THE ULTIMATE TV TUNER CARD *p. 84*

WINDOWS 8 Microsoft's top-secret plans revealed? *p. 8*

8 PC GAME-CHANGERS We identify the innovative tech that will transform your system in 2011 *p. 14*

MAXIMUM PC

MINIMUM BS • OCTOBER 2010

29 Incredibly Powerful PC Secrets

Our power-user's guide reveals the most essential tips, projects, hacks, and techniques! *p. 24*

Earn all 29 badges to prove your power-user street cred!

SUPER-CHARGE ANDROID! Elevate your smartphone to bold new heights with our advanced guide *p. 56*

NEXT-GEN MOBOS Shootout! We lab-test the fastest new 890FX and X58 motherboards *p. 46*

WHAT'S INSIDE INTEL'S LIGHT PEAK? *p. 64*

$8.99US

Future MEDIA WITH PASSION

10

0 70989 38753 9

Unleash your PC's Potential...

Try MAXIMUM PC

2 FREE Trial Issues

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**

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

To order, head to:
www.maximumpc.com/archive

OCTOBER

FEATURES

24 Mandatory Know-How
29 compulsory skills for every nerd's arsenal.

46 Mobo Mania
Which motherboard best suits your next rig? We test six that are sure to please.

56 Android
What you need to know about the up-and-coming mobile platform of choice.

DEPARTMENTS

Quickstart

08 NEWS Windows 8 secrets leaked; universal DRM goes beta.

14 LIST Eight new technologies you'll see in next year's PCs.

R & D

64 WHITE PAPER Intel's Light Peak.

65 AUTOPSY Wireless Night-Vision IP camera.

67 HOW TO Get Linux power on your Windows PC using Cygwin; keep an eye on your hardware with HWMonitor.

In the Lab

73 REVIEWS

92 LAB NOTES

96 BEST OF THE BEST

48

LETTERS

18 DOCTOR

94 COMMENTS

MAXIMUM PC

EDITORIAL
Editorial Director: Jon Phillips
Editor in Chief: George Jones
Deputy Editor: Katherine Stevenson
Senior Editor: Gordon Mah Ung
Reviews Editor: Michael Brown
Senior Associate Editor: Nathan Edwards
Online Managing Editor: Alex Castle
Online Features Editor: Amber Bouman
Online Assistant Editor: Alan Fackler
Contributing Writers: Loyd Case, Pulkit Chandna, Paul Escallier, Nathan Grayson, Tom Halfhill, Paul Lilly, Thomas McDonald, Quinn Norton, Zack Stern
Copy Editor: Mary Ricci
Podcast Producer: Andy Bauman
Editor Emeritus: Andrew Sanchez

ART
Art Director: Natalie Jeday
Contributing Art Director: Boni Uzilevsky
Photo Editor: Mark Madeo
Associate Photographer: Samantha Berg
Contributing Photographer: Patrick Kawahara
Contributing Illustrators: Adam Benton, Jim Kopp

BUSINESS
VP Tech and Living/GM: Kate Byrne, kbyrne@futureus.com
National Sales Director: Jane Evans, jevans@futureus.com
Regional Sales Director: Anthony Losanno, alosanno@futureus.com
Account Executive: Greg Ryder, gryder@futureus.com
Sales Manager: Aida Rodrigues, arodriguez@futureus.com
Integrated Sales Director: Joe Pomparelli, jpomparelli@futureus.com
Senior Marketing Manager: Andrea Recio-Ang, arecio-ang@futureus.com
Marketing Coordinator: Robbie Montinola, rmontinola@futureus.com
Advertising Coordinator: Jose Urrutia, jurrutia@futureus.com

CONSUMER MARKETING
Director of Consumer Marketing: Rich McCarthy, rmccarthy@futureus.com
Circulation Director: Crystal Hudson, chudson@futureus.com
Newsstand Director: Bill Shewey, bshewey@futureus.com
Consumer Marketing Operations Director: Lisa Radler, lradler@futureus.com
Renewal & Billing Manager: Mike Hill, mhill@futureus.com
Business Manager: Elliot Kiger, ekiger@futureus.com
Sr. Online Consumer Marketing Director: Jennifer Trinkner, jtrinkner@futureus.com
Customer Service Manager: Mike Frassica, mfrassica@futureus.com

PRODUCTION
Production Director: Michael Hollister
Production Manager: Larry Briseno
Senior Production Coordinator: Dan Mallory
Print Order Coordinator: Jennifer Lin

FUTURE US, INC.
4000 Shoreline Ct., STE 400, South San Franisco, CA 94080
Tel: 650-872-1642, Fax: 650-872-2207
Email: comments@maximumpc.com
Website: www.maximumpc.com

President: John Marcom
VP/CFO: John Sutton
Director of Human Resources: Nancy Durlester Dubois

SUBSCRIPTIONS
To Subscribe: Tel 800-274-3421
www.maximumpc.com/customerservice
Maximum PC ISSN: 1522-4279

Customer Service: Tel 800-274-3421
www.maximumpc.com/customerservice

BACK ISSUES
Tel 1-800-865-7240

REPRINTS
Reprint Management Service – 717-399-1900, ext. 100

Future
MEDIA WITH PASSION

Future produces carefully targeted magazines, websites and events for people with a passion. We publish more than 180 magazines, websites and events and we export or license our publications to 90 countries across the world.

Future plc is a public company quoted on the London Stock Exchange.

www.futureplc.com

Chief Executive: Stevie Spring
Non-executive Chairman: Roger Parry
Group Finance Director: John Bowman
Tel +44 (0)20 7042 4000 (London)
Tel +44 (0)1225 442244 (Bath)

29 Essential Skills, 2010 Edition

I just finished proofreading this month's cover story—"Mastering the Essentials"—and it made me contemplate the future trajectory of the PC power user. How many of these skills will remain relevant in 10 years? I started jotting down each of the categories and skills we detail in the story with an eye toward figuring this out. My gut instinct was that many of the power-user tactics we all cling to so dearly would fall by the wayside. Now that I've finished the list, I'm surprised at what I see. Let's get started:

Setting up a PC. An initial Windows/PC installation remains relevant in 10 years for sure. I don't see Windows or desktop PCs (or laptops) going anywhere. It's like the Joan Rivers of PC computing. Ditto benchmarks and security. (I'm really hoping I didn't jinx Joan Rivers just now.)

Three displays. Still relevant. In fact, even more so. In the year 2020, it's likely we'll be tipping you about hanging five to eight different screens off of one system. Granted, they won't all be physically tethered to a PC, but between wireless transmission of a video signal and cloud-based local nets, it's inevitable.

Backup and maintenance. Relevant. I'd imagine that Windows or Google will have monopolized and automated this category by then, however.

Networking. More relevant. As we slowly transition into the realm of personal clouds and wireless everything, understanding how to share and, perhaps more importantly, not share data becomes even more essential. The ability to seamlessly move data between all your devices and the cloud is one of the holy grails of network computing. It's almost here.

THE NUMERO UNO'S PICKS

Motherboard Throwdown
page 46

Android Guide
page 56

Intel Light Peak White Paper
page 64

Troubleshooting. In 10 years, I'm sure that Windows will be able to self-diagnose and repair its own problems. (Pause). I'm kidding! As the OS becomes more simplified, fixing it will become more difficult. Still relevant.

Upgrades. The PC will remain an open architecture forever, so performance upgrades remain possible and desirable. Ditto overclocking. I wouldn't be surprised, however, to see this level of customization extending to Android and other devices, including Apple's.

Virtual machines. In 10 years, virtualization will be ubiquitous, to the point that it will be a commodity. What else are we going to do with all these threads? Imagine the hacks and uses we'll be able to leverage VM toward in 2020.

Holy scry sight, Readerman! It turns out that over time, a core set of skills will become more, rather than less, relevant? That's surprising, encouraging, and also logical. In many ways, essential skills revolve around concepts and tasks that last forever.

George Jones

LETTERS POLICY Please send comments and questions to george@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Unfortunately, George is unable to respond personally to all queries.

THE NEWS

Whispers about Windows 8

A leaked corporate presentation reveals many details about Microsoft's next OS —ZACK STERN

Want a sneak peek at Windows 8? The new OS will log you in with facial recognition, tie local user account preferences online, introduce a new off state that boots quicker, and more. Microsoft isn't spreading these details, since it's likely to be a few more years before Windows 8 ships. Instead, dozens of confidential slides seemingly escaped Redmond to spread around the world faster than an Office macrovirus. Here's what we've learned.

IS THIS LEGIT?

The information surfaced on Italian site www.windowsette.com and landed at Microsoft Kitchen (http://bit.ly/ax16mK). Microsoft isn't commenting on the details, but everything looks believable to us, from cloud features that echo current computing trends to droning corporate-speak copy. (Example: "For channel partners, the Store provides the best method to brand and generate sustainable post-sale revenue.")

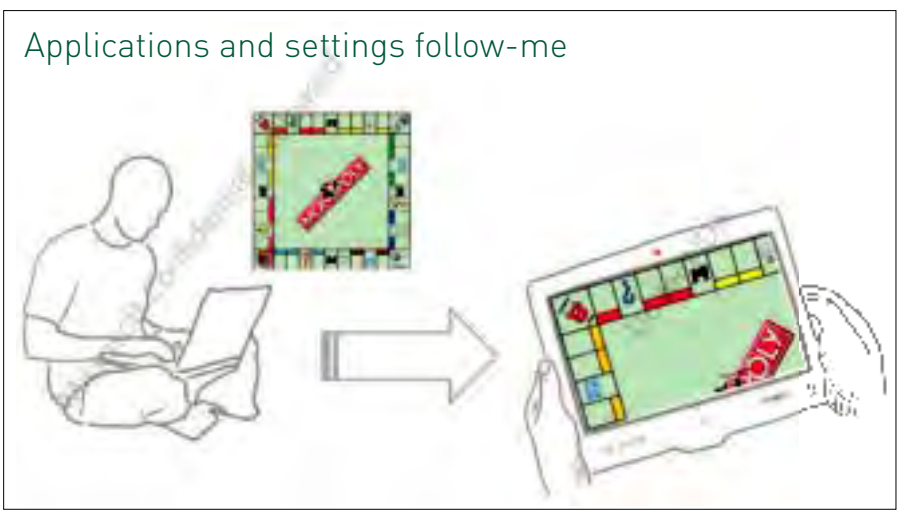
The slides state that the information is subject to change, noting at the bottom, "Windows 8 discussion, this is not a plan of record." Some slides ask the recipient—likely an HP engineer since his name was watermarked on the deck—for an opinion. So the presentation is more conversation than final decision.

Many slides reference HP in the content, but one mentions Dell. Does that mean they're fake? We think that's just as likely a mistake on Microsoft's end. Still, we won't know for sure until Microsoft begins publicly detailing the new OS.

VARIOUS SLIDES REFERENCE FEATURES THAT SHIFT YOUR DATA FROM A LOCAL DISK TO ONLINE SERVERS

POINTS OF INTEREST

We dug through the deck to uncover its secrets. These are our favorite six that will change the way Windows works.



If the leaked documents are to be believed, the Windows Store will let you access the same content from different kinds of Windows 8 devices.

New off state: A 0-watt state that combines Hibernate and full Logoff could cut boot times in half, compared to a cold PC. Microsoft is aiming to "deliver an appliance-like look and feel." The state seems to support wake-on-LAN to automatically revive a system, so even when off, your PC can still be accessed.

Push-button reset: If your Windows 8 system gets garbled to the point that you want to reinstall, this feature can help. It'll save your files, settings, and even applications while Windows reverts to its original state.

Windows Store: Many slides detail aspects of a new software store. Microsoft wants to sell applications that "consumers… can use on any Windows 8 device." One slide shows how the same Monopoly game would work on a Windows 8 tablet PC and laptop.

Cloud integration: Various slides reference features that shift your data from a local disk to online servers. Windows user accounts are "evolving from machine-centric to user-centric," storing settings and preferences online for access from other systems. Applications bought through the Windows Store can behave the same way, retaining settings across devices.

Improved help: Microsoft is trying to update its integrated help system, again leaping for the clouds. With an Internet connection, you'll get information from Microsoft, "your PC manufacturer," and even "experts and enthusiasts in the community."

Be like Apple: The presentation dedicates a full slide to analyzing and echoing Apple's edge. A cyclical group of statements essentially says that if you make great products, you'll generate customer loyalty and more purchases. Hopefully, that concept came easily.

'Affordable' Gulftown Lands

Latest Core i7 has consumers scratching heads in confusion

If you want to know how Intel's been racking up those record earnings reports, you can look at the company's new "affordable" alternative to its flagship 3.33GHz Core i7-980X six-core chip.

Though initially expected to ship at the $562 price gap, the new 3.2GHz Core i7-970 is actually being sold in volume prices at $885. That's not exactly a huge savings over the Core i7-980X, which fetches $999. The price has users questioning the point of the new chip. Intel officials didn't comment on the pricing, but it's clear Intel is not feeling threatened by AMD's budget six-cores.

Not all was bad news for Intel budget buyers, though. Intel finally cut the price of its 2.93GHz Core i7-870 from $562 to $294 and also graciously cut the price of the 3.06GHz Core i3-540 by 12 percent. –GU

New Core i7-970X will sell for close to $900.

Ebooks Outsell Hardcovers on Amazon

Life undoubtedly got a little harder for Amazon's Kindle once the Apple iPad debuted, seducing the masses with its shiny, colorful tabletness, but the just-a-simple ebook reader is experiencing its own triumph. In a recent press release, Amazon founder Jeff Bezos boasted of reaching a "tipping point," whereby the online retailer's sales of digital books for the Kindle is outpacing the sales of hardcovers, even though hardcover sales continue to grow. More specifically, for every 143 ebooks Amazon sold in the second quarter of 2010, it sold 100 hardcovers. The divide is even more pronounced when you consider the numbers from June alone, where the ratio is 180:100. Bezos acknowledged that the Kindle's recent price drop from $259 to $189 has played a big part. –KS

Get in Touch

New iMo Mini-Monster 10-inch submonitor lets you add touch-screen functionality to your existing PC setup

The 1024x600 screen is powered by a single USB 2.0 cable. Its resistive touch screen responds to both fingers and the built-in stylus. Its fold-out stand let's you prop the display on a desktop or fold it in for tablet-like use or mounting. It sells for $260. (www.mimomonitors.com) –KS

Engineers Need to Beat the Heat

For several years now, microprocessor performance has been limited by power consumption and its waste product, heat. It's the main reason why few processors have broken the 4GHz barrier, and it's why high-end PCs resort to liquid-cooling or have more fans than a Kabuki dancer.

If energy costs were the only consideration, enthusiasts (like *Maximum PC* readers) might not care. A 500-watt processor would use the same amount of electricity as five more 100-watt house lamps. It would definitely raise the electric bill, but the increase probably wouldn't be severe enough to stop someone who buys or builds high-end PCs.

Energy costs are a bigger worry for data centers with hundreds or thousands of servers. Sometimes these centers are limited by the amount of electricity the local grid can supply, but cooling is a problem, too. It's not unusual for the building's air conditioners to consume more electricity than the computers do.

PCs are similarly limited. Mass-market PC vendors are wary of liquid-cooling. Air-cooling with fans is simpler, but noisier—and nobody wants a PC that sounds like a vacuum cleaner. To worsen the problem, users keep moving to smaller and smaller systems. Heat is more confined in laptops, netbooks, tablets, and smartphones, and there's less room for heatsinks, pipes, and fans.

Engineers are finding solutions. Multicore processors with simpler cores can burn less power than a more complex single-core processor. Some chips can turn individual CPU cores on or off. They can adjust their clock speeds and voltages to match varying software workloads, sometimes on a per-core basis. CPUs can enter low-power sleep modes for a few microseconds or switch off almost all their circuitry during longer periods of system inactivity.

These solutions are creative, but hardware engineers are running out of tricks. Software engineers need to step up. Today's software-development tools give programmers little or no feedback about power consumption. Watching metered PCs in a lab, I've seen simple word-processor functions consume more power than playing a DVD. That's absurd, and it can't last. Power-optimized software is the next frontier.

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

Wiebetech USB Writeblocker

Remember that time you went to your brother-in-law's house to fix his PC? You plugged your USB key into the PC and you instantly infected the key, and then later your own machine at home. And after that, your work machine! That's the sort of scenario Wiebetech's USB Writeblocker ($200, www.wiebetech.com) guards against. It's actually intended for forensics investigators who have to access USB devices without writing over data—or evidence. For the average tech though, the device lets you hook any standard USB mass storage device to a PC without any risk of contamination. –GU

iPhone 'Jailbreaking' Deemed Legal

And other new exemptions to the DMCA

The Digital Millennium Copyright Act, which was passed in 1998, isn't set in stone. Every three years, the Register of Copyrights reviews public complaints about the law and proposes changes to the Library of Congress. In years past, that review process hasn't resulted in much change to the law. But this year, the LoC surprised everyone with a few significant exemptions to the DMCA's prohibitions against DRM circumvention.

The LoC has conceded that there are instances when it's necessary to bypass the CSS encryption on DVDs. Namely, when "short portions of motion pictures" are used for educational purposes, documentary filmmaking, and noncommercial videos. Furthermore, ebook DRM can be cracked for conversion to an audiobook, if a commercial alternative doesn't exist. And in a blow to Apple, the Library ruled that "jailbreaking" the iPhone, or any other smartphone, to add legally acquired third-party software is perfectly permissible. **–KS**

Coming Soon: Unified DRM

If you're among the throngs of consumers frustrated at being unable to enjoy the media you purchase on any device of your choosing, you'll be encouraged to hear there's a possible solution on the horizon. And it's completely legal. In fact, it has the backing of major entertainment and technology companies, including Sony, Fox, Paramount, NBC Universal, Warner Bros., Comcast, Netflix, Samsung, LG, Intel, Microsoft, and many others. Nearly everyone, it seems, except Disney and Apple.

Known as the Digital Entertainment Content Ecosystem (DECE), the alliance will begin beta testing its cloud-based universal video encryption called UltraViolet this fall.

According to the UltraViolet website (www.uvvu.com), any content purchased with the UltraViolet logo will be accessible, either through streaming or download, from any UV-supported device that's registered with an individual's or family's cloud-based UltraViolet account.

In time, the DECE plans to extend the technology to music. It's conceivable this could be the long-awaited solution that pleases both content owners and consumers, if not for the fact that Apple devices account for a considerable share of the market. –KS

GAME THEORY

PC Gaming Pulse Check

Stories announcing the death of PC gaming are about as useful and interesting as drum solos (and no one ever made it all the way through "Moby Dick" without herbal assistance). I don't believe PC gaming will ever die, at least not as long as people keep coming up with new Solitaire variants. PCs have seen a steady decline over the past few years for all the obvious reasons: the expense of maintaining a cutting-edge system, the dearth of exclusive products, the narrowing gap between console and PC design, the rise of netbooks and smartphones, and a general proliferation of entertainment options.

Each year, E3 reveals the extent of this decline. There are plenty of cross-platform titles that are likely to shine on a PC: Rage, Call of Duty: Black Ops, Red Faction: Armageddon, Deus Ex: Human Revolution, Portal 2, Dead Space 2, Ghost Recon: Future Soldier, Bulletstorm, and Medal of Honor. Do we doubt that they will look and play best on a high-end PC? Can a 360 or PS3 really compare to the fine level of control and high visual detail of a PC?

Wrong question! The correct question is: How much is that fine level of control and high visual detail worth to the average gamer, particularly during a recession? Worth maintaining a desktop rig in addition to a portable computer and smartphone, when $300 buys you a fairly decent, hassle-free gaming experience? If high-end gaming is your hobby, then the answer is obvious. If not....

And what about new, exciting, high-profile products that are PC-exclusive? I counted 3.5. There's Crysis 2—the sequel to The Game That Killed PC Gaming. So gorgeous and advanced it can only be run on a computer that exists in the imagination, it appears to exist solely to torment the souls of PC gamer gearheads. So, it only counts for half a game. The remaining titles are Civilization V, Shogun II, and World of Warcraft: Cataclysm.

Worthy titles, all, and reminders of the elements that make PC a superior platform; but I'd feel more confident of their success if they could run on a netbook.

Thomas L. McDonald has been covering games for 20 years. He is an editor at large for *Games* magazine and blogs at sopgaming.blogspot.com.

Bing: a Year Later

It's been a little more than a year since Microsoft released its revamped search engine known as Bing. Since then, the site has had its ups and downs, first enjoying a steady rise in growth and then lagging somewhat. But in its latest accounting, Internet research company ComScore shows Bing increasing market share from 12.1 percent in May to 12.7 percent in June. Google lost ground in that time period, going from 63.7 percent to 62.6 percent. –KS

Droid X Bricking Fears Unfounded

But Motorola's new Android is less hackable than others

Despite Internet rumors to the contrary, the eFuse chip in the Droid X isn't some new, scary technology.

Motorola's Droid X Android phone immediately stirred up controversy on its release. Online chatter warned that attempts to install a third-party mod on the phone—a practice many Android fans relish—would brick the device. Critics placed the blame on the presence of an eFuse chip, which, they said, would disable the phone's bootloader at the first signs of tampering. Some went so far as to tie the chip's name to a "blow the fuse" or "trip the fuse" command.

But the eFuse chip isn't anything new. It's included on all of TI's OMAP3 processors, such as those in the original Droid and Milestone phones, both of which accept third-party mods. But that doesn't mean the Droid X is as amenable to modification as other handsets.

Engadget.com reports that when it asked Motorola to comment on the matter, the company denied allegations that eFuse would render a hacked phone useless, but did admit to taking protective measures. "If a device attempts to boot with unapproved software, it will go into recovery mode, and can re-boot once approved software is re-installed," Motorola said in a statement to the gadget blog. –KS

FREE AV PREVAILS

The promises of paid security suites isn't enough to sway customers

When Microsoft first announced plans to launch free antivirus software, Symantec and McAfee were outspoken critics, arguing that a freebie solution could never compete with their own products. But Microsoft Security Essentials is now the fourth-most deployed antivirus software on the market—ahead of both of those AV stalwarts—according to OPSWAT's latest antivirus market-share report. OPSWAT has a front-row seat to all the action as its flagship product, the Oesis Framework, is a widely used development kit for managing third-party security applications.

In fact, despite what the likes of Symantec and McAfee would have you believe, all four of the most-used AV tools are all absolutely free (the top three ahead of Microsoft's app, are Avast!, Avira AntiVir Personal, and AVG Anti-Virus, respectively). According to OPSWAT, free offerings now command a very healthy 42 percent market share. –PC

BYTE RIGHTS

Getting under the Hood of Copyright Law

What could be further from copyright nerditry than car repair? Really, what could greasy guys with their first names embroidered on the front of their coveralls have in common with the bespectacled button-down crowd that "blogs" about "Intellectual Property"? Probably more than either side would be comfortable with.

Cars have gone all computerish in recent years. Many functions that used to be mechanical are now handled by software, and their problems take software to fix. These days, software means lock-ins, trade secrets, DMCA violations, the whole mess. And the car companies are right there with software and media, arguing for their death-grip on what they make. Many otherwise-simple repairs can't be diagnosed or completed without an expensive and unnecessary trip to the authorized dealer for a bit of talking to the dealer's computer.

To reverse engineer that software and repair the car themselves, independent repair people would have to violate copyright and in some cases the DMCA. Those cars go to the dealer, or go unfixed. That's right, the DMCA even screws up cars. That's impressive.

To fix this, a national "Right of Repair" has been proposed in Congress, but after 10 years, it's getting nowhere. Now Massachusetts is close to passing a state version, which would require car manufacturers to make diagnostic codes and software available to independent repair shops. That's a step in the right direction, and it could open a door not just to other states passing Right of Repair laws, but to arguing that maybe we should have a right to repair things other than cars. But even with a Right of Repair, the car companies are the ones that get to determine how things work, and what counts as repaired.

Not everyone wants to or should modify their cars, but it's not illegal to crack the hood and poke around. Why should it be illegal to crack our cars' software and see how it works? A Right of Repair should come with a DMCA exemption for tinkering with car. Then we can expand it to tinkering with anything else.

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 New Technologies to Look for in Next Year's PCs

8 3TB DRIVES

Internal models, that is.

7 NATIVE USB 3.0

Yes, more than two ports of 400MB/s speed!

6 AMD's K11

A Bulldozer vs. a Sandy Bridge is at least a metaphoric slam dunk for AMD's next CPU.

5 450Mb/s 802.11n

In the real world, expect 150Mb/s—still, we'll take it.

4 PCI-E 3.0

Double your PCI-E speeds! We've liked the no-drama PCI-E spec, and 3.0 should be no different.

3 UEFI

We say good day to you, BIOS!

2 LGA2011

Your shiny new LGA1366 board? Obsolete. Meet its replacement: LGA2011.

1 LIGHT PEAK

See page 64 for details.

This month the Doctor tackles...

Upgrading from 32-bit to 64-bit
Blu-Ray Playback
Bulletproof Backup

Can I Block the PSU Fan?

I would like to update the PSU on my old PC. The case is an NZXT Apollo. The problem is that all the good power supplies have an upward-facing fan. My Apollo case holds the PSU at the top. You see my dilemma. Will obstructing the airflow from the PSU fan affect the PSU's performance in any way?

—Donat Torres

That is an intake fan, which draws air into the PSU (which then exhausts at the rear of the PSU), so it's important not to completely obstruct it. Fortunately, you shouldn't have to, as most cases allow you to mount the PSU in either orientation, so you will be able to mount the PSU with the fan facing down. If your case does not allow you to mount it with the fan facing down, check to see if there is adequate space to allow air to enter the PSU from the top. Even an inch of space between the top of the case and the PSU should be enough for the power supply to "breathe."

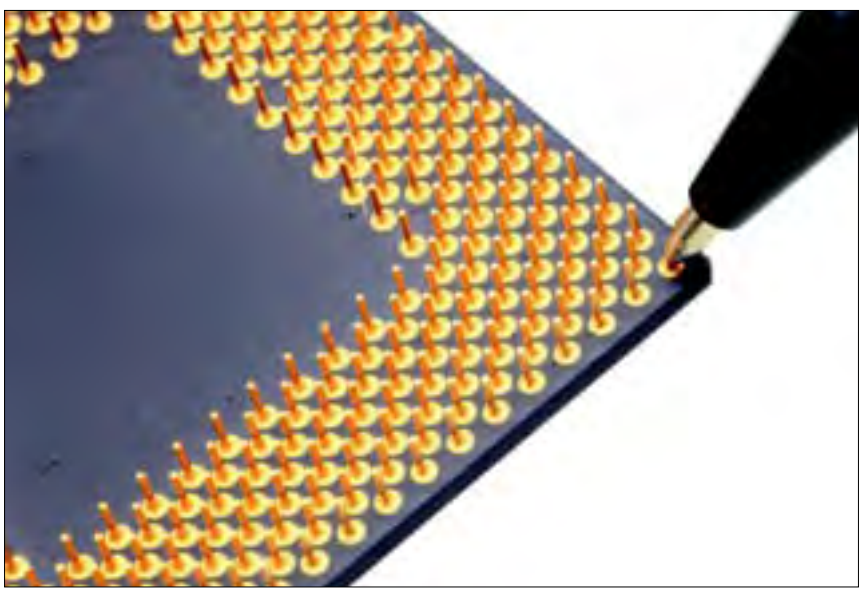
BD Playback and WMC

I'm trying to find a reasonably inexpensive way to add Blu-ray to my HTPC. I would like to be able to view the movies in Windows 7 Media Center (64-bit). I am seeing a handful of drives for $65 to $110 dollars on Newegg, but most of them only come with barebones software that functions outside of WMC. It seems that in order to play Blu-ray in WMC, I will need paid software, but that looks to be another $100 on top of the cost of the drive. At this price point it is costing me the same as a stand-alone Blu-ray player.

Are there options I am overlooking? At the very least, I might just buy one of the cheaper OEM drives, then try out the trial versions of various suites to nail down a good one that gives me Blu-ray in WMC. What do you think?

—Robert Burnham

If you want to watch your Blu-ray discs from within Windows Media Center, you'll need to buy a suite that offers a WMC plugin, such as TotalMedia Theater 3 ($90, www.arcsoft.com). If you don't mind watching your BD movies on a program outside of WMC, which is what we do, you can get a bundled copy of PowerDVD along with the Samsung SH-B083L BD combo drive—our recommendation in the July "Budget Upgrades" story—for $99 from Amazon.



You can usually salvage a CPU with bent pins. We like the ol' mechanical pencil method ourselves.

Funeral for a CPU?

I'm concerned I may have damaged my CPU. I had an old HP M7750N with an Athlon 64 X2, Asus ASM2N-LA board, 4GB DDR2/667, and a Hauppauge WinTV HVR 1600 TV card. I turned on the computer and got a black screen with static lines. I thought my 9-year-old Dell monitor was on the fritz, so I bought a Samsung PX2370 and connected it, but got the same problem. I took it to Best Buy and was told that the problem could be the TV tuner, the onboard graphics, or the mobo itself. The PSU tested fine. I took out the TV tuner and still had the same problem. I forgot to check the RAM.

I got a BioStar TA790 GX XE 5.x board that supported all my hardware (to see if the board was at fault) but when I removed the heatsink, it brought the CPU with it. Some pins were bent. I realigned them with a small screw driver. My question is: Did I damage the CPU? If I try to re-use it, will it damage the new board? A new CPU isn't much (maybe $50 or $60), so if there's any risk, I'll just get a new one.

—Paul Bruce

This is a very common mistake to make when the thermal

paste acts more like adhesive and simply won't let go of the CPU. The Doctor recommends that you slowly twist the heatsink to and fro until it loosens up, or even run the machine for a few minutes to warm up the thermal paste a bit to make it easier to remove. As far as damage, unless you've literally ripped the pins from the CPU, it's unlikely to be broken. Those chips are incredibly robust. There is also no threat of damage to the new board unless the pins are so damaged that they would get jammed into your new board's socket upon removal. By the way, if you ever have to fix another bent pin, we quite like using the tip of a mechanical pencil rather than a screwdriver.

WHEN I REMOVED THE HEATSINK, IT BROUGHT THE CPU WITH IT. SOME OF THE PINS WERE BENT

Upgrading from 32-bit to 64-bit

A while back, I bought a Core i7-920 system with 6GB of RAM to run the 32-bit version of Vista. I chose the 32-bit version because I had a lot of software that was 32-bit, including Photoshop, Flash, Illustrator, and 3DS Max. I thought I was stuck with 32-bit, so when I upgraded to Windows 7 Home Premium this year I did a clean install using the 32-bit upgrade disc. The upgrade pack also included a disc for 64-bit. Can I use this to move to 64-bit? When I tried the 64-bit disc, it gave me an error. If I reinstalled Vista and then installed the 64-bit disc, would that work? Or is my only option to buy another full version of Windows 7?

