Whichever route you choose, be



Hey, we're as surprised as you are, but Symantec's Norton Internet Security 2009 offers all-in-one protection without the bloat we've come to expect from Norton.

sure to install only one antivirus program, as these integrate tightly with your OS and can conflict with one another. And if you're attracted to the promises of a program we haven't reviewed, do your research before running the installer. Though an unknown AV app may seem innocuous, you might actually be installing malware masquerading as a legit program. It's OK to be narrow-minded and stick with reputable vendors; and don't ever trust an unexpected pop-up trying to sell you security by claiming it found infections on your PC—11 times out of 10, these are scams.

We don't recommend you make a habit of downloading suspicious files, but every now and then you might encounter a file that seems so suspect you're not even sure you trust your AV program's clean bill of health. You can solicit a second opinion from a free online service called Virus Total (www.virustotal.com). Once you upload the fishy



Installing 40 AV apps on your PC would be nothing short of a nightmare. Instead, upload a suspicious file to VirusTotal.com to have it checked out by more than three dozen scanning engines.

file, Virus Total will analyze its makeup with the aid of up to 40 antivirus and antimalware scanning engines, then list the result of each one. While not fool-proof, Virus Total updates the scanners regularly with the developers' latest signature files, making the chances of an infected file slipping through the cracks highly unlikely.

Your Power Supply Matters

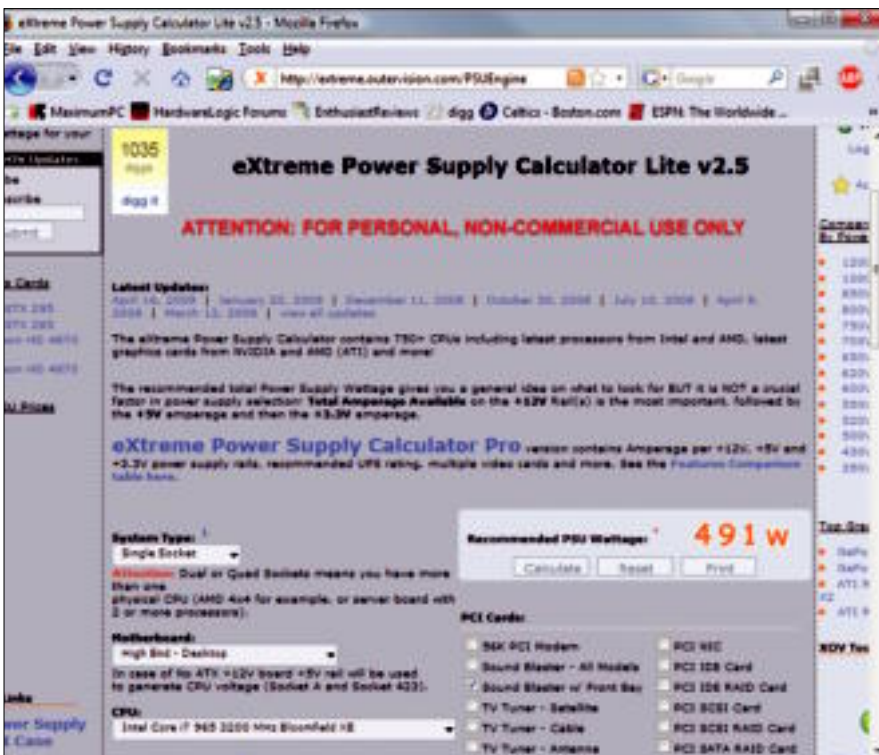
Trying to save a few pennies on a PSU could cost you dearly

You might be tempted to grab the least expensive power supply with the highest wattage rating you can find and call it a day. After all, a PSU won't make your games run faster or MP3s sound better, so why bother spending any more than you have to? Take it from us, a higher-priced PSU can be worth every bit its weight in gold, and here's why.

The hotter it gets inside a PSU, the less power it's able to produce. Some manufacturers take advantage of this by rating their PSUs at a much lower temperature than what they will ever see inside a case. For example, a unit rated for 600W at a chilly 25 C might only be capable of 450W at a more realistic 40 C to 50 C. On top of that, knock off another 100W or so if the label represents a peak power rating instead of continuous. But wait, there are even more ways of double-dealing. Some manufacturers will skip on their PSUs' internal components—a practice that's often associated with lower-weight units. While this helps the manufacturer cut costs, you'll pay dearly for it with voltage fluctuations that can damage your components, cause intermittent reboots, and lead to premature failure. Suddenly, that bargain-basement unit doesn't seem like much of a bargain anymore. You can avoid all this by biting the bullet and paying more up-front for a reputable brand, such as PC Power & Cooling, Corsair, and Seasonic, to name just a few.

Take the guesswork out of determining what size PSU will keep your system humming along. OuterVision's online eXtreme PSU Calculator (<http://extreme.outervision.com>) analyzes your parts and does a good job of estimating how much power your system is likely to pull. Likewise, both ATI and Nvidia maintain a list of CrossFireX-certified (<http://bit.ly/3Y8wD>) and SLI-certified (<http://bit.ly/10AHM4>) PSUs. As a general guideline, shoot for 550W to 600W for a midrange build, and 750W or more for a fully loaded rig. Pay particular attention to how many amps are rated for the +12V rail, as this is where today's systems draw the bulk of their power from.

After choosing a reliable PSU, consider investing in an uninterruptible power supply (UPS), otherwise known as a battery backup. Should you lose electricity as the result of a thunderstorm (or any other reason), your battery backup takes over long enough for you to save any documents you might have



We don't like leaving anything to chance. By using the eXtreme Power Supply Calculator, we can get a pretty good idea of what size power supply we'll need for our next build.

been working on. A quality UPS will also offer power conditioning to insulate your system from voltage spikes, line noise, and brownouts.

Choosing a UPS is a little different than picking out a power supply. Most battery back-ups come with a volt-ampere (VA) rating, with an 800VA unit being roughly equivalent to 540W of output capacity. This will be enough to provide up to about 15 minutes of backup power for most systems. A 1,500VA unit will keep you up and running even longer—anything higher is overkill for just about any desktop system. If you're still unsure what size you should look for, play around with APC's UPS selector (<http://bit.ly/dwGjU>).



A surge protector won't prevent your PC from turning off if there's a power outage. For that, you need a UPS. Some UPS software will even save open documents and shut down your system automatically before the battery runs out.

Practice Safe Computing

Without constant vigilance, the Internet can be a dangerous place

We've found that the best recipe for avoiding most problems you're likely to encounter consists of one part common sense and two parts safe computing habits. Installing an antivirus application isn't a free pass to go romping around the web willy-nilly; you still need to exercise some sound judgment. Start by being selective in which websites you visit. Stay away from the seedier sides of the web offering up warez, keygens, and other illicit downloads, as they're not only morally unsound, but also dangerous. Also avoid unknown sites that try to install ActiveX controls or toolbars.

Avoid clicking suspicious links, especially if they show up in an email. Hackers have become really adept at sending out legitimate-looking emails claiming there's an urgent matter with one of your online accounts, such as a Paypal dispute or a discrepancy with your banking institution. Once you click the link, you're taken to a fake website that looks and acts just like the one it claims to be, but there's nothing innocent about it. The sole purpose of these sites is to harvest your personal information, including your username, password, credit card numbers, social security number, and anything else you're fooled into divulging. Typos and bad grammar serve as dead giveaways that someone's trying to dupe you, but it's not always that obvious.

You also need to be wary of email attachments. As sophisticated as today's attacks have become, malware writers know the easiest way to spread a virus is still by email. Live by the rule of thumb that if you weren't expecting an attachment or don't know who it came from, don't download it. And if you were expecting an attachment, scan it with your antivirus software before opening it.

Use different passwords for different sites, and make them hard to guess. You should use a combination of letters and numbers to make a password impervious to brute force dictionary attacks, but nothing so complicated that you won't remember it and thus feel compelled to write it down. (For more ideas on creating and storing strong passwords, check out this month's How To story, "Hack Your Dropbox" on page 66.)

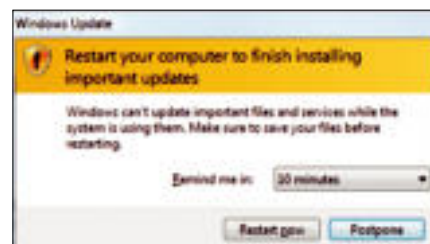
Make it a habit to periodically check for software updates, and whenever possible, configure your programs to check for updates automatically. By keeping your software



One of the problems of being a power user is that others usually aren't as savvy as you. You might not be able to change that, but you can set up limited user accounts for anyone else who uses your PC.

patched, hackers will have a harder time exploiting your machine and will move on to easier targets. If you're not updating your software, then you are the easier target.

And finally, set up a separate account for any guests or kids you might have, and then restrict their permissions. Only you should have administrative control over your Windows installation. In both XP and Vista, the option to do this is found in the Control Panel under User Accounts. In XP, create a Limited account for anyone else who might use your PC, and in Vista, create a Standard User account.



Don't be tempted into turning off Automatic Updates to avoid nags to reboot. A secure PC more than makes up for the minor inconvenience.

Set up a Virtual Machine

Experiment all you want without putting your rig at risk

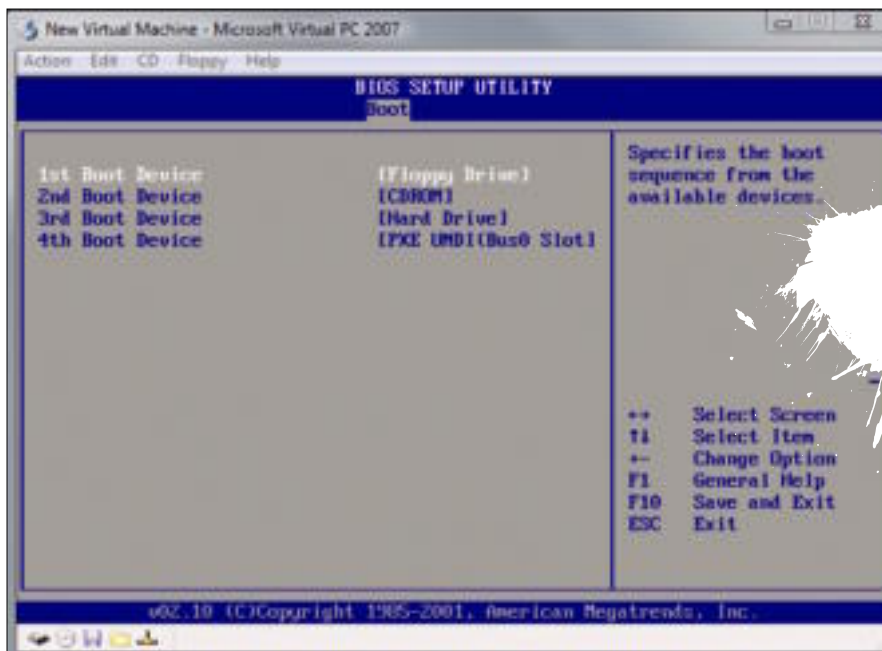
Virtual machine (VM) software allows you to run another operating system on top of your existing OS, thereby giving you access to a secondary PC without the costly hardware investment. It does this through a combination of tapping into the host PC's existing resources, such as the CPU and RAM, and providing its own abstract hardware, such as a virtualized motherboard and videocard.

There are several advantages to setting up a virtual machine, the primary one being the ability to experiment with software without the risk of mucking up your system. Being a beta tester keeps you on the cutting edge of software development, and with a VM installed, you never need to worry about a poorly written program thrashing your pristine installation of Windows. You're also given the freedom to explore potentially dangerous applications that might be laced with malware. However, there's a caveat: Some virus strains can now recognize a VM and lay dormant until installed on the host PC, so it's best to leave any suspicious files on the VM.

You can also use a VM to learn a brand-new OS and explore different Linux distributions without the hassle of dual-booting, or to set up a legacy OS, like DOS, for revisiting old games. Maybe you want to test out your programming acumen, or simply have an alternate OS in place for troubleshooting. In short, there are a lot of things you can do with a VM.

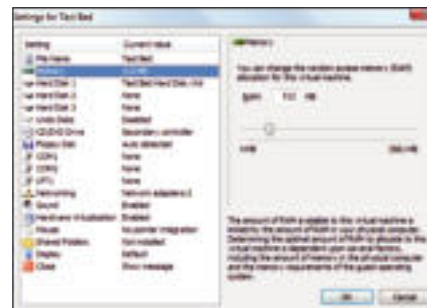
For best results, you'll need a PC with at least a 1GHz processor and 512MB of RAM. You'll also need a separate license for each OS you plan to install, but you don't need to pay for VM software. We like Microsoft's Virtual PC 2007 (free, <http://bit.ly/JRpzv>) for its easy setup, although it lacks USB support and other features found on VMWare's Player and Server packages. Microsoft should be putting the final touches on Windows Virtual PC by the time you read this, which will remedy its shortcomings and add a ton of new functionality.

After installing Virtual PC 2007, you'll need to set up your VM. It's here where you'll allocate resources to your VM, and you'll want to be careful not to go overboard and adversely impact the performance of your main PC. We typically set the amount of RAM to one-quarter the total installed, putting a ceiling at 1GB. When setting up the virtual hard disk, set aside anywhere from 10GB



A virtual machine works just like a real PC, so if you're having trouble installing Windows (or Linux), go into the VM's BIOS and double-check the boot order. Make sure the optical drive comes before the hard drive.

(Linux) to 50GB (Vista) or more, depending on how you plan to use your VM. Once you're finished, your VM will act like a separate PC, complete with its own BIOS. Put your Windows or Linux installation CD/DVD in your optical drive, start up the VM, and install just as you normally would. Once you're finished, apply any security updates, just as you would on your main PC, and then start experimenting. If you manage to mess up your VM, simply start the process over from scratch—no harm, no foul!



Depending on what you plan to do with your VM, you can allocate more or less RAM from your primary PC. Allocate too much, however, and your PC could become lethargic.

Configure Your Router, the Right Way!

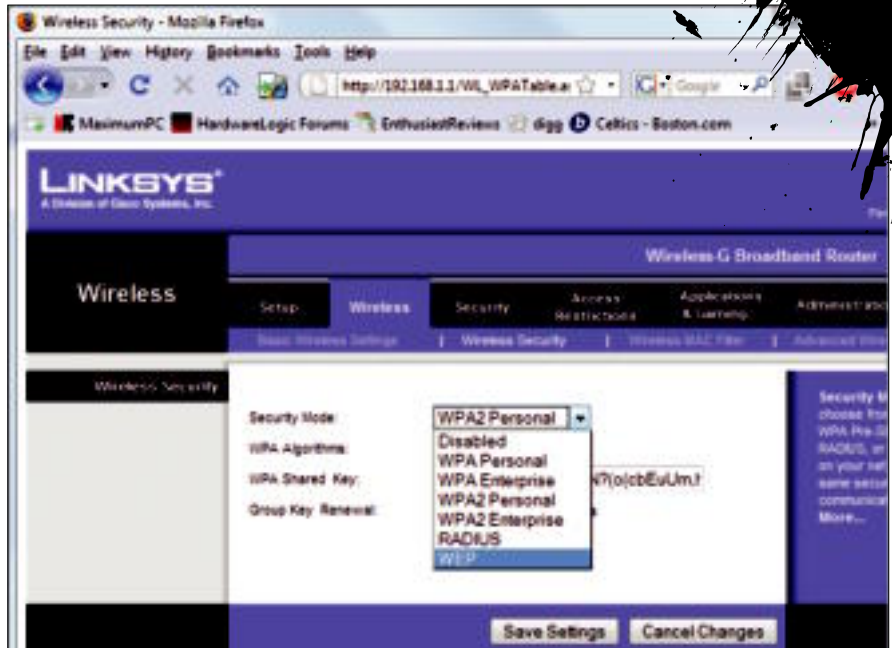
A vulnerable router is an invitation to all sorts of abuse

Your home security is only as strong as its weakest link, and oftentimes that's the router. Wireless routers have made it possible to share a high-speed Internet connection with multiple PCs without having to run a mess of cables throughout your home, but if you haven't secured your Wi-Fi connection, you're inviting anyone into your network that is able to pick up your Wi-Fi signal. The danger goes far beyond just saturating your bandwidth; those leeching off of your Internet connection can intercept data packets and sniff out login information, lift files from your PC, or share copyrighted material over your IP address so if the authorities come knocking, it will be on your door.

To avoid such unpleasantness, you need to lock down your wireless signal. Most router settings can be accessed by typing 192.168.1.1 into your browser (consult your router's manual if this doesn't work). You'll be prompted for a username and password, and unless you've already set one up, type admin for both fields (again, this may vary by router).

Once inside your router, look for an Administration tab and enter a more secure password. If your router gives you the option of changing the username, go ahead and do that, too. Next, head over to the Wireless section and put in a unique SSID. Then look for a Wireless Security subheading and select the strongest encryption method your hardware supports, which for most modern builds will be WPA2 (if your hardware supports only WEP, consider upgrading to a more modern router, as WEP is easily cracked). When entering a passphrase for WPA2, use a combination of letters, numbers, and even symbols, and make sure it's at least eight characters long. Alternately, you can use one of the many passphrase generators found via a Google search. Keep this information handy, as other PCs in your home network will ask for it when attempting to connect for the first time.

If you're particularly paranoid about stumbling onto a phishing site not already blocked by your browser, you can replace your ISP's Domain Name System (DNS) servers with OpenDNS (www.opendns.com), a free, ad-supported alternative with added security. Whenever you type in a web address, DNS translates the URL into the actual IP address. OpenDNS's name servers maintain an actively



The now ironically named Wired Equivalent Privacy (WEP) will only keep casual war drivers at bay. With the right tools, that script kiddie next door can break through WEP and start serving up illegal files through your IP.

updated list of known phishing sites, and can recognize common misspellings that could potentially redirect you to a harmful site. To configure your router to use OpenDNS, follow the site's instructions for whichever make/model router you own.

The last thing standing between you and an Internet-borne attack is a firewall. Most routers come with a built-in hardware firewall, but it's a good idea to supplement this with a software firewall. Both Windows XP (SP1 and later) and Vista include a software firewall already installed and turned on by default, but if you want to add outbound protection to the mix, you'll need a third-party solution, like Comodo (free, <http://bit.ly/14BgZJ>) or ZoneAlarm (free, <http://bit.ly/OBr4S>).



Above and beyond protection from phishing sites, OpenDNS's Dashboard lets you configure various security settings and filter Internet browsing, like blocking known porn sites.