—Karla Egley

The bad news is that you can't do an in-place upgrade from a 32-bit version of Windows to a 64-bit version of Windows. The good news is you can do a clean install from your upgrade disc, using one of several methods, all totally legit, since you do have a licensed copy of Vista you're upgrading from.

First, try just doing a clean install, but skip the step where you're asked to input the license key. Try inputting it once Windows is fully installed. If that doesn't work, you can install Windows 7 over itself. Open up the Windows 7 Upgrade disc from within the Windows 7 install you just did, and select Upgrade. Let the installation complete, then once you've booted into the newly upgraded Windows 7 install, you should be able to activate normally.

Clearing BIOS Password

I bought a used Dell Dimension E521 at a yard sale the other day. When it boots, it asks for a password before it begins booting the OS. I assume there was a password set in the BIOS. Is there any way to clear the password so I can do a clean install of Win XP Pro?

—Jonathan Martin

With the machine powered off and unplugged, try removing the CMOS battery from the motherboard for a minute, then putting it back in. This should clear the CMOS, including the BIOS password, and restore the BIOS to defaults.

Dual Boot on RAID 0

I'm getting ready to partition two new 300GB hard drives for a dual-boot RAID setup with XP and Windows 7. I was going to make one 500GB partition for Windows 7 and use the other 100GB for XP. When I create the partitions, which one should I do first in order to have the 500GB on the outside of the RAID so it is the faster of the two? Also, should I install XP first or Windows 7? I have a Gigabyte P55-UD3R motherboard.

—Tim Heiden

In order to have the 500GB partition on the outside tracks, you should create the 500GB partition first. When it comes time to install, install XP first, then Windows 7. While Win 's boot loader accommodates booting into multiple OSes, XP's doesn't. Depending on your RAID controller, you might need F6 drivers (so called because you need to load them at the beginning of the Windows XP install process, a process triggered by pressing F6). You can find those on Gigabyte's website. One thing to consider: If you put two OS drives on a single RAID 0, you will lose both partitions (and both OSes) if either of the drives fails. And though the odds of that are small, they're not small enough for us to be entirely comfortable with the prospect.

Bulletproof Backup?

I recently went through the nightmare of losing my OS drive. I was able to restore most of my data using Norton 360 V4 but my pictures were not being backed up like I had thought. Thus began my quest to find a data recovery

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.

program. After much searching on the Internet and trying subpar programs, I headed over to your website and tried your recommend File Scavenger 3.2. This was the only program that did the job.

With that painful lesson behind me, what's the best way to set up a fail-safe storage system that can take a beating and survive a nuclear blast? My first thought was using an SSD for the OS, dual 2TB HDs for data storage, and another RAID using dual 1TB HDs for essential data backup and a copy of the OS drive. Is this overkill, or could you suggest a more elegant solution?

—Jason Spilker

That's way overkill, Jason. First, and we can't stress this enough, RAID is not a backup solution. Second, there's little value in backing up program files; focus on documents only. Here's what one editor recommends: "Because I have multiple PCs at home, I rely on a Windows Home Server machine for daily backups: It's automatic and redundant (as long as you install more than one hard drive in the server and turn on share duplication). But if my house were to burn down, I'd still lose everything unless I backed up the server to a removable hard drive every day and stored that drive offsite.

"A simpler solution is to use a cloud-based service, such as Carbonite (www.carbonite.com), KeepVault (www.keepvault.com), or Mozy (www.mozy.com), for your essential documents. Relying on a third party for backup does, however, theoretically expose you to privacy loss—and you have to take the company's word that it has a backup and/or redundancy scheme in case its servers are destroyed. Some services will back up servers, too, but that option can be pricey."

SyncToy, free from Microsoft, lets you create "folder pairs"; use it to periodically sync a folder to a flash drive.

Sync a Folder to a Flash Drive?

I was wondering if there is an application for updating my flash drive, which I use every day to transfer files from a certain folder on my computer. I always have to overwrite data because I don't want to look through everything to see the files I don't have. Do you happen to know of one that can do this?

—Collin Citrowske

Microsoft has a free tool called SyncToy (http://bit.ly/aWVl33) that's just the ticket. You choose a pair of folders (for example, your flash drive and the folder on your computer) and choose to sync them in one of three ways: synchronization (which makes sure all files in either folder are in both folders, echo (which moves files from the computer to the flash drive and deletes folders on the flash drive that are deleted in the main folder), and contribute (which adds files to the flash drive without deleting anything).

SECOND OPINION

Home Server Clarification

Several readers wrote in regarding "Migrating to Home Server" (August 2010). In answer to a question from Michael Engles, we stated that he wouldn't have to reformat his three NTFS-formatted 1.5TB media drives in order to use them with Windows Home Server; he could just slot them in. Although this is true, readers including Brian Adelson and Sam Wagner wrote in with major caveats. Both raised nearly identical points. Here's Brian's letter:

One of the biggest advantages of using Windows Home Server is the Hard Drive Extender. This allows for multidisk data redundancy, arbitrary expansion of storage utilizing hard drives of varying sizes and interfaces, and a virtual single storage pool that spans across the drives. My assumption is that Michael Engles wanted to move these three 1.5TB hard drives to Windows Home Server and utilize the drive extender to pool these drives into one large storage space. If this is the case, he would, unfortunately, have to format the drives.

I also noticed that Michael plans to use a 40GB hard drive as the system drive for his server. With the original WHS, all data copied to the server was initially placed on the system drive, to be distributed out to the data pool. The most recent updates change this so that all data copied to the server is initially placed on the largest drive in the pool, allowing large files to be copied to the pool successfully. If Michael is content with using that 40GB drive for his system drive, make sure he has the most recent updates for WHS, or he may run into some errors with large files. I would instead suggest using one of the 1.5TB drives as a system drive, since it is much more difficult to upgrade the system drive in WHS than it is to upgrade a pooled drive, and that measly 40GB is going to feel very small very quickly. Also, that 40GB drive is probably not nearly as fast as the 1.5TB drive, so system performance may suffer if using that 40GB drive as the system drive.

My suggestion for solving his problem is as follows:

1. **Buy one 1.5TB hard drive for the WHS system drive.**
2. **Set up WHS with only the single blank 1.5TB drive.**
3. **Add one of your current 1.5TB drives to the machine; it will be seen as just another local drive.**
4. **Copy all media from current 1.5TB drive to the WHS shared folders.**
5. **Once all data has been copied, add the current 1.5TB drive to the drive pool.**
6. **Repeat steps 3–5 until all current hard drives have been added to the pool.**
7. **Enable drive duplication for any media you really don't want to lose.**

ILLUSTRATED MERIT BADGES BY JIM KOPP

Mastering the Essentials

These 29 essential PC skills define the core competency of any power user

BY THE MAXIMUM PC STAFF AND PAUL LILLY

Do you consider yourself a power user? It's a tough question. After all, where do you draw the line? Hardware hacking? Command-line skills? Unix?

As we sat down to answer this question, the possibilities seemed endless, making our task feel more daunting. Windows registry hacks? Networking know-how? Upgrades? We even asked you, our readers, to contribute your suggestions. We received a bunch of great ones, the best of which are captured on page 38. But this only further broadened our pool of ideas.

Undeterred, we took a step back to consider the very essence of a power user. Eureka! A power user, we reasoned, is not a simple state of being. It's a path, filled with accomplishments and achievements and failures and applied knowledge. And merit. We imagined a Boy Scout sash, filled with badges indicating various acts of heroism and knowledge, as well as empty spaces where future achievements will eventually reside.

On the following pages, you'll learn what our version of this path is. Enjoy!

Setting Up Your PC

The first few hours of any new PC's existence are critical. Set things up right and you'll enjoy years of stability and longevity. Get things wrong and... well, you know how that goes. Every mistake, oversight, and wrinkle introduced during a new PC's inception will compound itself over time. Here are the essentials to getting it right.

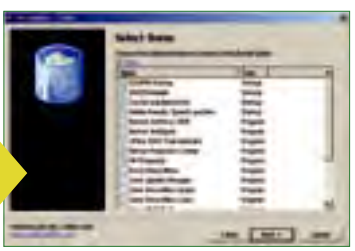
INSTALL WINDOWS THE RIGHT WAY

You already know how to install Windows—pop in the disc and watch an episode of *The Office*—but what do you do when it's finished? The first step we take is to fire up Windows Update and install any and all applicable patches. You'll most likely have to reboot your system, at which point you should check Windows Update again.

When that's finished, head over to your motherboard maker's website and download/install the latest chipset drivers specific to your mainboard. Next, install the latest graphics driver for your videocard, and then finish things off by updating any other components, like your soundcard and/or network adapters. Windows' default drivers will handle most components in a fairly stable fashion, but you're going to get the best results from native drivers.

Banish Crapware from a New PC

Trials and toolbars and links, oh my! As a way of generating revenue from software vendors, OEMs often shovel all kinds of performance-hampering crapware onto your new PC. You can spend the first 30 minutes hunting down uninstallers and restoring your system to pristine condition, or knock out the bloat with a single blow using PC Decrapifier (http://bit.ly/aJ4WS), a free utility that detects and uninstalls whichever programs you select.



PC Decrapifier is ideally suited for any PC purchased from a retail outlet or online vendor. Goodbye, crapware!

Manage Power Usage and Sleep Better at Night

Navigate to the Control Panel and select Hardware and Sound > Power Options. For portable PCs where battery life is a priority, we build off of the Power Saver profile. Similarly, choose the High Performance setting if you're working with an enthusiast-class rig. Once you have a starting point, tweak the individual settings by clicking Change Plan Settings and then Change Advanced Power Settings. Here are our favorite toggles:

HARD DISK You can configure your HDD to switch off after a set period of inactivity. If you own a modern hard drive, chances are it already comes with several power-saving features built in, so don't expect any miracles here. And if you own an SSD, any potential power-saving benefits go right out the window because of a lack of moving parts.

USB SELECTIVE SUSPEND When enabled, USB devices will stop drawing power while in an idle state. This is done at the driver level, so not all devices support this setting.

PROCESSOR POWER MANAGEMENT Notebook users looking to extend battery life can set the Maximum Processor State to a value less than 100 percent. The obvious drawback here is that you'll lose performance when performing CPU intensive tasks, and since today's processors come with all kinds of power-saving features already built in, this is of dubious value on modern machines.

DISPLAY A brightly lit LCD drinks electricity like it's going out of style, and what's the point if you aren't even looking at it? Notebook users should configure the display to dim after a short period of inactivity, or better yet, turn off altogether. Desktop users won't see much benefit, but hey, you'll sleep better at night knowing you reduced your carbon footprint.

When you're finished configuring your power options, look for any problems using Windows' Powercfg utility. To do this, open an elevated command prompt (right-click on cmd and run as an administrator) and type `powercfg -energy -output c:\report.html`. Windows will then observe your PC for 60 seconds and spit out an energy report at the location and filename specified.

Set Up Three Displays

Before shuttling those old LCD monitors to the landfill, consider filling your desktop with a triple-display setup instead. In most cases, you'll need a second videocard to make the magic happen, but it doesn't have to be gaming grade—a PCI card will work just fine. Unlike previous versions of Windows, Windows 7 isn't likely to cough up a hairball in this scenario. Once installed, go into Display Properties to finalize your configuration options. For even more control, we recommend running UltraMon (http://bit.ly/r1kx) or DisplayFusion (www.displayfusion.com) to squeeze out additional features, like multiple taskbars, from your three-headed monster.

Use Benchmarks to Expose Shoddy Settings and Busted Hardware

There's more to benchmarking than just bragging rights. It's also an ideal way to gauge whether your components are firing on all cylinders. An unusually low benchmark score could be indicative of a misconfigured setting, or even a faulty piece of hardware.

Before you begin your first benchmark run, prep your PC to eliminate any outside variables. Disconnect from the Internet, turn off your screen saver, turn off auto update, and disable your antivirus and any other background tasks. It's also a good idea to defrag your hard drive (but not your SSD). Finally, reboot your PC.

Use a mix of synthetic and real-world benchmarks, starting with Futuremark's PCMark Vantage Suite (http://bit.ly/9LGKUk) to get an overview of your system as a whole. To suss out your CPU, fire up Maxon's Cinebench 11.5 (http://bit.ly/b3jyRb). You can benchmark your RAM with SiSoft Sandra's (http://bit.ly/9JsKn0) built-in benchmarking tools, and for your GPU, we recommend a variety of tests, including Futuremark's 3DMark Vantage (http://bit.ly/aFN6Tt) and built-in game benchmarks, such as the one included with Far Cry 2.

Stress testing is a little different than benchmarking, in that you're primarily testing for stability, not performance. Running Prime95 (http://bit.ly/LnCXq) will let you know if your overclock is stable (select Run Benchmark from the Options menu), while Memtest86+ (www.memtest.org) does an excellent job at exposing defective RAM. To use the latter, download either the bootable ISO or auto-installer for USB keys and boot directly from either one. Let Memtest86+ run a full pass on each stick individually.

Far Cry 2's built-in benchmark allows you to measure your new system's real-world performance. It's a great way to gauge whether your rig is running in a healthy manner.

Three Smart Ways to Protect Your Data

STUPEFY HACKERS WITH STRONG PASSWORDS While using your girlfriend's name as a password qualifies as a heartfelt gesture, it's also a boneheaded security risk. Avoid using passwords that are easy to guess and instead use a mix of alphanumeric characters and symbols. At the very least, use symbols and numbers like @, 3, !, or 0 in place of the vowels A, E, I, or O. If what you're trying to password protect is mission-critical, use an online password generator such as this one from PC Tools (http://bit.ly/a6v1Xg).

LOCK DOWN YOUR ROUTER TIGHTER THAN FORT KNOX Without a password in place to protect your wireless Internet, you're not only a sitting duck, but inviting trouble. Keep bad guys out by using a unique SSID and by securing your router with a password. To access your router, type 192.168.1.1 into your browser (or check your router manual for an alternative). You'll be prompted for a password—type "admin" for both entries, or consult your router manual if this doesn't work. Now, navigate to the security section. This will vary by make/model—if you own a Linksys router, for example, head over to Wireless > Wireless Security and choose the strongest encryption your network adapters support, such as WPA2. Type in a strong password mixing both letters and numbers, and either write this down (temporarily) or commit it to memory. You'll need to punch this in when prompted on any PCs or Internet-connected devices that tap into your router.

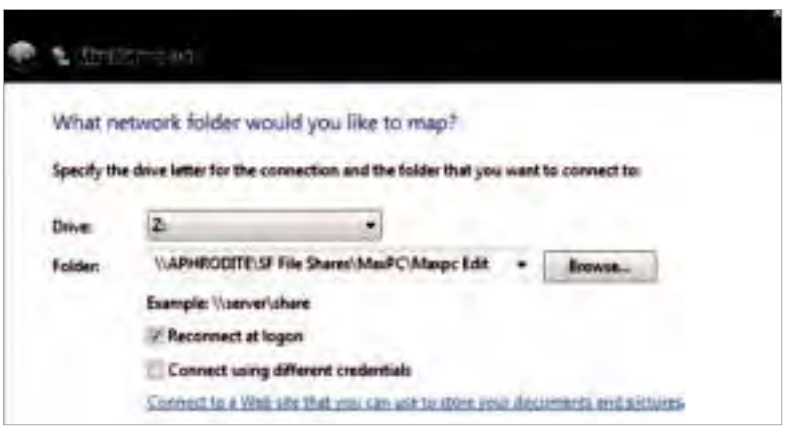
SECURE YOUR SENSITIVE DATA Don't make the mistake of thinking that a deleted file is gone forever. All any two-bit hack has to do is Google "data recovery" to find a list of apps that promise to resurrect files already emptied from the recycle bin. Use Eraser (http://eraser.heidi.ie) when you need to securely delete files. If you're getting ready to dispose of your hard drive, KillDisk (www.killdisk.com) decimates any traces of data. And finally, put your trust in TrueCrypt (www.truecrypt.org) for on-the-fly encryption.

Network Windows

Being able to dig below the surface of Windows is an essential skill. The faster you can access your data—from any location—the more enjoyable your life will be. The ability to quickly help your friends and family via remote access is pure power user.

MAP NETWORK DRIVE

Mapping a network drive in Windows 7 is both quick and easy, once you know how to do it. Open My Computer and highlight the drive you want to map. Select Map Network Drive from the toolbar. In the pop-up window that appears, select a drive letter for your mapped drive. Click the Browse button to drill down to the folder you want to map and be sure the Reconnect at Logon box is checked. All that's left is to click Finish. You should now see the mapped network drive in the My Computer window.



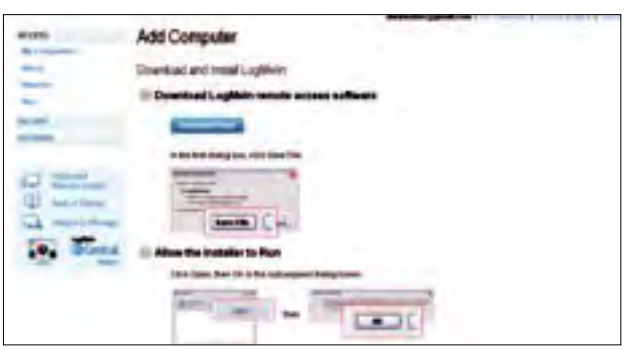
You'll save time and energy by mapping a frequently used network directory to a drive.

Create Secure Remote Access

It's an indelible truth of being an advanced user: Our loved ones need our help when things go wrong. Quite often, it's nearly impossible to provide that sort of help over the phone—the entire process often becomes counterproductive, usually eliciting a great deal of frustration rather than resolution of any kind. So what ends up happening? You get in your car and drive far too many miles only to discover that your mom simply needed to disable some pop-ups in "The Windows." What a waste of time and gas, and now you've got to stay for dinner.

OK, we're digressing. The next time you're at mom's house, do yourself a favor that'll save you some gas, time, and grief later on down the line. Head over to www.logmein.com, download the free software onto mom's computer, and create an account. The next time you receive a distressed phone call, you can hop on your own PC, take remote control of mom's desktop, and address any simple fixes she needs from the comfort of your own home.

Once the software is installed on the computer you need remote control over, taking the reins becomes as easy as logging into LogMeIn.com (which only requires a username and password, all free). The open-source software allows you to perform almost any task you normally would using your PC, over the Internet. You can save and make changes to files, reorganize the desktop, and adjust system settings—more than enough capabilities required for what's usually an easy fix.



LogMeIn Free is easy to download and install, and will allow you to remote access your desktop from virtually anywhere with an internet connection.

Incidentally, LogMeIn has a wide range of uses that extend far beyond remote controlling a desktop. With the right software iterations, you can remote control any given desktop from a smartphone or tablet PC, too. For a more in-depth look at LogMeIn, go to http://bit.ly/aIyTcf.

Master Folder Permissions with Windows 7 HomeGroups

In the old days, setting up a home network with printer and file sharing was about as fun as watching a train wreck… from the conductor's seat. With Windows 7, Microsoft has removed most of the headaches associated with sharing files, thanks to the advent of HomeGroups.

HomeGroups only work with PCs running Windows 7, leaving Vista and XP users to go pound sand. To set up a HomeGroup, navigate to Control Panel > Network and Internet > Choose Homegroup and Sharing Options. Mash the Create a HomeGroup button and check the boxes for the types of files you want to share, including Pictures, Music, Videos, Documents, and Printers. In the next step, you'll be given a case-sensitive password. Write this down—you'll need it when adding other PCs to the HomeGroup.

To connect another PC to the HomeGroup you just created, follow the same path as before and press the Join Now button. Enter the password you jotted down and Windows will take care of the rest.

You may not want to share the same files and folders with everyone in your HomeGroup. Maybe you've recorded some, ahem, special-interest videos that would place little Johnny in therapy for the rest of his life if he viewed them, or confidential documents detailing your secret identity as a spy. Whatever the case, it's easy enough to selectively share files with others on your network.

To detach an entire folder or a single file from your network, open it in Windows Explorer, select the Share With pull-down menu, and click Nobody (you'll also find the Share With option in the right-click context menu). Alternately, you can give your HomeGroup just Read or both Read/Write permissions in this same section, or share the folder with only specific people in your HomeGroup. In the case of the latter, select Specific People from the Share With pull-down menu and select only those you want to have access to your file or folder. Next to each name, you can grant specific levels of access; for example, you can restrict little Johnny to only viewing your vacation photos, and you can give everyone else both read/write privileges.

For even finer control, bulldoze your way back to the HomeGroup section in the Control Panel and select Change Advanced Sharing Settings. From here you can set up different rules for Home, Work, and Public networks, as well as troubleshoot connection issues. If someone is unable to access your network shares, they might be using an ancient wireless adapter that doesn't support 128-encryption. If that's the case, scroll down to File Sharing Connections and select "Enable file sharing for devices that use 40- or 45-bit encryption." You can also turn printer sharing on/off, as well as several other self-explanatory options.

You can quickly and easily set up file sharing across your entire network through this screen.

TIME SAVERS

15 Essential Windows 7 Shortcuts

When it comes to Windows, the shortest distance between point A and point B isn't a straight line, but a keyboard shortcut. Commit these to memory and you'll work faster:

WIN+HOME Minimizes all inactive Windows, not only giving you quick access to the desktop, but hides what you've been up to when the boss strolls by.

WIN+LEFT/RIGHT ARROW Docks the active Window to either side of the screen.

WIN+UP/DOWN ARROW Maximizes or minimizes active window.

SHIFT+WIN+LEFT ARROW Shuttles the active Window to an adjacent monitor.

WIN+NUMBER (1-9) Launch or toggle to the corresponding program in the taskbar.

CLICK AND SHAKE WINDOW Minimizes all other Windows (and strengthens your forearm).

WIN+TAB Initiates Flip 3D, which renders live thumbnail images of open windows in a 3D view.

CTRL+WIN+TAB Initiates a persistent Flip 3D display so you don't have to hold down the Windows key.

CTRL+Z Undoes an action.

CTRL+A Selects all items in a document or Window.

ALT+DELETE Displays the system menu (Remote Desktop Connection).

ALT+HOME Displays the Start menu (Remote Desktop Connection).

CTRL+SHIFT+D Clears the calculation history (Calculator).

NUMLOCK+ASTERISK ON NUMPAD Displays all subfolders under the selected folder.

SHIFT+RIGHT-CLICK A FILE Adds a Copy as Path entry to the right-click context menu.

Maintenance and Prevention

PCs, automobiles, and human bodies all have one thing in common: Performance tends to degrade over time. Real power users know how to ward off the effects of old age. Here are some key strategies.

STAY PRIVY TO SOFTWARE UPDATES

An ounce of prevention is worth a pound of cure, and you can prevent most malicious attacks by keeping your software up to date. That's easier said than done when you're juggling dozens of programs, but you don't have to go it alone. Secunia Personal Software Inspector (www.secunia.com) scans your system for outdated apps and plugins, and then arranges everything in a handy report complete with direct download links to the latest patches for each program.

It's best to let Secunia PSI constantly monitor your rig for unpatched software, and if you're intentionally using an older program for compatibility reasons, simply set up a rule to ignore it. Fire up the advanced interface by clicking the Advanced link in the upper right corner. Select the Settings tab and click Create Ignore Rule. Give it a name, and in the Rule box, enter the path to that program, like C:\Program Files\App\app.exe.

Eradicate Malware with Extreme Prejudice

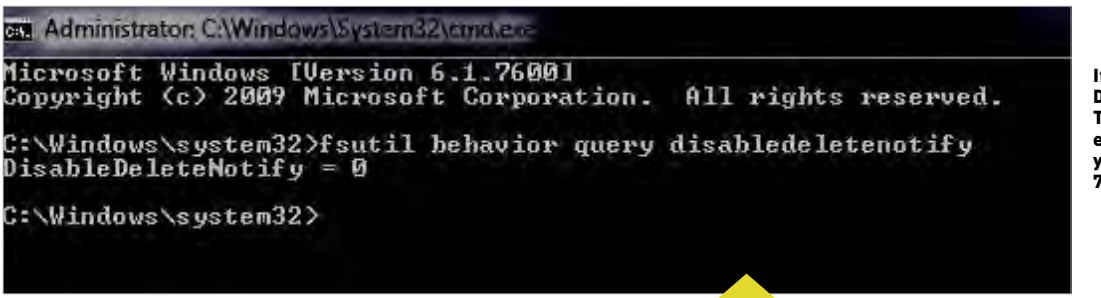
Before you throw in the towel and reinstall Windows, update your antivirus definitions and run a full scan, or if you're fixing a PC that doesn't have any AV software installed, use a cloud-based scanner, like Panda ActiveScan (http://bit.ly/2T0ite). Any IT tech worth his salt will also carry around SuperAntiSpyware (www.superantispyware.com) and Malwarebytes (www.malwarebyes.org) in his toolbox.

Depending on how bad Aunt Mabel messed up her PC, you may need to escalate your efforts with HijackThis (http://bit.ly/8MW39). HijackThis combs through registry and file settings where malware is most likely to hide out, but it doesn't discern between good and bad entries, so don't go blasting away settings willy-nilly. When in doubt, get a second opinion online by copying/pasting the log contents of a scan to www.hijackthis.de or http://hjt.networktechs.com. It's also a good idea to carry around HijackReader (http://bit.ly/dAOLK8), which is the online version of the log analyzer in case you're unable to access the web.

Clear out the Cobwebs

A year's worth of accumulated dust in your rig is pretty much the equivalent of outfitting each of your components in a custom-knit wool sweater—not good. A tiny bit of maintenance every now and then can ensure that your system breathes easy. Your main weapon in the fight against dust? Compressed air. Here are some tips:

- **Remove all wires from your rig and unplug the main power supply.**
- **Make sure you've got a nice, bright light while you're peering at your computer's innards. Besides helping you find clots of dust, this will help you notice any faulty wiring or other minor problems on your mobo.**
- **Remove a side panel to expose your components. If possible, remove both sides so you avoid simply blowing the dust around the inside of the case.**
- **Hold the can upright and spray in short, controlled bursts. No need to hose your computer down. You should have more than half a can left after you've finished spraying your components.**
- **Pay close attention to fan-based components—your case fans and heatsink often accumulate dust between the blades.**



If DisableDeleteNotify=0, TRIM is enabled on your Windows 7 SSD.

Disk Maintenance

The conventional wisdom is thus: As drives fill up, they get slower. Access times get longer, and files get fragmented because they have to find space where old data has been deleted. Therefore, you have to defragment your disk regularly in order to keep your machine at its best. But does that still apply?

If you're rocking a mechanical hard drive on Windows XP or earlier, yes. You should defrag your drive every month or so—more often if you'd like. We like Auslogics Disk Defrag (www.auslogics.com) or Piriform Defraggler (www.piriform.com). Vista and Windows 7 automatically defrag mechanical drives by default, so you'll probably never have to worry unless you're working with very large files. If you have a solid state drive, though, do not defragment! Because defragmenting involves moving data around on the disk, it's write-intensive. And that can and probably will diminish the lifespan of your SSD. Again, don't do it.

Solid state drives are susceptible to slowdowns as they fill, but they require a different approach. Modern SSDs support the TRIM command, which enables the OS to continually keep the SSD optimized. You'll need an SSD with firmware that supports TRIM, Windows 7, and Microsoft or Intel's AHCI drivers. If you don't have all those things, you'll need a garbage-collection utility. Check your drive manufacturer's website or use an SSD-optimized utility like PerfectDisk 11 (www.perfectdisk.com).

Not sure if you've got TRIM up and running on your Win7 machine? Open a command prompt and type `fsutil behavior query DisableDeleteNotify` and hit Enter. If Windows returns `DisableDeleteNotify = 0`, then TRIM is running. If not, type `fsutil behavior set DisableDeleteNotify = 0` and hit Enter.

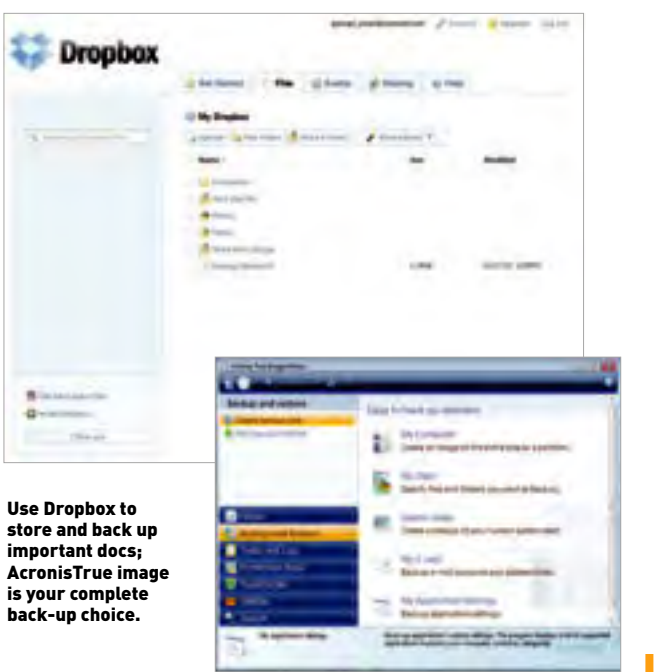
Back Up Your Data the Right Way

Your water-cooling loop just sprung a leak, and liquid is spraying everywhere. Sparks fly and your HDD catches fire, melting like a popsicle on a hot summer day. It's bad, but not disastrous because you've been backing up your data. Right?

Let's start with that presentation you've been working on. Your boss won't be any the wiser to your water-cooling woes because when you show up for work tomorrow, you'll pull the PPT deck off your Dropbox (www.dropbox.com) account, which offers 2GB of free online storage.

On your way home, you'll pick up parts to rebuild your PC and restore things to the way they were by loading an image you took with Acronis True Image (www.acronis.com). Pop in the bootable restore CD you created with Acronis (see page 32) and you're off and running.

Crisis averted, right? Sure, so long as the fire didn't spread and take out everything you own, including your external hard drive. In that case, it's a good thing you backed up your mission-critical files, gigabytes of family photos, and a video of little Billy taking his first steps to another hard drive that you keep at your parents' house or other offsite location.



Use Dropbox to store and back up important docs; AcronisTrue image is your complete back-up choice.

Create a PC First-Aid Kit

No matter how well you take care of your PC, sooner or later something will go wrong. This is fact. But you don't have to let it take you by surprise—here's how you can make a simple emergency kit that can save your bacon when things start to go wrong.

Create a USB Thumb Drive Toolbox

To start you'll need a suitably large USB thumb drive. We're going to load it with some apps that will help you troubleshoot your PC, fix problems, and recover from disaster. A gig or two will be plenty to hold all of the apps, but in the worst case scenario you may be using this thumb drive to hold data that you recover from a damaged hard drive, so bigger is always better.

Here's the list of apps we recommend for your toolbox:

→**Malwarebytes' Anti-Malware, SuperAntiSpyware, and Combofix:** One of the most common causes for a misbehaving PC is malware—viruses and other malicious apps that spy on you and slow down your computer. Unfortunately, no single app can find 100 percent of malware, so we recommend keeping at least these three cleaning programs in your toolkit. Run Malwarebytes' (http://bit.ly/BjJJ) and SuperAntiSpyware (http://bit.ly/23MxVo) first, and then Combofix (http://bit.ly/mJgzK) if the problem persists.

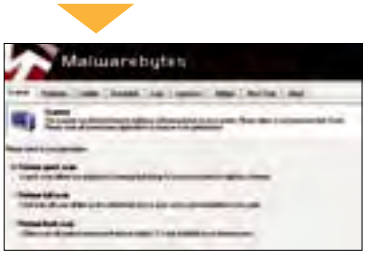
→**CCleaner and Revo Uninstaller:** Another way to speed up a beleaguered PC is to declutter the hard disks. We recommend CCleaner (http://bit.ly/E9eo) for general housekeeping (removing useless files, registry cleaning) and Revo Uninstaller (http://bit.ly/236r) for targeted removal of unwanted programs that are too sticky for the standard Windows Add/Remove Program utility.

→**ZoneAlarm Free:** When dealing with a poorly maintained computer with lots of out-of-date software and potential malware, it can be hard to tell what data is being sent from or to the PC. A good first step to getting things under control is to throw up a good, free firewall, such as ZoneAlarm (http://bit.ly/OBr4S).

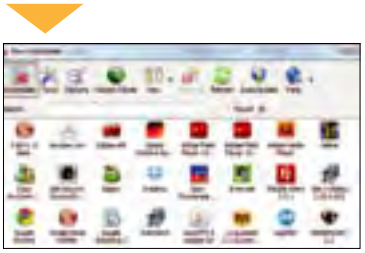
Create a Recovery Image

Of course, you want to be able to fix every problem without losing any of your data, but that's not always possible. Sometimes you have to cut your losses with a bad PC, and when that time comes nothing will make your life easier than a good recovery image. You can make a recovery image at any time, but the absolute best moment is immediately after you perform a fresh Windows installation and install your must-have apps. That way, whenever you need to, you can reload that image onto your drive and be back to a pristine environment with just the apps you need. Of course, you'll still need a backup solution for your important documents and data.

Normally, we like to find free software solutions to all of our problems, but backup and recovery is one area that's so important we think it's worth paying for. Acronis True Image Home (www.acronis.com) makes it incredibly easy to make a recovery image and to keep your important data backed up, and it's available for a very reasonable $50 (or less, if you catch it during a sale.)



Malwarebytes' Anti-Malware is great, but you should run multiple anti-malware programs.



Revo makes getting stubborn programs off your computer a breeze.

ZoneAlarm is a great first line of defense against web-based attacks.

Upgrades (and Downgrades)

Real power users don't attempt to upgrade their PCs. They simply perform the task. We humbly present our guidance for upgrading the parts, performance, and functionality of your system.

Upgrading Your CPU

Can we boil down how to upgrade your CPU into three paragraphs? Yes. First, don't make the rookie mistake of assuming that because you have a square opening, any square chip will fit in it. If you have an LGA775 board, upgrading your chip will require a heavy amount of research before you can pull the trigger.

OK, so you know your board will physically work with the new chip. Now make sure the BIOS will, too. Many rooks drop in the new processor, turn on the power, and scratch their heads when their board won't POST. Another hour is then spent trying to troubleshoot when the issue is likely a conflicting or outdated BIOS.

More importantly, mind those pins. On AMD chips, you can easily recover from a bent pin. On any LGA-based socket—in use on all modern Intel boards—a bender on the motherboard can spell permanent disaster.

Upgrading Your Videocard

Like a CPU upgrade, the GPU upgrade isn't solely about spending your tax return on the fattest GPU you can find and hitting the power switch. Today's top-end GPUs are hot, heavy, and gulp power like a Lamborghini Murcielago motoring down the interstate. Single-card upgrades are simple but still require some foresight.

First, is your power supply up to snuff? To run Nvidia's GeForce GTX 480, you'll need a minimum of a 600-watt PSU that can supply 42 amps on the 12-volt rail. A Radeon HD 5870 needs a minimum of 500 watts and 40 amps on the 12-volt rail. Since you don't really know what other new components you'll stuff into your system down the road, we recommend buying more power supply than you need. A 750-watt unit is probably the sweet spot for price-performance.

Finally, power-hungry GPUs produce more heat than most CPUs, so factor that into your upgrade. You need adequate airflow to keep the card and the surrounding components cool post-upgrade.

Adding More RAM

Adding RAM isn't always as straightforward as you'd think, but here are the fundamentals:

→LGA1156 and LGA775 users should add RAM in pairs. The RAM should generally match, but most motherboards are smart enough to deal with DIMMS that don't have the same timing.

→Because of their reliance on the ancient front-side bus, older Intel chips with 8MB or 12MB of L2 cache aren't greatly affected by running in single-channel. So if you want to add just one DIMM for financial reasons, you can do so without suffering much of a performance hit.

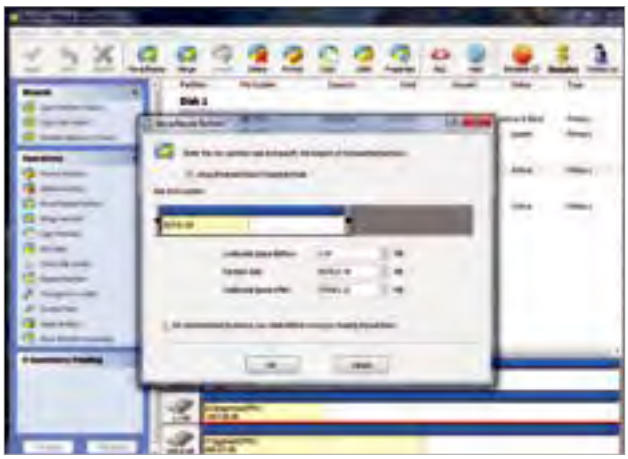
→Chips with integrated memory controllers, such as any Core ix, Athlon II, or Phenom II, should run in dual mode. Of course, LGA1366 boards should be run in tri-channel mode if possible. We say if possible because some budget-oriented LGA1366 boards have just four DIMM slots. That fourth slot could be used to add RAM, but memory in that slot would not be running in tri mode.

Upgrading Your Boot Drive

There are many reasons to upgrade your boot drive: Maybe you're running out of room, or you're switching to SSD, or your boot drive is failing. Regardless of the reason, there are several ways of moving into the new digs.

First, consider backing up your documents and performing a clean install. It's good to make a fresh start on a fresh drive. If you don't have OS recovery disks or installation media for your programs, though, or you'd just rather not go through the hassle of reinstalling programs and drivers, you can use free trial software to copy your entire OS partition to a new drive.

You'll need the trial version of Acronis True Image Home 2010 (www.acronis.com) and (optionally) a partition program like Partition Wizard (www.partitionwizard.com). First, defragment your current boot drive. Then run True Image, select Utilities from the left-hand menu, then Clone Disk. Select the Manual button, then your source and destination disks. Depending on the size of your old and new drives, you may wish to use either the As-is or Manual option and manually resize your partition later with Partition Master or Partition Wizard. Start the image. You'll be prompted to reboot, after which Acronis will complete the image and let you know when the drive is ready. Then just swap it in and go! Acronis even copies the boot sector for you.



Partition Wizard Home Edition is one of the few free partitioning programs that works with both 32- and 64-bit versions of Windows. You can use it to resize your boot partition if you're upgrading to a smaller, faster drive.

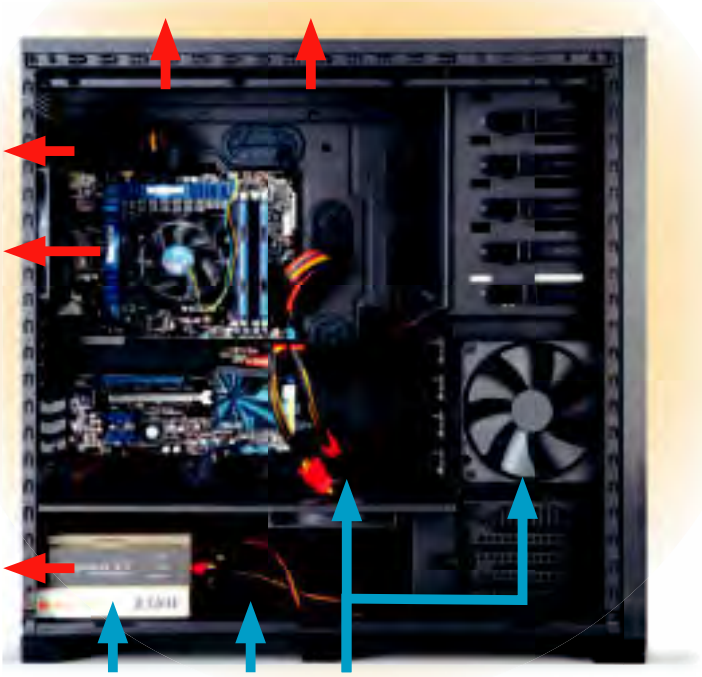
If you're switching from a mechanical drive to an SSD, you might have to use the partition tool to shrink your old boot partition to the fit on your new drive. You may also have to use a tool like SSD Tweaker (http://bit.ly/42xTrR) to make sure your new drive is optimized. Don't forget to turn off defrag for SSDs.

Flashing Your BIOS

Motherboard vendors frequently release BIOS updates that add support for new CPUs (even whole new architectures), as well as enhance certain features and improve stability. Because flashing your BIOS can potentially brick your board, most vendors only advise it if your rig isn't working, probably to cover their own butts.

Different mobo manufacturers dictate different methods. Some offer a tool that lets you flash the BIOS from within Windows. Some offer executable files that automatically flash the BIOS when you run them, while some require booting from a floppy or USB. You can find instructions and downloads on your mobo manufacturer's website.

Improving Your Cooling



Proper airflow is important. In this case (Corsair's 800D), air from the PSU never enters the rest of the case. Cool air is drawn up from the bottom of the case into the main compartment, then exhausted at the case's top and rear. A separate fan cools the hard drives, then routes behind the motherboard tray and vents at the case's rear.

READERS RESPOND

What's Essential to You?

As we began determining which PC skills are most pertinent for this story, we had a thought. Why not ask *you* which skills are most essential? We posed the question via our Facebook fan page, and we were pleased by the responses. Here are the best ones. Congrats, guys. We're sending you each a collector's set of Maximum PC coins.

If you missed out on the fun, make sure you're a fan of our Facebook page by clicking to www.facebook.com/maximumpc. And if you want to see all of the responses we received, head to http://bit.ly/c2hQ62.

Nathan Cork Registry editing is a must. Make Windows work for you and don't be constrained to the standard defaults.

David Thompson Know how to set up and configure your own wireless network—from taking the router out of the box and hooking it up to configuring the WEP/WPA keys and getting online for the first time.

Dylan Sauce Be able to get an IP from a hostname, and know how to use traceroute to find out why you can't get there.

Chad Hershey Edit your registry via a DOS prompt or recovery console. Be able to find your Windows product key without the little sticker, and be able to repair a broken Windows install (and become a hero to your girlfriend in the process).

Garrie Downard The most important skill is to be able to explain basic PC maintenance and troubleshooting to the average computer user who is not a power user. I've noticed many techies either talk down to non-technical people or talk over their heads. A lot of everyday computer issues (software and hardware) could be avoided if someone just took the time to explain how, when, and why maintenance should be done.

Upgrade Your Router's Firmware

Your router is outfitted with a CPU, memory, and an operating system, just like your PC. The router's OS is known as firmware, because it resides in and executes from flash memory. Over time, the company that manufactured your router will likely release updated versions of that firmware to fix bugs and increase performance. With few exceptions, you should take advantage of these releases.

First-party firmware updates will boost performance, while third-party updates may unlock new functionality.

Third-party router firmware sometimes delivers better performance and might even expose entirely new features of the hardware that the manufacturer, for whatever reason, decided to hide or ignore. In this example, we'll replace a Linksys WRT-600N's factory firmware with the free alternative firmware DD-WRT (download from www.dd-wrt.com).

Take care when updating your router's firmware, and always use a hardwired network connection to reduce the risk of bricking your router. The first step is to reset your router to its default values by inserting a paperclip into the reset hole in the back of the router. Then, open your router's web user interface by typing its IP address into a web browser. Since you've reset the router, the login-ID and password will have reverted to the factory default value (admin/admin in the case of the WRT-600N). The firmware update field is typically located in the router's Administration field. Once you've found that, click the Firmware Update button, locate the new firmware file, and click the Start Upgrade button.

It's critical that the update process not be interrupted—don't unplug the router, click the brower's back button, or anything else that might prevent it from completing. Many routers will display a message when the firmware update has been successfully completed. When the update is finished, re-enter the router's web user interface and begin exploring any new features that have been added. You might also need to re-establish wireless security and any custom settings you made to the previous firmware.

Use Network Jumbo Frames

Enabling jumbo frames can significantly increase your network's throughput while consuming fewer CPU cycles. This applies mostly to performing file transfers within your network. But you can only enable jumbo frames on gear that has a gigabit Ethernet interface, and any devices on your network in the path of the file transfers—your router, your PC, your NAS box, and any other switches in between—must all be capable of passing the same size frames.

If most of your network traffic is Internet-related (file transfers, email, web browsing, etc.), there's not much value in enabling jumbo frames because you don't have a gigabit connection to the Internet. If you use your network primarily for latency-sensitive traffic, such as VoIP or online gaming, enabling jumbo frames could cause performance issues because these apps generally perform better with smaller frames.

Click the Windows 7 Start menu and then right-click Computer and choose the Manage option. Click Device Manager in the left-hand column, click Network adapters in the center column, and then right-click the network adapter you're using to connect to your network and choose Properties. Click the Advanced tab and look for Jumbo Frame in the Property window. Now, choose the MTU size you wish your NIC to operate with. You'll probably want to experiment with these values by benchmarking how long it takes to transfer a large file. If you get a bump in speed at 4K, try 9K. If performance degrades at that size, dial it back until you find the optimum value.

If you want a better understanding of how jumbo frames work, check out this story at MaximumPC.com: http://bit.ly/clrafz.

Special Projects

Ambition—the desire to boldly fly your PC into the computing stratosphere—is one of the dividing lines separating the normal from the hardcore. To qualify as a true power user, you'll need to possess knowledge of at least one of these three special skills.

Install Linux from a Live CD

Understanding Ubuntu is more than a source of pride; it's the quick path to rescuing a damaged OS or an outdated system

One of the quickest ways to prove that you're one of the high-tech hardcore is to run an alternative operating system. In case you can't figure it out, we're not talking OSX here—we're talking about Linux. Despite its reputation as being only for the most advanced users, Linux is actually remarkably easy to install. Here are the steps we take to get up and running.

CREATE A LIVE CD

There are other ways to install Linux, but we're going to show you how to install using a live CD, which is both the easiest and most useful way to go. Simply put, a live CD is a bootable version of an operating system contained on a CD. Almost all Linux distros can be installed from a live CD.

There are tons of distros out there, with different advantages and disadvantages. As usual, we're going to use Ubuntu as it's the most popular, and also the most user-friendly of all the varieties of Linux. To download the Ubuntu live CD, just hit up www.ubuntu.com and click Download Ubuntu. Select the version of the OS that you want (32-bit for more compatibility, 64-bit for a modest performance boost) and download the .iso file.

In Windows 7, all the necessary tools to burn the .iso image to a CD are included in the operating system, so you can just double-click the file you downloaded, insert a CD, and follow the instructions. If you're still on an older version of Windows, you may not have image-burning software. If that's the case, we recommend ImgBurn (www.imgburn.com), which is powerful, lightweight, and free.

INSTALL UBUNTU

Once you've got your live CD burned, just pop it in the tray and restart your PC. You should be given the option to boot from this disc. If you aren't, you'll need to go into your BIOS and change the boot order so that your CD drive is ahead of your HDD. When you boot from the disc, you can choose to install right away, or to try using Ubuntu without installing. If you choose to try it out, you can begin the Windows-like installation wizard at any time by clicking the Install Ubuntu icon on the desktop.

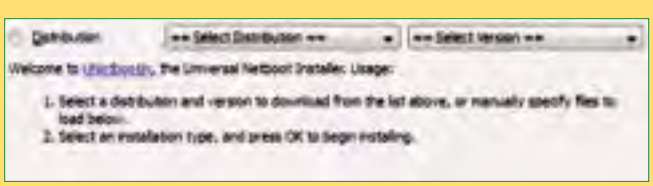
PORTABLE OS

Install Linux from a USB Drive

Live CDs are a convenient way to run or install Linux from any machine, but there's a problem: If a new version of your preferred Linux distro is released (which happens pretty frequently) you're going to have to burn a new disc.

Fortunately, there's a way around this: Use a USB thumb drive. As long as your computer supports booting from a USB drive (most modern PCs do), installing from one is a convenient, easy and economical alternative to using a live CD.

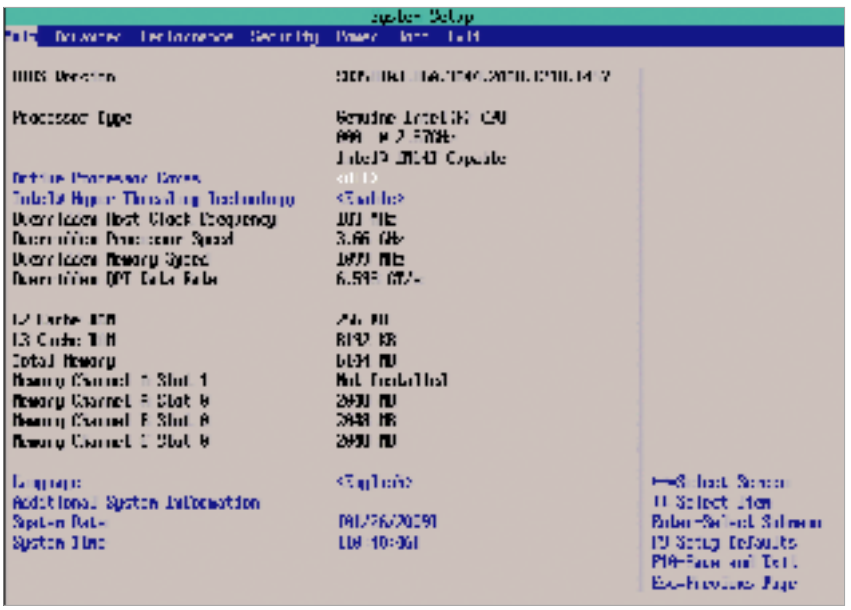
To do it, you just need a small application called UNetbootin, available at http://bit.ly/2UcbwV. Download the application and run it. UNetbootin can make a live USB key from an .iso image, such as the one you downloaded to create a live CD, or it can download a distribution automatically from a long list of Linux options. Select whichever you want, point to a USB drive, and click OK. That's it! Now you just need to plug your thumb drive into a computer and restart.



UNetbootin makes creating a USB drive installer a one-step process.

Overclock Your CPU

It's easier to accomplish than ever, but amplifying your CPU's clock speed is still one of the last frontiers of the power user



Whether you're tweaking the base clock, host clock, front-side bus, or reference clock, the process of overclocking is amazingly similar on the Core i7, Core 2, and Phenom II platforms.

Even if you don't overclock, as the tech expert your friends and family turn to in times of need, you should know the fundamentals of the process.

Overclocking is literally running your CPU out of spec. Isn't this dangerous? Sure, the usual caveats are voiding your warranty, risking data corruption, and even blowing up the CPU. OK, the PSA's over. Let's get on to the fun.

We all know that many new AMD and Intel CPUs can run at far higher speeds than they're rated at for retail, but for sales and marketing reasons, they're locked at lower speeds. Unlocking this free performance is the goal. So how do you do it? There are three major platforms in circulation today: Intel's LGA1156/LGA1366, AMD's Socket AM2+/AM3, and Intel's slowly fading but still quite popular LGA775 Core 2 series.

Despite amazingly dissimilar designs and microarchitectures, these platforms all overclock the same basic way. Each CPU features a clock multiplier. This is a ratio that sets the clock speed when the machine is booted. It's usually something like 20x or 18.5x. In all CPUs except for Intel's Extreme and K chips and AMD's Black Edition chips, this is locked so you cannot increase the multiplier to overclock.

The second half of this equation is the base clock, or bclock, for Intel's Core i7/5/3 chips. (This is equivalent to the front-side bus in the Core 2 parts and the reference clock setting for AMD chips.) Our example will utilize the 2.66GHz Core i7-920 chip. This chip has a multiplier of 20x and a bclock of 133MHz. Take 20 and multiply it by 133 and you get 2,660MHz. Get it? To overclock this chip, we go into the BIOS and slowly increase the bclock. For even the oldest Core i7-920, we can run the bclock up to 160MHz for a total overclock of 3,200MHz. That's a moderate overclock that will likely never give you any problems.

The same concept can be applied to Core 2 and Athlon II/Phenom II processors. AMD chips, however, have a few other settings you need to pay attention to such as HyperTransport speed and north-bridge speed. Since you'll be increasing the reference clock for your overclock, you may unintentionally overclock the Hyper Transport or north bridge to unstable heights. To keep these from becoming problematic, you may have to manually set the HyperTransport and north bridge to lower values.

Memory speeds on all three platforms may also rise beyond what your RAM is rated for as you overclock. On Core ix, Core 2, and Athlon II/Phenom II, you should be able to manually lower your RAM clock speeds to keep the modules within a stable range.

Many midrange and enthusiast motherboards allow you to overclock from the comfort of the operating system.

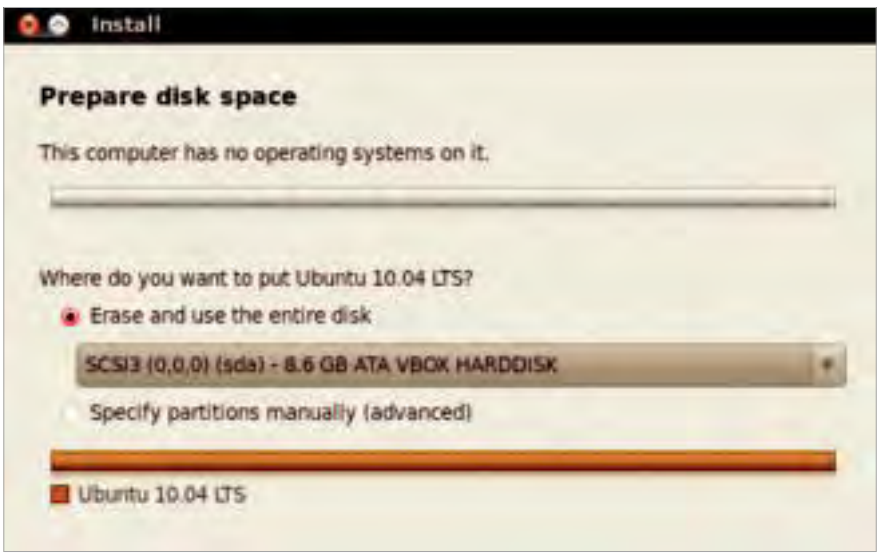
VOLTAGE

Here's where it gets sticky. Not all CPUs overclock equally—even within the same product line. And some will require additional voltage increases to the chip to get to higher levels. A bclock/FSB/reference overclock poses almost no danger. Adding voltage, however, is where you can screw things up.

For the various chipsets and motherboards, you may also have to add a little voltage to the north bridge to hit those higher clock speeds. We recommend that you add voltage judiciously. To find out how much, it's best to learn from others' experiences. Search MaximumPC.com's forums and other enthusiast sites to see how much voltage other people had to add to hit their overclocks. It's likely that someone else out there has already overclocked your system configuration.

Install and Operate a Virtual Machine

The ability to safeguard your system via virtualization can be invaluable. Here's how you make it happen



Just like a real PC, you have to install an OS on a virtual machine.

A virtual machine is exactly what it sounds like—a machine (a computer, really) that doesn't have its own hardware. Instead of having a hard drive, the virtual machine writes to and reads from a single file on the host machine's HDD. Since it doesn't have its own processor or memory, it also borrows those resources from the host.

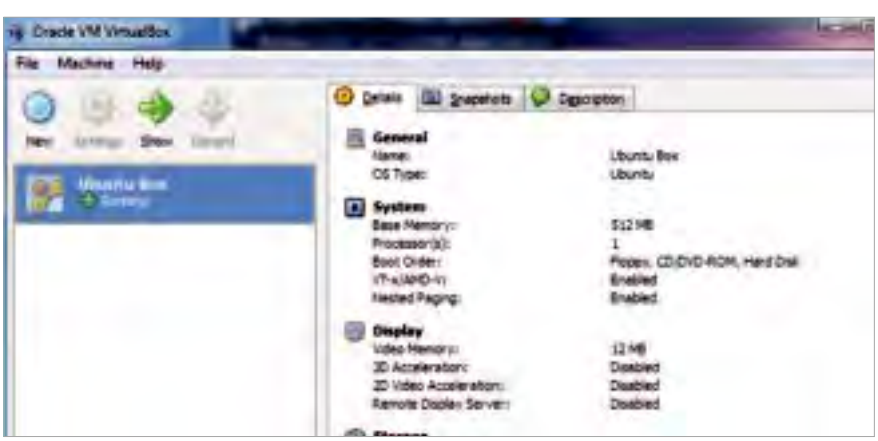
So why would you want to run a virtual machine on your system? For one, because the virtual environment is totally self-contained, anything that goes on in the virtual machine cannot affect the host environment. This makes it an excellent sandbox for trying out software or operating systems that you might not feel comfortable running on your primary system. If you suspect a document might contain a virus, for instance, you can clone a virtual machine, transfer the file onto it, then read the document. Whether or not there's a virus, you can just delete the virtual machine, and your real machine is safe.

Another cool feature virtual machines permit is the ability to support "guest" operating systems. In other words, a virtual machine running on your Windows PC can provide a Linux environment for you to use, without the need to dual-boot or restart and boot from a live CD. Of course, this works the other way, too, so you can use virtual machines to run Windows applications on a Linux desktop.

INSTALLING VM SOFTWARE

Numerous virtual machine solutions are available online, though many are really only for businesses, and most aren't free. There are several popular free offerings, but we're going to focus on VirtualBox, a totally free VM program maintained by Oracle. Getting a virtual machine up and running is easy:

First, visit the VirtualBox homepage (www.virtualbox.org) and download the free application. Install it using the default install settings.

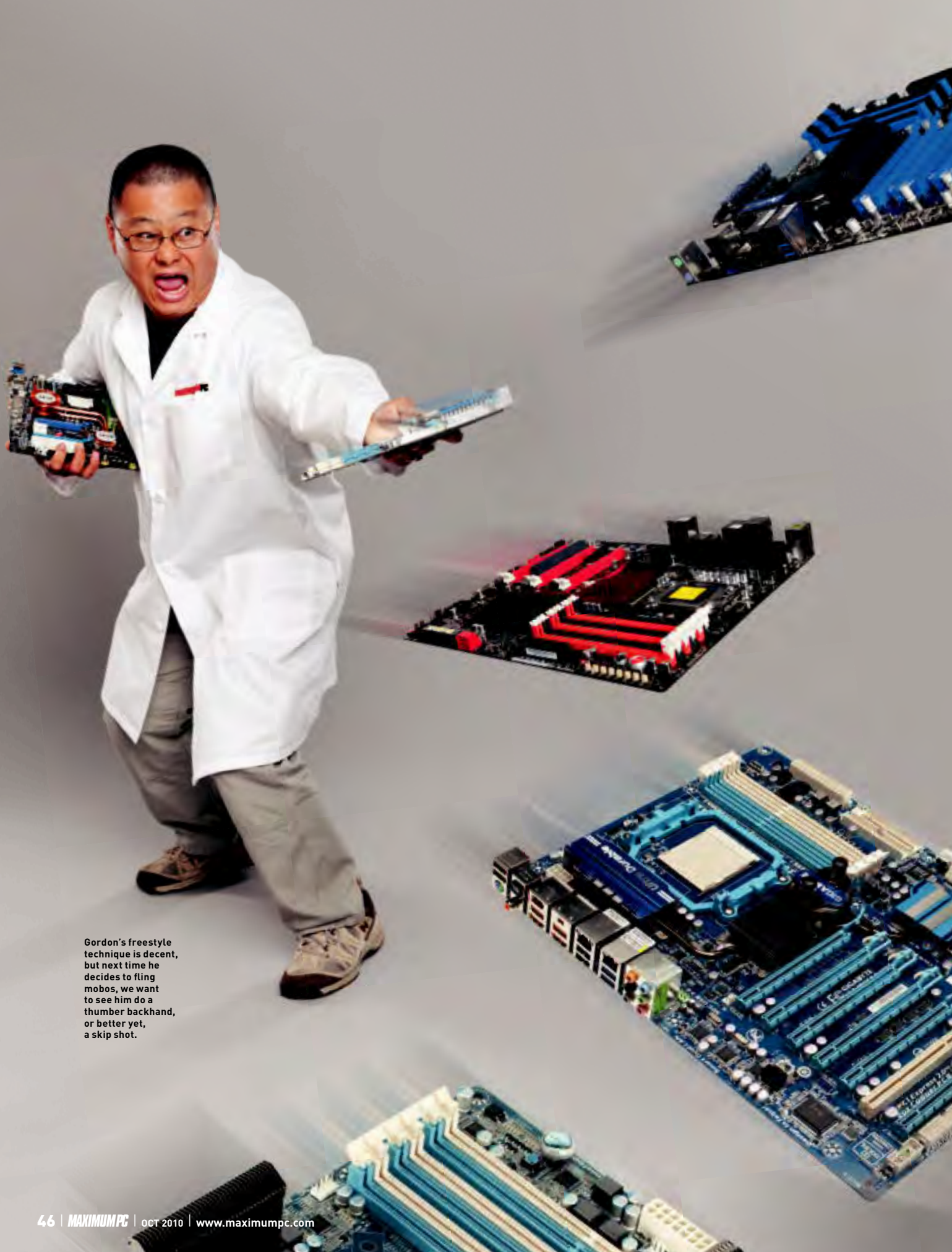


VirtualBox can show you detailed stats for all your virtual PCs.

Once installed, run VirtualBox. The window that opens will be mostly empty at first, so click the New button to create a virtual machine. You'll be asked what operating system you want to install, and how much memory and hard disk space you want to allocate to this virtual machine. Allocating a greater amount means better performance and storage space (respectively), but at greater cost to the host system.

Once your virtual machine has been created, it will appear in the VirtualBox window "powered off." Click it and select Play. VirtualBox will start the virtual machine and run a wizard designed to help you install the OS that you specified when you created it. Generally, this is as simple as pointing VirtualBox to the drive that includes the install CD for your operating system. This can be your Windows install disc, or a live Linux CD, but it has to be bootable.