Get in Tune with Your System

More oftenthan not, there are signs of impending disaster, if you know where to look

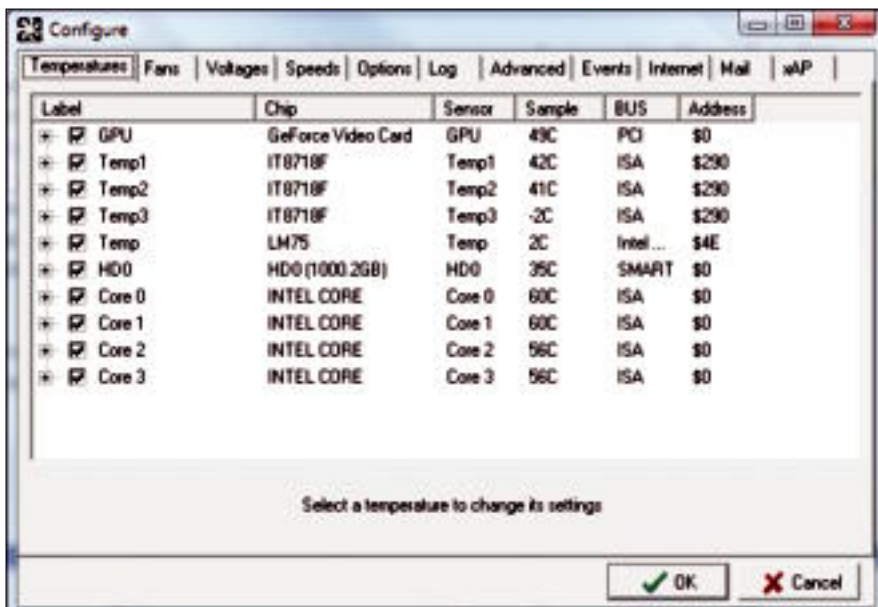
Whether you're a professional race car driver or a power user pushing your PC to the limit, it's imperative you become one with your hot rod. By doing so, you can pick up on subtle nuances that would otherwise fly under the radar and predict problems before they happen. But you don't need to rely on your instinct alone.

Are those new videocard drivers helping or hampering performance? You'll know if you first establish a baseline for comparison. Benchmarks aren't just for bragging rights, they can also serve as helpful diagnostics and clue you in when something is amiss. Futuremark's 3DMark Vantage runs your GPU through a series of 3D gaming tests, while its PCMark Vantage analyzes your system as a whole (both free, www.futuremark.com). Run both of these and refer back to your scores whenever you make a change, be it new hardware or a driver update. See our online benchmarking guide (<http://bit.ly/cLEBx>) for a list of even more free benchmarks that will tax various subsystems of your PC.

To ensure your rig doesn't overheat and blow up (figuratively), get in the habit of monitoring temperatures. SpeedFan (free, www.almico.com/speedfan.php) will help you do this and can even adjust your system's various fan speeds based on the temperature of your components. SpeedFan also comes with a S.M.A.R.T. tab, which reports the health of your hard drive and can sometimes be useful in predicting when a drive might be on its last legs.

If you find that your temperatures tend to run high, there are a number of different ways you can lower them. Most third-party CPU heatsinks offer far better cooling potential than the stock units AMD and Intel provide. In most cases, you get what you pay for, so don't expect to slap a \$5 cooler on your Core i7 and unleash a new level of overclocking headroom—it won't happen. Switching to a high-performance thermal compound, like Tuniq's TX-2 or Arctic Silver 5, can also shave off a few more degrees. For case cooling in general, be sure you have enough fans in your system. You should have at least two 12cm fans, one in the front to pull air in and one in the back as an exhaust. If it's an option, add another exhaust fan on top. Some cases even come with 20cm or 25cm side-panel fans, giving your entire setup a blast of cool air.

Finally, investigate any sounds that are out



By using SpeedFan to monitor your system's temperatures and dynamically adjust fan speeds accordingly, you can run a quieter PC without overheating your components.

of the ordinary. A failing hard drive will often make a clicking or grinding noise shortly before it stops working completely, so if you hear this, back up any important data right away. If your system suddenly seems quieter than it used to be, check to see that one or more fans haven't stopped spinning.



Benchmarks are a handy way of monitoring your system's health. We like PCMark Vantage because it runs a variety of scripts intended to stress all the major components rather than focus on a single piece of hardware.

Keep a PC First-Aid Kit

In case of emergency, you should keep handy a repository of spare parts that can address a PC's most common points of failure

CABLES If you're lucky, hardware that appears to be faulty might really just need a new cable. We've seen it happen. You should keep an assortment at your disposal, including SATA, IDE, Ethernet, and USB cables of various sizes.

OPTICAL DRIVE There are many symptoms to a failing optical drive, including slow performance, corrupted files when installing Windows, or the inability to work at all. Keep a spare drive around for good measure.

HARD DRIVE Grinding noises coming from your PC are never a good thing, and usually mean your hard drive is about to go belly-up. Keep a spare hard drive within reach for emergency backups and trouble-shooting.

THERMAL PASTE Over time, your thermal compound may dry up and lose its ability to transfer heat. Always keep a tube of thermal paste on hand, whether you're applying a fresh coat or installing a new heatsink.

USB HARD DRIVE ADAPTER Whether your motherboard is fried or you're trying to move your desktop files to a notebook PC, migrating data is made a million times easier with a USB hard drive adapter.

BOOT DISC If your system suddenly refuses to boot, you only need to panic if you didn't have the foresight to create a boot disc. Use this to get into your system to retrieve files, clean up malware, and fix other issues.

SCREWS AND STANDOFFS We don't know why we end up with fewer screws than when we first started, but we always do. Keeping a supply of various-size screws and standoffs solves this problem so we can focus on the task at hand.

THUMB DRIVE With the price of flash media plummeting, there's no reason not to keep a spare thumb drive around. Use it to transfer files in a pinch, store diagnostic utilities, or even as a bootable drive.

ARCTICLEAN Some thermal-grease cleaners leave behind a nasty residue as a result of perfumes and other foreign substances that have been added. ArctiClean doesn't and it works better than isopropyl alcohol at breaking down thermal paste and pads.

CMOS BATTERY A faulty CMOS battery can cause your system to forget the date and time, refuse to boot, display quirky error messages, or lose your BIOS settings. Thankfully, these tiny batteries are ultra cheap and a cinch to replace.



If They Weigh the Same as a Duck, *They Must Be... Ultraportable!*

But how do today's feather-light notebooks measure up in features and performance?

BY KATHERINE STEVENSON

With all the fuss being made about netbooks, you'd think they were God's gift to computing convenience. Sure, there's something to be said for those low-cost, low-power machines, but what if you actually need to get some real work done? There's nothing convenient about being hobbled by an anemic processor, a relatively low-res screen, a shrunken keyboard, and the various other compromises that contribute to a netbook's cost savings.

For extreme portability in a machine that packs a punch, you'll need to set your sights higher, to an ultraportable notebook. Ultraportable notebooks are every bit as light, or lighter than, a netbook, with the added benefit of superior features and a more powerful processor. As a general rule, you'll find your hardest ultraportables among the business-class models, which are made for both regular travel and all-around productivity. Of course, convenience of this caliber comes at a premium price—usually four to five times the cost of the average netbook.

Thus, choosing an ultraportable is not a decision to be taken lightly. To help you out, we gathered up four elite representatives of the class and put them through rigorous testing. Obviously, we can't expect any ultraportable machine to have the muscle required for chores like video editing, batch transcoding, or serious gaming. But we do expect these notebooks to accomplish the gamut of typical day-to-day tasks, including photo editing, slide-show creation, and multitasking. And we expect them to offer all the comfort and features necessary for full-fledged computing on the go.

So let's see how these featherweights fare.





PHOTOGRAPHS: MARK MADEO
MODEL: ETHEL



Lenovo ThinkPad X200s

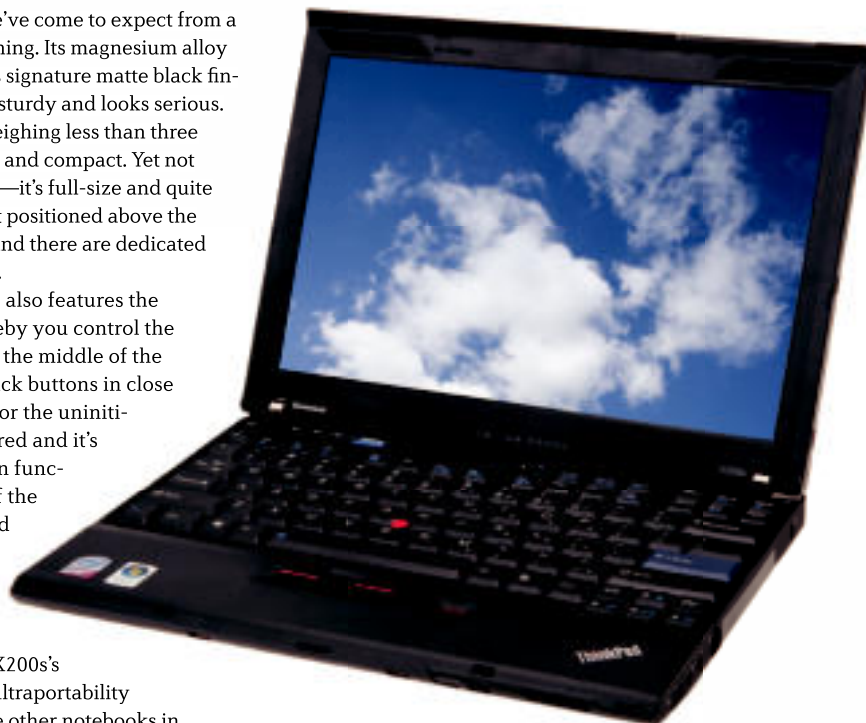
Its lack of an optical drive is offset by great value

Lenovo's X200s has qualities we've come to expect from a ThinkPad—and that's a good thing. Its magnesium alloy chassis is wrapped in the line's signature matte black finish, making for a notebook that feels sturdy and looks serious. And at 11.2x8.25x1.25 inches and weighing less than three pounds, the X200s is also lightweight and compact. Yet not so compact that the keyboard suffers—it's full-size and quite comfortable for typing. A handy light positioned above the screen will illuminate the keyboard and there are dedicated buttons for controlling audio volume.

As with all ThinkPads, the X200s also features the TrackPoint navigation system, whereby you control the cursor using an isometric joystick in the middle of the keyboard, with the left- and right-click buttons in close proximity just below the spacebar. For the uninitiated, TrackPoint can be easily mastered and it's nice that you can perform navigation functions without moving your hands off the keyboard. But unlike larger ThinkPad models, the X200s doesn't feature a conventional touchpad as well, which will disappoint folks who like that option.

Another notable omission is the X200s's lack of an optical drive. These days, ultraportability needn't negate this amenity, as all the other notebooks in this roundup prove, so we're wondering why Lenovo couldn't fit one in. The X200s is also the only notebook here that doesn't sport a webcam.

The X200s has an upper hand in performance, however. Its 1.86GHz Intel Core 2 Duo Mobile CPU is a low-voltage chip, which cuts heat and saves energy at the expense of some power, but it still helped the notebook turn in respectable benchmark scores and share top honors with HP's entry (which features the same CPU). Compared with our admittedly aged standard zero-point notebook, the X200s did better in both our Photoshop and ProShow tests, albeit by just 1.7 percent and 3.8 percent, respectively. And while no one should buy a notebook this small for gaming, the X200s



Lenovo's X200s offers the ThinkPad line's trademark TrackPoint navigation, but no touchpad.

turned out an impressive 156fps in Quake 3—good news for fans of 10-year-old shooters.

The X200's productivity abilities are aided by a 1440x900-resolution screen—which offers slightly more real estate than the 1280x800 screens featured by the other rigs in this roundup—and a 160GB 7,200rpm hard drive, with a shock-detection mechanism that ensures the drive heads are parked in the event of movement. (Lenovo also offers SSD options: Intel's 80GB high-performance drive for \$400 more, or a 128GB model for \$450.) All the requisite ports are present, including three USB ports and an ExpressCard/54 slot. The notebook's 6-cell battery provided juice for a good four hours when playing continuous video—not the best time in this roundup, but respectable nonetheless.

The upshot is that the X200s is portable, sturdy, and up to the task of your average workload. It's also \$500 less than its competitors. While we could certainly take that money and buy Lenovo's docking station with an optical drive for around \$340, or buy an external DVD burner for even less, we prefer to have the whole kit-and-kaboodle in one complete package.

SPECIFICATIONS

OS	Windows Vista Business 32-bit
CPU	1.86GHz Intel Core 2 Duo Mobile SL9400
RAM	3GB DDR3/1,067MHz
CHIPSET	GS45
STORAGE	Hitachi 160GB 7,200rpm (HTS722016K9SA00)
OPTICAL	None
SCREEN	12.1 inch, 1440x900
PORTS	Ethernet, modem, three USB 2.0, VGA, ExpressCard/54, 5-1 media reader, mic, headphone
BATTERY	6-cell Li-ion
LAP/CARRY	2 lbs, 15.6 oz / 3 lbs, 9.8 oz

LENOVA THINKPAD X200s
\$1,495, www.lenovo.com

VERDICT **8**



HP 2530p

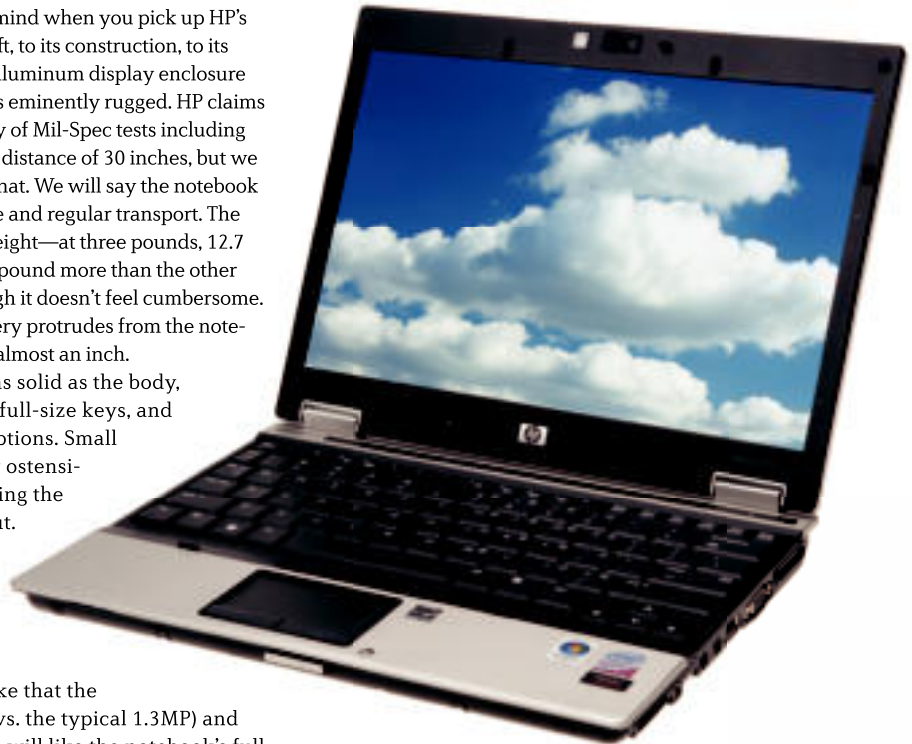
A small machine that was meant to be manhandled

The first word that comes to mind when you pick up HP's 2530p is "solid." From its heft, to its construction, to its scratch-resistant anodized aluminum display enclosure and palm rest, this notebook seems eminently rugged. HP claims that the 2530p has passed a battery of Mil-Spec tests including 26 drops from different angles at a distance of 30 inches, but we didn't have the stomach to verify that. We will say the notebook seems up to the rigors of heavy use and regular transport. The price of this sturdiness is added weight—at three pounds, 12.7 ounces, the 2530p weighs about a pound more than the other notebooks in this roundup, although it doesn't feel cumbersome. We're more bothered that the battery protrudes from the notebook's 11.1x8.5x1.5-inch body by almost an inch.

The 2530p's keyboard feels as solid as the body, with a conventional key layout, full-size keys, and both TrackPoint and touchpad options. Small nubbins just above the palm rest ostensibly prevent the keys from abrading the screen when the notebook is shut. Like the X200s, the 2530p sports a keyboard light. An LED-lit touch-sensitive volume slider above the keypad would be handy if it weren't so twitchy. Teleconferencers will like that the 2530p features a 2MP webcam (vs. the typical 1.3MP) and a dual-array mic. Most everyone will like the notebook's full complement of ports and slots—our only complaint is that there are just two USB ports.

Under the hood, the 2530p boasts the same low-voltage 1.86GHz Intel Core 2 Duo Mobile CPU found in Lenovo's X200s, combined with 3GB of DDR2/800MHz—HP says it will switch to DDR3 when performance benefits warrant the price premium—and Intel's record-setting SSD. The drive is a less-common 1.8-inch formfactor, with an 80GB capacity. (If your storage needs exceed this limit, HP offers a 160GB 5,200rpm HDD option for \$200 less or you can swap out the notebook's DVD burner for MultiBay storage of varying capacities.)

Tinkerers will appreciate that the 2530p offers more ac-



Included software lets you use the 2530p's webcam to take snapshots of business cards and transfer the info to Outlook.

cess to its innards than any of the other notebooks here, with easy access to one of the notebook's DIMMs, two Express card slots—one occupied by a Wi-Fi card, the other wired and ready for EVDO—a Bluetooth radio, and the drive bay.

While the 2530p had a very good showing in the benchmarks, performing neck-and-neck with the X200s, we were surprised it wasn't faster. We thought the read speed of the SSD, which averages 180MB/s in HD Tach, would give the 2530p a marked advantage in the Photoshop and ProShow tests, but that wasn't the case. Perhaps the X200s's 1,066MHz RAM helped level the playing field. Nevertheless, the 2530p proved to be plenty capable of performing a variety of chores and its 6-cell Li-ion battery gave us more than four hours of uninterrupted use in our video run test.

If you're looking for an ultraportable solution that gets the job done and requires no babying, the HP 2530p is that product.

SPECIFICATIONS

OS	Windows Vista Business 32-bit
CPU	1.86GHz Intel Core 2 Duo Mobile SL9400
RAM	3GB DDR2/800MHz
CHIPSET	GS45
STORAGE	Intel 80GB SSD (SA1MH080G1HP)
OPTICAL	HL-DT-ST DVD-RAM GSA-U20N
SCREEN	12.1 inch, 1280x800
PORTS	Ethernet, modem, two USB 2.0, FireWire, VGA, ExpressCard/54, SD, mic, headphone
BATTERY	6-cell Li-ion
LAP/CARRY	3 lbs, 12.7 oz / 4 lbs, 9.7oz

HP 2530P
\$2,100, www.hp.com

VERDICT 9



Toshiba Portege R600

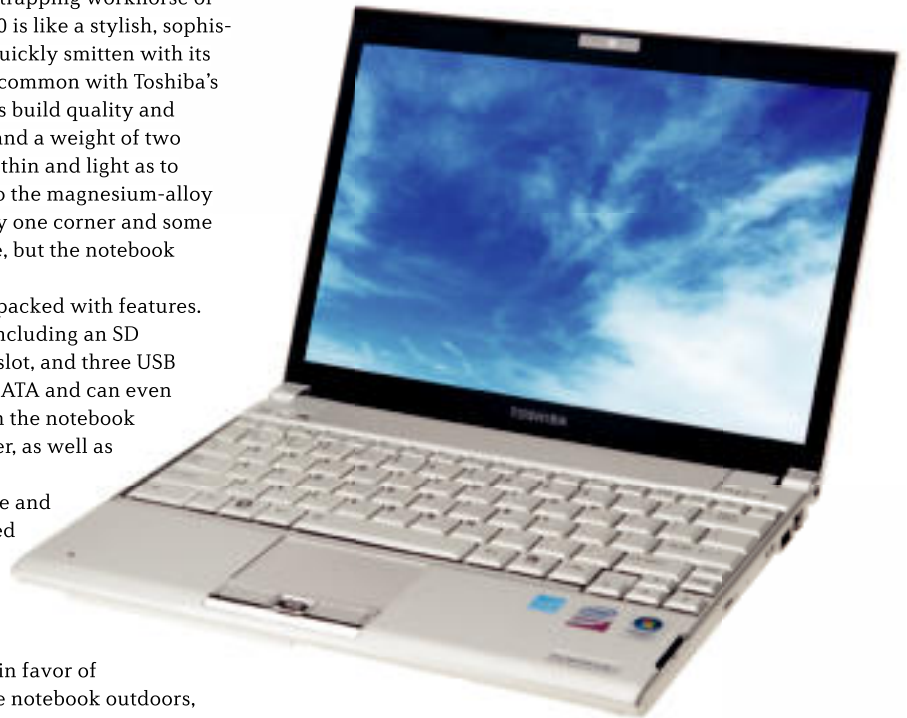
The ultimate in ultraportability

If you think of HP's 2530p as a strapping workhorse of an ultraportable, Toshiba's R600 is like a stylish, sophisticated cousin—and we were quickly smitten with its charms. The R600 shares much in common with Toshiba's R500, but with improvements to its build quality and structure. At 11.1x8.5x0.8 inches and a weight of two pounds, six ounces, the R600 is so thin and light as to seem ethereal. There's some flex to the magnesium-alloy case when you lift the notebook by one corner and some bendiness to the display enclosure, but the notebook doesn't feel fragile.