At this point, you're essentially doing exactly what you would with any new computer. Click through the OS installer, and you'll find yourself with a brand-new virtual PC. When you have the VirtualBox window active, all your keystrokes and mouse movements will be "captured" by the virtual PC, rendering you unable to control your host PC. To switch back to the host PC, just press the "host button," which is Right-Ctrl by default.



Gordon's freestyle technique is decent, but next time he decides to fling mobos, we want to see him do a thumber backhand, or better yet, a skip shot.

Coming at You Fast & Furious: Performance Motherboards for AMD and Intel

We put the top 890FX and X58 mobos through their paces

BY GORDON MAH UNG AND PAUL LILLY

Ready to finally build your post-recession machine?

That's good, because we've decided to round up the best and brightest motherboards available. And we're not talking Micro ATX, sub-$100 budgetrino boards here. We reached for the most feature-filled, over-the-top X58 and 890FX boards from the top three mobo vendors.

Want to know how over the top? One board lets you remotely reboot or overclock it using your cell phone. Another features power connectors usually found only on dual-processor server motherboards. Hell, one has a heat pipe so freaking big, some editors here thought it was some sort of new PCI-E add-in card. And one board is so large, you'll have to buy a case specifically for its generous dimensions.

So if you're ready to build a machine that will motor you away from those recession doldrums, keep reading because the best board here will be the one you want in your AMD or Intel machine.

Gigabyte X58A-UD7

X58

A worthy board for folks still rolling legacy parts

Want to know how insane the enthusiast motherboard bracket has become? Gigabyte's X58A-UD7 seems *pedestrian* next to the other two contenders here. Sure, it has a rakish, liquid-cooling-ready heat pipe to keep the north bridge chilled out, but frankly, without that Hybrid Silent-Pipe 2 in place, the board is damn near boring next to its contemporaries. Where's the dual 8-pin supplemental CPU power connectors? Or Bluetooth remote-control capability, wired remote overclocking tool, or audio riser card?

Instead, it includes a floppy port and parallel ATA port! We haven't seen those since way back in aught nine.

Fortunately, as Han Solo said, the X58A-UD7 has it where it counts, kid.

VERDICT

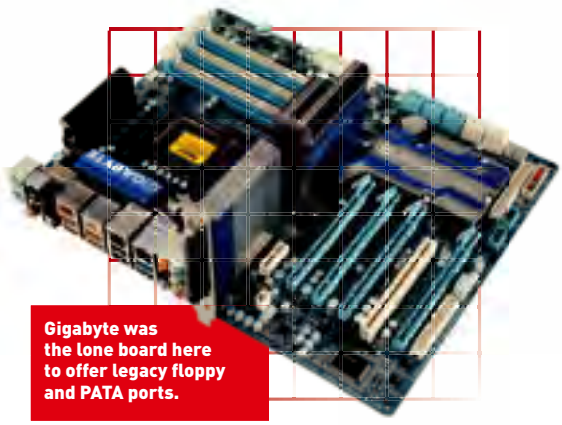
GIGABYTE X58A-UD7
$350, www.gigabyte.com

8

USB 3.0 is there—thank you, NEC—as is SATA 6 courtesy of a Marvell 9128 controller. Four x16 PCI-E physical slots are featured, allowing up to tri-SLI or three-way CrossFireX. You should note, however, that not all slots will run in full x16 PCI-E 2.0 in a three-way config as the X58 chipset doesn't have enough PCI-E lanes to support it. We're also not fans of the PCI-E layout for tri-carders, which is incompatible with most cases.

We certainly can't quibble with Gigabyte's SATA configuration—10 front-facing SATA ports along with two rear eSATA ports. There are also no major layout gaffes—though there is a minor one. When the Hybrid Silent-Pipe 2 is in place, you can't reach the card release for the top GPU with your fingers.

The board's performance is another thing we can't complain about. Thanks to a slight out-of-the-box overclock, the



Gigabyte was the lone board here to offer legacy floppy and PATA ports.

X58A-UD7 hangs in front or near the front in every test. The truth is, X58 boards are pretty even-Steven performance-wise. It comes down to features and bling. And though the X58A-UD7 has plenty to offer, we were more swayed by the competition's bells and whistles and harmonicas.

MSI Big Bang-XPower

X58

Did the universe begin with an LGA1366 CPU and MSI's Big Bang?

One look at the Big Bang-XPower's row of six x16 physical PCI-E slots tells you the board is special. PCI? Feh, who the hell needs that in 2010?

MSI has now also adopted the one-clip DIMM slots that let you easily remove RAM without having to pull out the GPU first. The board also includes a somewhat nifty wired remote to monitor system vitals and perform an overclock. Unfortunately, we found the OC Dashboard a bit buggy. While trying to crank up the bclock using the small device, we had to manually refresh the display in order to see the correct frequency.

MSI is the only board of the three here to include an audio riser card to get the audio codecs off the electrically noisy mobo floor. The "Quantum Wave" card still uses the same Realtek ALC889 chip as the other

VERDICT

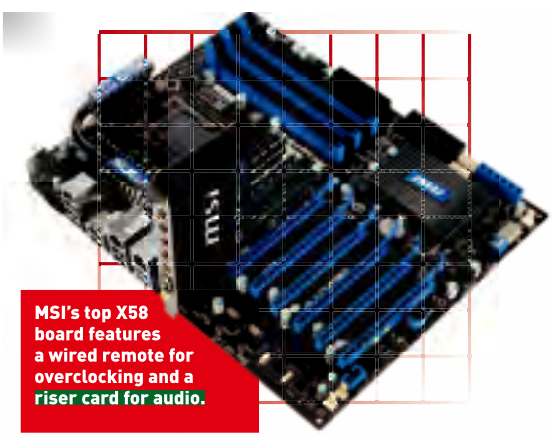
MSI BIG BANG-XPOWER
$300, www.msicomputer.com

9

two boards here, but MSI licensed Creative's algorithms, including ALchemy as well as EAX5 in software.

The Big Bang is aimed at overclockers and it shows. Because extreme overclockers apparently need more voltage than a small city, the Big Bang has not one, but two EPS12V 8-pin connectors to juice the CPU. An additional 6-pin GPU power connector helps feed current to multi-GPU setups. Want to override the standard voltage limits on the board? A set of switches lets you do that. Don't trust the mobo's voltage readout? You can directly check voltage output with a multimeter. Also quite nifty: touch-sensitive surface buttons that let you power on, reset, and vary the bclock. They're no better than standard buttons but they're cooler.

We found few layout issues to beef about, and this is the only LGA1366 board that doesn't impede your access to the GPU release switch. We did find what we consider a bug, though: The board defaults to S1 standby, which keeps all of the fans



MSI's top X58 board features a wired remote for overclocking and a riser card for audio.

whirring and power going to the peripherals. The European EuP 2013 mode, aka use-less-than-1W-of-power mode, is also on, which prevents USB devices from waking the machine. Here in America, we can use more than 1 watt on standby, so set the board to S3 standby, disable the EuP 2013 mode, and switch on "wake on USB."

X58

Asus Rampage III Extreme

This board gives you a reason to use Bluetooth

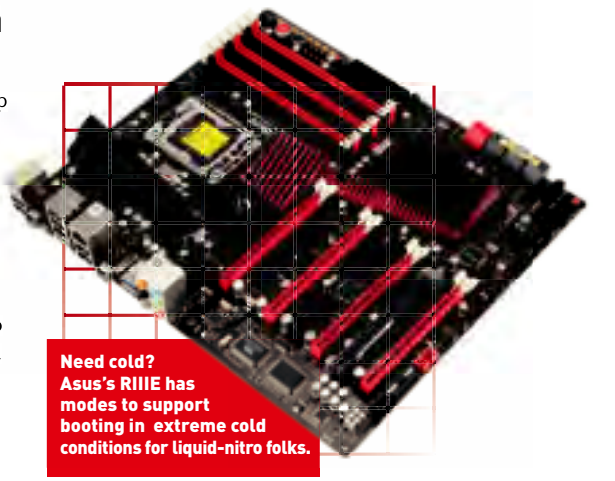
At first glance, you might think the Asus Rampage III Extreme board has just four PCI-E slots, which would be simply wimpy next to the whopping six slots in MSI's Big Bang-XPower. But don't be fooled by the optical illusion. The Rampage III actually has five PCI-E slots capable of fitting full x16 PCI-E cards, and one oddly empty space.

Like the Big Bang, the Rampage III gives you the option of running dual EPS 12V 8-pin power connectors for the terawatts it takes to overclock a Core i7. Additional power for GPUs is provided by two 4-pin Molex connectors on the board (one of which is poorly placed). And also like the Big Bang, the Rampage III's DIMM slots conveniently feature one-clip release latches. In specsmanship, the board plays the same game with discrete SATA 6 and USB 3.0 chips as the other two boards. And in deference to the extreme overclocking crowd, the Rampage III features switches to shut off individual GPUs and multimeter ports to check voltage directly. There's even a switch to enable booting at ultra-low temps when running liquid nitrogen. Seriously.

Perhaps the coolest feature of the board, however, is RC Bluetooth. With the app on your WinMo, Symbian, or Android phone (sorry, iPhone), you can reboot, reset, or monitor the board's temps, clocks, and voltage, as well as plain-English POST codes. We thought we'd hate it but it's surprisingly cool.

Less cool is the north-bridge cooler on the board, which is big enough to block most large heatsinks. In Asus's defense, the cooler is optional and most likely used when liquid-cooling, but c'mon, guys. We do, however, have to give Asus some props for continuing to drill the board out so that it will take either LGA775 or LGA1366 coolers.

Frankly, there's very little to complain about with the board. It's pricey, but it's also feature-packed without being garish.



Need cold? Asus's RIIIE has modes to support booting in extreme cold conditions for liquid-nitro folks.

MAXIMUM PC KICK ASS!

VERDICT **9**

ASUS RAMPAGE III EXTREME
$380, www.asus.com

UP AHEAD

Maximum PC Reads the Motherboard Tea Leaves

For the record, neither AMD nor Intel have told us squat about what to expect out of their next-generation chipsets. Instead, we sifted the Internet rumor mill and grilled motherboard vendors for what little info we could get.

First up, Intel. There have long been rumors of an X68 chipset and new ICH11 south bridge. Those rumors, however, are likely wrong. The chipset is shaping up to be a minor update of the current X58. Expect native SATA 6 support and possibly more PCI-E lanes. We wouldn't expect USB 3.0, though. Rumored to be included in ICH11, USB 3.0 is looking more like it won't be integrated until late 2011.

More important for Intel is the P65 chipset. The company badly needs to update the P55 chipset, which is finding itself starved for bandwidth now that SATA 6 and USB 3 components are arriving. Intel is unlikely to continue compatibility with its upcoming Sandy Bridge CPUs and its current crop of chipsets. There's already talk of an LGA2011 socket for Sandy Bridge that, obviously, is incompatible with LGA1366. The LGA1156 will likely get left out in the cold, too.

AMD's plans are a bit murkier and more secretive. With an integrated GPU, AMD's upcoming Fusion chips is almost certain to require a new socket and a new chipset. Of course, the big question is, will current AM3 boards support AMD's upcoming Bulldozer core? At this point, we're going to give it a 50/50 chance. AMD has been fairly wonderful at giving its users an upgrade path, so it's likely the company could cash in on some of that good will by introducing an updated socket. We can usually count on Intel to make you buy a new board, though. Sigh.

X58: The Final Analysis

With performance essentially equal, it comes down to overall experience

We know, enthusiasts like to see benchmarks and measurements and numbers. But, as we've observed for a long time, performance across the same chipset rarely sees major variances. That lesson is evident here, where there's no clear performance winner. Each board scored minor victories that were most likely the result of a benchmark's margin of error and/or each board's out-of-the-box overclock. The Gigabyte board, for example, runs its bclock at 134.9, which gives it a slight clock-speed advantage. Still, all the boards are fast.

In the overclocking department, we didn't try to wring each board to its fullest potential manually, as that's dependent on the individual overclocker. We did, however, test how each board handled automatic overclocking. Interestingly, all three were pretty safe automatic overclocks, taking our 2.8GHz Core i7-930 to the 3.33GHz Core i7-975 Extreme Edition range without fail. Of course, everyone knows that's a pretty wimpy feat. All three companies are simply being realistic. Folks who use the automatic tools will be happy with what they get but anyone who buys a board designed to boot with frigid liquid-nitrogen is going to overclock manually.

So, what this comes down to are features and the setup experience. Surprisingly, with the amount of engineering and qualification that goes into the top-tier boards, not everything is perfect. The Gigabyte X58A-UD7 was probably the trickiest. Out of the box, with the latest public BIOS and a retail Core i7-930, the board kept falling back to a 15x multiplier, which made our 2.8GHz chip a 2GHz chip. And no, it wasn't in SpeedStep mode. That won't trip up an enthusiast, but Joe 12-pack might not know he's underclocking a chip. Only manually setting the multiplier to 22x gave us the right clock speed.

The Gigabyte's ET6 utility also kept tripping Windows 7's UAC control on each boot. Another kvetch about the Gigabyte board: It's qualified for tri-SLI and includes a bridge, but you will need a special case to accept the last card. Both MSI's and Asus's tri-SLI configurations should fit in most standard enclosures.

Not that the MSI and Asus boards were without fault. As we noted above, MSI's default power configuration was plain wacky. Requiring a user who has just spent a ton of cash on a top-tier board to enable S3 and tweak two power settings to enable "wake on USB" seems wrong. Granted, at $300 on the street, MSI's board is the cheapest of the three here. And we do dig the Big Bang's PCI-E layout and surface-mounted controls.

As for the Rampage III, Asus needs to send its north-bridge fan design back to the drawing board. Besides it not working with large coolers, the fan is shrill and prevents you from reaching the top GPU latch with your fingers. And how 'bout another USB header? The other two boards here pack two USB headers for case front-panel ports, but Asus only gives you one.

In the end, though, those are pretty minor complaints. It was a very close competition between Asus's Rampage III Extreme and MSI's Big Bang-XPower, but the RC Bluetooth mode and out-of-the-box flawless setup give the Rampage III Extreme the edge.

Benchmarks

	GIGABYTE X58A-UD7	MSI BIG BANG-XPOWER	ASUS RAMPAGE III EXTREME
PCMark Vantage 64-bit Overall	**8,993**	8,903	8,940
Everest Ultimate Mem Read (MB/s)	14,618	**15,406**	14,628
Everest Ultimate Mem Write (MB/s)	12,076	**14,776**	12,194
Everest Ultimate Mem Copy (MB/s)	16,470	**17,036**	**17,062**
Everest Ultimate Mem Latency (ns)	59.8	60.2	60.5
SiSoft Sandra RAM Bandwidth (GB/s)	22.8	22.6	23
3DMark Vantage Overall	**15,549**	15,211	15,443
3DMark Vantage GPU	**14,643**	14,415	**14,640**
3DMark Vantage CPU	**18,618**	18,227	18,483
Valve Particle test (fps)	**149**	144	**149**
Resident Evil 5 low-res (fps)	**130.1**	128.2	126.7
HAWX low-res (fps)	175	**177**	174
HD Tune Pro Sustained Write (MB/s)	98.9	**102**	**102**
HD Tune Pro Burst (MB/s)	136.7	136.7	**172**

Best scores are bolded. We outfitted all three motherboards with an Intel 2.8GHz Core i7-930, 6GB of Corsair DDR3/1333, a VisionTek Radeon HD 5850, a ThermalRight Ultra-120, a Western Digital 1TB Caviar Black, and Windows 7 Professional.

Gigabyte GA-890FXA-UD7

890FX

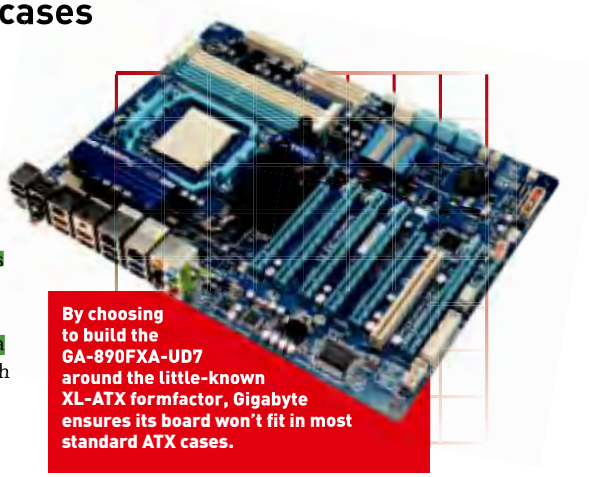
This oversized mobo is incompatible with most cases

Gigabyte has a frustrating habit of releasing a dozen motherboard models per chipset, and sometimes more—we counted no fewer than 15 Gigabyte boards based on Intel's X58 chipset. That isn't the case in 890FX land, where Gigabyte offers just two variants to choose from—the GA-890FXA-UD5, and the board reviewed here.

The differences between the two are big, and we mean that literally. Unlike the UD5, the UD7 ditches the tried-and-true standard ATX formfactor and comes constructed in XL-ATX, which is even larger than Extended ATX (E-ATX). Only folks with full towers need apply, and even then you'll want to verify with your case manufacturer that an XL-ATX motherboard will fit. Gigabyte's Chassis Support List of qualified cases (http://bit.ly/c5CSa2) is disappointingly sparse, though not all-inclusive.

It quickly became apparent why Gigabyte needed all that real estate. The UD7 comes crammed with six PCI-E slots with support for an indulgent quad-CrossFireX setup. Further making use of the ample space, Gigabyte takes you on a trip down memory lane by including both legacy IDE and floppy ports, the only board in this AM3 roundup to do so. This in addition to eight forward-facing SATA ports, onboard buttons (power, reset, and clear CMOS), and a standard PCI slot. We didn't find the kitchen sink, but Gigabyte did the next best thing by tossing in a water-cooling block already attached to the north bridge.

The UD7 came roaring out of the gate by narrowly winning nine out of the 15 benchmarks in our three-way AM3 grudge match, but then faltered when it came time to overclock. Manual tweakers don't have anything to worry about, but using Gigabyte's EasyTune software was laborious. The process took so long we had to walk away, only to return to find that Windows had crashed. Uncool.



By choosing to build the GA-890FXA-UD7 around the little-known XL-ATX formfactor, Gigabyte ensures its board won't fit in most standard ATX cases.

VERDICT

GIGABYTE GA-890FXA-UD7
$245, www.gigabyte.com

7

Asus Crosshair IV Formula

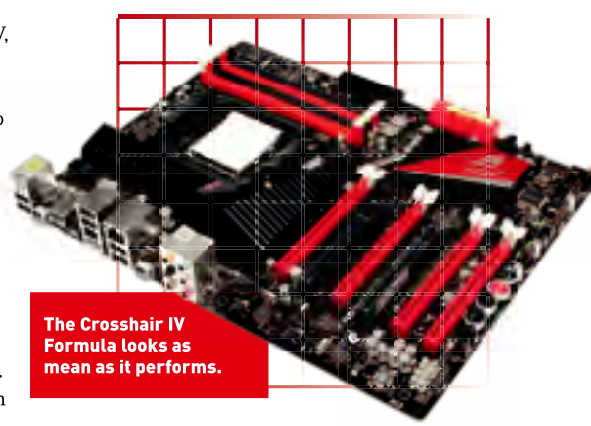
890FX

This motherboard blows (in a good way)

Any old scrap heap will get you from point A to point B, but it's about the ride, playa, and that's where the Crosshair IV Formula shines. Not only does the red and black color scheme look pimp, the board backs up its ferocious style with extensive overclocking controls and enough cooling potential to blow down a brick house. How so? Asus plopped *eight* freakin' PWM fan headers around the motherboard.

AMD users accustomed to building rigs on the cheap might question why someone would want to spend more than $200 on a motherboard, because let's face it, AMD's claim to fame has been to beat Intel on the bang-for-buck front. Boards built around AMD's flagship 890FX chipset, like the Crosshair IV, command a premium, and Asus went the extra mile to help lessen the blow. Subtle touches abound, like the one-clip RAM slots and snag-less I/O panel, both of which we've seen on previous Asus boards. Want more? Try gold-plated audio inputs, a bevy of onboard buttons controlling everything from powering on your board to one-touch overclocking, and the familiar Q-Connector for front-panel connections.

We're just scratching the surface, folks. Asus supercharged the onboard audio with a SupremeFX X-Fi module, which adds groovy effects like EAX and Creative's Crystalizer. Several contact points around the board allow armchair electricians to keep tabs on actual voltages (as opposed to what the BIOS reports) with a multimeter. Asus even tosses in a year-long subscription for Kaspersky Anti-Virus rather than a wimpy 30-day trial.



The Crosshair IV Formula looks as mean as it performs.

If we're to find fault with the board, it's that Asus included two standard PCI ports instead of another PCI-E slot. If you're going to kill off PATA, you might as well go the extra mile and dump PCI, too. That's all that holds this board back from a Kick Ass award.

VERDICT

ASUS CROSSHAIR IV FORMULA
$230, www.asus.com

9

890FX

MSI 890FXA-GD70

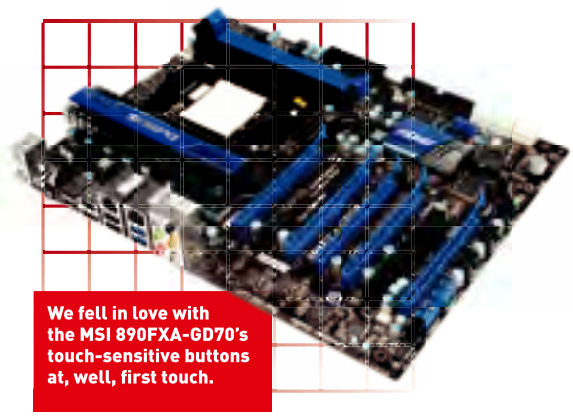
Overclocking made easy (and comparatively inexpensive)

It's almost impossible to drop a processor into MSI's 890FXA-GD70 motherboard without overclocking it. The reason has nothing to do with MSI not letting you run a chip at stock speeds—it does—but the temptation to goose your processor presents itself at every turn. If you're poking around the BIOS, you need only enable the OC Genie Light option for a free speed boost. Alternately, you can turn a knob on the motherboard to make front-side-bus adjustments on the fly. And yet a third way to overclock is to fire up the included Control Center software and start moving sliders, or press the OC Genie button and be done with it. Using the latter option, we were prompted to restart our test bed, at which point the MSI board cranked our Phenom II X4 955BE up from 3.2GHz to a stable 3.68GHz. Not bad.

MSI includes five PCI-E x16 ports on its 890FXA-GD70, two of which operate in full x16 mode when running two videocards in a CrossFireX configuration. A standard PCI port resides toward the bottom, while a single PCI-E x1 port sits near the top. You'll lose this when installing a two-slot graphics card, which we prefer over losing a full length PCI-E port.

We like that MSI positioned the six forward-facing SATA 6 ports slightly lower than most other boards. This keeps them out of the way of overhanging videocards, though you might have trouble reaching those top-mounted optical drives in a lumbering full-tower chassis.

Like Asus's Crosshair IV Formula, MSI's board comes with a plastic connector for the front panel, and both boards sport no-snag RAM slots. But we give the slight edge to MSI for the additional PCI-E slot, extra GbE LAN port, touch-sensitive buttons, and IDE port. And it certainly doesn't hurt that it's less expensive.



We fell in love with the MSI 890FXA-GD70's touch-sensitive buttons at, well, first touch.

MAXIMUM PC KICK ASS!

VERDICT **9**

MSI 890FVA-GD70
$200, www.msi.com

NO SLI FOR YOU!

Don't Expect to Mix AMD with Nvidia Multi-card Configs

Viewed from the comfort of today's X58 platform, the multi-GPU war seems like a hundred yarns ago. Unfortunately, AMD users continue to suffer in the ongoing war between ATI and Nvidia.

Today, if you want to run an Nvidia multi-card configuration, you buy an Intel board. If you have an AMD board, your only choice is to buy CrossFireX. Of course, it's not that Radeon HD cards are bad; in fact, ATI's resurgence with the award-winning Radeon HD 5870 and 5970 cards has many satisfied AMD users.

But still, as capable as the 890FX boards are, why can't you run Nvidia cards if you want to? Is it a technical problem?

Neither company would say, but we're certain it's not. We've seen a clear pattern where you could run either brand of cards in a multi-card setup on any chipset and with any CPU, provided there is enough PCI-E bandwidth.

To try to shed some light on the subject, we attempted to pry info from AMD and Nvidia as to the reason for the hold-up. Unfortunately, we weren't very successful. Nvidia provided us with a terse response: "We have no plans to support SLI on motherboards using AMD chipsets." And AMD was no better. It's apparently quite happy for its customers who want to run two or more cards to have ATI logos on them.

Board vendors aren't so happy, though. Those we spoke with said they've looked at options to get SLI running on AMD boards, and one even said that its engineers have tested hacked SLI running on an 890FX to see if it works and it does just fine.

Unfortunately, there's nothing to force anyone's hand here. When Nvidia faced a situation where Intel chipset users were choosing CrossFire over SLI, the company caved and started allowing board vendors to include SLI support. With AMD's much smaller market share, it appears that the situation won't change until one company blinks.

890FX: The Final Analysis

Does AMD have the moxie to run an enthusiast platform?

We have to give credit to the AMD faithful for sticking it out with the underdog, for what has quite frankly been a bumpy ride. Some of the best times date all the way back to the Barton (Socket A/462) era, in which even high-end boards, like the Asus A7N8X and Abit NFS-2, could be yours for about $100. After that, Socket 939 reigned supreme in Sunnyvale, but not before AMD pissed people off with its stopgap Socket 754 and 940 platforms, both of which had barely left the assembly line before reaching obsolescence.

Here we are on stable ground again. Chalk it up to remarkable engineering or just plain good planning, but while Intel has been busy juggling sockets, AMD has made the most out of its AM2, AM2+, and AM3 platforms with a staggering amount of backward compatibility. The bigger problem for AMD has been the chipset, and most notably the wonky AHCI support. That's been the case even as recently as 790FX, but AMD appears to have finally figured things out with its 890FX chipset. We ran all three boards in AHCI mode, and while we did run into a single hiccup, we can't definitively blame it on AHCI.

So, where does that leave these three enthusiast boards? If we're basing our opinion on performance alone, Gigabyte's GA-890FXA-UD7 walks away with the crown in the narrowest of victories. But for the most part, there really isn't a whole lot that separates these boards in terms of benchmarks other than bragging rights, and even then, is pulling in 155 frames per second in HAWX really worth gloating over with the competition scoring 154.3 (Asus) and 153.3 (MSI)? If it is, then by all means, grab the Gigabyte board, and make sure to pick up a chassis that can accommodate XL-ATX formfactors while you're at it—you won't be cramming Gigabyte's board into your mid-tower.

We're more enamored with the Asus Crosshair IV Formula and MSI 890FXA-GD70. The Crosshair IV wins on sex appeal, and again, if you're splitting hairs over benchmarks, then this time the nod goes to Asus. Throw in the gold-plated audio inputs, Q-Connector, SupremeFX X-Fi module, and enough fan headers to generate a tornado, and you're left with one helluva mobo. So how did MSI earn a Kick Ass award?

To start with, MSI managed to cram one more PCI-E port onto its board than Asus did, and also found room for an IDE port. Sure, the Crosshair IV comes with an additional PCI slot, but now that even soundcards ship in PCI-E form, is anyone even using PCI anymore? Anyone? And while both boards nailed the layout, we like that the SATA ports sit a tad lower on MSI's mobo, keeping them away from overhanging videocards.

Finally, we have to give MSI props for its OC Genie. It took a single button press and a 20-second reboot to supercharge our 955BE by almost 700MHz. And did we mention MSI's board is the least expensive?

Benchmarks

	MSI 890FXA-GD70	ASUS CROSSHAIR IV FORMULA	GIGABYTE GA-890FXA-UD7
PCMark Vantage 64-bit Overall	**11,439**	11,180	9,870
Everest Ultimate Mem Read (MB/s)	7,928	8,043	8,050
Everest Ultimate Mem Write (MB/s)	6,728	6,783	6,790
Everest Ultimate Mem Copy (MB/s)	9,589	**9,947**	**9,966**
Everest Ultimate Mem Latency (ns)	56.8	55.4	55.6
SiSoft Sandra RAM Bandwidth (GB/s)	12.4	12.8	**13**
3DMark Vantage Overall	13,509	13,562	13,504
3DMark Vantage GPU	14,582	14,599	14,632
3DMark Vantage CPU	11,067	**11,179**	10,967
Valve Particle test (fps)	**90**	74.3	76.7
Resident Evil 5 low-res (fps)	79.63	80.3	81.1
HAWX low-res (fps)	153.3	154.3	155
HD Tune Pro Sustained Write (MB/s)	103.4	103.3	105.1
HD Tune Pro Burst (MB/s)	224.3	225.8	**231**

Best scores are bolded. We used a 3.2GHz Phenom II 955 Black Edition, 4GB of Corsair DDR3/1333, a VisionTek Radeon HD 5850, a Cooler Master Hyper 212, a Western Digital 1TB Caviar Black, and Windows 7 Professional. Burst and write tests were obtained with a 64GB Kingston SSD Now.

Dare to Compare

	X58			890FX		
	ASUS RAMPAGE III EXTREME	GIGABYTE X58A-UD7	MSI BIG BANG-XPOWER	ASUS CROSSHAIR IV FORMULA	GIGABYTE GA-890FXA-UD7	MSI 890FXA-FD70
PCI-E x16	4	4	0	3	2	5
PCI-E x8	0	0	0	0	2	0
PCI-E x4	1	0	0	1	2	0
PCI-E x1	0	1	0	1	0	1
PCI slots	1	1	0	2	1	1
Number of x16 PCI-E 2.0 electrical slots	2	2	2	2	2	2
SATA 3Gb/s ports	7	6	6	1	1	2
SATA 6Gb/s ports	2	4	2	6	6	6
SATA 6 controller	Marvell 88SE9128	Marvell 88SE9128	Marvell 88SE9128	AMD SB850	AMD SB850	AMD SB850
Rear ports	7 USB 2.0, 2 USB 3.0, 1 eSATA, gigabit Ethernet, optical S/PDIF, PS/2 keyboard, 5.1 audio, line-in	4 USB 2.0, 2 USB 3.0, 2 eSATA/USB 2.0, six-pin Firewire 400, four-pin Firewire 400, dual-gigabit LAN, PS/2 mouse, PS/2 keyboard, optical S/PDIF, coax S/PDIF, 7.1 audio, line-in	4 USB 2.0, 2 USB 3.0, 1 eSATA/USB 2.0, one six-pin Firewire, dual-gigabit LAN, PS/2 keyboard, PS/2 mouse, 7.1 audio, line-in, optical S/PDIF, coax S/PDIF	7 USB 2.0, 2 USB 3.0, 1 eSATA, gigabit LAN, PS/2 mouse, 7.1 audio, optical S/PDIF, line-in	6 USB 2.0, 2 USB 3.0, 2 eSATA/USB 2.0, six-pin Firewire, four-pin Firewire, dual-gigabit LAN, PS/2 combo mouse/keyboard, 7.1 audio, line-in, optical S/PDIF, coax S/PDIF	5 USB 2.0, 2 USB 3.0, 1 eSATA/USB 2.0, dual-gigabit LAN, 7.1 audio, line-in, optical S/PDIF, coax S/PDIF, PS/2 keyboard, PS/2 mouse
Fan headers	6 four-pin	2 four-pin, 3 three-pin	1 four-pin, 4 three-pin	8 four-pin 8 four-pin	1 four-pin, 3 three-pin	1 four-pin, 4 three-pin
LAN	Intel Gigabit PHY, Bluetooth	2 Realtek RTL8111DLPHY	2 Realtek RTL8111DL	Marvell Yukon 88E8059	2 Realtek RTL8111DL	2 Realtek RTL8111DL
Misc. I/O controller	Jmicron JMB363	Jmicron JMB363, Gigabyte SATA2	Jmicron JMB362	Jmicron JMB363	Jmicron, JMB362, Gigabyte SATA2	Jmicron JMB363
USB headers	One	Two	Two	Three	Three	Two
Firewire controller, header	VIA VT6308P, one header	TI TSB43AB23, one header	VIA VT6315, one header	VIA VT6315, one header	TI TSB43AB23, one header	VIA VT6315N, two headers
Audio Codec	Realtek ALC889	Realtek ALC889	Realtek ALC889	VIA VT2020	Realtek ALC889	Realtek ALC889

USB.3.0

Where's Native Support for the New, Faster USB?

Every motherboard we reviewed here features SuperSpeed USB 3.0, but none has true native support. The blame lies with Intel and AMD, because neither has yet added support for the latest USB spec in their respective south-bridge chips.

To get around this limitation, motherboard vendors have tapped discrete USB controllers from such vendors as NEC to hit those super-fast transfer speeds over USB. That's good enough to get a USB 3.0 logo on the motherboard box, but it's not good enough for true enthusiasts who don't want to be limited to a mere two ports.

So, why the hold-up? It didn't take this long for USB 2.0, did it? Actually, it practically did. USB 2.0 launched in early 2000, with most mobo vendors integrating NEC chips for USB 2.0 support. It wasn't until two years later, when Intel launched its ICH 4 south bridge with the DDR-based 845E, that USB 2.0 became truly integrated.

OK, so maybe we're just being impatient, but we wanted to hear from the chipset makers why the much-requested feature wasn't on tap for this year. AMD's explanation was that it was one of the features that didn't make the priority list when the 890FX (and its accompanying SB850 south bridge) was in the factory.

Intel said it's following the game plan it used with USB 2.0: The spec is finalized, discrete controllers are released and integrated into boards, and then, when there's enough actual hardware out there that needs it, the company will add native support.

The company also refuted tin-foil hat theories that Intel was intentionally sandbagging USB 3.0 in order to push its upcoming Light Peak optical technology. "Light Peak does not compete with USB 3.0. The first USB 3.0 products started to appear in the market in 2009, with a volume ramp expected to begin in 2010, using discrete controllers," the company told *Maximum PC*. "We see Light Peak and USB 3.0 as being complementary, as Light Peak enables USB and other I/O protocols to run together on a single, longer cable and at higher speeds in the future. We expect both to exist together in the market and on the same platform at the same time. The Light Peak initiative does not signify any change to Intel's direction on USB 3.0 or any other existing I/O efforts." For more on Light Peak, see our White Paper on page 64.

ILLUSTRATION BY ADAM BENTON

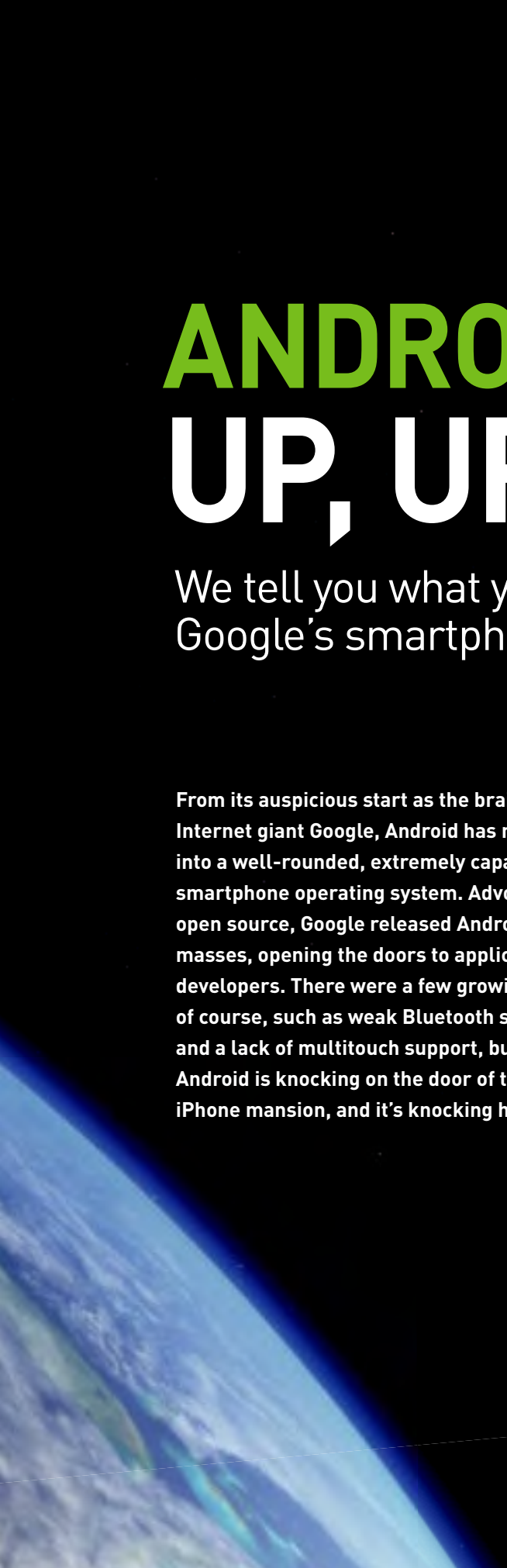
ANDROID: UP, UP & AWAY!

We tell you what you need to know to master Google's smartphone OS

BY PAUL ESCALLIER

From its auspicious start as the brainchild of Internet giant Google, Android has matured into a well-rounded, extremely capable smartphone operating system. Advocating open source, Google released Android to the masses, opening the doors to application developers. There were a few growing pains, of course, such as weak Bluetooth support and a lack of multitouch support, but today, Android is knocking on the door of the iPhone mansion, and it's knocking hard.

Android hardware offers some of the most powerful smartphones we've ever seen. The Android Market app store is growing strong, and the Android user base is expanding just as fast. Android phones are flying off the shelves faster than they can be created, so we think it's about time we put together a guide for the Android power user. On the following pages, we'll walk you through what you need to know about Google's mobile OS and how to make the most out of it.



General Usage Guide

Using Android is relatively straightforward, your basic touch-screen interface. You'll find that many applications and functions utilize the "long press," where you hold your finger to the screen rather than just tap it. Think of a long press as a right-click on a mouse; it will bring up additional functionality for the object you press. All of this will be familiar to anyone coming from any other touch-enabled smartphone.

When coming from an iPhone, though, the transition can be somewhat awkward because the Android platform brings several additional buttons over the iPhone's single-button interface. Get comfortable with Android's Menu button, as it's essential. You'll find that many settings, functions, and options can only be accessed via the Menu button. Holding the various hard keys can also bring up additional functions; for instance, holding the Home button will open a list of recently used apps.

For Android devices with a hardware keyboard, you also have the option of using keyboard shortcuts, which are done through combinations of keys. You can create custom shortcuts under the Quick Launch option in the Applications section of your phone's settings.

DEFAULT KEYBOARD SHORTCUTS

QUICK LAUNCH

- Search + B = Browser
- Search + C = Contacts
- Serach + E (or) G = Email (or) Gmail
- Search + M = Maps
- Search + S = Messaging

INSIDE THE BROWSER

- Menu + B = Bookmarks
- Menu + W = New window
- Menu + R = Refresh or stop page load
- Menu + F = Find on page
- Menu + J or K = Navigate backword or forward

INSIDE MAPS

- Menu + D = Directions
- Menu + M = Change Map mode
- Menu + O = My Location

Optimize Your Android Experience

One of the key features Android offers is the ability to customize nearly every aspect of your device. You can download widgets to keep information available right on your home screen, install custom skins and keyboards, and create notifications and ringtones.

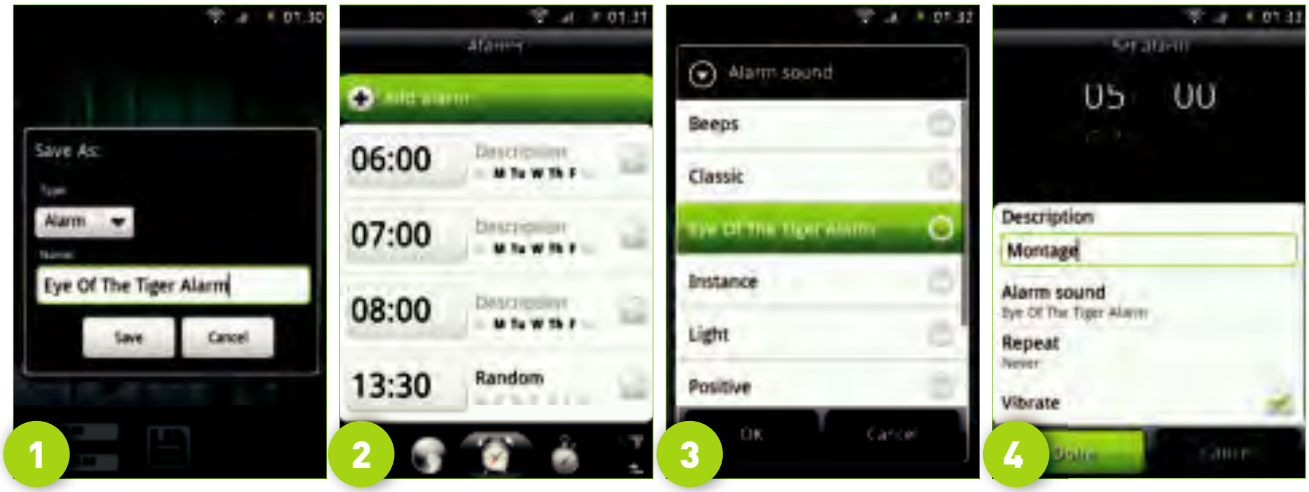
STAY UP TO DATE USING WIDGETS

Widgets are small applications that run on your home screen and keep information right at your fingertips. A simple long press on an empty space on your home screen will bring up the option to add widgets. Because many apps in the Android Market have widgets, there are widgets for just about everything, including texting, Twitter, and email; weather, stocks, and news information; and music controls. Because Android lets you configure several home screens, you can group messaging widgets on one screen, news and weather on another, your music library and Pandora on the next, and so on, keeping all of your important information just a finger-swipe away. Widgets on your home screen are kept active and update regularly, so you have to be careful not to add too many, especially on older and lower-end devices. If swiping between home screens begins to appear sluggish, you may want to consider removing a few widgets.

STAY ORGANIZED WITH SHORTCUTS

Just as with widgets, Android lets you add shortcuts directly to your home screen. Adding a shortcut is done the same way as adding a widget; just long press on an empty

With Android, you can have several home screens, each with its own unique collection of widgets.

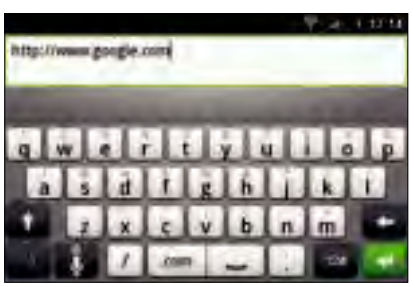


In four simple steps, you can set up a different custom alarm to wake you on each day of the week.

space and you'll see the option to create a shortcut. If there's anything you find yourself doing often with your phone, creating a shortcut can make it even easier. Shortcuts can be created for launching a bookmarked website, calling a specific contact, accessing settings, playing a music playlist, opening a specific inbox, and of course, applications. If you find your home screen becoming cluttered with shortcuts, you can create home screen folders that let you group similar shortcuts together. For instance, you can put all of your email inboxes into one folder, your work contacts into another, and your personal contacts into yet another. One common practice is to create application shortcuts on your main home screen for your top four to eight apps—generally messaging, email, browser, and maps. Then, one screen over, put the runners up, like the Market, contacts, calculator, etc. It doesn't particularly matter where you put your shortcuts or how you group them as long as it's intuitive to you, and you can find them quickly.

FIND YOUR PERFECT SOFTWARE KEYBOARD

One of Android's most criticized features is its default software keyboard, but thanks to Android's unrestrictive nature, there are several great alternatives available both on and off the Android Market. We recommend



The HTC IME modified keyboard is superior to Android's default keyboard.

Better Keyboard (available on the Android Market for $2.99), the HTC IME modified keyboard (http://bit.ly/cd0sBO), and Swype (www.swypeinc.com).

All of these keyboards offer significant improvements over the stock Android keyboard. Better Keyboard has a multitude of skins as well as many customizable settings. HTC IME modified keyboard is a well-made imitation of the keyboard found in HTC's popular SenseUI custom Android skin. Swype offers a unique and original text input interface that greatly improves texting speed.

Installing a custom keyboard is not entirely straightforward, though. You will need to both enable the keyboard in the Keyboard and Language section of your phone's settings, as well as long press on a text box and select the new input method.

USE IDENTIFIABLE RINGTONES AND NOTIFICATIONS

Like all modern mobile phones, the Android platform lets you select and create your own ringtones. Creating ringtones and notifications can be done manually or with the help of an app from the Android Market. Manually adding a ringtone to your phone involves creating several specific directories on your SD card, based on the type of ringtone you'd like to add. The other method is far easier. Simply download the Ringdroid app (free from the Android Market) and use it to edit and trim your audio files before saving them as a ringtone, notification, or alarm.

You can customize notifications and ringtones on a per contact basis by opening the desired contact's information and selecting Set Ringtone. You can change email notifications within the Gmail app (though you might want to select Silent if you receive a lot of emails).You can also set a different song to wake you for each day of the week by creating an alarm ringtone of your favorite songs, and creating an alarm for any given day, selecting the desired song.

With the aHome app, you can apply themes that even make your Android phone look like OSX.

CREATE A UNIQUE LOOK

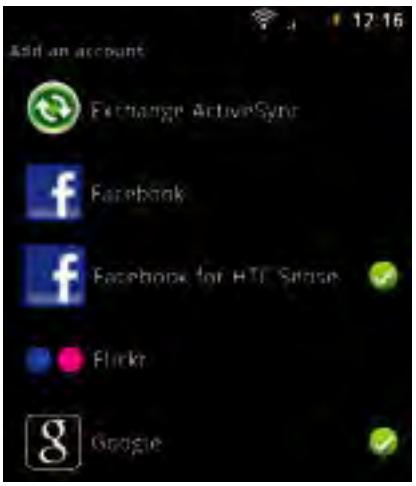
The keyboard and ringtones aren't the only things Android lets you customize. You can also select your own background wallpaper, which for many Android 2.1 devices includes Live Wallpapers that actually move and react to your interactions. Wallpapers are just the tip of the iceberg, though. Apps like aHome, found on the Android Market for $4.99, let you apply skins to just about every aspect of your interface. With aHome, you can download skins, themes, fonts, and widgets to make your Android phone look as unique as possible. Some themes not only change colors and add flare, but also make significant changes to the interface itself, allowing you to customize the way you interact with your phone.

Under the Hood: Tweak Your Settings

With GPS, Bluetooth, 3G (even 4G), and astounding processor speeds, smartphones are smarter than ever. All of this extra intelligence means that the apps can be more complex, information can come faster, and battery management is far more critical. It's important that you configure your settings properly to get the most out of your phone.

SYNC MORE WITH INTEGRATED ACCOUNTS

When first setting up your Android phone, you have the option to add several different types of accounts, including Facebook, Flickr, Microsoft Exchange, and of course, Google. You can always add more accounts after setting up your phone by going into Accounts & Sync under your phone's settings, although only Android version 2.0 and later allows for multiple Google accounts. Here, you'll be able to add additional Google accounts for syncing calendars and email, Facebook accounts, which can sync your contacts (including contact photographs and phone numbers), Exchange accounts for syncing with Microsoft Exchange servers, and Flickr accounts for sharing photos.



Use the Add Accounts screen for syncing additional social networks with your phone.

NETWORK SPEED VS. BATTERY LIFE

Having 3G connectivity is extremely convenient, especially when accessing large amounts of Internet data, like when streaming music or videos, but there are still some places where 3G just isn't available yet. If you live in an area where a 3G signal is poor or nonexistent, it can adversely affect your phone's battery life. When a 3G phone is on a 2G network, it significantly boosts its transmitting power in hopes of finding that faster 3G tower, which drains your battery even faster. Fortunately, Android lets you disable your 3G antenna if you are on the edge or outside of a 3G coverage area. You can do this by going into your phone's settings under

MUST-HAVE APPS

Staples for Your Android Arsenal

Just like the iPhone, Android is nothing without apps. We consider the following applications to be essential for getting the most out of your Android phone.

ASTRO FILE MANAGER Today's smartphones are quickly approaching the capabilities of modern computers. They can already browse the web, play music and video, take photos, and edit documents, all while streaming it up and down the internet. Managing all of this data would be impossible without the help of a file manager. Astro File Manager, available on the Android Market, is currently the pinnacle of Android file managers, and, at least for now, is completely free. Astro doesn't just let you look at a file tree of your SD card; it gives you a full-featured toolset for managing your files. With Astro, you can cut, copy, paste, and delete as well as zip and unzip files, install apps, view photos and documents, play videos, and search and transfer files.

ADD A TASK MANAGER Android is touted as the king of multitasking, and it certainly does that very well. Unfortunately, this puts a lot of faith in developers, trusting that they will manage their resource consumption fairly and diligently. Unfortunately, this isn't always the case. There are always a few apps that will run unnecessarily in the background, slowing down your phone and eating up your battery. A task manager allows you to close the background processes you don't need, freeing memory and saving battery life. Several great task managers can be found in both free and paid versions on the Android Market, the most popular of which are Advanced Task Manager and TasKiller, which both allow for configurable automated task killing. Both are available in free "Lite" or ad-supported versions, but even the full versions are less than $1.

UPGRADE YOUR MESSAGING APP Apart from the standard keyboard, Android's stock messaging app, while perfectly functional, is another weak link in the platform—it's biggest downfall being a bland interface and barren feature list. Fortunately, all of this can be remedied with a quick trip to the Android Market where you can find Handcent SMS and Chomp SMS, both free, feature-packed messaging apps. Each offers a similar feature list, capable of sending

Mobile Networks in the Wireless & Networks category. You will see an option called Network Mode or Use Only 2G Networks, depending on your device. You will want to select the GSM Only option or check the box for 2G Networks. This same concept can also be applied to 4G phones like the EVO 4G.

MORE POWER-SAVING TIPS

As you can imagine, it would be a real pain to change your phone's settings every time you entered or exited a 3G coverage area. The Android Market offers a ton of setting-toggling widgets, both free and paid. There are widgets for toggling everything, including 3G/2G, GPS, Bluetooth, Wi-Fi, and screen brightness. If battery life is your priority, keep all of these settings off until you need them. Information syncing is the next big battery killer. Many widgets, like stocks, news, and weather, for example, connect to the Internet regularly for updated information. For most of these widgets, you can specify the update interval either while placing the widget, or while inside it through its settings. It's best to avoid short intervals, like five minutes, because they will have a significant effect on battery life. Two-hour intervals are generally ideal, especially for nonessential information. You can also turn off background syncing altogether in the Accounts & Sync section of your phone's settings. This will allow applications to sync only when they are in the main window.

You can find the Searchable Items category under Search in the main Settings menu.

CONFIGURE YOUR SEARCH SETTINGS

Being a creation of Google, it's not surprising that Android offers a plethora of search functionality. If you're constantly using your phone to search the web, you've probably found the Android Search widget and have it smack in the middle of your home screen, but there's more to that little search bar than meets the eye. Hidden under the Search category in your Android phone's settings are some very useful tools. Under the Google Search Settings, there is a checkbox that enables web suggestions. When you're typing with your thumbs, this is extremely useful, as it lets you type the first couple letters of your query and returns a list of probable entries. You'll also want to look into the Searchable Items option, where you'll be able to configure exactly where that Search widget looks. You can set it to search the Internet, your contacts, your music, your mail, even your text messages.

LOCATION, LOCATION, LOCATION

Mobile phones have had Assisted GPS for quite some time now, but it wasn't until somewhat recently that true turn-by-turn directions and other location-based services came to the mobile-phone platform. That being said, you'll notice a couple options under the Location settings of your Android phone. The first, Use Wireless

and receiving MMS messages, saving attached files to the SD card, and customizing conversation threads. Which to choose is primarily a personal preference. The most significant difference is that Chomp SMS has a powerful widget while Handcent SMS instead has a sophisticated popup notification box. Both offer a great alternative to the standard messaging app.

Chomp SMS provides a clean interface and handy home screen widget.

LOCALE Available on the Android Market for $9.99, Locale is relatively expensive, but it's one of the best apps on the Android platform. With Locale, you can program your phone to be aware of its location at all times, and adjust its settings accordingly. For instance, when you get home or arrive at work, Locale can automatically enable Wi-Fi and turn it off again when you leave. It can put your phone on vibrate when you walk into the conference room at work or into your favorite movie theatre. It can block calls from specific people based on your location or the time of day. There are also plugins available that allow other applications to launch or perform specific actions with location or time cues from Locale. With the proper setup, you may never have to manually change your settings again.

WAVESECURE MOBILE SECURITY Losing your cell phone can be a nightmare. Smartphones are expensive to replace, and then there's always the fear that should someone find it, they can potentially wreak havoc with the information that might be on it—usernames, passwords, phone numbers, maybe even credit card numbers. WaveSecure, a free app from the Android Market, gives you several lines of defense. If you've only misplaced your phone, WaveSecure can enable your phone's GPS and relay its exact location to you. If it turns out that your phone has been stolen, WaveSecure can lock it remotely, back up your data, and even wipe your data clean, ensuring that the thief can't do anything like steal your identity or rack up a huge phone bill.

The WaveSecure app helps you find your phone when it's lost and protect your data when it's stolen.

Networks, is a course-positioning system, which triangulates your approximate position based on tower signal strength. It's accurate to about 1.5 miles, which makes it useful for most any location service that goes by zip codes. The other, Use GPS Satellites, is the true AGPS setting, which can be accurate up to three meters. This must be enabled for features like turn-by-turn directions and track recording. While using network location only will save some battery power, Android is actually very adept at managing the GPS receiver to the point that you will not see much of a difference in battery life with both settings enabled at all times.

GET MORE OUT OF MAPS WITH GOOGLE LABS

Google Maps is by far one of the most used apps on the Android platform. You can use it to search for nearby businesses, complete with addresses and contact information. It can also give you directions, and for devices with Android version 2.0 and later, live turn-by-turn instructions. While all of these features are great, there are actually more, somewhat hidden features available through Google Labs. To access these features, hit the Menu button while in the Maps app and select More. You'll see the Labs option, inside of which is a list of independently created and unreleased features, such as a scale bar, a point-to-point measuring function, and additional shortcut buttons.

Google Labs is accessible in the Maps app via Menu > More > Labs.

Root Your Phone for Extra Funtionality

Although Android is an open platform, cellular carriers still like to put certain restrictions on their devices. Wireless tethering is a prime example. The Android platform is more than capable of wireless tethering, but without root access to the system, it's impossible. Up until the release of Android version 2.2 Froyo, you had to "root," or hack, your Android phone to get wireless tethering (with a few exceptions). Prior to Froyo, running applications from the SD card was also not possible without hacking root privileges. Rooting also allows for various other functions that apps on the Android Market provide, such as overclocking, and taking screenshots.

Rooting has another great advantage, as well. It allows you to install custom ROMs. While Froyo is bringing a lot of root-only functionality to official Android releases, it's hardly available on a single model. By way of a custom ROM, Froyo can be ported to devices that do not yet have Froyo or may never get it. The same has already taken place for 2.1 Éclair, bringing it to devices months before the manufacturers released an official update. For a more detailed guide to installing custom ROMs see our article on Maximumpc.com: http://bit.ly/asXmB9.

OS vs. OS

If Android's So Great, Who Needs Chrome?

Android's adoption rate has been growing steadily, and so has the Android platform, from its humble beginnings on a single device as Android 1.0, to its numerous hardware and software upgrades in its current form as Android 2.2. Of course the updates will keep coming, introducing new features and utilizing new technologies. Just recently, rumors of Android 3.0 surfaced, suggesting that Android was branching out from the mobile-phone market. Google was quick to denounce these rumors, of course, as Android is and always will be a mobile phone OS, but that hasn't stopped the OS from spreading its wings.

Android's open nature has allowed manufacturers to experiment with the OS on other platforms, including tablets and netbooks. Even Google's newly announced Google TV is created for Android, and will pave the way for Android-powered HDTV's like Sony's Dragonpoint. It's possible that Android's success has exceeded Google's original intentions and has become a potential threat to the company's upcoming Chrome OS, an operating system designed to be as lightweight as possible, ideal for tablets and netbooks.

Android and Chrome OS have some similarities. Both are designed to have a small operating footprint, are ideal for ultra portable devices, and utilize an app-driven interface. The similarities end there, though. Chrome OS puts an entirely different spin on the operating system. Instead of providing you an interface with your hardware, Chrome OS is simply an interface with the Internet, basically a web browser with a few system management features. The goal behind Chrome OS is to alleviate the need for local storage; everything is stored on the cloud. Its applications are almost all web-driven, capable of being run in a standard web browser. As Google has stated, "Chrome OS is being created for people who spend most of their time on the web."

Android, while capable of always being connected to the Internet, is designed as much more than just a web browser, and if Android were created to work in the same sense as Chrome OS, every Android user would have his or her data plan revoked due to exorbitant data use. While the two operating systems overlap, Chrome OS has a much more specific target than Android, and the two should be able to coexist without much issue.

WHITE PAPER

Light Peak

Intel's optical bus aims to supplement—or replace—most of your current connectors –ZACK STERN

Make room in your desk drawer for more obsolete cables. Buses that rely on electrical signals might soon be replaced with fiber-optic alternatives that use light waves, if Intel has its way. "Electrical interconnects have some practical limits we're starting to see," says Victor Krutul, director of Intel's optical I/O team. "When you go through a connector, you get reflections and noise; you get electromagnetic interference."

Intel's optical Light Peak technology replaces copper wires with laser pulses traveling through fiber-optic cable. Not only does it not suffer from any of copper's shortcomings, it's capable of transferring data at speeds up to 10Gb/s in 100-meter lengths. And Intel is already planning to scale the technology to 100Gb/s.

LIGHT PEAK TECHNOLOGY IS CAPABLE OF DATA TRANSFER RATES OF 10GB/S

Rather than functioning as an entirely new data bus, Light Peak will serve as a wrapper for existing buses. A single cable will be capable of carrying USB 3.0, HDMI, and other digital signals at the same time. Intel is meeting with consumer-electronics manufacturers to develop a Light Peak standard and to form a consortium, although Intel has already defined much of the technology. We'll explain how Light Peak works—from the controller chip to the optics and cable—and where USB 3.0 fits into all of this.

CONTROLLER CHIPS AHOY

Light Peak is a bridging technology that begins and ends with Intel's 12mm-square controller chip. This silicon sliver can drive two Light Peak ports and performs three primary tasks: enumeration, routing, and power management.

At the enumeration level, a handshake occurs, during which Light Peak devices identify themselves. Plug a Light Peak–enabled HDMI display and USB keyboard into your PC, for instance, and the Light Peak controller will be informed that you've connected an HDMI display to port one and a USB keyboard to port two.

From a routing perspective, the I/O controller inside the PC (or other device, as the case may be) transmits native bus signals—USB 3.0, DisplayPort, PCI Express, and more—to the Light Peak controller. The controller keeps the data intact, but translates it from electrical current to pulses of light capable of traveling over the fiber-optic cable. A Light Peak controller inside the receiving device—a NAS box, for example—then translates those pulses back into electrical current.

The transmitting Light Peak controller adds a header on top of the data packets, so that the receiving controller can identify them and send them on to the proper device. This all happens at the transport layer, so the OS doesn't require any Light Peak software for the hardware to work.

Power management is the third leg of the Light Peak stool: Intel expects that Light Peak cables will include copper wire to carry electrical power as well as fiber optics for data. And when a device that's connected via a Light Peak cable stops sending data—when your MP3 player finishes syncing to your PC, for example—the controller will automatically shut itself off to conserve power.

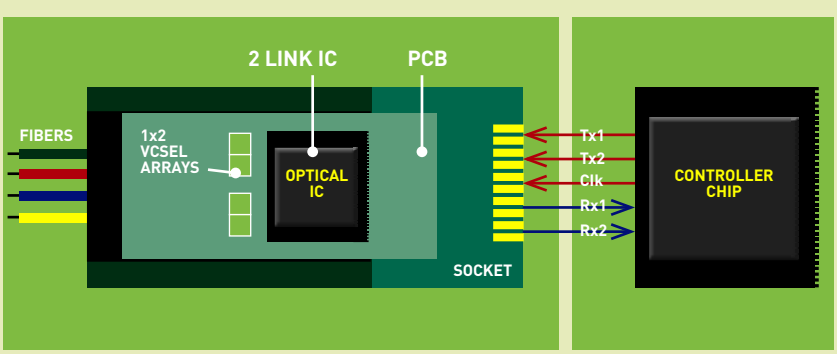
A CLOSER LOOK AT OPTICS AND CABLES

Photo detectors, lasers, and other components transmit and receive Light Peak signals. The photo detector remains active at all times, looking for data. When a connected device produces a signal using its tiny laser (a 250-micron-square vertical cavity surface-emitting laser, or VCSEL, to be precise), the detector wakens its corresponding controller chip.

Intel will add lasers to reach 100Gb/s speeds. "With optical, you can use wavelength-division multiplexing, or WDM,"

HOW IT WORKS

A Light Peak Connection



Light Peak devices will transmit data using light waves, instead of electrical current. Boasting a data-transfer rate of 10Gb/s, Light Peak is capable of transferring a full-length Blu-ray movie in less than 30 seconds.

according to Krutul, "which is just a fancy way of saying I can put multiple colors of light on a fiber. One can use a prism-like device to mux [multiplex] the different colored lasers into the fiber [at one end], and a second one at the other end to demux [de-multiplex] them."