And svelte as it is, the R600 is packed with features. It offers a healthy array of ports, including an SD media reader, an ExpressCard/54 slot, and three USB ports—one of which doubles as eSATA and can even be used for charging devices when the notebook is off. Amid all that is a DVD burner, as well as a volume dial.

The R600's keyboard is full-size and feels firm during use, and it's paired with a conventional touchpad. And unique to all the other notebooks here, the R600's 1280x800 screen is transreflective, so the backlight can be turned off in favor of bright natural light when using the notebook outdoors, which can preserve battery power. A button at the upper-right of the keyboard lets you toggle between the two states. When we tried using the screen outdoors, we found the feature most effective when the sun was shining directly on the screen. Fortunately, battery life with the LCD is strong; sporting a 6-cell battery like the other notebooks here, the R600 kept pace with the pack, lasting four hours and 17 minutes while playing continuous video.

With a notebook as thin as this, you can expect some compromises in processing power. The R600 can't weather the thermals of even a low-voltage proc, so it's equipped with an ultra-low-voltage 1.4GHz Intel Core 2 Duo Mobile, which puts out just 10W TDP (thermal design power) vs. the



Despite its wafer-thinness, the R600 is equal to its peers in features.

17W of an LV part. The 400MHz clock-speed differential between this and the 1.86GHz procs was apparent in the benchmark scores, but the R600's performance was still acceptable, and it can handle general computing chores effortlessly. It can even run Quake 3 at 107fps, for what that's worth. Our model came with a 160GB HDD, with movement detection to protect the drive (a 128GB SSD can be had for a whopping \$850 extra).

Another consequence of the R600's slim proportions is that its internal components aren't easily accessible. Only a single hatch can be removed from the notebook's underside, exposing a single DIMM—another module resides deeper in the machine on the motherboard.

Be that as it may, the Toshiba R600 stands out above the other notebooks here with its *supreme* portability, while still offering comparable features, a quality build, and a stylish appearance.

SPECIFICATIONS

OS	Windows Vista Business 32-bit
CPU	1.4GHz Intel Mobile Core 2 Duo SU9400
RAM	3GB DDR2/667
CHIPSET	GS45
STORAGE	Toshiba 160GB 5,400rpm (MK1652GSX)
OPTICAL	Matshita DVD-RAM UJ862BJ
SCREEN	12.1 inch, 1280x800
PORTS	Ethernet, two USB 2.0, USB/eSATA, VGA, ExpressCard/54, SD, mic, headphone
BATTERY	6-cell Li-ion
LAP/CARRY	2 lbs, 6 oz / 3 lbs

TOSHIBA PORTEGE R600
\$2,150, www.toshiba.com

VERDICT 9

Fujitsu P8020

This small wonder fails to stand out in any one area

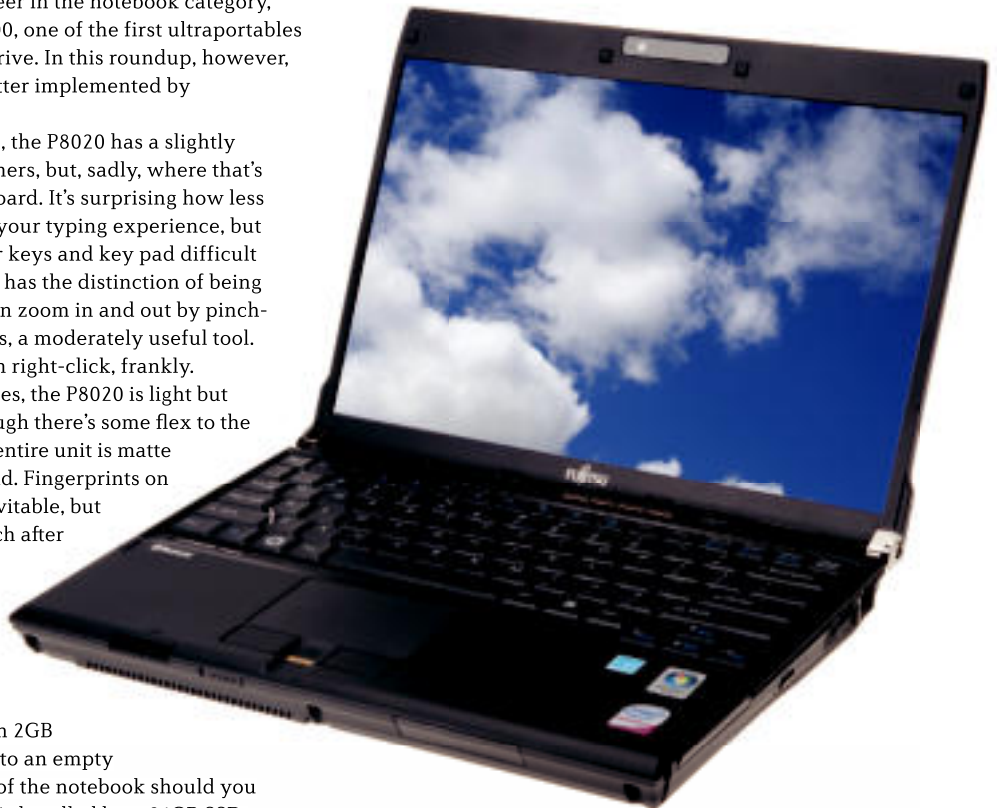
Fujitsu has been a pioneer in the notebook category, dating back to its P2000, one of the first ultraportables to feature an optical drive. In this roundup, however, the standard Fujitsu set is better implemented by its competitors.

At 10.75x8.25x1.5 inches, the P8020 has a slightly smaller footprint than the others, but, sadly, where that's most apparent is in the keyboard. It's surprising how less than a half-inch can change your typing experience, but we found the slightly smaller keys and key pad difficult to use. The P8020's touchpad has the distinction of being multi-touch, meaning you can zoom in and out by pinching or separating your fingers, a moderately useful tool. We'd rather have multi-touch right-click, frankly.

At two pounds, 13.8 ounces, the P8020 is light but feels well-constructed, although there's some flex to the body and display cover. The entire unit is matte black, save the glossy black lid. Fingerprints on this surface are of course inevitable, but the lid also picked up a scratch after minimal use.

The P8020 is no thinner than the X200s and 2530p, but Fujitsu opted for the same ULV 1.4GHz processor found in the R600 and paired it with 2GB of RAM—there's easy access to an empty DIMM slot on the underside of the notebook should you want more memory. Storage is handled by a 64GB SSD. (A 128GB SSD will run you \$200 more, while hard drive options ranging from 160GB to 320GB will save you from \$200 to \$300.)

The SSD has the advantage of being more durable than an HDD, but we'd prefer more capacity, especially since the Toshiba-brand MLC drive in the P8020 doesn't offer any performance advantage—it had an average read speed of 67.2MB/s in HD Tach, which isn't dramatically better than the 52.1MB/s of the R600's 160GB HDD. In fact, the P8020 fared



The glossy finish of the P8020's display enclosure is matched by a glossy screen.

worse than the R600 in all the benchmarks except battery life. That's not to say it didn't perform satisfactorily. The P8020 has the chops for productivity and content-creation purposes; it can certainly serve for typical day-to-day use.

In terms of ports and slots, the P8020 matches the other notebooks in this roundup—although it features PC Card rather than Express Card technology, which doesn't really limit your expansion options but does seem quaint.

In the end, the P8020 suffers most from the caliber of the competition. Taken as a whole, the P8020 is a competent machine, with a wealth of features packed into its wee form-factor. But with other ultraportables costing the same or less while offering superior qualities and/or features, the P8020 can't help but seem average by comparison. ⏻

SPECIFICATIONS

OS	Windows Vista Business 32-bit
CPU	1.4GHz Intel Mobile Core 2 Duo SU9400
RAM	2GB DDR3/800MHz
CHIPSET	GS45
STORAGE	Toshiba 64GB SSD (THNS064GE4BBDC)
OPTICAL	Matshita DVD-RAM UJ862BJ
SCREEN	12.1 inch, 1280x800
PORTS	Ethernet, modem, three USB 2.0, FireWire, VGA, PC Card, SD, mic, headphone
BATTERY	6-cell Li-ion
LAP/CARRY	2 lbs, 13.8 oz / 3 lbs, 9.2 oz

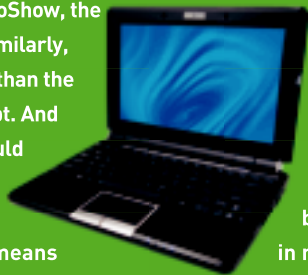
FUJITSU 98020
\$2,330, www.fujitsu.com

VERDICT 7

Ultraportable vs. Netbook

Despite the merits of an ultraportable notebook as a productivity tool, there will no doubt be folks who are getting a netbook for their all-purpose corporate use. The prospect of a four-fold cost savings can lead to a lot of interest.

To make the comparison a little more relevant, we tested our favorite netbook—the \$400 Asus Eee 1000HE—against the ultraportables in this roundup. The benchmarks show that while the ultraportables took a little more time to run, the netbook was three times slower than the ultraportables in our Photoshop script. And that the netbook could not even complete the benchmark that's not even close to the speed of its ultraportable counterparts.



What this all means is that you'll be doing a lot more waiting to follow the dough. And that's not even taking into account the keyboard, touch pad, and screen, which are noticeably smaller on the 1000HE and sure to be a pain to use. Shoot, the 1000HE might offer superior battery life every minute of that gain just to bridge the gap, but it's cancelling out the benefit.

There are just no two ways around it: if you're looking for futzing around on the net and sending e-mail, a netbook is a regular and varied computing.

1000HE BENCHMARKS

PROSHOW (min:sec)	
PHOTOSHOP CS (min:sec)	██████████
QUAKE 3 (fps)	
BATTERY LIFE (hr:min)	



ULTRAPORTABLE BENCHMARKS

	Lenovo X200s	HP 2530p	Toshiba R600	Fujitsu P8020
PROSHOW (min:sec)	38:47	39:04	51:54	52:57
PHOTOSHOP CS (min:sec)	3:53	3:52	4:50	5:36
QUAKE 3 (fps)	155	156	107	95
BATTERY LIFE (hr:min)	4:00	4:10	4:17	4:26

Best scores are bolded.

The History of the Modern PC

The computer you use today is a far cry from its early forebears, yet those humble machines of yore represent bold revolutionary steps that led to personal computing as we know it. We highlight 25 of the most influential machines in PC history

BY ERIK KLEIN

Imagine a world in which all cars are like the Toyota Prius: four-door midsize hybrids. Sure, they aren't bad cars, you can paint them any way you want and even modify some parts, but in the end you still just have a generic Toyota with a funky paint job.

That's the world of personal computing today. It doesn't matter if you're running Windows, Mac OS, or Linux. Your machine is almost certainly using Intel chips at its core and almost everything else is fairly generic—even the world's greatest case mod with water-cooled dual-Xeons and quad-SLI graphics is just a really fast PC.

This was definitely not the case 35 years ago. A quick tour of the Computer History Museum in San Jose, CA (www.computerhistory.org) reveals machines that were as varied and unique as the companies that made them.

The microprocessor, if there even was one, was supplied by Intel, MOS, Zilog, RCA, or any number of other companies. Memory was static, dynamic, and shift-register. Programs were loaded from paper tape, punched cards, cassette tape, floppy disks, cartridge, or even manually switched in by hand.

In the following pages, we take a close look at some of the most influential personal computers of the past 40 years. From pre-microprocessor machines to the venerated IBM PC, each of these systems contributed in some way to the modern personal computing era.





Circa
1971

Kenbak-1

Widely considered to be the first true personal computer, John Blankenbaker's \$750 Kenbak-1 had almost everything a modern computer has: I/O (lights and switches), memory (256 bytes of shift-register memory), and a full set of op-codes. Missing were storage and an actual CPU; the Kenbak predated the microprocessor by more than a year, so the logic was implemented in discrete transistor-to-transistor logic (TTL). Only a few dozen were ever built.



SPECIFICATIONS

RAM	256 Bytes
CPU	No CPU (logic in TTL)
Supporting OS	None
Notable Firsts	By most accounts this was the first PC

Circa
1973

Xerox Alto

Xerox's Palo Alto Research Center (PARC) was the source of numerous computer innovations including the mouse and the windowed graphical user interface. The company's Alto system was never a commercial product but it did incorporate most of the aspects one expects from a modern computer: mouse, hard drive, networking, and a windowed GUI represented on a bitmapped screen. Xerox still built thousands and showed them off to people like Bill Gates and Steve Jobs.



SPECIFICATIONS

RAM	64K-256K words (128K-512K bytes)
CPU	Proprietary 16-bit
Supporting OS	Alto OS
Notable Firsts	First GUI, first mouse

Circa
1974

SCELBI-8

In early 1974 there weren't many microcomputers available, but in March of that year, SCELBI (Scientific, Electronic, Biological) introduced its \$550+ 8 series, based on the Intel 8008 microprocessor. Offered were the 8h hobbyist kit and the 8b business computer. In addition to the machines, SCELBI produced some programming books and software. When the company realized that the documentation and programs made more money than the machines, it quickly adjusted its business model and abandoned hardware sales.



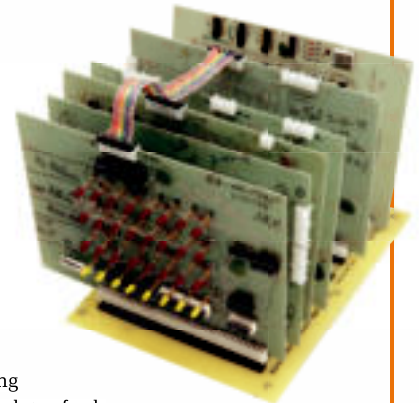
SPECIFICATIONS

RAM	1K-16K
CPU	~.5MHz Intel 8008
Supporting OS	None
Notable Firsts	First microprocessor-based hobbyist PC

Circa
1974

Mark-8

Radio Electronics and *Popular Electronics* magazines used to engage in contests of one-upmanship for front-cover projects. The July 1974 *Radio Electronics'* cover featured one of the first CPU-based PCs, the Mark-8 minicomputer kit. For \$50 you got an instruction booklet and some circuit boards. After gathering other components and doing lots of soldering, you would end up with a real 8008-based computer with 256 bytes of RAM and some basic I/O.



SPECIFICATIONS

RAM	256B-16K
CPU	.5MHz Intel 8008
Supporting OS	None
Notable Firsts	First popular computer kit

Circa
1975

MITS Altair 8800

In 1975, responding to *Radio Electronics*' Mark-8, *Popular Electronics* debuted the Altair 8800, an Intel 8080-based machine sold as a 1K kit for \$500. Although the Altair wasn't the first PC, it still generated excitement. A soon-to-be Harvard dropout named Bill Gates was so impressed that he and some friends wrote a version of BASIC for it. This, eventually, led to the founding of Micro-Soft, later Microsoft. The machine also defined the S-100 bus standard.



SPECIFICATIONS

RAM	256B-64K
CPU	2MHz Intel 8080
Supporting OS	MITS DOS, CP/M, and others
Notable Firsts	First S-100 bus machine, first widely popular PC

Circa
1976

IMSAI 8080

With the overnight success of the MITS Altair 8800, others quickly geared up to tap into the market. IMS Associates Incorporated (IMSAI) quickly reengineered a pre-production machine to conform to the new S-100 standard while simultaneously fixing a number of obvious flaws in the MITS design. The result was the IMSAI 8080—the first personal computer clone and a movie star to boot. In the end, the IMSAI outsold and outlasted the Altair.



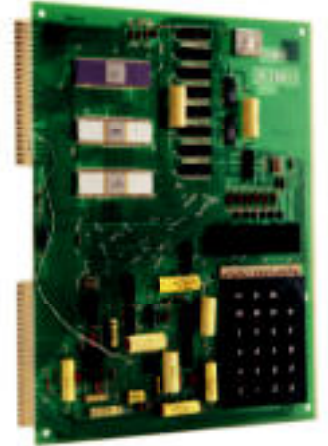
SPECIFICATIONS

RAM	1K-64K
CPU	Intel 8080
Supporting OS	IMSAI DOS, CP/M, and others
Notable Firsts	First S-100 clone

Circa
1975

KIM-1

The KIM-1 was designed to showcase the new MOS 6502 microprocessor. The chip was introduced at \$25 per unit when the cost of Intel's 8080 was nearly \$200 in bulk. In spite of the price, the 6502 was for real, as the KIM-1 proved. A couple of guys named Steve quickly built a single-board computer using the new chip and then named the machine after a fruit. Lots of others followed.



SPECIFICATIONS

RAM	1K
CPU	1MHz 6502
Supporting OS	None
Notable Firsts	First use of the 6502 computer

Circa
1976

Apple I

In 1976 Steves Jobs and Wozniak were both active in the tight-knit Silicon Valley computer hobbyist scene. Inspired by what they saw at various Homebrew Computer Club meetings, they sold their toys (a calculator and a van) for the capital to hand-build the earliest Apples, launching an industry icon. The \$666.66 Apple I wasn't particularly revolutionary, but it was well engineered, included video circuitry, and was relatively inexpensive, which helped it catch on.



SPECIFICATIONS

RAM	4K
CPU	1MHz 6502
Supporting OS	Cassette BASIC
Notable Firsts	Apple's first computer

Circa
1976

Sol-20

Until the Sol-20 hit the scene, a personal computer was pretty impersonal. The best a user could hope for was rows of switches and lights or a hex keypad and a handful of LEDs. Lee Felsenstein, the yardstick-wielding moderator of Homebrew Computer Club meetings, changed that with his S-100-based Sol-20. This machine (sometimes kit) was the first “out of the box” PC, sporting a keyboard, video circuitry, and ROM-based software available at power-up.



SPECIFICATIONS

RAM	4K–64K
CPU	2MHz Intel 8080
Supporting OS	SOLDS, CP/M, Northstar DOS, and others
Notable Firsts	First integrated machine with keyboard, video, etc.

Circa
1977

Commodore Pet 2001

The \$600 Commodore PET was the first fully integrated “appliance computer” that included everything needed out of the box. A popular machine, especially in the educational market, it was attractively designed and built into an amazingly sturdy steel case, although the keyboard and limited RAM were issues. These deficiencies, as well as others, were addressed with later updates and helped the Commodore sell well in the United States and Europe.



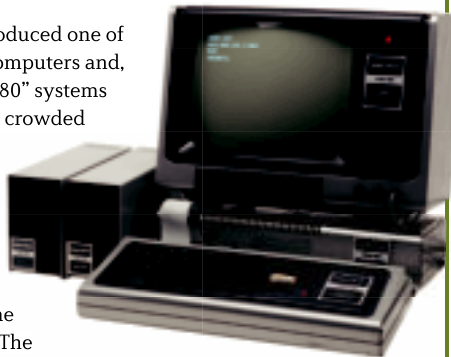
SPECIFICATIONS

RAM	8K
CPU	1MHz MOS 6502
Supporting OS	Built-in BASIC
Notable Firsts	First fully integrated “appliance” computer

Circa
1977

TRS-80 Model I

Tandy/Radio Shack produced one of the earliest personal computers and, for a while, the “Trash-80” systems were very popular in a crowded market. The TRS-80 competed well with the Apple II and Commodore PET and earned a loyal following among the limited number of home computer enthusiasts. The Radio Shack system was based on the Zilog Z-80 processor (an Intel 8080 clone, with a few upgrades) and used a modified Tandy television as its monitor.



SPECIFICATIONS

RAM	4K–48K
CPU	1.78 MHz Zilog Z80
Supporting OS	TRSDOS
Notable Firsts	First Tandy/Radio Shack computer

PIRACY'S EARLY DAYS

Bill Gates' Letter to Hobbyists

Early users groups from coast to coast were venues for geeks to gather, demonstrate their knowledge, and share their inventions ...or the inventions of others.

In one notable early incident, a regular at the Homebrew Computer Club obtained a copy of Altair BASIC on paper tape. Prior to the next meeting he made dozens and dozens of copies, which he freely distributed to other attendees.

So, in 1976 Bill Gates had a problem. He was making software that everyone loved but that few were bothering to pay for. In frustration, Gates penned an “Open Letter to Computer Hobbyists,” which was published in the Homebrew Computer Club newsletter and elsewhere. In the missive he explained that the unauthorized copying of software was theft and that doing so inherently discouraged developers from producing good software.

The letter sparked some harsh exchanges, including a more pointed follow-up letter by Bill Gates, and ultimately started the discussion about software piracy. This discussion has, of course, picked up steam and continues to this day.

Circa
1977

Apple II

After the Apple I, Steve Wozniak designed a new version of his baby which addressed several of the original's biggest shortcomings. For one, the new machine was a complete system. The power supply and keyboard came standard! With BASIC and a hardware monitor in ROM, the Apple II was a "turnkey" system, which had suddenly become de rigueur for the industry.

An open architecture combined with brilliant marketing helped Apple become a household name.



SPECIFICATIONS

RAM	16K–48K
CPU	1MHz 6502
Supporting OS	Apple DOS
Notable Firsts	First mass-market Apple

Circa
1978

Exidy Sorcerer

The Exidy Sorcerer was an early Z80-based system that tried to bridge the gap between lower-end home/educational machines and the S-100 business world. Exidy offered an S-100 expansion chassis that could be plugged into its base system to make a full-fledged S-100 box.

The Sorcerer was likely the first personal computer with a cartridge slot for at-boot software. Cartridges used hollowed-out 8-track tapes to hold the circuit boards and ROMs.



SPECIFICATIONS

RAM	8K–64K
CPU	2MHz Zilog Z80
Supporting OS	CP/M
Notable Firsts	First cartridge-based PC

Circa
1979

Atari 400/800

Atari became a household name with its arcade games and built on that reputation with home gaming systems and, eventually, home computers. The Atari systems, like their competitors, the Commodore Pet and Apple II, used the 6502 processor, but Atari's gaming roots resulted in the inclusion of several custom chips to control sound and graphics, making the Atari 800 an early gaming masterpiece. This helped the machines find a solid following in the home market.



SPECIFICATIONS

RAM	16–48K
CPU	1MHz 6502
Supporting OS	Atari DOS
Notable Firsts	Atari's first home computer

Circa
1980

Apple III

The Apple III represents Apple's first real failure. This Apple was intended to be a true business computer, but early design flaws and a high price kept it from success while IBM came in and stole the show. The machine would overheat, causing the mainboard to warp. One official Apple solution promoted percussive maintenance to fix the issue—users were advised to drop the machine several inches to re-seat loose RAM chips.



SPECIFICATIONS

RAM	128K
CPU	1MHz 6502
Supporting OS	SOS, CP/M, Apple DOS
Notable Firsts	Apple's first misstep

Circa
1981

Osborne 1

Adam Osborne did lots right when he bundled his computer with all the useful applications—word processing, spreadsheet, database, programming, etc.—and sold it for a reasonable price.

The Osborne “luggable” was an evolutionary dead-end (which didn’t prevent dozens of other companies, from Compaq to Zorba, from copying the formfactor) but it did show that people wanted to take it with them and it

proved that hardware was only a means to software.



SPECIFICATIONS

RAM	64K
CPU	4MHz Z80
Supporting OS	CP/M
Notable Firsts	First suitcase portable, first system bundled with full suite of applications

Circa
1981

Epson HX-20

Epson’s HX-20 was the world’s first effective and popular notebook computer. It could run for 50 hours on its internal battery, had a real keyboard, built-in productivity applications, and mass storage. It even had a built-in printer! Sure, the 4x20-character LCD was a bit limiting and the tape drive was slow, but this was a real computer in a sub-4lb. package that worked!

In time, all laptops would be this way.



SPECIFICATIONS

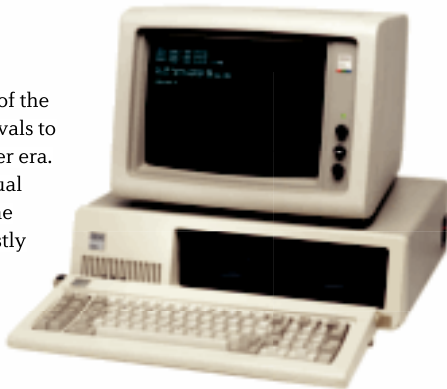
RAM	16K
CPU	.6MHz Hitachi 6301
Supporting OS	CP/M
Notable Firsts	First notebook computer

Circa
1981

IBM PC

The IBM PC was one of the most anticipated arrivals to the personal computer era. IBM countered its usual process to produce the PC quickly using mostly off-the-shelf parts.

Almost all modern PCs, even those running Mac OS and UNIX flavors, are descendants of this venerable architecture. More profound, however, was the impact of Microsoft licensing DOS and BASIC to IBM. The open agreement allowed Microsoft to eventually sell these products to other vendors.



SPECIFICATIONS

RAM	16K-640K
CPU	4.77MHz 8088
Supporting OS	PC DOS, CP/M, UCSD-P
Notable Firsts	First successful IBM personal computer

Circa
1982

Commodore 64

The Commodore 64 is one of the most recognized computers ever built. It should be; it holds the world record for the most units sold of any computer. What the C64 lacked in technology it made up for in popularity and price. This machine helped cement the idea of a “home” computer because the machine was both affordable and accessible. While a few Commodores were used for productivity, most ended up as game systems.



SPECIFICATIONS

RAM	64K
CPU	1MHz MOS 6510
Supporting OS	Built-in BASIC and CP/M (with additional hardware)
Notable Firsts	Most-sold PC ever

Circa
1982

Franklin Ace 100

The nascent personal computer industry had never addressed copyright issues for hardware and firmware designs until Franklin copied the Apple II (down to the ROMs) and started selling them at a discount. Apple quickly sued and, in 1983, won a judgment against Franklin in a landmark court case. Franklin was forced to reengineer its products and to reverse-engineer Apple's ROMs, but by then it was too late.



SPECIFICATIONS

RAM	16K-48K
CPU	1MHz 6502
Supporting OS	Apple DOS
Notable Firsts	Caused the first software copyright lawsuit

Circa
1982

Compaq Portable

A few guys from Houston got together to design the first true PC clone—on a place-mat, no less! Sure, at nearly 30 pounds it wasn't a lightweight, but it was "portable" and, most importantly, you could run Flight Simulator on it. They reverse-engineered the IBM PC BIOS to stay legal and quickly built one of the more successful computer companies. Compaq ultimately outlasted Big Blue in the PC market.



SPECIFICATIONS

RAM	128K-640K
CPU	4.77MHz 8088
Supporting OS	MS-DOS, CP/M
Notable Firsts	First black-box reverse-engineered IBM PC clone

Circa
1983

IBM PCjr

IBM tried the home computer thing, too. Although the IBM PCjr was highly publicized and much anticipated, the reality of the machine was well below expectations. Sure, it was a powerhouse compared to the Ataris and Commodores it targeted, but it also cost hundreds more and it came with a really crappy keyboard. In the end, being a 16-bit player in an 8-bit market wasn't enough to save this little peanut.



SPECIFICATIONS

RAM	64K-640K
CPU	4.77MHz 8088
Supporting OS	IBM PC DOS
Notable Firsts	First IBM home computer

NOT-SO-PERSONAL COMPUTERS

The Big Boys of Computing's Early Days

Before computers were staple appliances in the home, they were the domain of corporate offices, research laboratories, and even government bases. Like the one in Adam West's batcave, these machines were mechanical giants, taking up entire rooms and prominently displaying analog parts. The Computer History Museum in Mountain View, CA, hosts a grand collection of these computing artifacts, and here are three of our favorites.

SAGE (SEMI-AUTOMATIC GROUND ENVIRONMENT) AIR DEFENSE COMPUTER

The SAGE display represents a small portion of the typical 300-ton installation of a computer used by the military to detect threats. These vacuum tube computers were deployed in redundant pairs at 27 linked installations throughout North America with the goal of tracking Soviet bombers during the Cold War. The SAGE project, started in 1954, included forward-looking technology such as modems, networking, and even light guns. The software driving the machines was amazingly advanced for the day, as well. An up-close look even reveals a cigarette lighter built into the console!



Circa
1983

IBM PC XT

A hard drive and an OS with subdirectories don't seem like much now, but in 1982 these were hawt! IBM and Microsoft weren't the first to deliver either technology, but they were the first to really mainstream it. Before the XT, hard drives were a luxury. After the XT, they were expected. The updates showed that IBM recognized the real users of its technology and its earlier underestimation of the PC market.



SPECIFICATIONS

RAM	64K-640K
CPU	4.77MHz 8088
Supporting OS	PC DOS, CP/M, UCSD-P
Notable Firsts	First IBM PC with a hard drive

Circa
1984

Apple Macintosh

Introduced in a now-world-famous Super Bowl ad, the Apple Macintosh wasn't the first GUI PC—it wasn't even Apple's first GUI PC—but it was the little computer that could, and it sparked a revolution in personal computer design while redefining people's expectations of PCs. The Mac not only represented a new technological age for Apple, it defined a break from its "open architecture" standards of the Apple II era.



SPECIFICATIONS

RAM	128K
CPU	8MHz Motorola 68000
Supporting OS	MacOS
Notable Firsts	First "affordable" GUI-based PC

Circa
1984

IBM PC/AT

The PC/AT introduction was the last time IBM managed to set the PC pace. Its Intel 80286 processor was a true 16-bit unit, so IBM had to redesign the eventual ISA bus for 16-bit addressing. The '286 also upped RAM limits from 1MB to 16MB and brought about new levels of suffering with Expanded and Extended memory management. The AT had enough power for Microsoft to sell a new DOS shell called Windows.



SPECIFICATIONS

RAM	256K-16MB
CPU	6MHz 80286
Supporting OS	IBM PC DOS, CP/M and others
Notable Firsts	First IBM 16-bit PC and bus

A look back at these old machines shows the clear path of Moore's Law. Since the release of the IBM PC/AT, the personal computer has grown faster and microchips have shrunk smaller by orders of magnitude. The antiques we've showcased may be considered slow and crude by today's standards but they all contributed, even if only a little, to the PCs we use today. ☺

IBM SYSTEM 360 The IBM System/360 represents a major turning point in computer history. Prior to the 1965 introduction of the System/360 a computer upgrade meant a complete rewrite of all software. With the 360, IBM unified its computer architecture and permitted users to move up and down the line using the same software and operating systems. This enabled computing to penetrate deeper into industry worldwide and allowed IBM to dominate the market for decades.



BABBAGE DIFFERENCE ENGINE Charles Babbage (1791-1871) was perhaps the earliest computer pioneer. He designed numerous computing devices using Victorian-era technology, although the limits of that technology made it impossible for him to ever build any of his ideas. Fast forward 150 years and our technology proved his concepts viable with the creation of a working Babbage Engine. A functional replica of this analog computer sits in the lobby of the Computer History Museum, on loan until the end of this year.



WHITE PAPER

Internet Protocol

Let's dig into the layer cake that is the Internet —MICHAEL BROWN

Conceptually speaking, the Internet can be viewed as consisting of four functional layers: the Link Layer, the Internet Layer, the Transport Layer, and the Application Layer. Each layer has several protocols, sets of rules that define how data is formatted and transmitted, which are known collectively as the Internet Protocol Suite. We'll discuss all four layers here, but we'll dive deepest into the Internet Layer and its associated Internet Protocol (IP)—because this is the worldwide network's most fundamental component.

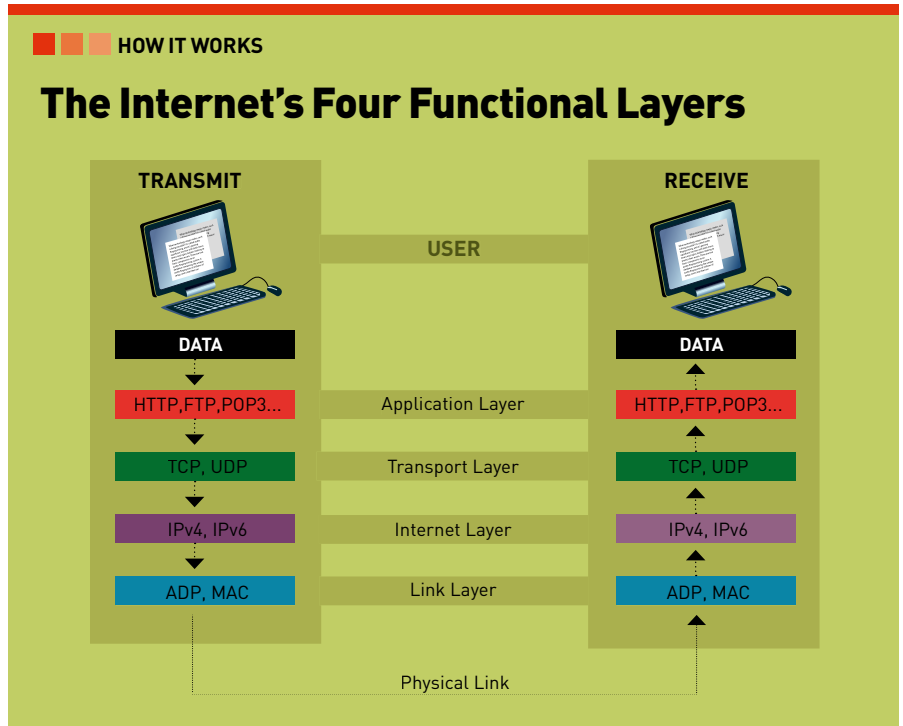
The Link Layer is the lowest layer and is responsible for delivering data over whatever hardware is in use. A link consists of the physical and logical components that are used to interconnect host computers and other types of network nodes (a node is any electronic device that's connected to the network, including hosts). Link Layer protocols, including Address Resolution Protocol and Media Access Control, operate only on a host's link.

The Internet Layer sits on top of the Link Layer, but we'll return to it later since its collection of protocols includes Internet Protocol, the primary focus of this white paper. The Transport Layer comes next, and it is responsible for encapsulating blocks of data into packets—an information payload bracketed by control information that informs the network how to deliver the data—and delivering it to the appropriate application program running

INTERNET PROTOCOL ASSUMES THAT THE ENTIRE NETWORK INFRASTRUCTURE IS BOTH DYNAMIC AND UNRELIABLE

on the host computer. The two most common protocols used in the Transport Layer are Transport Control Protocol (TCP) and User Datagram Protocol (UDP).

The Application Layer is the highest level of the Internet's architectural model, and it contains all the protocols concerned with process-to-process communications via an IP



When you interact with the Internet—by accessing a website, downloading a file, streaming media, and so forth—your communications flow through four network layers, each of which has several protocols designed for the task at hand. Internet Protocol, which comes into play on the Internet Layer, defines the structure and addressing of data packets traveling over the network.

network. You'll likely be familiar with many of the protocols that operate at this level, since they include HTTP (HyperText Transfer Protocol), FTP (File Transfer Protocol), POP3 (Post Office Protocol, version 3), and even BitTorrent.

INTERNET PROTOCOL

Internet Protocol (IP) defines addressing methods and packet structures and is used to deliver packets from a source host to a destination host based on the hosts' respective addresses. Internet Protocol is considered a connectionless protocol because, unlike a voice telephone network, it doesn't rely on a circuit being established before one host can transmit packets to another. Internet Protocol can be used on hetero-

geneous networks, meaning that information can travel over any combination of Ethernet, ATM, Wi-Fi, Token Ring, and many other types of networks. Version 4 (IPv4) is the most common version of Internet Protocol in use today, but its successor (IPv6) is being deployed rapidly; the two coexist in the meantime.

The genius of Internet Protocol lies in its assumption that the entire network infrastructure is both inherently unreliable and dynamic: Links and nodes can disappear at any time while new links and nodes are constantly coming into existence, but none of this can prevent a data transmission from reaching its destination.

The Internet is designed according to an end-to-end principle: The bulk of its intelligence is located at the ends of its transmission

Acer Aspire One ZG5

The netbook (or mini-notebook) category burst out of nowhere in 2007, ushered in by Intel's Atom platform and promising inexpensive, eminently portable computing to all. Here's what you'll find in a typical netbook.

paths; the routers in between simply forward packets to the next closest gateway based on the ultimate destination's address. Because of this, Internet Protocol provides only what's known as "best effort delivery," meaning that it does not guarantee that data will be delivered or that the user can expect any particular quality of service. In fact, packets can be corrupted, duplicated, arrive in a different order from that in which they were sent (perhaps because one took a longer path), or be lost altogether without the node at either end of the transmission path being notified.