Light Peak cables are bidirectional, utilizing a single 125-micron fiber-optic strand to send data and a second one to receive. The cables are 99 percent fabricated from glass; the balance of the material is a doping agent. Intel considered using plastic fiber, but opted for glass because it delivers superior bandwidth. As we've already mentioned, a copper strand will carry electrical current to power devices.

Each fiber strand boasts an active area of 62.5 microns, providing ample tolerance to envelop the lasers' eight-micron beams. Intel specifies multi-mode strands, which means the light waves follow multiple paths as they travel down the strand. Multi-mode fiber delivers higher bandwidth than single-mode fiber (in which light waves travel in a straight path), but the signal can become distorted by the time it reaches the end of the strand. That's why Light Peak cables will be limited to 100 meters.

SETTING STANDARDS

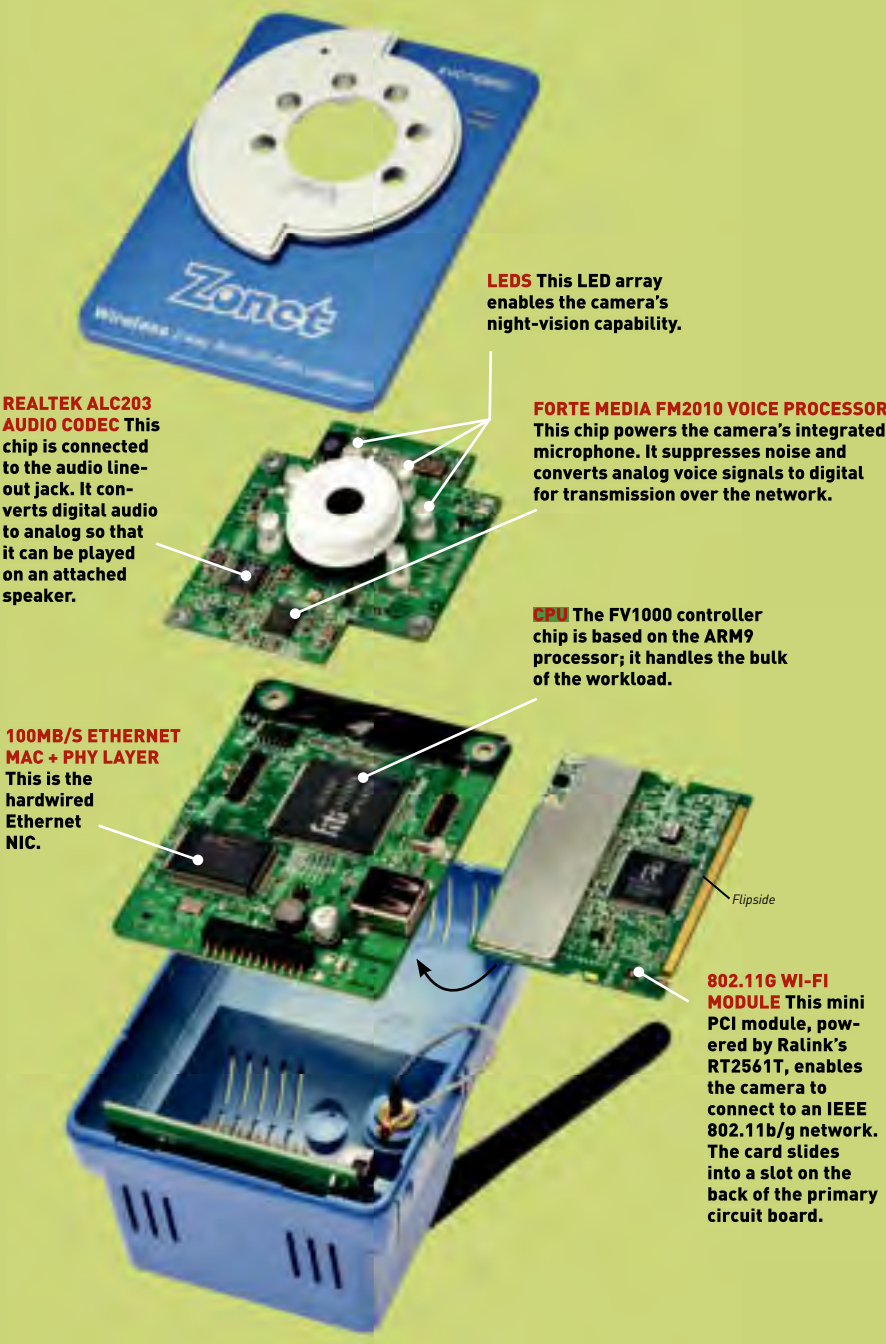
Intel hasn't formally announced any OEM partners that will put Light Peak into consumer devices, although executives from Sony and Nokia have publicly announced their support for the technology. Intel is developing the Light Peak controller chip and has recruited Avago, Ensphere Solutions, FOCI, Foxconn, Foxlink, IPtronics, and SAE Magnetics to build the lasers, optics, and cables.

If you're wondering where that leaves USB 3.0, which Intel has yet to support in any of its chipsets, Intel says not to worry. "Our work with Light Peak in no way signals a change of our support for USB 3.0," Krutul says. "We expect that both of them will be in the market simultaneously—maybe even in the same PC."

Intel had anticipated that Light Peak consumer devices would ship in 2010, but Krutul says the company has revised its target. "We expect companies will start announcing components at the end of 2010, and that we'll see Light Peak integrated into computers and devices in 2011."

Wireless Night-Vision IP Camera

This security camera's formfactor probably looks familiar. Fitivision Technology built private-label versions of it for Swann, Trendnet, Zonet, and others.



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

68 GET LINUX POWER ON YOUR WINDOWS PC WITH CYGWIN

70 KEEP AN EYE ON YOUR HARDWARE WITH HWMONITOR

GO GO GADGET RSS READER

ALEX CASTLE
ONLINE MANAGING EDITOR

Gadgets made their first Windows appearance in Vista, as part of the Sidebar. With the release of Windows 7, they were freed from the shackles of the Sidebar—able to be placed anywhere on the desktop. However, they're still not found on most users' desktops. We think that part of the problem is the shoddy selection of gadgets found in the gadgets window by default. Here are three alternatives:

▶ Install a simple, multifunction search bar on your desktop with MultiSearchIt (http://bit.ly/hXdoQ).

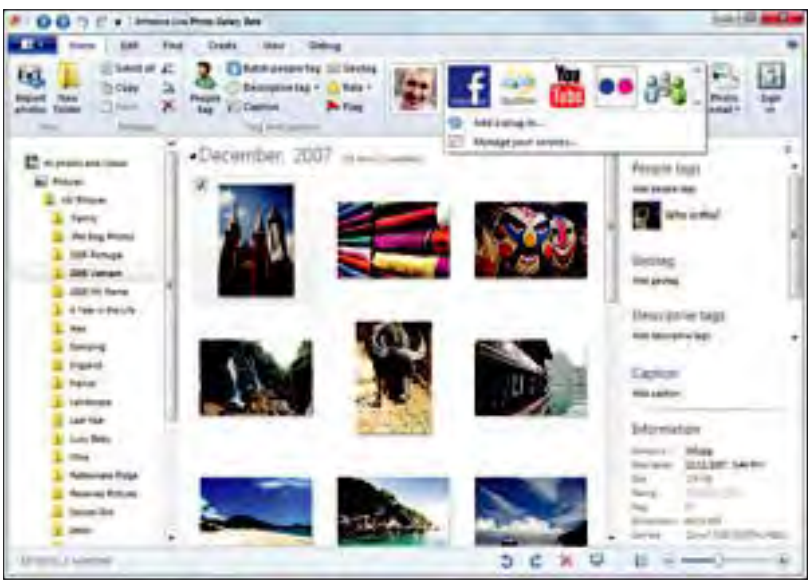
▶ Instead of the default CPU meter, try HWMonitor Meter (http://bit.ly/bQTT1o). Then read our how-to on page 70.

▶ If you use Twitter, you can update from your desktop with Twitter Explorer (http://bit.ly/sb5uU).

To bring all your gadgets to the front of the display stack, use the Win + G hotkey.

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



Check out the new Windows Live Essentials

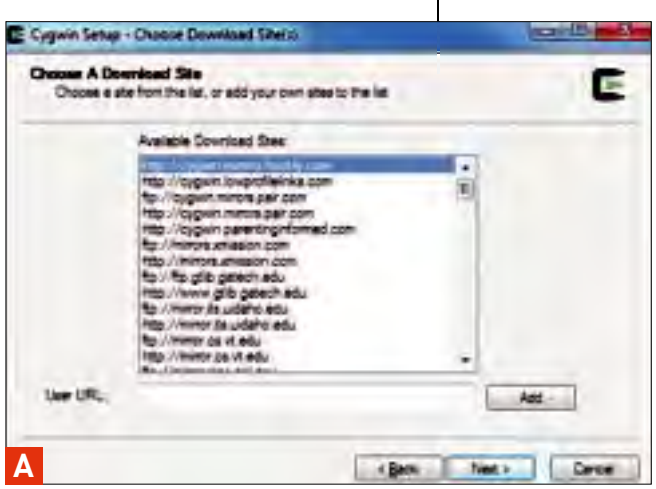
The new version of Windows Live Essentials—the optional set of multimedia and social tools from Microsoft—is now available for download (in beta) at http://bit.ly/aMGhSm. The differences in the 2011 version of the software include new interfaces, new features, and more integration. For details about all the new features in Windows Live Essentials, check out our article online at http://bit.ly/cZAdQU.

Get Linux Power on Your Windows PC with Cygwin

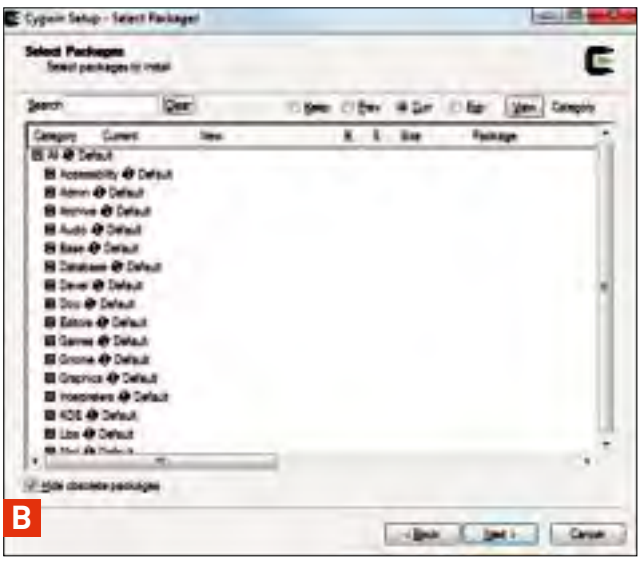
In this month's "Essential Geek Skills" cover story, we show you how to install Linux from a bootable CD. We believe that everyone who considers themselves a computer enthusiast should have at least some experience with a Linux environment, but it can be daunting to just jump into the deep end of a completely unfamiliar operating system. We recommend you first get your feet wet with Cygwin, a free program that provides you with a Unix-like command line, without having to leave Windows. Cygwin is not a Unix emulator (it cannot run native Unix programs, although it does contain the tools needed to compile and run a program from source code), but it does have a wide array of optional packages that let you use most of the tools and utilities that you would commonly use in Unix, in Windows. In this guide, we'll show you how to get Cygwin set up, the basics of how to navigate a Unix file system, and how to find more information as you need it. –ALEX CASTLE

1 INSTALL CYGWIN

To get started with Cygwin, go to www.cygwin.com and click the link that says "Install or update now." Run the setup.exe program that gets downloaded, and when asked, select the Install from Internet radial button.



A



B

The location that you choose to install Cygwin to is important, because that same folder will (by default) act as the root of your simulated Unix file system. In other words, pick somewhere with a little extra disk space. You'll be asked where to store the downloaded installation files (anywhere's fine, as long as you have enough room to handle what can be a gig or two of optional packages) and what kind of connection type you use. For most people, the Direct Connection setting will be fine.

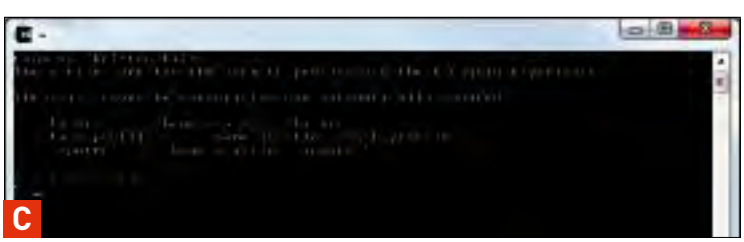
You'll also be asked to choose a mirror to download Cygwin from (image A). You can choose one at random if you want, but since the download might be pretty sizeable (depending on what components you choose to install) it could be worth your time to check out the official mirror list at www.cygwin.com/mirrors.html and select one that's located close to you. You can copy-paste mirror addresses to the User URL field at the bottom of the window.

There will be a short download, then you'll get to the meatiest part of the installation process—the package selector (image B). Here, you'll select which packages you want to download with Cygwin. These packages define what functionality Cygwin will have once installed, and there are a *lot* of them. If your goal right now is to just get your toes wet and see what this whole thing's about, you can leave only the defaults selected, which will provide basic command-line functionality. We'll also show you how you can add any of these packages at any time, so don't worry that you're passing up something you'll need later.

Click through the rest of the installer, and wait for Cygwin to download and install the files it needs. Save the setup.exe file somewhere, because you'll need it if you want to install more packages in the future.

2 RUN CYGWIN

Now that you've installed Cygwin, run it by clicking its entry in the Start menu. You'll see a window with the *bash* shell running—the same shell used


C

by GNU Linux (image C). You should see some configuration files, your Windows user name (which is also your Cygwin username, by default), and a dollar sign, which is the start of the command line. The ~ after your user name shows that your current directory is the home directory—think of it as C:\ in Windows.

That said, the home directory that you're looking at in Cygwin is not C:\, but a folder in your Cygwin directory. By default, your home directory is located in C:\Cygwin\home\[your user name] in the Windows directory tree, and all folders and files you create will be in there. To test this, type `mkdir test` into the command line, then hit Enter. This is the Linux equivalent of the Windows `mk` command, and creates a directory in the current active folder, using the argument as a name.

To see the directory you just created, type `ls`. This displays the contents of the current folder—the equivalent of the Windows `dir` command. You should see your test directory. To switch to that directory, type `cd test` just like you would in Windows. To return to your home directory, type `cd ~` at any time.

Here are some other basic commands you'll need to navigate Cygwin (and Linux):

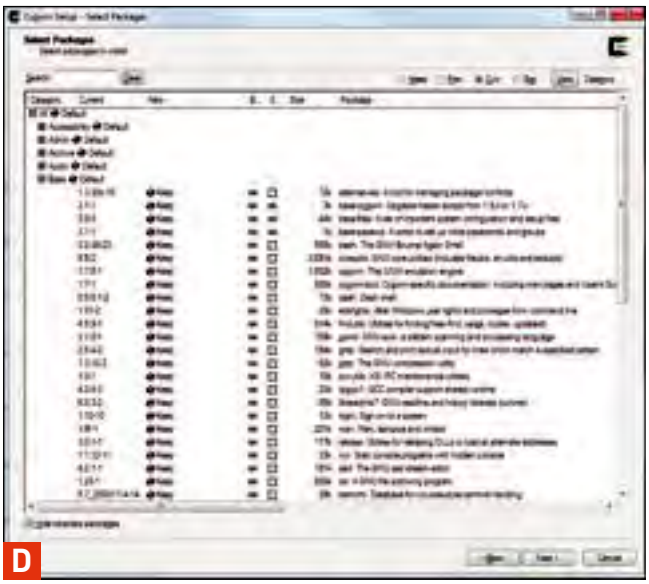
`del [file]` – Delete [file]

`cp [file] [directory]` – Make a copy of [file] and put it in [directory]

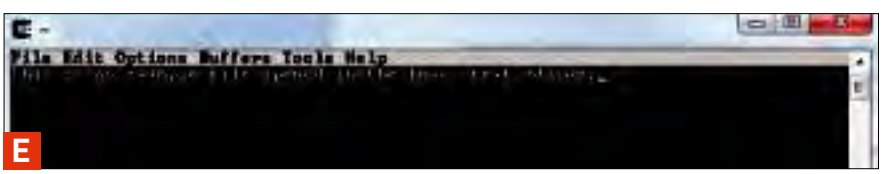
`mv [file] [directory]` – Move [file] to [directory].

3 LEARN YOUR WAY AROUND NEW PROGRAMS

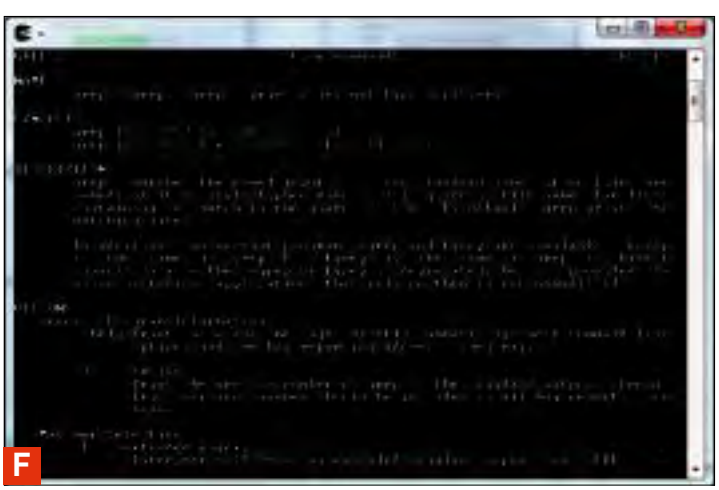
So, that's the basics of navigating around the Cygwin file structure. Of course, if you want to do anything more than shuffle file structures around, you'll need to install more packages. For instance, if you want a more powerful text/code editor, you might do a search and find out there's a very well-regarded program called Emacs available. To download the package, just run the setup.exe program that you used to install Cygwin, and click through to the package selection screen. Packages you downloaded the first time around will be marked Keep (image D) and everything else will say Skip. Find the Emacs package, and click Skip, so that it changes to a version number to download. Finish the setup.exe program, and you'll now have a new text editor for Cygwin. To test it out, type `emacs test.txt`—the Emacs editor will open (image E). But getting around Emacs is pretty tough at first—there are tons of hotkeys to memorize. So how do you use it? For that matter, how do you use any of these programs?


D

Obviously, we can't tell you how to use every command—even a thorough walkthrough of a single complicated command wouldn't fit into this article. Instead, we'll give you a quick primer on how to educate yourself. If you've got a command that you think you'd like to use, but you aren't sure how, entering the command `man` followed by that command (for instance: `man emacs`) will show you the manual page for the command (image F), including a description of what it does, what sort of syntax it takes, and which flags it can accept. In the manual display, scroll down through the document with the space or E key, and scroll up with W or Y. If you want information about a certain topic, but don't know the name of the specific command, use `man -K [search term]` to search through all manual pages.



E


F

Keep an Eye on Your Hardware with HWMonitor

When building, optimizing, or troubleshooting a computer, an adept hardware monitor is an extremely useful tool. HWMonitor allows you to keep track of all of your system's important vital stats, and because it's created by CPUID, creators of CPU-Z, HWMonitor has impeccable support for even the newest hardware. With its temperature monitors, it's an ideal tool for any overclocker, and with its voltage monitors, energy-conscious underclockers will be happy, too. For those with HTPCs or other noise-critical systems, the fan-speed reports will help you identify the maximum fan speeds to keep your system as quiet as possible while still providing adequate cooling. HWMonitor even supports notebook hardware, giving battery-power levels, capacities, and even wear levels. CPUID also offers a Pro version for about $25 that provides additional functionality, like remote monitoring and history graphs. In this guide, we'll walk you through the setup process, and explain HWMonitor's features. –PAUL ESCALLIER

INSTALLING HWMONITOR

You can download the free version of HWMonitor at http://bit.ly/dxeleD, or you can purchase the Pro version, or try it for 30 days, at http://bit.ly/bdmtip. Both versions offer downloads for the setup executable, as well as 64-bit, 32-bit, and Win98 runtime editions. If you're unsure whether you have a 64-bit or 32-bit system, you should download the setup.exe and run the installer. It will automatically check your system and install the appropriate version. Be careful, though, the installer will ask you to install the Ask.com toolbar, and although it appears

to be required, you can actually continue the installation without any of the boxes checked (image A).

If you prefer to avoid the installation dialogue altogether, you can download either the 64-bit or 32-bit runtime directly in zip format. Simply extract the .exe file from the zip file and you're ready to start monitoring your hardware.

Because this .exe file is self-contained, you can also drop it on a thumb drive to use as part of a diagnostic toolkit. If you plan to use HWMonitor regularly, be sure to extract the .exe somewhere you'll be able to find it easily, because by bypassing the installation dialogue, you will not have a Start menu folder or desktop shortcut unless you create them manually.

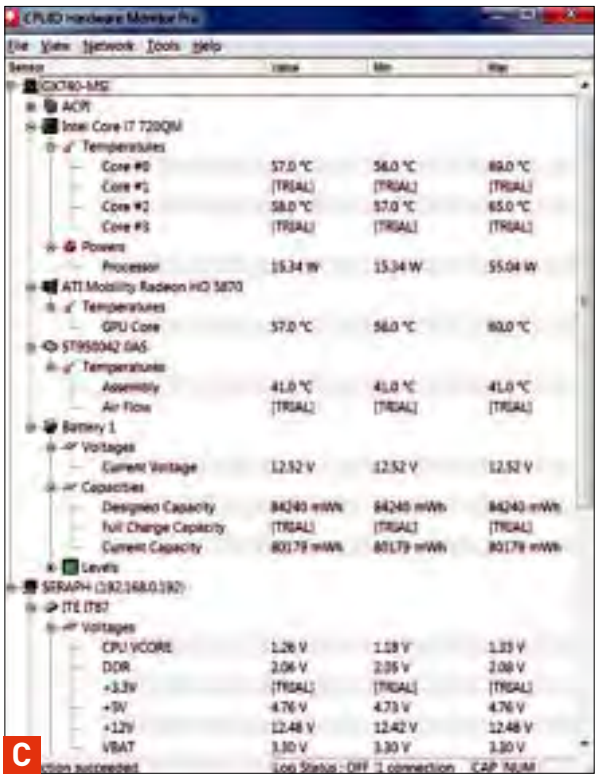
USING THE FREE VERSION

Using the free version of HWMonitor is very straightforward. Because it doesn't have the logging and graphing features of the Pro version, the free version is best used for keeping an eye on the current status of your various system stats; however, it still monitors your system when running in the background and will record the maximum and minimum values over a given time. This way, you can clear the Min/Max values under the View menu before running a benchmark or stress test, and return later to check the maximum values your components reached (image B).

USING THE PRO VERSION

The Pro version of HWMonitor adds a bit of complexity and a lot of additional functionality. The most useful feature you'll get out of the Pro version is the logging capability. The first thing you'll want to do is go into the Tools drop-down menu and configure your Options. The logs are created in graph form as images, with an optional setting to create a CSV file as well. Most importantly, you'll want to set a file path so that you can find the logs once they're created. You'll also notice options for remote monitoring, temperature scales, and even support for live feedback through a G15 keyboard.

Under the Network drop-down menu, there is a Listening Mode option. Selecting this will allow another computer running HWMonitor Pro on the local network to monitor your system stats remotely. With the Connect option, you can connect to another computer that has Listening Mode enabled. You can connect either directly with an IP Address, or through the Enum Network option, which will display a list of discoverable systems on your network. Remote monitoring is great when you need live feedback but don't have the HWMonitor window visible on your desktop (image C).



C

If you're thinking about using the 30-day free trial of HWMonitor Pro to set up and optimize a new system with all the extra features before those 30 days are up, you'll be a bit disappointed. While the Pro version trial does give you access to all of the Pro version tools and functions, it also censors several sensor readings. In fact, the free version actually has more sensor readouts than the Pro trial, but cannot log the data or monitor remote systems.

REVIEWS

Tested. Reviewed. Verdictized.

INSIDE

74 HP ELITEBOOK 2540P ULTRAPORTABLE

75 ASUS ENGTX460 TOP VIDEOCARD

76 EMACHINES ER1402 PC

78 HP ZR30W 30-INCH LCD MONITOR

80 SEAGATE FREEAGENT GOFLEX PORTABLE 500GB HARD DRIVE

82 APPLE IPHONE 4

84 CETON INFINITV MULTI-TUNER PC CARD

85 CORSAIR HYDRO H-70 LIQUID-COOLING SYSTEM

86 PATRIOT INFERNO 100GB SSD

87 CIRGON ENCORE MULTIMEDIA SERVER

88 LIAN LI PITSTOP PC-T1 MINI-ITX SPIDER TEST BENCH

90 PHANTOM LAPBOARD WIRELESS KEYBOARD AND MOUSE

91 SINGULARITY

ONLINE

- EVEN MORE REVIEWS!
- NO BS PODCAST
- BREAKING TECH NEWS
- BEST OF THE BEST

HP EliteBook 2540p

This ultraportable business notebook gets the job done

The 2540p's scratch-resistant finish, spill-resistant keyboard, and mil-spec build quality make it perfect for heavy travel.

In last year's ultraportable notebook round-up (August 2009), HP's EliteBook 2530p put in a strong showing, wowing us with its good looks, sturdy construction, and strong performance. Its successor, the EliteBook 2540p, is strikingly similar in many regards but has the advantage of new and improved components and a lower price.

At 11.1x9.5x1.5 and a lap weight of three pounds, 16 ounces, the 2540p is not the slimmest or lightest business ultraportable out there, but frequent travelers will no doubt appreciate how solid it feels. The notebook—which is built to military standards for toughness, we're told—sports a magnesium-alloy casing with a scratch-resistant brushed metal exterior, durable hinges, and a secure clasping mechanism. The keyboard is sizable and easy to type on, and you're given both a touchpad and TrackPoint for navigation. The notebook also offers a handy, popout keyboard light.

Sounds like last year's 2530p, right? That is, until you get to the processor. The 2540p's Core i7-640LM naturally trumps its predecessor's Core 2 Duo SL9400 with a higher clock speed (2.13GHz vs. 1.86GHz), Turbo Boost (up to 2.93GHz), and HyperThreading, resulting in performance gains ranging from 22 to 52 percent in our benchmarks. Gains are even greater compared to our Toshiba R600 zero-point notebook. (HP also offers the option of a standard-voltage CPU and 7,200rpm drive if you forego the optical drive.)

Our model came with an optical drive, allowing us to watch movies on the 2540p's 12.1-inch 1280x800 anti-glare screen, or an external display using either the notebook's VGA or DisplayPort ports. To test battery life, we opted to play a looped video file as opposed to a DVD, figuring that the 2540p's runtime would exceed the length of a movie disc. Indeed it did. The 2540p's 6-cell battery lasted four hours on power-saving mode, closely matching the runtimes of last year's crop of Core 2 Duo ultraportables.

The 2540p comes with a trio of HP apps geared toward business convenience: QuickLook 3 gives you one-button access to Microsoft Office when your notebook is off by storing that information in a separate partition from your OS. You can not only see your email, calendar, and contacts in an instant, but edit that information as well. QuickWeb, as it implies, give you near-instant access to a browser when the notebook is off or hibernating. And Power Assistant gives you a multitude of ways to monitor, tweak, and even graph your power consumption.

Should you want to add or swap out hardware, the 2540p offers easy access on its underside to one of the notebook's two DIMMs, the hard drive bay, and an ExpressCard slot should you decide to add a broadband modem. Road warriors could scarcely do better than this durable, hard-working, ultraportable rig. —KATHERINE STEVENSON

SPECIFICATIONS

CPU	2.13GHz Intel Core i7-640LM
RAM	4GB DDR3/1333
Chipset	Intel QM57
Drives	Toshiba 250GB (5,400rpm)
Optical	HP DVD+/-RW (UJ892)
Connectivity	VGA, DisplayPort, four USB 2.0, FireWire, headphone/mic, Smart Card reader, SD reader, ExpressCard/34, Wi-Fi, Bluetooth
Lap/Carry	3 lbs, 15 oz / 4 lbs, 12.4 oz

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	3,000	1,260 (+138.1%)
Photoshop CS3 (sec)	290	183.6
Proshow Producer (sec)	3,114	1,533 (+103.1%)
MainConcept (sec)	3,635	2,530
Quake III (fps)	86.7	191.7 (+121.1%)
Quake 4 (fps)	8.0	17 (+112.5.1%)
Battery Life	257	240 (-6.6%)

0 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point ultraportable is a Toshiba Portege R600; with a 1.4GHz Intel Mobile Core 2 Duo, 3GB of DDR2/667 RAM, integrated graphics, a 160GB 5,400rpm hard drive, and Windows Vista Business 32-bit.

MAXIMUM PC KICK ASS!

VERDICT 9

HP ELITEBOOK 2540P

+ RUGGED	− RAGGED
Solid build; strong performance; generous feature set.	There are lighter, slimmer, and sexier ultraportables out there; we'd like more storage.

$1,630, www.hp.com

Asus ENGTX460 TOP

Budget Fermi gets an overclock

Is Nvidia's latest budget card the second coming of the GeForce GT 8800?

It's been interesting watching the evolution of Nvidia's Fermi graphics. We've seen a range of cards, all built using variations of the original chip—a 3 billion transistor monster that runs hot and consumes power like a vampire sucking blood from a hapless victim.

Now Nvidia is shipping a new Fermi, previously code-named GF104. Aimed at the hearts and minds of mainstream PC gamers, the GTX 460 is a new chip, ringing in at just under 2 billion transistors and substantially more power-efficient. Two versions of the chip are available, a low-end and a high-end version.

If you compare the GF104 to the GF100, the 1GB GTX 460 has 144 fewer shader cores than the 480 found in the GTX 480 and 16 fewer ROPs, but the same number of texture units. Even the lower-end 768MB GTX 460 offers more texture units than the pricier GTX 465, but the memory width is narrower. So we'd expect the GTX 460 to perform very well on older games and still pretty well with current-generation, shader-heavy titles at resolutions up to 1920x1200.

Asus's ENGTX460 TOP card takes the budget 768MB version and pushes the core clock frequency to 700MHz (25MHz higher than stock) and the memory clock to 920MHz (20MHz higher than stock.) Beefing up the memory clock might make up a bit for having only three 64-bit memory controllers. We compared the card's performance to stock 768MB and 1GB cards, the PNY GTX 465, and a Radeon HD 5830.

The overall performance looks pretty good relative to the reference 768GB card, but in most of the benchmarks, the 1GB card still wins out—that additional memory controller makes a difference. The margins are negligible, though. The Asus card does ship with the SmartDoctor voltage-tweaking utility, which even allows voltage tweaks to the core. The card also has direct heat-pipe contact with the GPU to facilitate cooling. Those two features will likely allow users to push clock speeds even higher, but as usual with GPUs, be cautious.