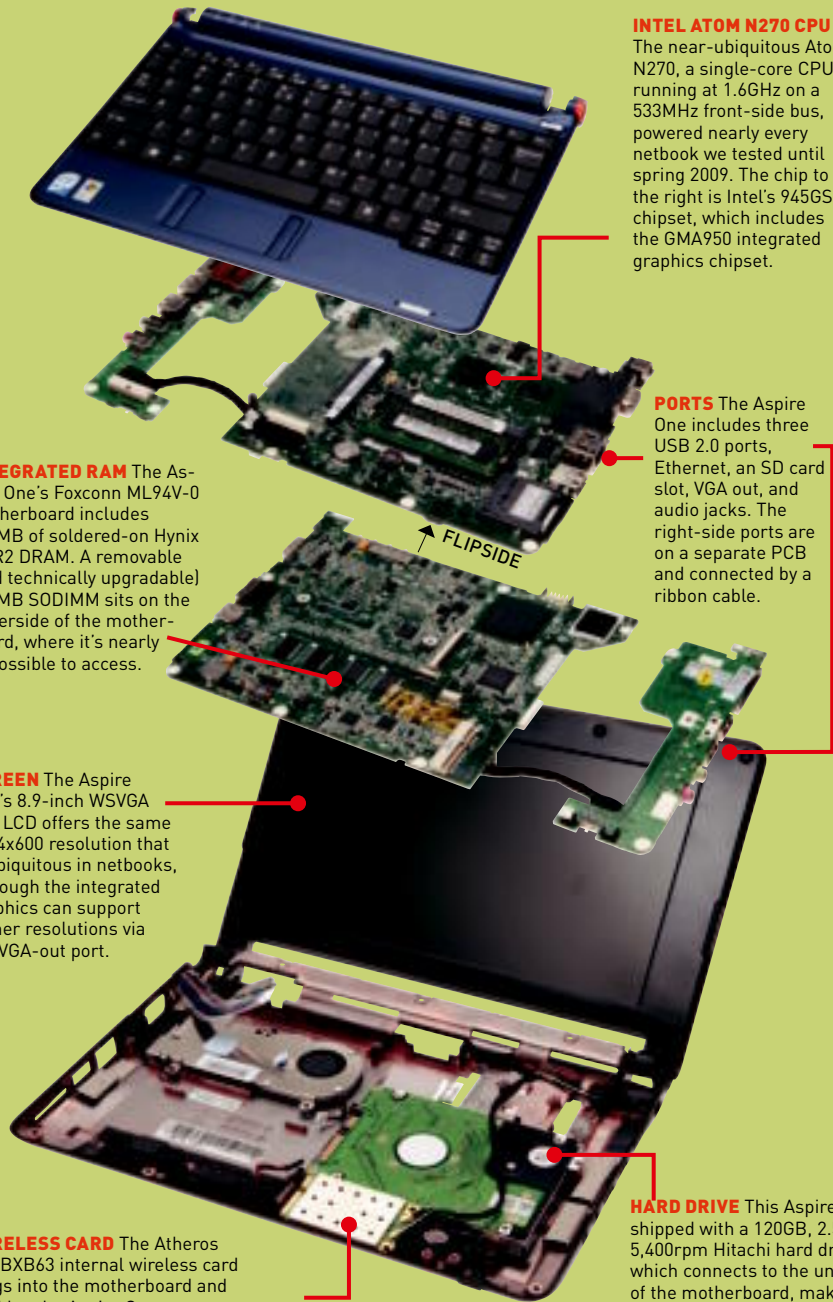
IPv4 can ensure that the IP packet header is free from errors by computing a checksum at each routing node, but IPv6 dropped this feature in order to increase the speed at which packets travel through network routers. In any event, it is the responsibility of upper-layer protocols—such as TCP—to correct reliability issues, such as data corruption, lost or duplicate packets, and out-of-order packet delivery.

IP ADDRESSES

The primary difference between IPv4 and IPv6 resides in their address systems. A unique IP address is assigned to every device participating in the network. These are stored as binary numbers, but typically displayed in a human-readable format: 208.77.188.166, for instance. IPv4 uses a 32-bit structure (capable of establishing four billion unique addresses), while IPv6 uses a 128-bit scheme (capable of creating 340 undecillion unique addresses—an undecillion is a one followed by 36 zeroes).

As private local-area networks began to proliferate in the 1990s—primarily in homes and businesses—it began to look as though the world might run out of IPv4 addresses, so a set of private IP addresses was set aside and reserved exclusively for that purpose (private IPv4 addresses range from 192.168.0.0 to 192.168.255.255). Unlike a conventional IP address, a private IP address is not assigned to a specific individual or organization and it can be used without the approval of a regional Internet registry.

Using a technique known as IP masquerading, an entire collection of private network addresses can be hidden behind a single public IP address that is assigned to a specific individual or organization. Since private IP addresses cannot be routed on the public Internet, network address translation (NAT) is used to modify the IP address contained in the packet header as the packet passes through the router, so that it matches that public IP address. A process called port forwarding can be used to allow traffic from the Internet to reach hosts with private IP addresses within the masqueraded network. ⚡



INTEL ATOM N270 CPU The near-ubiquitous Atom N270, a single-core CPU running at 1.6GHz on a 533MHz front-side bus, powered nearly every netbook we tested until spring 2009. The chip to the right is Intel's 945GSE chipset, which includes the GMA950 integrated graphics chipset.

PORTS The Aspire One includes three USB 2.0 ports, Ethernet, an SD card slot, VGA out, and audio jacks. The right-side ports are on a separate PCB and connected by a ribbon cable.

INTEGRATED RAM The Aspire One's Foxconn ML94V-0 motherboard includes 512MB of soldered-on Hynix DDR2 DRAM. A removable (and technically upgradable) 512MB SODIMM sits on the underside of the motherboard, where it's nearly impossible to access.

SCREEN The Aspire One's 8.9-inch WSVGA TFT LCD offers the same 1024x600 resolution that is ubiquitous in netbooks, although the integrated graphics can support higher resolutions via the VGA-out port.

WIRELESS CARD The Atheros AR5BXB63 internal wireless card plugs into the motherboard and enables the Aspire One to connect to 802.11b/g networks.

HARD DRIVE This Aspire One shipped with a 120GB, 2.5-inch, 5,400rpm Hitachi hard drive, which connects to the underside of the motherboard, making it (like the RAM) impossible to upgrade without disassembling the whole netbook.



SUBMIT YOUR IDEA Ever wonder what the inside of a power supply looks like? Don't take a chance on destroying your own rig; instead, let us do the dirty work. Tell us what we should crack open for a future autopsy by writing to comments@maximumpc.com.

HOW TO

Step-by-Step Guides to Improving Your PC

THIS MONTH

64 USE SYMBOLIC LINKS TO MASTER VISTA'S FILE SYSTEM

66 HACK YOUR DROPBOX

1 + 1 = 3

One of the great things about Windows computing is the vast selection of open source and freeware applications available to download for personal use. Whenever you come across a task that can't be completed with Windows' built-in suite of apps—audio editing or disc-image burning, for example—chances are you can find a free program online that'll do the trick.



NORMAN CHAN
ONLINE EDITOR

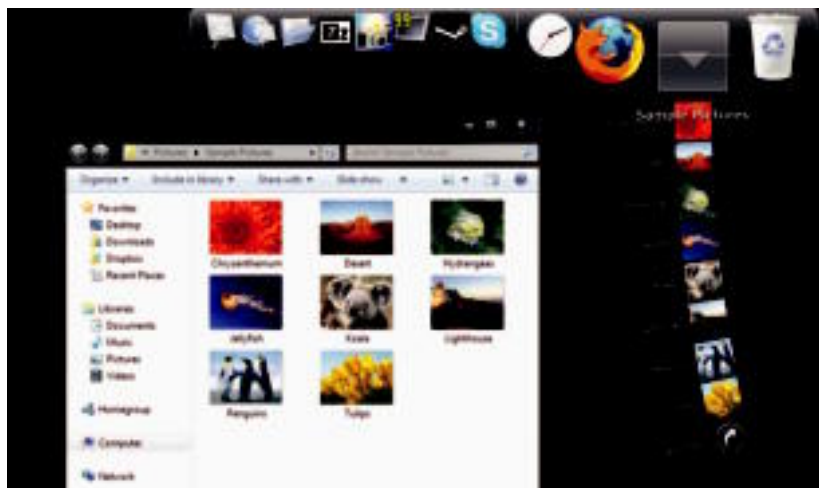
Often times, these task-specific utilities can actually be improved when integrated with other programs. For example, the Dropbox enhancement guide on Page 66 uses this principal to apply the cloud-storage service to other desktop programs like Steam and BitTorrent.

This past month, we spent a lot of time at the office brainstorming these application “mash-ups.” We drew up a list of useful programs and went through each of them, trying to identify weaknesses or missing features that could be acquired by using a second program. Eventually, we came up with nine great software mash-ups, which you can find at <http://bit.ly/W1Er0>.

SUBMIT YOUR IDEA

Have a great idea for a How To project? Tell us about it by writing to comments@maximumpc.com.

WINDOWS TIP OF THE MONTH



Steal Mac OS X's Desktop Features

Have your Apple-loving friends ever tried to taunt you with Mac OS X's flashy desktop interface?

OS X's Dock and Exposé are admittedly nifty, but you don't have to switch operating systems to use them.

Just download Rocketdock (www.rocketdock.com)

and Switcher (www.insentient.net), two free programs that emulate the Mac desktop without dis-

abling the Windows Start Menu or Alt-Tab function.

Use Symbolic Links to Master Vista's File System

With Windows Vista, Microsoft introduced a new capability to its operating system: the ability to create symbolic links. Accessible only from the command line, symbolic links are a powerful way to manipulate the file system. This guide will provide a little background info about symbolic links and hard links, and show you how to use the `mklink` command to create them. We'll also show you a couple of examples, including how to use `mklink` to manage your Steam games and music files. —ALEX CASTLE

1 WHAT IS A SYMBOLIC LINK?

A symbolic link is akin to a shortcut. It creates an address pointer to a different part of the file system, redirecting your computer to that location when the link is accessed. What makes a symbolic link different from a shortcut is that it is handled at the operating system level, rather than at the application level. So, whereas only a few programs (such as `explorer.exe`) know how to handle a shortcut file, a symbolic link can be used with almost any program that deals with the Windows file system.

With a symbolic link, if the target directory or file is deleted, the link becomes non-functioning, as it points to a file that no longer exists. In a way, this gives symbolic links extra flexibility, because you can create a symbolic link to a file or folder that doesn't actually exist, but will later. Symbolic links take up no space, and if you delete a symbolic link, nothing happens to the original data.

QUICK TIP

Although the `mklink` command was added in Windows Vista, there is some symbolic link functionality in Windows 2000 and XP. Using the Junction tool from Microsoft (available for free at <http://bit.ly/3wpi18>) you can create symbolic links on the older OSes. Unfortunately, these links don't work across a network, making them significantly less useful than those created with `mklink`.

2 WHAT IS A HARD LINK?

A hard link is functionally very similar to a symbolic link, but is fundamentally different. Rather than pointing to a part of the file system, a hard link points to data on the hard drive. In other words, when you create a hard link, you're not merely creating a link or a shortcut to another file—you're creating a new file that points to already extant data.

This is best illustrated by the fact that if you delete the original file, any hard links to that file will still work normally, as the data they point to is still there. The data will remain until every hard link pointing to it is deleted.

3 USING THE MKLINK COMMAND

To create a symbolic link, open the command prompt (go to Run and type `CMD`) and enter the `mklink` command with the following syntax: `mklink <link> <target>`

The `<link>` parameter is the name you want to give to the newly created link. The `<target>` parameter specifies the location you want to link to. The location can be an absolute path (such as `C:\Documents and Settings\acastle\My Documents\Articles`), a relative path (such as `Articles\October 08`), or the address of a network share (such

as `192.168.1.3`). The target can be a single file or an entire folder, depending on which command-line options are specified. The options are as follows:

- **Default:** If you use `mklink` without any command-line flags, it will default to creating a file symbolic link. Thus, the specified target must be a single file. For example, to link a game save file to a mounted network drive, you could enter:


```
mklink D:\Games\civilization
iv\game1.sav M:\Games\
civilization iv\game1.sav
```
- **/D:** With the `/D` flag, `mklink` creates a directory symbolic link. This is just a symbolic link that points to a whole directory rather than a file. You would generally use such a link the same way you would use a shortcut to a directory. As an example, it could look like this:


```
mklink /D C:\
Photos \192.168.1.4\photos
```
- **/H:** With the `/H` flag, `mklink` creates a hard link, rather than a soft link, as described above. It must point to a file, not a directory. It would look like this:


```
mklink /H C:\app\config.ini E:\apps\
exampleapp\config.ini
```
- **/J:** The `/J` flag is the hard link equivalent of the `/D` flag. It creates a hard link

```
C:\>mklink
Creates a symbolic link.

MKLINK [ /D ] [ /H ] [ /J ] Link Target

/D      Created a directory symbolic link. Default is a file
symbolic link.
/H      Created a hard link instead of a symbolic link.
/J      Created a Directory Junction.
Link     specifies the new symbolic link name.
Target  specifies the path (relative or absolute) that the new link
refers to.

C:\>
```

to a directory, rather than a single file. For example, if you wanted to create a hard link to a folder, you could use this command: `mklink /J D:\Articles C:\Users\username\Documents\Articles`

If at any time you simply enter `mklink` into the command prompt, you'll be shown a brief list of the command-line options.

4 SAMPLE USE: STORING STEAM GAMES

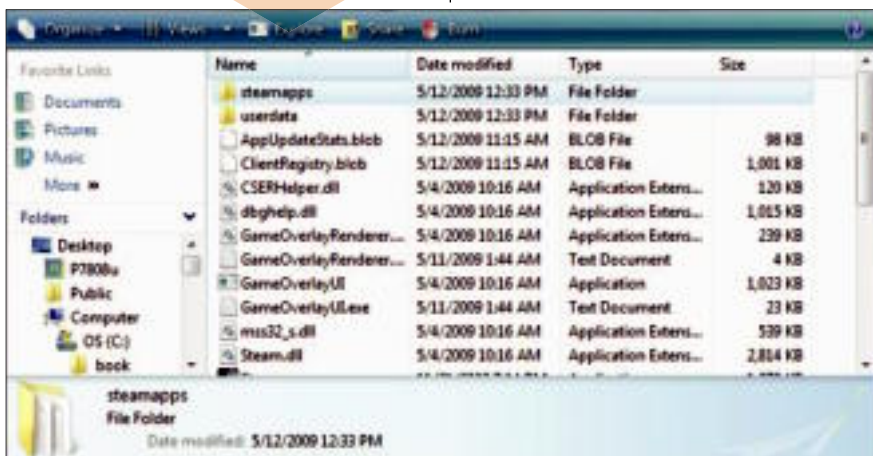
Steam is an excellent example of an application that is not entirely flexible in the way it uses the file system. When you first install Steam, you can choose where you want games saved, but after that point, every new game you download is installed to the same place. With hard links, we can fix that.

Why would we want to have Steam games installed in different places? Consider the following example: Say we have a computer with two hard drives: a 300GB WD VelociRaptor and a 1.5TB Seagate Barracuda. We use the faster-accessing VelociRaptor for gaming, so we install Steam on one of its partitions. Eventually, the VelociRaptor begins to fill up, so we have to start evaluating how we're using the space.

For a game like *Crysis*, which will be accessing tons of data off the disk—fast—we definitely want to use the faster hard drive. However, for a game like *Civilization 4*, which is older and loads quickly under the majority of circumstances, we can afford to move the game's data over to the slower drive, clearing up a couple of gigabytes on the faster but smaller hard drive.

To set up our link, we need to find the files we want to move. In our example, they're located in `D:\Games\Steam\steamapps\common\sid meier's civilization iv`. We'll move that folder somewhere on the 2TB drive, for instance to `E:\Games\sid meier's civilization iv`. Now, before starting up Steam again, we need to create a hard link to fill in the hole we left when we moved the folder. The command we'll use to do that is: `mklink /J D:\Games\Steam\steamapps\common\sid meier's civilization iv E:\Games\sid meier's civilization iv`

Now, when Steam looks for the *Civilization 4* files, it will find them right where it's expecting them to be. However, the hard link is pointing to data that's actually on the 2TB drive. Using this technique, we can store our games wherever we like.



Hack Your Dropbox

Getting files from one place to another is one of the oldest tasks in the book. We've used floppies, ZIP disks, CDs, DVDs, Blu-ray discs, thumb drives, email, and more to get the files we need from point A to point B. But now there's Dropbox (www.getdropbox.com), which has—in the half-year or so since it came out of beta—become our very favorite way of making sure that we always have our most important files at hand.

Here's a quick recap on how it works: You create a free account with Dropbox and install a small app on your computer. This app creates a folder on your computer (wherever you choose) and monitors that folder at all times. Whenever you change the contents of this folder, by adding, modifying or deleting files, Dropbox automatically syncs these changes to your account's folder on its servers. Additionally, any other computer logged into that same account will have its Dropbox folder synced as well. There's nothing earthshaking about this capability, but the whole process is amazingly simple and makes collaboration an absolute breeze.

Still, with a little creativity, Dropbox can be a lot more than just a way to move files from one computer to another. We've compiled a list of the coolest Dropbox tricks we've heard of so far, so read on to find out how you can use Dropbox and other free software to organize your Torrents, keep your passwords safe, and more. —ALEX CASTLE

1 KEEP ALL YOUR PASSWORDS SAFE

Everyone knows that good password security requires passwords that are A) long, B) complicated, and C) different for every website and service you use. Of course, these three requirements also make it a total pain to memorize all the passwords you need, meaning that most people don't follow the rules, either using one password across many services (a security risk) or writing their passwords down near the computer (also a security risk).

That's where KeePass (www.keepass.info) comes in. KeePass is a free, open source password safe. It allows you to generate a unique, totally random password for every site or service you use, while requiring that you only remember a single master passphrase. Whenever you attempt to log into a service, KeePass asks for your master passphrase, then automatically enters the appropriate password from your safe.



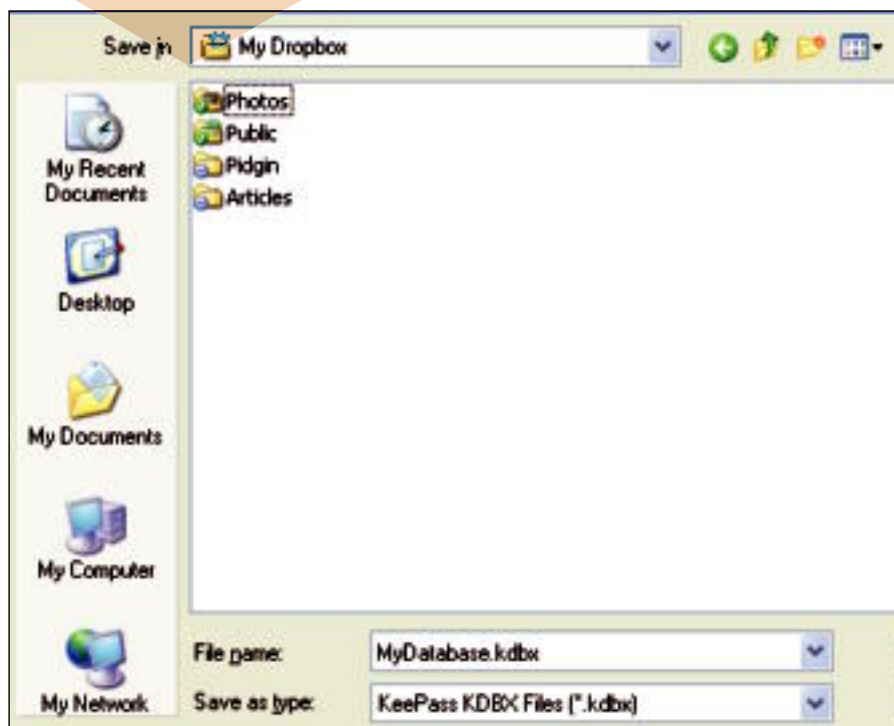
But what if you frequently use two different computers (say, a desktop and a laptop)? You could use a USB drive to keep your KeePass password archive with you at all times, but that's one more little bit of hardware you have to keep track of. Instead, use Dropbox to keep an up-to-date copy of your password file on both computers at all times. Just tell KeePass to save your password archive somewhere in your Dropbox synced folder.

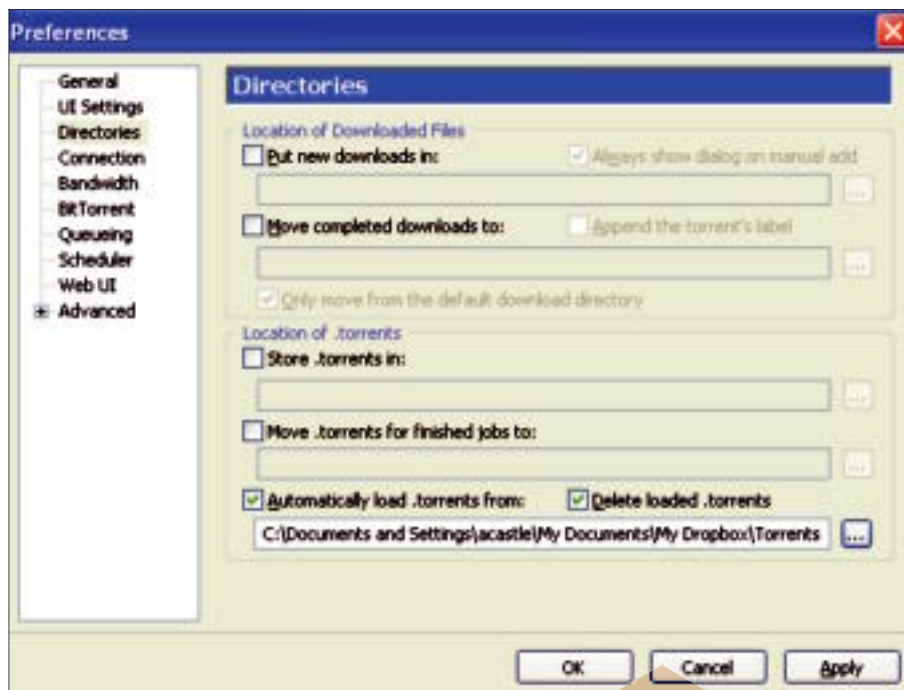
Worried about security? Fuhged-aboutit. KeePass saves your password in an archive encrypted with nigh-unbreakable AES 256-bit encryption. That means that as long as you pick a strong, long password, getting a hold of your KeePass file won't do a hacker a bit of good.

2 ACCESS AN ENCRYPTED DRIVE, ANYWHERE

We like Dropbox. We like TrueCrypt. So what if... *What if*, we were to use the two together? Crazy, we know, but by combining the top-notch encryption of TrueCrypt with the easy syncing of Dropbox, you can create an encrypted drive accessible from any computer.

Download and run the TrueCrypt





executable (www.truecrypt.org) and choose to extract it (rather than install it) to your Dropbox folder. From there, make an encrypted volume, as described here: <http://bit.ly/j8kxk>. This will allow you to run TrueCrypt and mount your encrypted volume straight off of the Dropbox folder, on any machine.

There's one thing you should note about this method: Whenever Dropbox updates a file, it first compares the old file and the new, then uploads or downloads only the bits that have changed. On the one hand, this is good because it means you don't have to re-upload your entire 500MB encrypted volume every time you add something to it. On the other hand, a hacker could (theoretically) see how the encrypted data is changing as you add or change files in the volume—an encryption no-no. Still, this is definitely not something you have to worry about if you're just looking for a little extra security for your Dropbox files.

3 ORGANIZE BITTORRENT

How often have you found yourself sitting at work only to find that a file you're interested in (a demo for a new game you're excited about, for instance) has just become available online. Sure, you could sit there patiently and wait until you get home to download it; but why bother waiting when you could have it ready for you as soon as you get there? Most of the big BitTorrent

clients have some sort of web-based control, but those can be tricky to set up, and require that you have a static IP (or set up a DynDNS account). Using Dropbox, it's much easier.

Here's what you'll need to do: First, make sure you have a BitTorrent client capable of automatically loading .torrent files from a folder. All the big ones are capable of this, including uTorrent, Vuze, and the standard BitTorrent client. Next, set it up to monitor your Dropbox, or a folder in your Dropbox (My Documents/My Dropbox/Torrents, for instance) and automatically open any .torrent file added to that folder.

Now, if you see a file you want to grab, just download the .torrent file to your Dropbox/Torrents folder, and your home PC will start the download as soon as Dropbox syncs. It's as simple as that.

4 ACCESS YOUR IM LOGS FROM ANY COMPUTER

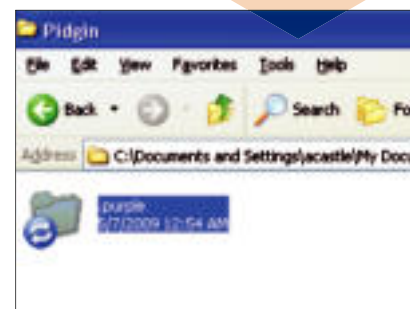
A lot of people use instant messaging to keep in touch with their coworkers during the day. We certainly do here at the Maximum PC office, but we're sure the same can be said of many less-technically forward offices, as well. Because of that, there are times when, while you're at home, you want to remember something from a conversation you had while you were at work, but you

can't because your IM logs are stored on your work computer.

That doesn't have to be the case. If you use Pidgin (www.pidgin.im), a free, open source multiprotocol IM client, you can tell it to save its logs in a folder in your Dropbox. As long as Pidgin is set up that way on all of your computers, they will all share access to the same logs.



Actually setting it up so that Pidgin saves your logs somewhere other than the default location is a little trickier than you might imagine, though. You'll need to change the PURPLEHOME environment variable on your system, which defines where Pidgin saves its configuration files and logs. To do this, open the control panel and select System. Then select the Advanced tab, and click Environment Variables. Now, click New under the System Variables box. In the Variable Name field, enter PURPLEHOME and in the Variable Value field, enter the location of your Dropbox folder. Now Pidgin will use a folder inside your Dropbox called .purple to save its data.



If you're OK working from a fresh install of Pidgin, that's all you'll need to do. If you have existing settings and logs that you want to keep using, just copy the .purple folder from its default directory (Application Data) to your Dropbox directory. ☺

REVIEWS

Tested. Reviewed. Verdictized

INSIDE

- 74 MAINGEAR EPHEX PC →
- 75 SAMSUNG NC10 NETBOOK
- 76 SEAGATE BLACK ARMOR NAS 440
- 78 NOCTUA NH-U12P COOLER
- 80 THERMALTAKE ELEMENT S MID-TOWER
- 82 MICROSOFT SIDEWINDER X8 MOUSE
- 84 NETGEAR MOCA ETHERNET ADAPTER
- 86 GEFEN WIRELESS HDMI
- 87 DELL WASABI PZ310 PRINTER
- 89 MOTIONDSP VREVEAL
- 90 PLANTS VS. ZOMBIES
- 91 SIMS 3

ONLINE

- EVEN MORE REVIEWS!
- BEST OF THE BEST
- EDITORS' BLOGS
- THE NO BS PODCAST



Maingear ePhex

It's like an early dream machine

It's become a cliché in hardware reviews to call a PC “the fastest machine we've ever seen,” but there are no better words to describe Maingear's ePhex.

It truly is the fastest machine we've ever seen. And you would expect that from a parts list that looks like someone just checked the “bestest” box before clicking the buy button.

Peep these specs: Intel's new Core i7-975 Extreme Edition CPU. This new CPU may seem like it's just 133MHz faster than the Core i7-965 Extreme Edition CPU, but it's actually a new stepping of the core that enhances overclocking. Maingear overclocks the chip from 3.33GHz to a very stable 4GHz. To the new i7, Maingear adds 12GB of Kingston DDR3/1600 on the Asus Rampage II Extreme board, a 2TB Western Digital drive, two Intel 80GB X25-M SSDs in RAID 0, and not two, but *three* GeForce GTX 285 cards in tri-SLI. To keep it all running, Maingear water-cools all three GPUs and the CPU, and then tosses in a 1,200 watt PC Power and Cooling Turbo-Cool PSU.

The package is stunningly fast, as you can imagine. The majority of our benchmark records, surprisingly, have been held by a Velocity Micro 3.66GHz Core i7 machine that we reviewed late last year. That's an amazing feat in itself, but the Maingear box not only bumped the Velocity Micro from the top spot, it set new records in every single benchmark. Premiere Pro CS3? Fastest. Photoshop CS3? Fastest. ProShow Producer? Fastest. MainConcept? Fastest. UT3? You get the picture. The most impressive scores were perhaps in Crysis. We run the CPU bench section of this punishing game because it's closest to an in-game experience, but we've long wondered if it's been the CPU that's shackled performance. We haven't seen the

needle move past 54fps in months—even with tri-SLI machines we've reviewed previously. The Maingear's water-cooled GPUs spiked up to 70fps at 1920x1200 resolution with quality set to Very High. With 16x AA enabled, the rig's scores dip to just 59fps.

Needless to say, it's impressive when a machine captures every single benchmark record. Compared to last month's Polywell Core i7 machine (overclocked to 3.6GHz), the Maingear represents well, turning in scores from 20 to 68 percent faster than the Polywell rig. We'd be remiss, however, if we didn't point out that the Polywell cost \$5,000 less. In an age when people are happy to scrape pennies together to buy a netbook, that kind of savings is nothing to sneeze at.

Performance aside, the Maingear's not perfect. The paint job was good but far from flawless. We've seen much better work from the likes of Smooth Creations or Falcon Northwest. There were just enough blemishes that someone who put out \$8K might be bummed. And even with the water-cooled components, the Maingear is quite audible under long, heavy loads. Part of that comes from the Turbo-Cool PSU, which sounds like an F-15 on afterburners, but the fact is, keeping this much hardware cool and running reliably can't be done silently.

The machine was definitely reliable. Adrenaline junkies might wonder why Maingear



Look out, there's a new benchmark sheriff in town.

didn't push it to, say, 4.5GHz, but we demand stability. We put the box through an overnight Prime95 run and it never crashed. Likewise, we subjected it to a burn-in using a wickedly mean double-secret Intel utility and the machine ran rock solid.

So, if you're able to swallow the price and the noise, you're unlikely to find a faster machine today.

—GORDON MAH UNG



VERDICT **9**

MAINGEAR ePHEX

+ SPEED

Outpaces all other machines we've tested in every benchmark.

- SPEED RACER

A tad loud and priced higher than most people's cars.

\$8,305, www.maingear.com

BENCHMARK

ZERO POINT			
Premiere Pro CS3	1,260 sec		468: [169%]
Photoshop CS3	150 sec		72: [108%]
ProShow	1,415 sec		465: [204%]
MainConcept	1,872 sec		863: [117%]
Crysis	26 fps		70: [169%]
Unreal Tournament 3	83 fps		213: [157%]

Our current desktop test bed consists of a quad-core 2.46GHz Intel Core 2 Quad Q6700, 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard. We are running two EVGA GeForce 8800 GTX cards in SLI mode, a Western Digital 150GB Raptor and a 500GB Caviar hard drive, an LG GGC-H20L, Sound Blaster X-Fi, and PC Power and Cooling Silencer 750 Quad. OS is Windows Vista Home Premium 64-bit.

SPECIFICATIONS

Processor	Intel 3.33GHz Core i7 975 @ 4GHz
Mobo	Asus Rampage II
RAM	12GB DDR3/1600
Videocard	Three water-cooled GeForce GTX 285 in tri-SLI
Soundcard	X-Fi Titanium Fatal1ty Pro
Storage	Two 80GB Intel X-25M SSD in RAID 0, Western Digital 2TB Caviar Green
Optical	Pioneer BDC-202, HL-DT-ST GH22LS30
Case/PSU	Silverstone TJ-10 / PC Power and Cooling Turbo-Cool 1200

Samsung NC10

An Atom N270 stalwart, aging gracefully

With the latest crop of netbooks beginning to sport Intel's new Atom N280, which features a slightly higher clock speed (1.66GHz vs. 1.6GHz) and a faster front-side bus (667MHz vs. 533MHz), how well does a netbook built around the earlier Atom N270 hold up? To find out, we put Samsung's NC10 to the test.

The Samsung NC10 is a pearl-white clamshell with a chrome-like strip running around the outer edge of its base. It has a 10.2-inch, LED-backlit, anti-glare monitor; a 1.3MP integrated webcam; 1GB DDR2/667 RAM; a 160GB hard drive; and a 6-cell battery—basically, nothing we haven't seen before. But while it's not the newest kid on the block, the NC10 is still more than capable.

Thanks to the 6-cell battery, the NC10 pulls down more than five hours on our full-screen DVD-video playback test, better than all netbooks we've tested, save two Eee PCs, which lasted five-and-a-half hours each. It chugged through our Photoshop benchmarks in 708 seconds, a mere 2.5 percent slower than our champion, the 1.66GHz-equipped Asus Eee PC 1000HE, but faster than all previous N270-based netbooks we've tested, with the exception of the Eee PC 1002HA and Lenovo S10.

Starting with the NC10, we are replacing our Quake Live pass/fail test with frame

rates for Quake III Arena. Released in 1999, this is an old game, to say the least, but it's a realistic indicator of the caliber of gaming you can expect to get from a machine of this size. (Quake 4, released in 2005, for example, looked like a slide show on the NC10). The NC10 turned out 58fps when playing Quake III on High Quality—virtually the same frame rate achieved by the Asus 1000HE. Netbooks will never be gaming notebooks, but they are a perfect way to enjoy old classics on the go.

The NC10's build quality is strong and the unit includes most of the important things on our checklist—three USB ports instead of just two, a multcard reader, easily upgradable RAM, and long battery life. The NC10's antimicrobial keyboard is comfortable to type on;

■ ■ ■
VERDICT **7**

SAMSUNG NC10

■ NCC-1701	■ NC-17
One of the best N270 Atom netbooks; great battery life and performance.	Small touch pad; no wireless-N or Gigabit Ethernet.

\$440, www.samsung.com

its track pad is responsive but a bit small.

The NC10 is a strong leader of the last generation of netbooks, but with newer models like the Asus Eee 1000HE including 802.11n wireless, Gigabit Ethernet, and slightly better performance for a lower price, the NC10 is starting to show its age. Watch for its price to drop as newer models come out; it's a solid netbook and will remain so, and you could scoop up a bargain. With the NC10 holding up after months on the market, we can't wait to see what the NC20 offers. —NATHAN EDWARDS

Samsung's NC10 netbook offers great battery life, solid construction, and good performance. And it's not a fingerprint magnet.

SPECIFICATIONS

Display	10.2-inch LED-backlit WSVGA@1024x600
Processor	1.6GHz Intel Atom N270
Chipset	Intel 945GSE
Graphics	Intel GMA950
RAM	1GB DDR2
Storage	160GB (5,400rpm)
Ports	Three USB, audio in/out, multcard reader, VGA out, 10/100 Ethernet
Wireless	Bluetooth, 802.11b/g
Lap/Carry	2 lbs, 15 oz / 3 lbs, 10 oz

BENCHMARK

Photoshop [sec]	708
Battery [hrs:min]	5:05
H.264	Yes
Quake III [fps]	58.6

Notes: Tested using our standard Photoshop benchmark. Battery life reflects full-screen DVD-quality video playback at 50 percent brightness and 50 percent volume in power-saving mode. H.264 test uses 1.92GB MP4 container file, encoded with the AVC1 H.264 codec at 720x358 at 1536KB/s, played back in Cyberlink PowerDVD 8. Quake III tested at High Quality at 800x600 resolution.



Seagate BlackArmor NAS 440

A whole lotta NAS for a whole lotta dough

Last month we reviewed Western Digital's MyBook World Edition, a small, white, single-drive, one-terabyte NAS box aimed solidly at Joe User. This month, we have the Seagate BlackArmor NAS 440, the MyBook's polar opposite in many ways. It's big, it's black, it's user-serviceable, comes with four Barracuda 7200.11 1.5TB drives, and is marketed toward small businesses without a dedicated IT staff.

The BlackArmor 440 is a brick, the front of which has a two-line green LCD status screen, a front door that opens to reveal the four hot-swappable screwless drive bays, one of the box's four USB 2.0 host ports, and a power button. The back holds the 12cm exhaust fan, the power jack (for the external power brick), two Gigabit Ethernet ports, and the other three USB 2.0 ports.

The LCD display offers system status information and a few buttons to navigate with, but the real power comes from the BlackArmor's web interface, which is easily accessible from the BlackArmor Discovery software included with the NAS. The Discovery software also provides easy mapping of shared folders—the defaults are Public and Downloads.

Via the web interface, admins can configure users' quotas and permissions (including who can access the devices on each USB port); set up email alerts; set up, manage, and monitor the SMART status of drives and volumes; and turn on iTunes and media sharing and global access. Other options include FTP, HTTPS access (using your own SSL certificates or ones generated by the NAS), CIFS, NFS, Bonjour, and more.

One interesting feature is the ability to create multiple RAID arrays on the same drives. It's a neat trick, but most users should



The BlackArmor 440 is probably more NAS than a home network needs.

stick with the single RAID 5 volume the 440 comes with.

One of the BlackArmor's most useful inclusions is the BlackArmor Backup service, a custom app by Acronis. The 440 includes 10 full-version licenses, and more can be acquired from Seagate. For small-office users, that's a lot of value.

In its default RAID 5 configuration, using one Gigabit Ethernet port, the 440 transfers files quickly. Copying a 2.79GB file from the NAS to a PC on the local network took two minutes and 38 seconds, while writing that file to the NAS took just over a minute. Connecting the other Ethernet port increases transfer speeds, but that port can also be used to make NAS-to-NAS backups or server backups.

After a week of testing, one of the 1.5TB drives in our review unit failed, so we got an opportunity to see the 440's recovery process in action. The LCD screen and the web management panel both displayed alerts, and the RAID 5 was still functional, though degraded.

To rebuild the array, all we did was eject and replace the faulty drive. From there, it was a matter of three or four mouse clicks before the RAID 5 array was recovering itself in the background. Rebuilding a 4.5TB array takes a long

time, so we were pleased that we could still use the volume normally during the process.

The Seagate BlackArmor 440 is a powerful NAS with a huge array of business-oriented features. In fact, it's almost certainly overkill for home users, unless you have a large home network. After all, it's eight times the price of the consumer-friendly MyBook World 1TB. But with its enormous capacity and wealth of features, it would make a very useful addition to a small office network.

—NATHAN EDWARDS

BENCHMARKS

	Seagate BlackArmor 440	WD MyBook World
Size	6TB (4.5TB in RAID 5)	1TB
PC to NAS, small (min:sec)	0:39	0:47
PC to NAS, large (min:sec)	2:38	3:10
NAS to PC, small (min:sec)	0:17	0:25
NAS to PC, large (min:sec)	1:04	1:31

Best scores are bolded. We used the contents of Maximum PC's November 2007 CD for the small-file testing, and a single 2.79GB file for the large-file testing. All scores are averages of three transfer trials.

VERDICT 8

SEAGATE BLACKARMOR NAS 440

<p>T-BONE</p> <p>Fast, beefy; powerful web interface; includes 10 backup licenses.</p>	<p>SALISBURY STEAK</p> <p>May be overkill for home users; pricey.</p>
---	--

\$1,600, www.seagate.com

Noctua NH-U12P

Cool and quietly competent

At first glance, the Noctua NH-U12P is nearly identical to another tower-of-power CPU cooler: Thermalright's Ultra-120 eXtreme (reviewed July). Like that cooler, the NH-U12P consists of a copper heat exchanger and four dual-heat pipes, topped with a tall stack of aluminum cooling fins with a front-mounted fan. At 6.2 inches high, 5 inches wide, and 2.8 inches deep, the NH-U12P is nearly the same height as the Thermalright, not quite as wide, but quite a bit deeper.