What's really encouraging is the power-draw numbers—the GTX 460 ties the Radeon HD 5830 on the power-consumption side, which means the GTX 460 isn't quite the space heater that the GTX 480 is.

At around $230, the ENGTX460 costs about the same as reference-clocked versions of the 1GB card, while offering performance almost on par with those cards, better cooling efficiency, and the potential for more overclocking. Whether you want the BMW features of the Asus card or higher memory bandwidth makes for a tough choice. —LOYD CASE

BENCHMARKS

	Asus ENGTX460 TOP	GeForce GTX 460 768MB Reference	GeForce GTX 460 1GB Reference	PNY GeForce GTX 465	Radeon HD 5830
Unigine Heaven 2.0 (fps)	18	18	**19**	**19**	13
Battle Forge (fps)	19	30	37	39	**40**
Dirt 2 (fps)	59	57	**62**	45	45
Far Cry 2 / Long (fps)	68	66	**72**	66	47
Far Cry 2 / Action (fps)	56	54	**60**	56	42
Tom Clancy's HAWX (fps)	63	62	65	**69**	50
Crysis (fps)	19	18	20	19	**21**
Just Cause 2	30	29	**31**	**31**	26
Aliens vs. Predator DX11	21	19	20	**22**	20
STALKER: Call of Pripyat (fps)	25	25	**30**	26	26
System power usage (idle)	137W	**130W**	**130W**	146W	137W
System power usage (load)	**241W**	252W	256W	285W	**241W**

Best scores are bolded. Our test bed is a 3.33GHz Core i7-975 Extreme Edition in an Asus P6X58D Premium motherboard with 6GB of DDR3/1333 and an 850TX Corsair PSU. The OS is 64-bit Windows Ultimate. All games are run at 1920x1200 with 4x AA.

DARE TO COMPARE

	GTX 460 468MB	GTX 460 1GB	GTX 465	Radeon HD5830
Shader cores	336	336	352	1,120*
Memory controllers	3	4	4	4
Memory width	192-bit	256-bit	256-bit	256-bit
Texture units	56	56	44	56
ROPs	24	32	32	16
Memory	768MB	1,024MB	1,024MB	1,024MB
Core clock	675MHz	675MHz	607MHz	800MHz
Shader clock	1,350MHz	1,350MHz	1,215MHz	NA
GDDR5 memory clock	900MHz	900MHz	802MHz	1,000MHz
Transistor count	1.95 billion	1.95 billion	3 billion	2.15 billion
Price (est.)	$200	$230	$280	$230

** AMD shader cores and Nvidia CUDA cores not directly comparable.*

VERDICT 8

ASUS ENGTX460 TOP

+ DIVINE

Factory overclocked; good cooling; low power use; great performance on midrange monitors.

– PROFANE

Priced like the 1GB cards, but can't quite keep up with stock 1GB GTX 460.

$230, www.asus.com

eMachines ER1402

Nettop computing means limited ability—eMachines delivers on that

We've seen our share of miniature PCs over the years. They generally get smaller, more power-efficient, and quieter—but they never seem to get faster.

Take eMachine's ER1402 machine, for example. This unique-looking, pedestal-mounted machine is the epitome of the original "nettop" concept: a low-power PC designed almost exclusively to browse the web. And that's about all you can do with its single-core, low-clock chip.

The ER1402 is similar in design to two recent "rigs" we've looked at: Polywell's gorgeous Giada (reviewed in March) and Dell's Zino HD (reviewed in June). The ER1402 sports an external power brick, HDMI and VGA ports, and an integrated chipset in the form of Nvidia's GeForce 9200. The CPU is an AMD 1.7GHz Athlon II Neo K125. The bad news is that the Neo K125 is single-core—pretty much an Athlon 64—so expect performance to be on par with, say, a Newcastle Athlon 64 3000+ circa 2004. Yeah, 6-year-old CPU technology. The good news is that the Neo K125 sips but 12 watts and runs amazingly cool. That's because the K125 isn't built on 130nm technology, it's built on AMD's, err, rather Global Foundries', latest 45nm process, which makes it very power-efficient.

We ran the same benchmarks that we used to review the Zino and Giada (both dual-cores, we might add) and the ER1402 came up quite short. In graphics, the GeForce 9200 actually gives you decent performance—for what it is—but it's not going to run anything made within the last six years at a decent frame rate.

But this isn't about performance, is it? It's about usability in the tasks such a PC would be suited for. You'll plug this machine into a spare monitor so the kids can play Flash-based games, or maybe use it to watch some web videos on your HDTV, right? Well, no. The single-core sub-2GHz chip doesn't have what it takes to run the CPU-intensive QuickTime at high-def. The latest version of Adobe Flash, with its GPU support, seems better, but even there, high-def video runs at the borderline of annoying. Even Netflix, which uses the very optimized Microsoft Silverlight player, can't run at HD resolutions on the ER1402 without dropping enough frames to piss us off.

That, to us, is a deal breaker. Sure, if you really only used the ER1402 to access email or play Flash games you'd be OK. But what if someone wants to watch HD video on YouTube, Netflix, or Vimeo? And it's not like people aren't doing those things, or that Internet video is moving toward lower resolutions and bitrates. Frankly, the demands of just about all Internet activity are going up, and the ER1402 can't keep up as it is out of the box.

So unless you're faced with serious space constraints, you'd be better served by Dell's similarly inexpensive, but less hobbled Zino HD. —GORDON MAH UNG

VERDICT **4**

EMACHINES ER1402

+ OFF THE HOOK	− OFF THE RACK
Very power-efficient; quiet; affordable.	Not enough power to deal with today's Internet video; even browsing was laggy.

$300, www.emachines.com

SPECIFICATIONS

Processor	AMD 1.7GHz Athlon II Neo K125
Ports	HDMI, VGA, memory card reader, analog audio out, optical S/PDIF out, four USB 2.0, gigabit Ethernet
RAM	2GB DDR3/800 (two SO-DIMMs)
Graphics	Integrated GeForce 9200 (nForce 720a)
Storage	160GB Western Digital 5,400rpm 2.5-inch hard drive
Optical	N/A
Case/PSU	Proprietary / external power brick

BENCHMARKS

	eMachines ER1402	Dell Insprion Zino	Polywell Giada Ion-100
Photoshop CS3 (sec)	510	**449**	552
Main Concept Reference (sec)	18,300	**7,080**	8,858
3DMark 2003	2,872	2,540	**3,371**
Quake III (fps)	118	**192**	118
Quake 4 (fps)	**32**	28.6	29

Best scores are bolded.

The design is unique but the single-core performance is pathetic.

HP ZR30w 30-inch LCD

Fit for a Dream Machine

HP's ZR30w is a spectacular value in the 30-inch display category, even if it is missing HDMI and portrait mode.

You might recall seeing three of HP's ZR30w 30-inch displays gracing the cover of our September "Dream Machine" issue. Considering our theme for that build was raw, wanton power, picking the ZR30w was an easy decision.

We haven't been this wowed by a display since we laid eyes on NEC's LCD3090 WQXi, which we reviewed in our March 2010 issue. But that 30-incher costs nearly twice as much as this one. Both monitors are based on S-IPS panels, as all the best LCD monitors are, and both deliver native resolution of 2560x1600 (a 16:10 aspect ratio). But the ZR30w's real claim to fame is color resolution of 10 bits per color per pixel (HP defines this as 30 bits per pixel), which enables it to produce 1.07 billion displayable colors. That's 100 percent of the sRGB color gamut and 99 percent of the Adobe RGB color gamut.

The ZR30w's video inputs are limited to a single dual-link DVI port and a single DisplayPort. There's HDCP support on both of these, but we would have appreciated the inclusion of an HDMI port, too. It's not that we want to send audio to the display—this one doesn't have built-in speakers, and we imagine they'd sound terrible if it did—it's just that having HDMI would be convenient. In fact, we wished this monitor was equipped with at least one more DVI or DisplayPort port, too, since we find ourselves using two computers at once (one for testing, one for writing) on a fairly regular basis. A four-port USB hub rounds out the connectivity features (two ports on the left-hand side of the bezel and two on the bottom, behind the panel).

There are four buttons on the lower right-hand size of the bezel, but they don't serve the function you might expect; that is, they don't call up an onscreen display for the purpose of making color adjustments. That's because the ZR30w doesn't have an onscreen display. The plus/minus buttons control brightness, while the power and source buttons do just what you'd expect.

The monitor moves with smooth precision on its stand, which has an open base that's handy for trapping pens and other small objects, but it's limited to height, tilt, and swivel; you can't pivot it into portrait mode unless you buy an articulated arm or some other VESA mount. The power supply is integrated into the monitor, so you don't need to worry about stashing a power brick under or on top of your desk.

One of the first things we noticed when we began evaluating the display using DisplayMate Multimedia with Test Photos Edition (www.displaymate.com) was absolutely no backlight leakage anywhere around the perimeter of the screen. The glass itself has a matte finish, so we didn't encounter any issues with glare or distracting specular reflections. The ZR30w delivered excellent color uniformity in our DisplayMate tests. And the monitor was perfectly capable of delivering Just Cause 2 action without any signs of motion blur. The ZR30w's $1,300 price tag doesn't put it in impulse-buy territory, but it does render it a spectacular value.

—MICHAEL BROWN

SPECIFICATIONS

Viewable Area	30 inches diagonal
Panel Type	S-IPS
Native Resolution	2560x1600 at 60Hz
Video Inputs	DisplayPort, DVI-D (HDCP on both)
I/O Ports	Four-port USB hub

MAXIMUM PC KICK ASS!

VERDICT 9

HP ZR30W 30-INCH LCD

+ BIG BAD MAMA	− GRIZZLY MAMA
S-IPS panel; great performance with both games and professional applications.	No HDMI; no media card reader; doesn't pivot to portrait mode.

$1,300, www.hp.com

Seagate FreeAgent GoFlex Portable 500GB

The first interesting external hard drive we've seen in a while

Portable hard drives are a commodity product, and it's hard to make them interesting. Take a notebook hard drive, slap it in a bit of plastic with a SATA-to-USB controller inside, and presto, there's your drive. If it's USB 2.0, it'll read at 33.3MB/s and write at around 29MB/s, and if it's USB 3.0, it'll read and write at the speed of the mechanical hard drive inside. Yawn.

There's precious little difference between most external drives, which is why we don't cover every single one to hit the market. But sometimes somebody does something new. Last month, OCZ slapped a solid state drive in a USB 3.0 enclosure, and it cooked. This time, Seagate's mixing it up. The new FreeAgent GoFlex drive series moves everything past the hard drive SATA port onto a detachable controller, so the USB 2.0 drive you buy today can, with the addition of a $30 upgrade cable, become a USB 3.0, eSATA, or FireWire drive.

The GoFlex's modular cables make it easy to upgrade.

The GoFlex is a plain black (or red, gray, or blue) glossy plastic sheath over a 5,400rpm notebook drive. The sheath protects the drive while leaving the SATA ports exposed; the SATA-to-USB controllers are detachable and clip directly to the drive's SATA ports. We're glad Seagate went with standard SATA connectors for its swappable interface cables rather than some proprietary scheme; in a pinch, you can connect your GoFlex drive directly to your rig's SATA ports—or use the GoFlex's SATA-to-USB controller to connect any 2.5-inch SATA drive to your computer via USB. The prospect of a cheap SATA-to-USB controller is itself a good incentive to go GoFlex.

The GoFlex case is well-constructed and doesn't seem flimsy. USB 2.0 transfer speeds were exactly what you'd expect—33MB/s reads and 29MB/s writes. We also tested the drive with the $30 USB 3.0 upgrade cable, which gave us sustained read and write speeds averaging around 65MB/s. We do have one complaint, and it's that access times seem very slow—nearly 24ms in some cases.

In addition to the standard GoFlex Portable drives, which contain 5,400rpm 2.5-inch drives in capacities from 320GB to 1TB, the GoFlex family includes Pro SKUs with 7,200rpm drives in them, Desktop SKUs with 3.5-inch drives (up to 3TB), and two add-on products, the GoFlex Net and GoFlex Theater. The Net is a NAS-like device that accommodates up to two GoFlex Portable or Portable Pro drives, and the Theater is a media-streaming and -playback device for your TV. Any GoFlex drive will work with either.

This USB 3.0 controller is among several GoFlex upgrade cables (sold separately).

The Memeo backup software included with the drive isn't great, but it's serviceable. We'd prefer something that didn't nag us to upgrade to a premium version, but it's easy enough to delete the software if you don't want it—which we don't. We like the idea of drives with upgradable and swappable cables, especially when we can use the SATA-to-USB adapter for any drive we want. It also means that if the controller or interface breaks, we're not stuck with a dead drive. The GoFlex family is one of the most innovative developments in portable storage, and we dig it. Given that the GoFlex doesn't command a price premium, there's no reason not to get one if you're in the market for a portable drive. **—NATHAN EDWARDS**

BENCHMARKS

	Seagate GoFlex (USB 3.0)	Seagate GoFlex (USB 2.0)
Capacity	500GB	500GB
HDTune 4.01		
Avg Read (MB/s)	65.0	33.3
Random-Access Read (ms)	24.2	23.8
Burst Read (MB/s)	108.2	33.3
Avg Write (MB/s)	63.5	29.6
Random-Access Write (ms)	24.1	23.6
Burst Write (MB/s)	108.3	33.3

All drives tested on our hard drive test bench: a 2.8GHz Intel Core i7-930 CPU on an Asus P6X58D Premium motherboard with 6GB Corsair DDR3/1333, running 64-bit Windows 7 Professional.

VERDICT 9

SEAGATE FREEAGENT GOFLEX PORTABLE

+ FLEX MENTALLO	− CHARLES ATLAS
Swappable cables that can be used for any drive; no price premium.	Naggy bundled backup software; occasional slow access times.

$120, ($30 for USB 3.0 upgrade cable), www.seagate.com

Pictures don't do the iPhone 4 screen justice—you have to see it for yourself.

Apple iPhone 4

Is the latest iPhone the smartphone king?

We don't cover a ton of Apple products here at *Maximum PC*, but we can't in good conscience ignore the iPhone. In a lot of ways, mobile phones are computing's newest, most exciting frontier, and the iPhone is still considered the king by many.

So, how is the king? Physically, the iPhone 4 is a big change over its predecessor, with a flat, glass-covered back surface. The edges of the phone consist of a flat metal band (also the phone's antenna) connecting the front and back surfaces. The new model is a bit more functional-looking than the older versions, but is exquisitely designed all the same.

By now you've probably heard about the infamous iPhone 4 antenna issue—the fact that the phone loses bars, sometimes to the point of dropping calls, when held with your finger touching a certain part of the antenna band. Apple insists that it's not as big of an issue as people claim, citing statistics that say the iPhone 4 has only a 1 percent higher rate of dropped calls than the iPhone 3GS, but the issue is real and easily replicated. Our advice? If you want the phone, plan to use it with a case, such as the bumper, which Apple now offers for free with the iPhone 4.

The killer feature of the iPhone 4 is, without a doubt, its screen—the nicest screen you can get on a smartphone right now. Its 3.5-inch so-called "retina display" manages to produce a maximum resolution of 940x640 pixels, for a pixel density of 326ppi. That handily beats the Droid Incredible's (already fabulous looking) 252ppi screen, and makes the iPhone 3GS's 163ppi screen look like garbage. Once you use it, you can't go back.

The iPhone 4 comes with the same 1GHz A4 ARM Cortex chip found in the iPad, and 512MB of RAM—double that of either the iPhone 3GS or the iPad. The hardware is pretty much the same as other top smartphones, like the Droid Incredible, but as before, Apple is the best at leveraging that hardware to provide a completely smooth experience when using the phone. The newest version of the iPhone OS, now called "iOS 4," provides a (limited) form of multitasking. Other OS features include folders for organizing applications and customizable home-screen backgrounds.

The camera in the iPhone has received an upgrade, as well. The new 5-megapixel camera takes pictures much faster, and is capable of recording 720p HD video, using the same touch-to-focus functionality used when taking photos.

The phone also features a VGA-resolution front-facing camera. It's there to fulfill the top new feature in the iPhone 4: FaceTime—a built-in video-calling feature that lets you talk, face to face, with anyone else using an iPhone 4. The feature only works if both parties are on a Wi-Fi network, but the quality is surprisingly good. We've never really been into video conferencing, but it's hard not to have fun the first time you try out FaceTime.

With the iPhone 4, Apple has taken care of most of the lingering criticisms about the iPhone (such as lack of multitasking) and added a couple of features that people have been clamoring for (a front-facing camera for video chat, for instance). The problem with dropped calls is a real one, and Apple's heavy-handed app policies and AT&T's shoddy network are still issues. If you can get past those hurdles, the iPhone 4 is an incredible piece of hardware, and has set the bar high for the rest of the industry. **—ALEX CASTLE**

VERDICT 8

APPLE IPHONE 4 32GB

+ SMARTPHONE	− FEATUREPHONE
Unparalleled screen quality; high-quality camera; (sort of) multitasking.	Needs a case to function properly; can only run approved apps; you're stuck with AT&T.

$300 with 2-year contract, www.apple.com

Ceton InfiniTV

Surprise! CableCARD is alive and awesome

DIY home-theater PC builders have waited a long time for a product like Ceton's InfiniTV 4. Drop one of these cards in your machine, insert the multi-stream CableCARD you acquired from your digital cable–TV service provider, and use Windows Media Center (Vista or Windows 7) to watch high-definition TV and record as many as four simultaneous high-definition streams—including encrypted premium content such as HBO and Showtime. Boom! Your PC is now a four-tuner DVR cum media server, and you can dump your service-provider's lousy set-top box.

Installing the InfiniTV was a snap. We inserted the card into an open PCI Express slot, slid our Comcast-provided multi-stream CableCARD into the InifiniTV's PCMCIA socket (which remains exposed on your PC's backplane), and connected our coaxial cable. If you purchase an InfiniTV 4, be sure that your cable provider gives you a multi-stream CableCARD, because that's the only way to access all four content streams. If for whatever reason you ever need to swap out CableCARDs down the road, you can do so without cracking the case.

Setting up the device within Windows Media Center was equally easy. We turned on our PC, installed the drivers, and navigated our way to Windows Media Center's Settings screen. A few EULAs and a couple of downloads later, we were effortlessly channel surfing and recording TV content. We did experience a moment of panic when we tried to watch HBO in HD and received no signal. Windows Media Center displayed a message directing us to call Comcast in order to watch premium channels. This took approximately five more minutes, after which we experienced no further problems accessing any of the channels included in our existing digital-cable subscription. We repeated this setup routine with three other PCs and experienced no hiccups or glitches.

The InfiniTV 4 wouldn't be half as appealing if it simply replaced a set-top box with a computer. But in addition to tuning in four channels at once, you can also stream recorded TV to other PCs in your home (provided they're running a version of Vista or Windows 7 that includes Windows Media Center—which is almost all of them). You can stream recorded or live TV to an Xbox 360 or any other official Extender for Windows Media Center device. The only limitation we encountered is that CableCARDs do not permit pay-per-view or on-demand viewing.

Unless your wireless network is extremely fast, you'll want to use hardwired Ethernet connections for streaming HD content from your recording-box PC to other clients. While you could copy the files from one machine to another, or copy them to a central server, you might encounter DRM issues—especially with premium content. The InfiniTV 4 transcodes whatever DRM your cable company is using to Microsoft's DRM. Media flagged as "copy freely" can be moved from one machine to another without restriction. Media flagged as "copy once," on the other hand, can be played back only on the machine that recorded it (although you can stream it, as described earlier).

The InfiniTV is expensive, but it's worth the bucks if you want digital-cable TV on your home-theater PC, your Xbox 360, and all the other PCs in your home.

—GEORGE JONES

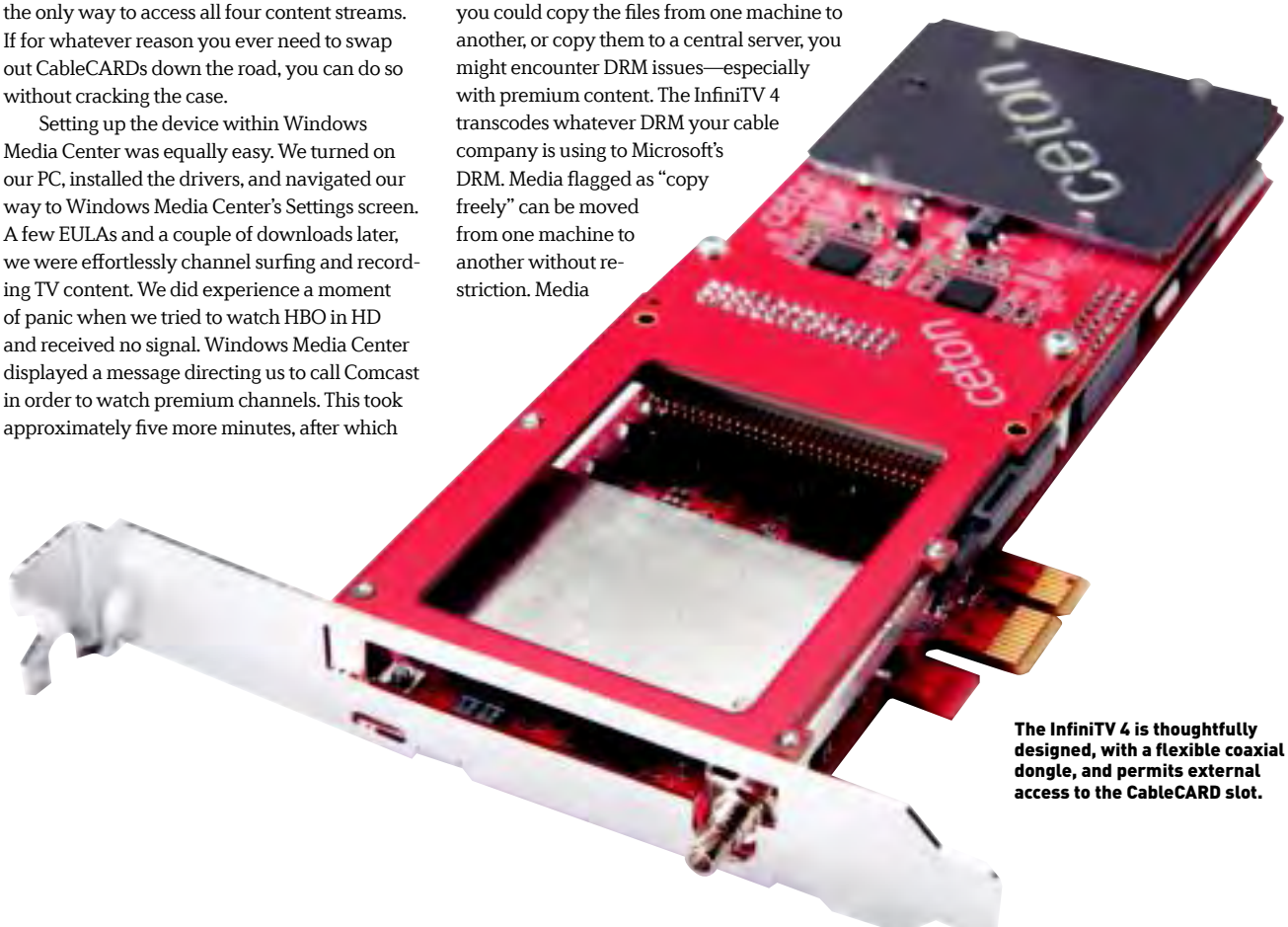
MAXIMUMPC KICK ASS!

CETON INFINITTV

VERDICT 9

+ COUNTING CARDS	− MARKING CARDS
Can record as many as four HD streams—including premium content.	Not compatible with satellite TV; expensive; no pay-per-view or on-demand viewing.

$400, www.cetoncorp.com



The InfiniTV 4 is thoughtfully designed, with a flexible coaxial dongle, and permits external access to the CableCARD slot.

Corsair Hydro H70 Liquid-Cooling System

Another Kick Ass cooler from Corsair

Back in September 2009, we reviewed Corsair's H50 all-in-one liquid cooler and awarded it a 9 verdict and a Kick Ass award for its cooling prowess, which put it roughly on par with our then-champion air cooler, the Thermalright U-120 Extreme. But times change and the competition eventually caught up. Corsair apparently hasn't been asleep, though. The company's new H70 ups the ante in all-in-one liquid coolers.

The Corsair H70, like the H50 before it, was designed in conjunction with Asetek, the all-in-one liquid-cooling OEM. For the H70, the team nearly doubled the thickness of the 12cm radiator, added a second 12cm fan for the coveted push/pull airflow, and slimmed down the pump/heat-exchange unit that rests on the CPU. The H70 also shipped with a pair of voltage-regulator cables, one for each fan, in an effort to reduce noise. Like others of its ilk, the H70's fans and radiator mount in place of your case's 12cm rear exhaust fan, although Corsair recommends you mount the H70's fans as exhaust rather than intake (as with the H50).

Alongside the H70 (with and without the regulator cables), we tested the H50 in single-fan mode, the Hyper 212+, and of course, the stock air-cooler that came with our new test bed's CPU (see Lab Notes on page 92 for the full specs of our test bed). Thanks to the overclock, our new test bed runs much hotter than our old one—at full burn, the stock cooler could only get the CPU down to 89 C. As they did on the old test bed, the H50 and Hyper 212+ performed within a few degrees of each other, keeping the CPU at full burn nearly 32 degrees cooler than the stock heatsink. The H70 brought full-burn temps down to 51 C—five to six degrees cooler than either. With the noise-regulating cables in place, temps were 2 C higher—still very impressive.

The Corsair H70 is a great all-in-one liquid cooler, though its two fans put out a lot more noise than the H50's—the regulator cables help a little bit. At $110 street, it's $30 more than the H50 and its competitors, and $80 more than the Hyper 212+. But every degree counts, right? —NATHAN EDWARDS

BENCHMARKS

	Corsair H70 (two fans)	Corsair H50 (one fan)	CM Hyper212+	Stock Cooler
Idle (C)	**33.25**	34.25	33.75	45.75
100% Burn (C)	**51.25**	56.5	57.5	89.25

Best scores are bolded. Idle temperatures were measured after an hour of inactivity; load temperatures were measured after an hour running Intel's internal Lynnfield thermal testing utility at 80-percent load. Test system consists of Intel Core i5-750 overclocked to 3.2GHz on an Asus P7P55D Premium board in a Corsair 800D case with stock fans.

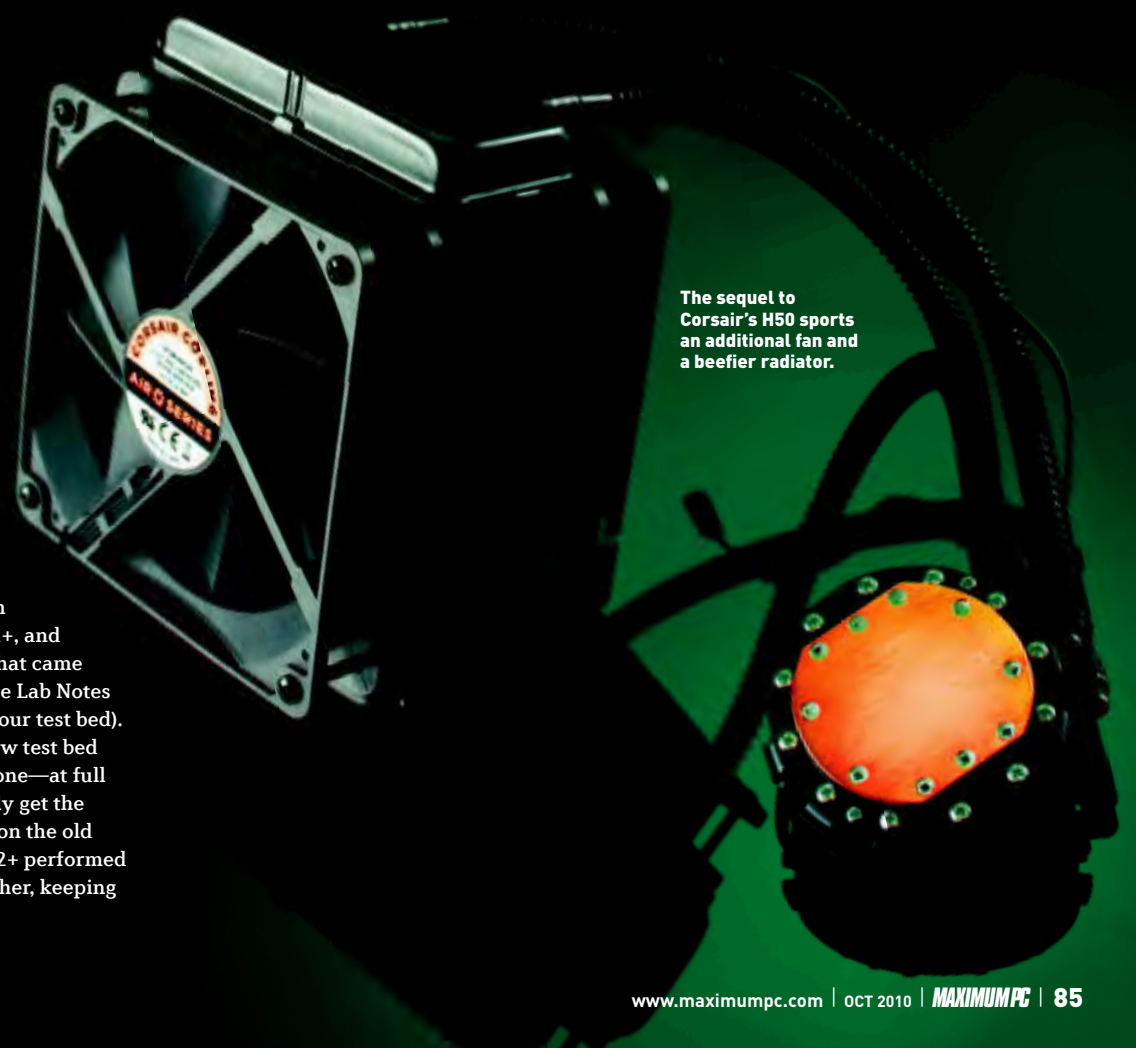
MAXIMUM PC KICK ASS!

VERDICT 9

COSAIR HYDRO H70 LIQUID-COOLING SYSTEM

+ HYDROGEN	- STUPIDITY
Powerful cooling performance; push/pull fans help.	Loud fans; a bit pricey.

$110, www.corsair.com



The sequel to Corsair's H50 sports an additional fan and a beefier radiator.

Patriot Inferno 100GB SSD

Patriot's SandForce SSD offers high performance—mostly

How is the Patriot Inferno different from other SandForce-powered drives? Well, it's red.