Noctua ships its cooler with a top-of-the-line brown-and-beige NH-P12 fan with nine slightly beveled blades, which is held onto the cooling fin stack by a set of rather flimsy wire clips. The fan itself comes with three 3-pin power options: regular, low-noise, and ultra-low noise, which set the fan to spin at 1,300rpm, 1,100rpm, and 900rpm, respectively. The fan is impressively quiet even at top speed.

We like Noctua's SecuFirm mounting system—two mounting brackets screw into a backplate and the cooler is fastened to the brackets via a pair of spring screws. This makes installation considerably easier than on similar models, in which the whole cooler must be mounted directly to the backplate,

although the position of the mounting screws means fans must be attached after the cooler is mounted.

In our tests, we found that the NH-U12P, paired (as shipped) with a single NH-P12, performed to within a few degrees of the Thermalright Ultra-120 eXtreme at both idle and full burn. Noctua shipped ours with an extra \$20 NH-P12 to clip to the other side of the heatsink, but we saw no reduction in temperatures when we used two fans instead of one.

A few gripes: The wire clips that attach the fan to the heat dissipaters are flimsy and difficult to attach, especially with the cooler already mounted to the motherboard. And the cooler just plain takes up a lot of room.

But for all that, it offers powerful, quiet cooling with performance and price nearly identical to our champion Thermalright U-120 eXtreme, with an easier install process to boot. —NATHAN EDWARDS

■ ■ ■
VERDICT
9

NOCTUA NH-U12P

<p>+ NOCTURNAL</p> <p>Great performance, multiple speed options, quiet at any setting.</p>	<p>- NOXIOUS</p> <p>Flimsy fan clips; bulky. Additional fans don't give better performance.</p>
--	---

\$60, <http://noctua.at>



The Noctua NH-U12P is one of the best coolers we've ever tested, and quite quiet at that.

BENCHMARKS

	Noctua NH-U12P	Thermalright U120-E	Stock Cooler
Idle (C)	25.25	24.75	38.25
100% Burn (C)	42.25	40.75	69.5

Best scores are bolded. Idle temperatures were measured after an hour of inactivity; load temperatures were measured after an hour's worth of CPU Burn-In (four instances). Test system consists of a stock-clock Q6700 processor on an EVGA 680i motherboard inside a Cooler Master ATCS 840 case with stock fans.

Thermaltake Element S

An array of thoughtful features in an understated design

Say you're a content creator—video, graphic design, whatever. You want a computer that's quiet, functional, and hopefully doesn't look like it was designed by a candy raver, or worse, Apple. That's what Thermaltake is betting on with its Element S, an understated black midtower case with restrained red accents and plenty of drive space that's marketed toward content creators.

The Element S is built from steel, painted black inside and out, and decked with black plastic trim on the top and a red-rimmed, black-plastic front-panel door. It weighs close to 18 pounds, and measures 21.3x9.1x20 inches. The model we tested included three fans: a 12cm, 1,300rpm front intake fan, a 14cm 1,000rpm rear output fan, and a 23cm 800rpm red LED fan on top. The case also includes rear mounts for two 6cm VGA exhaust fans, which is rare, but makes sense if you're encoding video using a high-end graphics card. The Element S also has two holes for water-cooling tubes, but doesn't include rubber grommets in them—they're just bare metal punchouts in the case that could puncture the tubing over time.

The Element S has three 5.25-inch bays and a seven-slot hard drive cage, the latter of which can be oriented so that the drives either sit

parallel to the front of the case or perpendicular to it. Swapping the cage's orientation involves removing a few thumbscrews, popping off the whole front panel, and temporarily removing the two front fan clips. Fortunately, the whole process takes just a few minutes. Mounting the drives with SATA ports facing the rear of the case improves airflow and makes connecting drives easy, but it makes the task of adding and removing drives slightly more difficult. The drives slide in and out on special thumbscrews, and lock in with a plastic clasp. Thankfully, Thermaltake includes enough of the screws to fill all seven drive bays.

Great news for fans of solid-state drives: The Element S includes mounts for two 2.5-inch drives, which is the kind of forward thinking we salute, and we wonder why it's still so rare in case design. Even cases that ship with 3.5-inch-to-2.5-inch drive bay adapters are rare, much less designs that let you keep all your 3.5-inch drive bays free. And while the motherboard tray on the Element S isn't removable, it at least features a backplate cutout for the CPU cooler.

The PSU mounts are slightly elevated to improve airflow for units with bottom-mounted fans; the front fan mounts feature clips so they can be swapped easily (or removed to switch the hard drive cage orientation), and the case's front bezels act as dust filters. The Element S's front panel connectors include audio in and out, two USB ports,



Beyond its modest exterior lies a wealth of hard drive bays and bonus features.

and an eSATA port.

We wish the optical drive bays were toolless (as it is, they require the use of a couple screws), but no part of installation was actually difficult.

The Thermaltake Element S is a good midtower case at a competitive price—at \$150, it's \$80 cheaper than the Silverstone Fortress, and \$30 cheaper than Hiper's Osiris. Both those cases, however, are made of pricier aluminum. Still, with plenty of drive bays and fans and not as much flash as most gaming chassis, the Element S strikes a more professional tone than more ornate cases, and offers a lot of substance in a grown-up case. —NATHAN EDWARDS



VERDICT		8
THERMALTAKE ELEMENT S		
+ ELEMENTARY Plenty of hard drive bays; SSD bays; nicely configurable.	− ELIMINATE No eSATA; only three optical drive bays and two front USB ports.	
\$150, www.thermaltakeusa.com		

Microsoft Sidewinder X8

Can a tasty new sensor save Microsoft's lumbering design?

Microsoft's latest Sidewinder mouse, the X8, combines a wireless design with the latest in optical sensor technology. Sporting a proprietary BlueTrack sensor, the X8 will work on most any surface, including granite and marble, which are problems for mice with more traditional optical and laser sensors. This is also Microsoft's first wireless Sidewinder mouse—it utilizes the traditional 2.4GHz band, but updates more times per second than most wireless Microsoft mice.

We love the button placement and scroll wheel on this mouse. All of the buttons are easy to find and quick to press and the scroll wheel is quick and responsive. The top and bottom thumb buttons are especially praiseworthy. Unlike other mice equipped with a pair of thumb buttons aligned in a fore and aft configuration, the Sidewinder's thumb buttons are aligned vertically, with Mouse5 placed above Mouse4.


Like the Razer Mamba, which we reviewed last month, the X8 features a play and charge cable. Using a magnetic power adapter that quickly and easily snaps into place, you can convert the X8 from battery power in mere seconds, should your battery die. The X8's connection system is a marked improvement over the Mamba.

The Sidewinder X8's sensor is also worthy of note. The BlueTrack sensor uses blue LEDs instead of the more traditional red LEDs or infrared laser to illuminate the surface under the mouse. The reflected blue light is picked up by a CMOS sensor, which tracks the surface's movement beneath the mouse and translates that into your cursor movements. The big benefit of the BlueTrack sensor is in the number of surfaces the sensor works on—we tested granite, shiny brushed metal, and black surfaces that confound other optical mice. Like other gaming mice, the X8 features an adjustable sensor, which caps out around 5,000dpi (as reported by the screen on the top of the mouse). In our testing, however, the mouse didn't feel as smooth as other high-end gaming mice we've tested recently, the Razer Mamba and the Logitech G9x. In fact, there were noticeable and regular skips when using the X8 in Windows.

Unfortunately, our biggest problem with the X8 is its size. If your hands aren't larger than average, this mouse is simply too wide and tall for most people's comfort. After several hours of use, our hands actually cramped from the stretching required to move the mouse. We recognize that large-handed folk need to use a mouse too, but we can't recommend this mouse to even them, due to the cursor hitching we experienced in testing.

—WILL SMITH

The X8 is Microsoft's first wireless gaming mouse, but despite some awesome thumb buttons, we can't recommend it.

		VERDICT 5
MICROSOFT SIDEWINDER X8		
+ MOLESKINE Great thumb-button placement; good for people with large hands.	+ MOLESKIN Enormous, jumpy sensor, especially at high resolutions.	
<small>\$100, www.microsoft.com/hardware</small>		

Netgear MOCA Coax Ethernet Adapter Kit MCAB1001

Turn coaxial cable outlets into a high-speed network connection

Netgear's MOCA (short for Multimedia over Coax Alliance) adapter is the can solution to the can't. If you can't get a reliable Wi-Fi signal throughout your home and you can't make an Ethernet cable run and you can't tap your home's electrical grid with a HomePlug Powerline adapter, then MOCA is the can.

Using existing standard cable coax wires, the Netgear MOCA adapter lets you turn your cable TV runs into a "home entertainment network." What the hell is that? Since the adapter is built around passing data through your cable TV, it's no surprise that MOCA wants to push its adoption as an easy way to get Internet connectivity to your set top box, game console, or media center PC.

Setup is Joe-six-pack friendly: Just unplug the coax cable from your TV set and plug it into the Netgear MOCA adapter. Run a second coax cable from the adapter to the TV. TV signals are passed through transparently, so your *American Idol* viewing won't be disturbed. And if the signal is degraded you can actually change the frequency the adapter operates on.

The included patch cable can be used to connect your game console or media center PC to the Fast Ethernet port on the back of the adapter. Power it up and go to the room where your router or modem is located. Now here's the rub: Do you have a cable run there? If you don't have a cable outlet in the same room as your router, you're SOL. Fortunately, in the land of the couch potato, most new homes are prewired for cable TV. Run coax cable to the second Netgear MOCA adapter, run a patch cable to an open Ethernet port on your router or modem, and power up both. If you're within the guidelines of a maximum cable run of 300 feet, you should be up and running.

The technology promises a theoretical 270Mb/s transfer speed, which is sufficient for high-def content. Using a Linksys Media Center Extender DMA2200, we streamed both standard-def material and high-def material using the Netgear MOCA adapter to our TV.

We also conducted a rudimentary file transfer to simulate how long it would take to move a file from a server to a media



The kit includes an adapter to plant near your router/modem and another to place near your set-top box or media center PC.

center PC. Using the Netgear MOCA, we moved a 2.4GB video file in about seven minutes. Switching to our 802.11g network, the same file transfer took about 13 minutes. Not bad, but certainly not Gigabit Ethernet. We didn't have 802.11n capability on our network to test its speeds, but we suspect the MOCA's transfer speeds are similar to the faster Wi-Fi version—with less of a security risk. Since the MOCA is hardwired and its range is fairly short—300 feet—someone would have to jack into your cable line to intercept signals. The packets on the MOCA adapter are also encrypted by default.

So what's the catch? The biggest ding is the lack of satellite capability. Even though a satellite provider is a member of the Multimedia over Coax Alliance, MOCA devices do not currently work with satellite installations. D'oh! Second, there's the cost. At \$190 for

two adapters, it's certainly not a cheap way to build a home network.

But again, the Netgear MOCA adapter is really for the person who can't get any other networking methods to work. For that person, the price may just be worth it.

—GORDON MAH UNG

VERDICT		8
NETGEAR MOCA COAX-ETHERNET ADAPTER KIT MCAB1001		
GILLIGAN'S ISLAND	LOST	
Easily builds a secured, wired network using existing coax cable.	Doesn't work with satellite providers.	
\$190, www.netgear.com		

Gefen Wireless for HDMI UWB

Wow! It actually works!

The fact that Gefen's wireless HDMI extender works at all is remarkable enough; the fact that it works better than the manufacturer claims borders on the miraculous. So why aren't we giving it a higher score? First, it would be cheaper to hire an electrician to install a hardwired HDMI connection; second, the extender is limited to HDMI 1.2a.

You can use HDMI 1.3 sources and cables, but the Ultra Wideband technology Gefen relies on just doesn't have the bandwidth to accommodate losslessly compressed multi-track audio (Dolby TrueHD or DTS-HD Master Audio); it falls back instead to either Dolby Digital or DTS surround sound or simple stereo, depending on the source. The system can't accommodate Deep Color (video with 30-, 36-, or 48-bit color depth) either, but it does support HDMI 1.3's lip-sync feature.

If your home has masonry walls and ceilings, on the other hand, it might not be possible to create a new cable run. And if your A/V receiver and home-theater PC or Blu-ray player are on the same side of the room, and what you need is a means of getting video to your projector on the opposite side of the room, the audio issue won't matter (neither will Deep Color, for that matter, if your projector or display doesn't support it). In short, Gefen's product is amazing, but its appeal is

limited to a small circle of consumers, which is why the company has to charge so much for each unit.

The transmitter is equipped with two HDMI inputs, one component video input, one stereo input, and an IR blaster jack. The receiver has one HDMI output, one stereo output, and an IR extender jack. Plug Gefen's \$25 IR extender into this port and you can send commands from the receiver back to an emitter plugged into the transmitter to control A/V gear in the same cabinet. But the transmitter doesn't have an IR receiver of its own, so the only way to switch inputs is to walk up to the device and push a button.

We tested the system by sending video from both a Blu-ray-equipped home-theater PC and a stand-alone Samsung Blu-ray player to an Epson PowerLite Cinema 500 mounted on the ceiling 15 feet away. Gefen recommends placing the transmitter and receiver as high as practical to prevent obstacles—including people walking past—from disrupting the signal, so we were surprised to discover that we could close the plywood door on our entertainment center without creating any issues at all. We sent the HDMI signal through a Sherwood RD-7503 A/V receiver first, so the fact that the Gefen unit doesn't support Dolby TrueHD or DTS-HD MA didn't matter a bit.


The system operates on a frequency range between 3.1GHz and 4.8GHz, so we didn't encounter any conflicts with either our dual-band router (which operates radios on the 2.4- and 5.0GHz frequency bands) or our DECT 6.0 cordless phone (which operates in the 1.9GHz range). The transmitter achieves its magic by compressing each video frame using the JPEG 2000 compression standard before zapping it through the air, but we were unable to detect any visual artifacts, dropped frames, or any appreciable difference when we compared its image quality to the hardwired HDMI connection we usually use.

Gefen's HDMI extender is undeniably expensive, but it's a remarkable technological achievement that delivers even better performance than its manufacturer advertises, so we can't complain. —MICHAEL BROWN

VERDICT		8
GEFEN WIRELESS FOR HDMI UWB		
+ WIDEBAND	- WIDE LOAD	
HD video and surround sound without wires; doesn't interfere with other wireless devices.	Limited to HDMI 1.2a in many respects; very expensive.	
\$1,000, www.gefen.com		



The transmitter and receiver are fairly conspicuous, being housed in 6.75-inch-wide aluminum boxes with large fixed antennas.



The tiny, inkless
Wasabi is wireless
and runs on batteries.

Dell Wasabi PZ310

A picture is worth 1,000 words, or about \$80

Most people's first experience with the Japanese spice called wasabi teaches them to never approach it again. It would be a shame if folks were similarly averse to Dell's Wasabi PZ310 printer, which offers fun, spontaneous, albeit tiny, prints.

For the most part, the Wasabi is a kissing cousin of the Polaroid PoGo printer that we reviewed in the July 2008 issue. Both printers use Zink's zero-ink technology. A thermal head heats up crystals embedded in the paper itself. Send a photo to the Wasabi, and a minute later, a 2x3-inch print pops out. A light adhesive on the back of each print lets you then plaster the image of your family, friends, or pet to any object that deserves to be cute-ified.




The Wasabi uses a slightly smaller power brick than the PoGo and adds a button to reprint the last pic. We found image quality to be similar to that of the Polaroid PoGo. We can say that, as with the PoGo, output from the Wasabi is not particularly sharp or colorful, and is occasionally splotchy. These aren't exactly the words you look for in association with a photo printer, but the primary draw of

the Wasabi and its ilk is the fun factor.

The Wasabi is a fun gadget. If you're at a party and snapping camera phone pics and you whip out the Wasabi to give away prints, the partygoers will think you're one cool dude. If you tried whipping out an inkjet and balancing it on the bar to do the same, you'd set off the dork alarm.

It helps that the Wasabi runs off of a replaceable lithium ion cell and can print using Bluetooth. When we tried the PoGo a year ago, the Bluetooth printing was horrible. Blame that on Bluetooth and the carriers—a combination akin to a Reese's Peanut Butter Cup made with shards of broken glass and shoe polish. Now a year later, with phone firmware updates in place and newer handsets, we had far better luck with the Wasabi and Bluetooth. That doesn't remove our warning, though: Bluetooth printing is about as reliable as a high-mileage Yugo.

Like the Polaroid PoGo, the Wasabi is a bit of a one-trick pony, but it does it well and for about 20 percent cheaper than its Polaroid counterpart. —GORDON MAH UNG

		VERDICT	7
DELL WASABI PZ310			
 SPICY TUNA ROLL	 UNI ROLL		
Truly a pocket picture printer. Lots of fun. No ink required.	Image output is mediocre at best.		
\$80, www.dell.com			

MotionDSP vReveal

Look out CPU, the GPU finally gets a killer app

What do a surveillance camera and the average home videographer have in common? Surprisingly, a hell of a lot—it's just the subject matter that's different.

One takes really poorly exposed, fuzzy, low-res videos of a gas station clerk getting a pistol jammed in his face, and the other takes really poorly exposed, fuzzy, low-res videos of a kid kicking a soccer ball or blowing out birthday candles.

Apparently, that's the logic MotionDSP used when it decided that its \$10,000-per-license, super-fancy video algorithms could not only be used to help the police catch carjackers, but also clean up the video of little Timmy's birthday, too.

We're not kidding. MotionDSP's algorithms were developed to help resolve license plate numbers from video by analyzing multiple frames before and after a frame. By using the additional data to reassemble one sharp frame, MotionDSP's algorithms are able to pull out far more detail than you would think possible.

MotionDSP's consumer app, vReveal, features a cleaning algorithm to remove pixilation, grain, and compression artifacts, along with a sharpening filter, auto contrast, and lighting and stabilization enhancements. The app also offers a resolution doubler, but alas, it's only available for very low-resolution video (a forthcoming pro version will likely support higher resolutions.)



vReveal cleans up messy video in a snap.

The results are fairly impressive. The vReveal app is able to clean up bad video far better than what you can do with consumer video editing packages and it does it very quickly, too, thanks to its GPU support. The app uses Nvidia's CUDA platform to tap the GPU's wealth of parallel processors to process video far faster than you could with any current CPU. We tested vReveal on this month's monster rig from Maingear (page 74) and a single GeForce GTX 285 gave us a 2x to 4x performance boost over

the overclocked 4GHz Core i7-975. SLI support is not currently available because of a limitation with CUDA, the company says, but MotionDSP expects to have a work-around to fix that problem and will make it available in an update.

The bad news is that vReveal will not support ATI's Radeon HD series until OpenCL arrives. It's also a bit of a letdown that vReveal is limited to standard-def material. The company says it's optimizing performance for HD video and will have a free update for that as soon as possible.

One final problem: Output from the app is either in WMV or uncompressed AVI only. We can see WMV, but uncompressed AVI is too much for the average home user and would swamp his or her hard drive in no time.

Overall, we're very impressed with vReveal, and while it's a bit pricey for the video dilettantes, it's a very handy tool for anyone who's hot and heavy into video editing.