SandForce-based drives have quickly emerged as the frontrunners in the solid-state wars, thanks to impressive read and write speeds, both sequential and random (which finally gives them an edge over the previous random-write leader, the aging Intel X-25M G2). All SandForce drives use the same controller, so differences between models come down to the commodity NAND used and—most importantly—firmware.

SandForce played a tricky game with its firmware, letting some manufacturers ship drives with release-candidate firmware, giving other vendors special "max IOPS" firmware, and so forth. Even its SF-1500 and SF-1200 controllers (enterprise and consumer, respectively) are only differentiated by firmware—but this firmware can vary quite a bit. We've never tested a bad SandForce drive, but the question remains: Is the Patriot Inferno a great SandForce drive, or merely a good one?

In sequential reads, the Inferno averages 191.6MB/s, just under the 196MB/s we see from the top SandForce drives but lower than the top speeds of Crucial's C300 drive (reviewed August 2010) or last year's Barefoot Indilinx drives like the Patriot Torqx and Corsair Nova V128. Average writes are the same as with any SandForce drive we've seen: around 221MB/s. Random 4KB read and write IOPS in HDTune are nearly the same as with the OCZ Vertex 2 and Corsair Force F100, but IOMeter tells a different story. At a queue depth of 32, with random 4KB writes, the Inferno gets around 10,000 IOPS. Both the Vertex 2 and Force F100, though (which use max IOPS and release-candidate firmware, respectively), are nearly five times faster, at around 48,000 IOPS each. The Inferno hews closer to drives like the Crucial C300, which got about 12,000 IOPS on a 6Gb/s SATA controller and 9,000 on 3Gb/s SATA.

Other than in random writes at high queue depths, the Inferno is right up there with the best SandForce drives we've tested—which puts it high on the list of the best solid state drives, period. It supports the TRIM command, which is essential in today's market. It's also red, which is a nice change from the grays and blacks of most SSDs, but (alas) doesn't make it any faster. At $360, it's around the same price as the 100GB Vertex 2, but for the money, we'd rather have the new Corsair F120, which is essentially the Force F100 but with only 7 percent overprovisioning instead of 13 percent—another bit of firmware trickery. The F120 shares the high random-write IOPS of the F100, has a higher capacity, and costs slightly less than the Inferno.

The Patriot Inferno is a great SSD, and the fact that it's not the best is a testament to the strength of the market right now. Customers who opt for the Patriot Inferno will get a great drive, but it's not the top of the heap. Of course, given the huge role firmware plays in the SandForce market, don't be surprised if that changes tomorrow. —NATHAN EDWARDS

BENCHMARKS

	Patriot Inferno	Crucial C300 (6Gb/s)	Crucial C300 (3Gb/s)	OCZ Vertex 2 (3Gb/s)
Capacity	100GB	256GB	256GB	100GB
HDTune 4.01 Avg Read (MB/s)	191.6	**302.9**	222.7	196.3
Random-Access Read (ms)	.1	.1	.1	.1
Burst Read (MB/s)	220	215.6	172.8	**228.0**
Avg Write (MB/s)	221.1	171.2	199.8	**221.9**
Random-Access Write (ms)	.2	.1	.1	.1
Burst Write (MB/s)	203.0	**222.4**	172.2	207.5
4KB Read (IOPS)	**11,067**	7,825	7,133	**11,045**
4KB Write (IOPS)	9,768	2,500	2,573	**10,066**
IOmeter Random-Write IOPS (4KB, Queue Depth 32)	10,673	12,425	8,760	**48,958**
Premiere Pro (sec)	360	350	**342**	359
PCMark Vantage HDD	38,138	**41,362**	35,507	39,309

Best scores are bolded. All drives tested on our hard drive test bench: a stock-clocked Intel i7-930 CPU on an Asus P6X58D Premium motherboard with 6GB DDR3, running Windows 7 Professional 64-bit. All 3Gb/s tests performed using latest Intel ACHI drivers; all 6Gb/s tests use onboard Marvell 9123 6Gb/s SATA controller with latest drivers.

VERDICT 8

PATRIOT INFERNO 100GB SSD

+ INFERNO OIL	− DISCO INFERNO
Solid SandForce sustained reads/writes.	Can't match the 4KB random-write IOPS of Corsair's or OCZ's drives.

$360, www.patriotmemory.com

Cirgon Encore Multimedia Server

A mom-friendly digital entertainment system

Ripping CDs and DVDs is second nature to a *Maximum PC* reader. Your entire audio and video library is stored on a server, so you can access it from any of the several PCs in your home. You've assembled every photo you've ever shot into dazzling digital slide shows with musical soundtracks. When you tire of your own music collection, you have presets for all the best Internet radio stations on your home-theater PC.

Now your less tech-savvy friends and relatives are bugging you to help them set up the same type of entertainment system at their pad. Hmm. Should you a) spend a dozen hours holding their hand while you distill years of experience into private lessons, b) politely tell them to pound sand, or c) recommend they buy Cirgon's Encore Multimedia Server?

We suggest you go with the Encore, even if it does fall short of wowing us (there's a DVD burner where the Blu-ray-read/DVD-write combo drive should be, for starters). The Encore is definitely not designed for power users: It features a single-core 1.6GHz Intel Atom 230, Nvidia's Ion chipset, and 1GB of DDR2/800 RAM on a Zotac Mini-ITX motherboard. But we like it because its software is as innovative as its hardware is mundane.

The Encore doesn't run Windows, nor does it run any retail application software. Cirgon tapped Red Hat's Fedora Linux operating system instead, and developed a custom user interface and a suite of apps that render complex media-oriented tasks extraordinarily simple.

Imagine teaching your mom how to defeat a DVD's DRM so she can rip it to her computer's hard drive as an ISO image, preserving its menus, optional soundtracks, subtitles, and all the extras. Don't forget to tell her about the software needed to mount the image when she wants to watch the movie. The Encore renders all that as simple as dropping the DVD in the tray and pushing a button to rip an ISO. It can rip CDs and encode them to your choice of MP3, FLAC, or WAV just as easily—downloading the correct tags and album art in the process. But with an Internet filled with awesome radio stations, Encore curiously limits you to LastFM. You also can't access Netflix, Hulu, or even YouTube.

Plug your digital camera into one of the Encore's USB ports (the machine lacks a memory card reader), press a button on the remote, and it will automatically copy the images to its hard drive and ask if you'd like to make a backup copy on DVD. You can perform rudimentary photo-editing tasks, but you'll want to use a full-featured program on a PC for anything serious. The slide-show production software, on the other hand, is genius. Adding music to a show is a piece of cake, and you can add narration using an optional USB microphone. On playback, the music automatically fades to the background when your narration begins.

Cirgon's Encore Multimedia Server boots and is ready to play in just 33 seconds.

The user interface is not visually sophisticated, relying primarily on text instead of icons, but we had no trouble reading the menus from our couch. Unfortunately, the system responds sluggishly to the infrared remote control; and since there's no physical keyboard, you're forced to rely on an onscreen facsimile to perform searches. You can plug in a hardwired keyboard, but Cirgon doesn't provide drivers for any wireless models.

Fill up the 1TB drive and you can add external storage using one of the Encore's USB ports, or you can connect it to a server or NAS box via the gigabit Ethernet port. There's an HDMI port, and analog, optical, and coaxial S/PDIF audio jacks to connect the box to your HDTV or A/V receiver.

As a power user, it's easy to dismiss the Encore as a simplistic walled garden. Despite the use of an open-source operating system, users will be entirely dependent on Cirgon when it comes to improving and expanding the product's capabilities. Unlike some other products based on open-source software—Logitech's Squeezebox, for example—the Encore has not spawned an organic third-party development community; in fact, Cirgon doesn't even sponsor a user forum.

On the other hand, a media appliance like the Encore could be just the ticket for those folks who covet your digital entertainment system but don't have the geek skills to build or maintain one like it. **—MICHAEL BROWN**

SPECIFICATIONS

Processor	1.6GHz Intel Atom 230
Mobo	Zotac IONITX-B-E Mini-ITX
Chipset	Nvidia MCP7A-ION
RAM	1GB DDR2/800
Videocard	Nvidia Ion (integrated)
Storage	1TB Seagate Pipeline HD
Optical	LiteOn iHAS224-06 24x DVD+/-R, 48x CD
Case/PSU	Custom HTPC case/external power supply

VERDICT **7**

CIRGON ENCORE MULTIMEDIA SERVER

+ LEVI'S	− MOM JEANS
Dead simple to use; rips encrypted DVDs as well as CDs; programmable universal remote.	No Blu-ray drive, web browser, keyboard, or third-party apps; surprisingly loud chassis fan.

$995, www.cirgon.com

Why does a 6.7x6.7-inch square motherboard need a case with a 20x20-inch footprint?

Lian Li Pitstop PC-T1 Mini-ITX Spider Test Bench

Good looks can't save a half-baked idea

Say this for the Pitstop PC-T1: It turns heads. Lian Li is known for its clean, all-aluminum chassis, which range from the budget to the exorbitant—mostly the latter. This time, it has spawned an all-aluminum Mini-ITX case that just happens to look like a spider. Practical? No. Ridiculous? Yes. Usable? Eh.

The Pitstop T1 comes flat-packed, like an Ikea desk. It has four two-piece legs, a main body piece, a motherboard tray, and two PSU brackets that hang from the rear and accommodate one standard ATX PSU. Given the three-segment body (spiders only have two) and four legs (spiders have eight), it's not anatomically correct. Then again, most spiders aren't Mini-ITX rigs, either.

To build a system into the T1, you first install a 3.5-inch drive (or 2.5-inch with an adapter) into the motherboard tray. The case accommodates one slimline optical drive, which attaches to a tray that then attaches to the underside of the mobo tray. The mobo tray attaches to the front of the main chassis body using four thumbscrews; the PSU brackets attach to the rear of the body using four more thumbscrews. The four legs, which attach to the corners of the main body, are secured using the same two-thumbscrew system at each of their two joints, although the leg segments themselves are attached to each other and to the body with a screw-and-bar mechanism.

The big problem with using thumbscrews as load-bearing mechanisms, of course, is that that's not what thumbscrews are for. The Pitstop has enough trouble trying to stand firmly on its own legs without any components attached; with a heavy PSU, hard drive, and motherboard on it, the case feels likely to collapse at any moment.

Though the T1 is billed as a test bench, removing any component other than the motherboard requires some disassembly of the rig. The hard drive bracket is directly beneath the motherboard, and swapping hard drives or optical drives requires removing the motherboard tray from the rest of the chassis and removing the motherboard itself. Because the motherboard sits atop the creature's head, there is no method of securing a PCI-E card, so you'd better hope your Mini-ITX board has onboard graphics. Even worse, the PSU brackets don't work for many PSUs, as they require 3/8-inch clearance on the left edge of the PSU's rear face, as well as half an inch of clearance on the upper left. We had to go through several PSUs before we found one that fit.

Of course, there's one even bigger issue with the PC-T1: Its footprint is huge—it can stretch 22 inches from leg tip to leg tip. That gives this mini-ITX rig a bigger footprint than last month's Dream Machine, for cryin' out loud.

We admire Lian Li for going all-out with the design, but as a working chassis, the PC-T1 will please almost no one. Between the PSU bracket that doesn't work with most PSUs, slimline-only optical support, one HDD slot, no support for PCI-E expansion cards, a colossal footprint, and wobbly legs, this arachnid couldn't hurt a fly. **—NATHAN EDWARDS**

VERDICT **5**

LIAN LI PITSTOP PC-T1 MINI SPIDER

+ T1	− T3
Stunning design; it does fit together.	Wobbly legs; no PCI-E bracket; picky PSU bracket.

$130, http://lian-li.com.tw

Phantom Lapboard

This unique keyboard can't overcome major flaws

There's a lot of history behind the Phantom lapboard (and its ill-begotten console progenitor) but we don't need to go into that. What you do need to know is that the Phantom lapboard is essentially a wireless keyboard on a hinge. You can (and must) lock it into an angled position to use the mouse on the surface below and to the side of the keyboard. Now, this raises a question: Do you like typing on a keyboard that's locked at a significant angle to the natural plane of your hands? Of course you don't.

Also, about that mousing surface. It's really slippery, and so is the mouse. And it doesn't have any sort of lip on it. So if you're thinking about relaxing on the couch and using the Phantom in any sort of natural position, forget about it. The second you take your hand off the mouse to type something, that sucker's clattering to the floor.

The keys don't have a lot of click to them, but the keyboard is otherwise all right. Phantom Entertainment is advertising that the board has 13 hotkeys, but this is sort of misleading, as they're actually referring to the media-player commands bound to the 12 function keys, none of which are programmable.

The mouse that comes with the Phantom Lapboard is a shiny black, pebble-shaped affair with an incredibly floaty scroll wheel with a clicking mechanism that makes it difficult to perform a single middle-click. Also, the mouse features no additional buttons, which makes it a hard sell as a gaming mouse.

The bottom line is that this thing is bad. The mouse isn't good for gaming, the angled keyboard is awful for typing, and for media playback you'd do much better with a slimmer wireless media keyboard with a built-in trackpad or ball, which are available for significantly less than the Lapboard's $140 asking price. —ALEX CASTLE

VERDICT **4**

PHANTOM LAPBOARD

+ PHANTOM OF THE OPERA	− STARLIGHT EXPRESS
Keyboard spins 180 degrees to accommodate lefties; a real mouse and keyboard on your lap.	Angled typing sucks; subpar mouse doesn't stay put; high price tag.

$140, www.phantom.net

The hinge only locks to one position. Hope you like that angle!

Singularity

Time flies, except when you tell it not to

The world is full of mysteries. What killed the dinosaurs? What is stored in Area 51? Why—oh dear goodness, why—does anyone think Dane Cook is funny? And now, there's a new head-scratcher for that list: Why didn't Activision give Singularity, easily its best new IP in years, a promotional push to match? After all, it's a fantastic game. It's the Mega Man to modern shooters' robot masters, absorbing the best bits of games like Half-Life, BioShock, and F.E.A.R., and mixing in just enough of its own unique ideas to keep things fresh.

So, what makes Singularity tick? Well, clocks, actually, when you get right down to it. See, Singularity's all about time travel, and while that makes for an entertaining—though not exactly revolutionary—plot about an alternate timeline in which Russia takes over the world, for once it's the game itself that benefits most from humanity's ill-advised canonball into the time stream.

Using a glove called the TMD, you're able to manipulate time and poor saps in a number of gruesome ways. Too many enemies? Put them in time-out with a slow-mo bubble and then deal with them at your leisure. Don't feel like getting your hands dirty? Press rewind on a nearby soldier and de-age him into a hideous "revert," which will proceed to vomit corrosive acid on everything that falls within its eyeless gaze. And that's only the tip of the iceberg.

There are, however, a couple places where the promise of magical time mittens isn't all it's cracked up to be. For one, Singularity's a bit of a slow starter, and after its first hour, you'll probably look down at your TMD-less arm and feel a bit ticked off. Also, the game's puzzles are—for the most part—a missed opportunity, and usually involve aging and de-aging crates. The potential's there for some truly ingenious brain-teasing, but instead, we found ourselves taken out of the experience when all-powerful wooden doors were immune to our time powers simply because the developers didn't want us to step off the beaten path.

If you hadn't guessed it already, Singularity's extremely linear. In many cases, though, this is just as much to the game's advantage as it is its detriment. After the first hour wheezes by and the game finds its footing, it's brilliantly paced. Just as mad-cap, beautifully orchestrated action sections crescendo, suspenseful, heart-pounding horror sections begin. Basically, no matter what you're doing, there's never a dull moment. By the same token, however, the developers keep you on a sometimes perplexingly tight leash, even going so far as to take away some of the game's coolest weapons right after you pick them up.

No, no, no! It's left foot, right foot, left foot, and then lose your hands in a gory gunfight! Let's take it from the top.

Feeling bad about finding a few gray hairs? Well, that guy just got aged into a pile of dust. You don't have it so bad.

Singularity's multiplayer, meanwhile, is a nice diversion but lacks longevity. For one, it has only two modes—deathmatch and territories—that are kept interesting by the inclusion of multiple classes for both soldiers and creatures. There's a tremendous amount of variety there at first—what with abilities like teleportation and wall-crawling in the mix—but the lack of modes really hurts it in the long run.

Ultimately, then, some might view Singularity as a spirited swing followed by a sobering miss. But they'd be wrong. Taken on its own merits, Singularity's a downright fun shooter that'll take the edge off the summer gaming doldrums. Does it live up to its full potential? Not quite. But it's still one hell of an awesome ride. **—NATHAN GRAYSON**

SINGULARITY

VERDICT 8

+ BACK TO THE FUTURE	− HOT TUB TIME MACHINE
Inventive time manipulation powers; creative weapons; intense levels; fun story.	Simple, primarily crate-based puzzles; slow start; limited multiplayer options.

$49, www.singularity-game.com, ESRB: M

LAB NOTES

Bringing out the Big Guns

Times change, and our cooling test bed is changing with them

NATHAN EDWARDS
SENIOR ASSOCIATE EDITOR

You may have noticed something different in our Corsair H70 review this month. We've moved our test bed from a stock-clocked Intel Core 2 Quad Q6600 to an Intel Core i5-750 CPU on an Asus P7P55D Premium mobo. Even though Intel's Socket 775 chips are still well-represented in the field, most enthusiasts have moved to Core i5 and i7 parts on Sockets 1156 and 1366. Though i5 and i7 chips are more thermally efficient than older parts, they can still put out the heat when overclocked. For our overclock, we pushed the 2.66GHz chip to 3.2GHz. We're also using some new software tools: CPUID's HWMonitor for temperature recording, and an internal Intel Lynnfield testing utility that really pushes our CPU—enough to get consistent full-burn temps of 90 C on the stock cooler. Any higher and the chip throttles. Higher base temperatures mean every cooler we test will have to work much harder, and our results will be more usable for overclockers.

AMBER BOUMAN
ONLINE FEATURES EDITOR

Since Lala.com was shut down (why, Apple, why?), I've been scouring the web for a new music-streaming service. I've been bouncing between Pandora, Slacker, Last.fm, and Stereomood but none of these services is meeting all my needs. I'm keeping my fingers crossed that Lala will come back (please?), but until then, the quest continues.

GORDON MAH UNG
SENIOR EDITOR

I'm finally going to sit down with an integrated graphics board and CPU to find out just how much chip you need to run web HD content using Flash, QuickTime, Silverlight, and a couple of other popular video formats. I've long suspected that the round number to shoot for is 2GHz or so. Hopefully, I'll know this next month.

MICHAEL BROWN
REVIEWS EDITOR

I've been on the hunt for a good Z-Wave controller and Ethernet bridge for some time, and I finally found an affordable one in Schlage's LiNK system. The kit comes with a keypad deadbolt and it enables me to control all my Z-Wave modules over the Internet. And with the optional thermostat, I can remotely program and monitor my HVAC system, too. The one thing I don't like is the $13 monthly subscription.

GEORGE JONES
EDITOR-IN-CHIEF

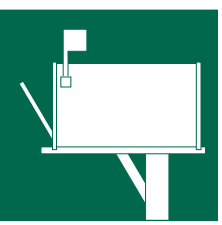
Testing Ceton's quad-tuner InfiniTV card was interesting. It's so straightforward that my testing methodology was rather limited. Ultimately, a product like this either works or it doesn't, so I installed it in several different PCs in both a client and server capacity and tested the functionality within Windows Media Center. It works, and how. Suddenly, CableCARD tech seems more viable.

ALEX CASTLE
ONLINE MANAGING EDITOR

As I write this, I've just received a review copy of StarCraft II (we'll have a full review next month, don't you worry) and man am I excited. It's been a long time since the PC has gotten the kind of AAA-quality exclusive that it deserves, and if there's anyone I trust to deliver, it's Blizzard.

We tackle tough reader questions on...

3D-Enabled Benchmarking
OS X Trim
AMD's Fusion



Dream Machine Puzzlement?

The 2010 Dream PC (September) was amazing. I felt like one of those screaming girls on old Beatles TV clips. My wife's not too happy though, because now I have a new "need." In this day of 3D gaming, why didn't you publish frame rates for some of the high-end games with 3D enabled? I can't imagine that machine would have any problems running 3D even in the most intensive games. With those monitors, 3D would probably give you vertigo. Also, it would have been cool to see what GPU-enhanced software like Adobe Premier would do on that killer SLI set-up versus a mere mortal PC like most of us have.

—Barry Sandall

Senior Editor Gordon Mah Ung Responds: We didn't test 3D because we couldn't. As cool as the HP monitors are, they do not support Nvidia's 3D Vision. Although, I have to say, I can't wait for the day when a 30-inch 3D panel is released. As for GPU-encoding, I don't believe that CUDA supports SLI, much less tri-SLI yet. Furthermore, the full complement of GPU-acceleration features in Nvidia's top-tier Fermi cards are not yet supported in Premiere Pro CS5 or even Photoshop CS5. Interestingly enough, you need a GeForce GTX 285 or Quadro 3800/4800/5800 card for all the CUDA effects. We imagine that this functionality will be added eventually.

Apple Snark Off-base?

In the August issue, you responded to a reader who called you out on snarking at Mac OS X because it doesn't have a Trim command, implying that the OS doesn't know what to do with an SSD. Let me refresh your memory. Remember how Apple shipped the first production computers with working USB ports and working USB keyboards and mice? Apple did the same thing with SSDs. Apple shipped the first production machine with an SSD—the MacBook Air—quite some time ago, and the MacBook Pros have had SSDs as a build-to-order option for almost as long, as does the MacPro desktop. As to why OS X doesn't have a "Trim" command, it's because there is no way Apple would ship a system with that kind of obvious botch. Obviously, Microsoft thinks exposing its users to such geekish nonsense is acceptable, but luckily that view is not universal. There are certainly valid criticisms to offer of Apple, but it's worth doing a bit of fact-checking to avoid flinging the random, errant snark. Credibility suffers otherwise.

—Mo

Senior Editor Gordon Ung Responds: The response was not that OS X doesn't "get" SSDs. It was that OS X doesn't have Trim support, which any good nerd knows is a must-have feature of a modern OS to get the maximum performance out of a modern SSD. If you think Apple doesn't need to support Trim, that's cool. It also doesn't happen to need to insulate the antennas in its phones. Let me refresh *your* memory: Remember when Apple created USB? Oh, wait, that was created by and for the PC industry. OK, how 'bout SATA? Oh wait, that was created by and for the PC industry. In fact, maybe you should give back PCI-E, PCI-E 2.0, DDR, DDR2, DDR3, SO-DIMMS, AGP, x86 CPUs, IDE, DVI, VGA, SATA, PCI, USB, and USB 2.0. I guess you don't need to give back USB 3.0 since, well, OS X doesn't have any drivers for that yet!

NOW ONLINE

Our Podcast Inspires Passion

If you aren't a regular listener to the Maximum PC No BS Podcast, you're missing out. Just ask uber-fan Joseph Noll, who enjoys our weekly rap session on PC hardware and news so much that he had a plaque made in the podcast's honor. Carved of wood and coated with enamel, the recreation of our podcast logo is proudly displayed on our office wall. Thanks, Joe! Go to MaximumPC.com and click on the No BS Podcast.

Rant aside, we found some performance tests online that indicated that the lack of Trim didn't seem to be a negative. This may be because the SSDs in Apple MacBooks are slower than most mechanical drives. We're guessing that Apple has implemented some sort of garbage-collection routine in the background of OS X that works well enough that users won't notice the difference, but we don't know enough to say for certain. In any case, the lack of documentation is a negative.

Whither AMD Fusion?

In recent issues, there was much fanfare about AMD's upcoming new integrated onboard graphics. Is this still happening? Or did the six-core Phenom II CPUs take over. Did I miss an issue or article or something? There doesn't seem to be any more news about it. This was supposed to revolutionize onboard graphics for those of us who don't play games.

—Nick

Senior Editor Gordon Mah Ung Responds: I think you're speaking of AMD's Fusion part that combines elements of the GPU and CPU into an "APU," or accelerated processing unit. Fusion, unfortunately, is not available yet. We're expecting parts in the next few months, with it really taking off early next year.

PC-Building Temperance, Please?

I'm excited to see the work that *Maximum PC* does highlighting interesting and novel PCs each month (per George Jones's editorial in September). I think that showing the diversity of things that can be done with a custom-built PC is a great role for the magazine. I would caution you, though, that not all of us readers want to see the most expensive, extreme build every month. The "Dream Machine," the "Ultimate TV & Movie PC," and other budget-busting builds are cool and fun, but they don't help the rest of us who are looking for guidance on affordable projects and parts.

I know it doesn't make for as exciting a cover as "Extreme kick-ass monster machine," but how about a feature on how to build an inexpensive (i.e., well under $1,000) yet functional kitchen PC for looking up recipes, playing some music, and checking out instructional videos while your hands are covered in grease and flour? What about building the perfect Mombox, with guidance on which components (or even off-the-shelf machines) to choose, which software to add/remove, and how to configure it to be as idiot-proof as possible? I know, I know, these sound like stories for lame 30-somethings instead of young hardcore gamers. But guess what? Some of your readers are former hardcore gamers (or, like me, long-time casual-plus gamers) who have other responsibilities in our lives.

—Maxim Weinstein

OBVIOUSLY, MICROSOFT THINKS EXPOSING ITS USERS TO SUCH GEEKISH NONSENSE IS ACCEPTABLE

Editor in Chief George Jones responds: Maxim, you make a great point that echoes the mind frame of the Maximum PC Lab. We build high-end PCs like the Dream Machine to establish the upper echelon of price, performance, and functionality, which in many cases is a year or two ahead of the curve. This is important, but it's not the end-all, be-all. That's why we highlight the best high-end, midrange, and budget parts each month on the back page of *Maximum PC*. The truth is that in some ways, the challenge of building out the fastest PC possible for $1,000 is more satisfying than building a $4,000 system. With this in mind, we're going to focus next issue's PC-building efforts around an affordable performance monster. (BTW, the Mombox idea is a great one. We'll start kicking that one around too.)

You also might want to check out the February 2010 issue for our story on building a kick-ass gaming rig for $647 (http://bit.ly/9aVzoz).

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.

NEXT MONTH

COMING IN

MAXIMUM PC'S DEFIANTLY MORE THAN 144 CHARACTERS NOV ISSUE

A No-Compromise $1,500 Gaming PC?

Our DIY guide tells you which gaming-oriented parts to buy and how to assemble it all.

Android vs. iPhone

Google's OS has made some remarkable strides over the last year, but can it topple Apple? Full reveal next month!

3D Display Shootout

Goggles on! Our Lab tests four new displays with an eye toward both standard and 3D performance.

Unleash your PC's Potential...

Try MAXIMUM PC

2 FREE Trial Issues

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**

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

To order, head to:
www.maximumpc.com/archive

AM3 MOBO

MSI 890FXA-GD70

Our pick for best AM3 motherboard is long overdue, but it's a good one. Fresh from a fierce battle against its two key rivals (see story on page 46), MSI's 890FXA-GD70 stands triumphant as the best board for your six-core Phenom II. One look at its no-less-than-five x16 physical PCI-E 2.0 slots tells you it's different. You also get native SATA 6Gb/s support thanks to the AMD chipset, and USB 3.0 ports to boot. And in the really slick department, the board offers touch-sensitive buttons for power and reset. Finally, overclocking doesn't get any simpler than with OC Genie. With the machine powered down, push the button, and then boot your machine for an overclock easier than instant oatmeal.

THE REST OF THE BEST

High-End Processor
Intel 3.33GHz Core i7-980X
www.intel.com

Midrange Processor
Intel 2.93GHz Core i7-870
www.intel.com

Budget Processor
AMD Phenom II X6 T1055
www.amd.com

LGA1366 Motherboard
Asus Rampage III Extreme
www.asus.com

LGA1156 Motherboard
Asus Maximus III Formula
www.asus.com

High-End Videocard
ATI Radeon HD 5970
www.ati.com

Budget Videocard
ATI Radeon HD 5770
www.ati.com

Capacity Hard Drive
Western Digital Caviar Black 2TB
www.wdc.com

Performance Storage
OCZ Vertex 2 100GB SSD
www.ocz.com

DVD Burner
Samsung SH-S223
www.samsung.com

Blu-ray Drive
Plextor B940SA
www.plextor.com

Full-Tower Case
Corsair 800D
www.corsair.com

Midtower Case
NZXT Hades
www.nzxt.com

30-Inch Display
HP ZR30w
www.hp.com

Speakers
Bowers & Wilkins MM-1
www.bowers-wilkins.com

Gaming Mouse
Madcatz Cyborg R.A.T.7
www.cyborggaming.com

Games we are playing

StarCraft II: Wings of Liberty
www.starcraft2.com

Minecraft
www.minecraft.net

Magic: The Gathering Online
www.mtgo.com

Team Fortress 2
www.teamfortress.com

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

MAXIMUM PC (ISSN 1522-4279) is published 13 times a year, monthly plus Holiday issue following December issue, by Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Phone: (650) 872-1642. Fax: (650) 872-2207. Website: www.futureus.com. Periodicals postage paid in South San Francisco, CA and at additional mailing offices. Newsstand distribution is handled by Time Warner Retail. Basic subscription rates: one year (12 issues) US: $20; Canada: US$32; Foreign: US$44. Basic subscription rates including monthly CD, one year (12 issues/12 CD-ROMs) US: $30; Canada: US$42; Foreign: US$54. Canadian and foreign orders must be prepaid. Canadian price includes postage and GST (GST #R128220688). PMA #40612608. Subscriptions do not include newsstand only specials. POSTMASTER: Send changes of address to Maximum PC, PO Box 5159, Harlan, IA 51593-0659. Standard Mail enclosure in the following edition: None. Ride-Along enclosure in the following editions: B1, B2, B3, B4. Returns: Bleuchip International, PO Box 25542, London, ON N6C 6B2, Canada. Future US, Inc. also publishes Mac|Life, Nintendo Power, PC Gamer, The Official Xbox Magazine, PlayStation: The Official Magazine, World of Warcraft Official Magazine, NVISION, Guitar World, Revolver, Guitar Aficionado, Windows: The Official Magazine, MOM, Crochet Today! and Pregnancy. Entire contents copyright 2010, Future US, Inc. All rights reserved. Reproduction in whole or in part is prohibited. Future US, Inc. is not affiliated with the companies or products covered in Maximum PC. Reproduction on the Internet of the articles and pictures in this magazine is illegal without the prior written consent of Maximum PC. Products named in the pages of Maximum PC are trademarks of their respective companies. PRODUCED IN THE UNITED STATES OF AMERICA.
CUSTOMER SERVICE: Maximum PC Customer Care, PO Box 5159, Harlan, IA 51593-0659. Phone: 1-800-274-3421. Email: maxcustserv@cdsfulfillment.com. Web: www.maximumpc.com/customerservice. Back issues can be purchased by calling 1-800-865-7240.
REPRINTS: Reprint Management Service. Phone: 717-399-1900 ext. 100.