—GORDON MAH UNG



The app leverages Nvidia's CUDA as well as multicore CPUs.

VERDICT 8	
MOTIONDSP VREVEAL	
STAR TREK Makes the case for GPU vs. CPU.	STAR WIPES Currently limited to standard-def video; only supports Nvidia's GPUs.
\$50, www.vreveal.com	

Plants vs. Zombies

Popcap's follow-up to Peggle brings hardcore tower defense to your backyard

Plants vs. Zombies takes the familiar desktop tower-defense formula—defensive towers line a path and shoot at endless waves of mindless automatons—and turns it on its side... in your backyard. In typical tower-defense games, you manage one path (and one set of baddies at a time). In Plants vs. Zombies, you have to manage five or six lanes and you have to plant your botanical towers in the same lanes the undead baddies walk.

The game starts simply; you have a few lanes to manage and one or two types of zombies. The number of lanes you have to manage and the number of plants you have at your disposal increases quickly, although the difficulty ramps up slowly over the first several hours of play. You'll eventually unlock about 50 different plants, each with a different function. Some will form the backbone of your sun economy (sun is the currency you exchange for each plant you place), some are purely offensive, some are purely defensive, and some fill various support roles.

To keep you in check, new zombies are continually introduced. Each different zombie type has new (frequently hilarious) powers, ranging from simple helmets and screen-door shields that let the undead absorb more damage, to Pogo-Stick and bungee zombies that can leap over your defense. Each type of zombie has multiple plant counters; for example, the balloon zombie, who floats happily over your defenses, can be countered by balloon-popping cacti as well as by the Blower, which generates a mighty wind that blows away flying zombies.

At the beginning of each level, before you select the plants you'll use, you're presented with a preview of the attacking zombies. With that knowledge, you can tailor your arsenal to counter the attacking zombies' special abilities. The game's 50 levels are set in a variety of environments (all around your suburban homestead, natch), including the front yard, the backyard, and night-time scenarios. With different environmental challenges in every area and dozens of different zombies to counter, no



At the higher levels of Plants vs. Zombies, you'll need to use every plant in your arsenal to defeat the hordes of undead.

one strategy will work in every level. Unlike many other tower-defense games, during the 20 or so hours that you play Plants vs. Zombies, you'll constantly find yourself adjusting your basic strategy to utilize new types of plants—or even trying something entirely new.

Along with the 50 levels of Adventure mode, you'll unlock another 30 or so mini-games, challenges, and survival boards. By

completing these challenges, you can earn cash to spend on upgrades to your plants, additional seed slots, and other powerups. Eventually, you'll also unlock the Zen Garden, a plant farm where you can grow seedlings to full-size plants. Keep the plants watered and fed and they'll generate a ton of cash for you.

Plants vs. Zombies brings something new and very fun to the tower-defense genre, but it takes a long time for the difficulty to ramp up enough to challenge aficionados of the genre. That's our sole complaint with the game, however. It's a perfect pick-up-and-play lunch break diversion, and definitely worth its \$20 price. —WILL SMITH



Kill enough zombies and you'll earn the coveted Golden Sunflower Trophy.



VERDICT **9**

PLANTS VS. ZOMBIES

+ PLANTS

Crazy-awesome character design; hours of fun; big laughs.

+ ZOMBIES

Takes a while to become challenging.

\$20, www.plantsvszombies.com, ESRB: E 10+

The Sims 3

Such a leap forward it feels more like The Sims³

By now, when people think of The Sims franchise, they think of a virtual dollhouse in which you guide little idiot people through the mundane details of their lives rather than living your own.

That reputation is both well-deserved and unjust. Now in its third iteration, you *still* have to worry about getting your Sims to a bathroom before they wet themselves. On the other hand, it can be so addictive that it often feels like there's someone watching you on his PC monitor, selecting you, then clicking on your computer and choosing "Keep playing The Sims 3" from your radial menu. If you're lucky, he'll let you go to the bathroom.

Fundamentally, The Sims 3 is a very similar game to its predecessors: You juggle the needs and wants of a family of Sims to make them healthy, wealthy, and wise. What has changed is the revolutionary increase in scale. Previous Sims games locked you into a single lot, and if you wanted to take your Sims elsewhere you'd have to sit through an epic-length loading screen. The Sims 3 loads an entire town, which both frees your Sims to stroll down the street or drive across town, and expands the number of characters living in the world at once from a handful to dozens, simulating an entire community. The ability to quickly zoom out and view the whole area alone puts this version head and shoulders above The Sims 1 and 2.

Without making any other earth-shattering changes to gameplay, nearly every aspect of the game has been overhauled and enhanced. Personalities are much more complex than before—each Sim is a combination of five out of more than 60 available traits, making their interactions deeper (but still easy to manipulate). Each Sim has wants, which provide you

a constant stream of things to work toward, and there are rewards for accomplishing minor and major tasks. The house building and furnishing toolset has improved with features such as a very clever visual sorting interface, allowing object placement on a finer grid and the ability to



I can see my house from here! And everybody else's house, the City Hall, the gym, the hospital....



You can create a Sim jerk using traits like Evil and Mean Spirited. Dan also enjoys gardening.

create your own color schemes.

Not everything works so well—the inventory system, for example, feels a bit sloppy and unintuitive, and there's no good tutorial to teach you to use it. Pathfinding gets wonky when two Sims want to use the same object or cross paths. The lifetime rewards you've been earning points for by completing each Sim's wants all this time? With a few exceptions, most are boring and anti-climactic. And there's

still that annoying period of down-time while you watch your Sims sleep every night.

Even so, it's difficult to imagine a Sims fan not being ecstatic over this game, and its accessibility makes it an excellent introduction to new and non-violent gamers. Heck, the ability to invite over the neighbors, switch into build mode, and wall them into windowless rooms until they expire gives even anti-Sims (and slightly sadistic) hardcore gamers something to love. Allowing you to play virtually any way you want is The Sims 3's greatest strength—you are virtually guaranteed to find a way to enjoy it. —DAN STAPLETON

VERDICT 9	
THE SIMS 3	
FULFILLING	DYSFUNCTIONAL
Simulates an entire town of Sims; great home-building tools; complex personalities.	Watching Sims sleep every night; unrewarding lifetime rewards; frustrating pathfinding.
\$50, www.thesims3.com , ESRB: T	

LAB NOTES

My First Personal Computer

A PC isn't just a toy for games and downloading illegal videos—it's a lifetime adventure

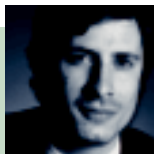
A new smartphone or game console may seem far safer for your kid than a personal computer (with that dangerous Internet attached to it), but I would argue otherwise. My first home computer was a brand-new Commodore VIC-20. With its 1MHz 6502, 5KB of RAM, and a 22-character display, I learned to program in BASIC, visited BBSes, wrote homework assignments on it, and, of course, played games.

That lowly VIC-20 led to a life of curiosity with all things tech-related and a passion for computers. That's not a bad investment for \$300, which adjusted for inflation is \$776.36.

In today's money, \$776 gets you a hell of a lot of computer. But just as back then, that computer could lead to a life as a software developer, web developer, hardware engineer, and yes, professional gamer. Not everyone who touches a computer and keyboard will do those things, but my point is that the boundaries are unlimited with a PC.



GORDON MAH UNG
SENIOR EDITOR



NATHAN EDWARDS
ASSOCIATE EDITOR

Though my first computer memories involve an old 1984 Macintosh and an Osborne 1, the first PC I actually used for games, school-work, and email was a 66MHz IBM clone running Windows 3.1, which my dad brought home from work in 1993. Ah, memories of booting Commander Keen shareware floppies from DOS in eight glorious colors.



NORMAN CHAN
ONLINE EDITOR

The first computer I built was a 50MHz 486DX with 8MB of RAM that ran Sim City 2000 and Star Wars: Rebel Assault like a champ. The 66MHz CPU requirement of the special SVGA edition of TIE Fighter became a source of great consternation in my household. Still, this machine served me well until I built a Pentium II 300MHz several years later.



WILL SMITH
EDITOR-IN-CHIEF

Gordon may have had a VIC-20, but my family's first PC was a TI-99/4A. While it was one of the first personal computers with a 16-bit processor, the TI-99/4A's 3MHz CPU is a few orders of magnitude slower than my iPhone. Still, I have a lot to thank that machine for—I learned the basics of BASIC programming and played my first computer games using my old TI.



KATHERINE STEVENSON
DEPUTY EDITOR

When I first started working at *Maximum PC* as a copy editor, way back in 2000, my home computer was a hand-me-down Mac Performa. Needless to say, that didn't stand with my new coworkers, who soon had me outfitted with an old Pentium III that no one else wanted. Hey, it was a serious machine compared to what I was used to.



ALEX CASTLE
ASSOCIATE
ONLINE EDITOR

Having grown up in a house chock-full of computers, it's a little hard to say what my "first" PC was. Still, I trace my interest in computers back to 1994, when my dad first showed me how to use our computer (decked out with a 66MHz Pentium CPU) to search Usenet for video game cheat codes, sparking a love for the Internet that's still with me.

We tackle tough reader questions on...

► Hybrid Drives

► Dusty PCs

► Free Video Players

Where Have All the Hybrids Gone?

I saw your Quick Start article about Western Digital buying an SSD manufacturer (June 2009). Is the hybrid drive alive or dead? It seems to me that a 2TB hard drive with something like a 16GB SSD cache could deliver the best of both worlds: capacity and performance.

—Andrew Linder

Associate Editor Nathan Edwards responds:

Andrew, the few manufacturers that had brought hybrid hard drives to market in 2007 and 2008 seem to have let the product lines languish and disappear. When hybrid hard drives were announced, adding even 256MB of NAND flash to a standard hard drive raised its cost considerably. As both standard hard drives and solid state drives get faster, cheaper, and more capacious, we'd expect most manufacturers to prefer drives that are one or the other, not both. However, Michael Hall of Seagate's Corporate Communications division says, "Hybrid drive technology is still very much alive. We continue to work on the technology." So stay posted, we suppose!

Dealing with the Dust Bunnies

I have an alternative suggestion on how to clean out a PC when it collects dust ("Make Your PC Better,

Faster. Stronger," July 2009). I have done this at least every six months, and my 5-year-old (this August) Athlon XP 2500+ computer works like the day I received it. Contrary to your statement that canned air is the best method, a vacuum cleaner CAN be used on or near any sensitive or fragile components if you use a mini-adapter kit. Just hook the regulator collar and mini hose with the desired attachments to the vac hose and use it to suck up the dust, or use it in reverse if your vacuum cleaner has a blower port. The mini-adapter kit is better, and costs about the same as a regular 12-ounce can of air, and can be used on a number of other fine electronics for your computer such as keyboards and, for folks who still have them,

mechanical mice. My mom is a sewing enthusiast and uses this kit on her sewing machines, too.

—Will Cookson

Senior Editor Gordon Mah Ung responds:

I have not seen such an adapter, but if you have one and can temper the suction enough so it won't vacuum up delicate components along with the dust, by all means use it. Maybe it's time to start *Maximum Vacuum Cleaner* magazine.

Movie Matters

Your recent issue included an interesting article about how to build a PC that enables one to copy movies to a home-built computer, and then stream them to your TV and other devices ("Rip Your Movie DVDs...", March 2009). Alternatively, why couldn't you just

download such a movie to a modern computer and burn it to a DVD disc (using DVD shrinking software), and then play that disc on your DVD player? Or use a computer with a quad-core processor, capable graphics card, and a Blu-ray drive to make HD-quality discs for viewing on a Blu-ray player? If this is possible (and legal), please give specifics. If more preparation is necessary, please write a "how to" article in one of your future issues.

—Bill Mallard

Editor in Chief Will Smith responds:

Unfortunately, there aren't any vendors that allow download-and-burn videos for reasonable prices, so that would make it a really short story. Most of the movies you can purchase online are encumbered by DRM that's a sig-

■ ■ ■ NOW ONLINE

The Awesome History of 3D Graphics Cards

One of the most important components in your PC's chassis is undoubtedly the videocard. The past 15 years have given us amazing GPU technologies to render virtual worlds and breathe life into game characters. Our comprehensive retrospective calls out all the milestones in the 3D graphics time line, starting with the first S3 ViRGE cards to Nvidia's latest GeForce. Jump aboard the nostalgia train at <http://bit.ly/JdpXc>.



nificant challenge to remove—much more difficult than DVD or even Blu-ray encryption. Until there's a legal (and reasonably priced) way to download burnable movies from the net, we'll stick to buying discs and ripping them, thank you very much. Plus, with everything stored on a hard drive, you can easily find what you're looking for, rather than having to root around for a disc.

Player Hater

First off, I must say that I love your mag. Maybe a bit less so now that the Dog is no longer a part of it. I always enjoy the software recommendations—that is, until Moyea (How To, April 2009). On my laptop I've been using RealPlayer Gold

Moyea FLV Downloader for its ability to run in the background, automatically saving videos as you watch them, and because it works on the sites we visit most frequently, like YouTube. Also, we prefer to download a single-purpose, lightweight app like Moyea, rather than an entire media player with the dubious RealPlayer pedigree.

Something for Everyone—Even the Jaded Folk

Congrats to Gordon Mah Ung! When I saw the cover of the July 2009 issue in my mailbox, I thought the “21 Instant PC Upgrades” article on the cover could not possibly be anything I

off and stress my system to its full potential.

My problem is that I'm sick and tired of games with violence, blood, and killing. I have been told Crysis is THE game to get for testing a system. I think it also has a lot of violence and killing. I'm looking for a game that's as technically challenging to run as Crysis but without all the blood and gore. Is there such a game? What ever happened to the type of games I played years ago like the Scott Adams adventures, Star Flight, Tex Murphy, and Roger Wilco? Are there any games of that type today that fully utilize today's technology?

—Joe Cacciatore

Editor in Chief Will Smith

responds: Well, Joe, right now, Crysis is the game that pushes the boundaries of 3D graphics more than anything else we've played. First-person shooters, like Crysis, tend to benefit most from the better art and more powerful engines than any other game genre.

The games you listed were almost all classic adventure titles, utilizing pre-rendered characters and backgrounds. While they may have looked real-time, the technology behind them was very simple by today's standards. (That's not to say that they weren't great games; Under a Killing Moon is one of my all-time favorites!) While they won't put any strain on your hardware, check out the games that Telltale is making (www.telltalegames.com). They've released a few series of new, modern adventure games. All are rendered in real time and they continue many of the traditions found in the classics you mentioned. ⏻

RIGHT NOW, CRYSIS IS THE GAME THAT PUSHES THE BOUNDARIES OF 3D GRAPHICS

(free) to snag .flv videos off a site I'm currently browsing; the only thing I have to do is right-click and tell it to download. Per your suggestion, I decided to try Moyea on my brand-new desktop. Every time I can't download a video with Moyea, I open my laptop and grab it using RealPlayer and have found that it gets .flv files from a lot more sites than Moyea. Since both are free and neither converts for you, your readers should get the one program that will get you more of what you wanted in the first place.

—Kurt

Associate Online Editor Alex Castle responds: We like

hadn't seen before. Being an IT administrator and having cut my teeth on an Apple IIc in the early '80s, there's not much I haven't seen or done. But the article was full of wonderful new apps and is the reason I've been reading *Maximum PC* since its boot days.

—Chip Adams

Good Old-Fashioned Gaming

I'm building my dream system, which consists of an Asus PT6 motherboard, an Intel 965 Extreme chip, 6GB RAM, an EVGA GTX 285 videocard, a 1,000W power supply, etc. I am looking for a game that will really show



LETTERS POLICY Please send your questions and comments to comments@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Letters may be edited for space and clarity. Due to the amount of mail we receive, we are unable to respond personally to all queries.

COMING IN MAXIMUM PC's Red Matter Edition SEPT ISSUE

>> Dream Machine

This year we'll build not one, not two, but *three* awesome configurations of various prices in order to turn the dream of a kick-ass PC into a reality for folks on any budget. Start salivating.

>> Geek Quiz

For everyone who thinks of him- or herself as a PC expert, our annual quiz of computing smarts will help keep you honest. You've still got time to study.

>> Reviews

Tune in for our hands-on assessment of Averatec's All-in-One media PC, AVC's Core i7 notebook, Patriot's 128GB solid state drive, and a bunch of other hot products.

Unleash your PC's Potential...

Try

MAXIMUM PC

Each issue of Maximum PC features:

- Brutally honest product reviews
- Hard-hitting editorials
- Tips to blast your machine's performance
- Insightful and innovative How-To's
- A CD loaded with new software, utility and game demos

2
FREE
Trial Issues

Reserve your **2 FREE** Trial Issues today!
There's no obligation.

To order, head to:

www.maximumpc.com/archive



PROCESSOR

Intel Core i7-975 Extreme Edition

Talk about a short life span. Intel has already retired its 3.2GHz Core i7-965 Extreme Edition for a slightly up-clocked part: the 3.33GHz Core i7-975 Extreme Edition.

Though the naked eye won't be able to spot any changes, the new 975 part actually features an updated core. Commonly called a "D step," the newer core adds increased overclocking potential and headroom. Intel doesn't officially say this, but early indications from the D-step 975 procs are that it will overclock more reliably than the original Extreme Edition. That doesn't mean the chip will always give you the same overclocking range you'd get from a Core i7-920, but the chip's unlocked multipliers and finer-grain Turbo mode ratios will give overclockers more flexibility over lesser parts.

If you want more proof of the Core i7 Extreme Edition's power, browse this month's reviews section where Maingear used the new chip to crush all of our benchmarks—and all previous PCs—to dust (page 74). www.intel.com



THE REST OF THE BEST

■ **LGA 1366 Motherboard**
MSI Eclipse SLI
www.msicomputer.com

■ **Socket 775 Motherboard**
Asus Striker II Extreme
www.asus.com

■ **Socket AM2 Motherboard**
MSI K9A2 Platinum
www.msicomputer.com

■ **\$500 Videocard**
Nvidia GeForce GTX 295
www.nvidia.com

■ **\$250 Videocard**
Nvidia GeForce GTX 275
www.nvidia.com

■ **\$150 Videocard**
ATI Radeon 4870
www.ati.com

■ **Capacity Storage**
Seagate Barracuda 7200.11 1.5TB
www.seagate.com

■ **Performance Storage**
Western Digital VelociRaptor
www.wdc.com

■ **DVD Burner**
Samsung SH-S223
www.samsung.com

■ **Blu-ray Burner**
LG GBW-H20L
www.lge.com

■ **Monitor**
Gateway XHD3000
www.gateway.com

■ **Full-Tower Case**
Cooler Master ATCS 840
www.cooler-master.com

■ **Mid-Tower Case**
Silverstone Fortress
www.silverstonetek.com

■ **Air Cooler**
Thermalright Ultra-120 Extreme
www.thermalright.com

■ **Gaming Mouse**
Logitech G9x Laser Mouse
www.logitech.com

■ **Keyboard**
Microsoft Natural Keyboard 4000
www.microsoft.com

■ **Wi-Fi Router**
Linksys WRT600N
www.linksys.com

Games We're Playing

■ **Left 4 Dead**
www.l4d.com

■ **Demigod**
demigodthegame.com

■ **Plants vs. Zombies**
www.popcap.com

■ **The Sims 3**
www.thesims3.com

For even more Best of the Best entries, such as speakers and budget components, go to <http://www.maximumpc.com/best-of-the-best>