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- Print from the Cloud
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# APRIL

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## The 6 Most Important Women in Computer History

I can't help it. Every few months, I spend a few days obsessively digging into web archives around a specific topic. This month's curiosity binge originated with ENIAC, the world's first general-purpose electronic computer.

Short for Electronic Numerical Integrator and Computer, ENIAC celebrated the 65th anniversary of its inception on February 14, 1946. As I started digging deeper and deeper into its origin, operation, and demise in 1955, I discovered that most of ENIAC's programmers were women.

I shifted gears, and started researching the role women have played in the history of computing and technology, and what do you know? Women's names are everywhere. I love history, and I'm embarrassed to admit that I had no frickin' idea.

So, in honor of Women's History Month, which starts in March, I'm forsaking opinion in favor of identifying six of the most important women in the history of our favorite hobby. I bet the breadth and scope of their work will surprise you.

► **Ada Lovelace:** The only legitimate child of Lord Byron, this math junkie took interest in Charles Babbage's work, and is widely recognized for writing the first computer program between 1842 and 1843, and for recognizing the capability of computers to transcend mere number-crunching.

► **Jean Bartik:** Born as Betty Jean Jennings, Bartik was one of the first programmers for the Army's ENIAC supercomputer. When the Army introduced ENIAC to the public, it introduced the inventors (Dr. John Mauchly and J. Presper Eckert), but not the female programmers.

► **Roberta Williams:** Carol Shaw, who made 3D Tic-Tac-Toe back in 1979, is known as the first female game designer, but Roberta Williams' design work on Sierra On-Line's series of adventure games in the 1980s easily makes her the most influential female game designer in history.

► **Radia Perlman:** Known as the "Mother of the Internet," Radia is famous for her invention of the spanning-tree protocol, a network protocol that ensures a loop-free topology for bridged Ethernet LANs with automatic backup pathing.

► **Grace Hopper:** Widely recognized as the progenitor of the hardware-independent programming language, Hopper is also the developer of COBOL, the first person to develop a compiler for code, and creator of the term "debugging." The Navy named the USS *Hopper* after her.

► **Frances Allen:** A pioneer in the fields of compiler optimization and parallelization, and a lifelong IBM'er, Allen is the first woman to win the Turing Award, which is essentially the Nobel Prize of computing.

As you might imagine, this is just the tip of the iceberg. If you think I'm kidding, check matters out for yourself. Like me, you're going to be surprised again and again.

**P.S.** On a totally random note, I have a challenge for you. There are three pink pigs scattered throughout this issue. Find them, and email me their locations, and I'll send the first 10 people to identify each one two Maximum PC coins.

*George Jones*



**LETTERS POLICY** Please send comments and questions to [george@maximumpc.com](mailto: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

## Where Are They Now?

# Windows Home Server Edition

HP and Microsoft once heavily touted Windows Home Server, a consumer solution aimed at multi-PC households, but the product has all but vanished —JOEL DURHAM JR.

**Y**ou need to back up your data; you need access to files from the notebook and desktop PCs around the house; you need lots of storage for your media, which you want to access from anywhere. Introduced by Bill Gates in January 2007, Microsoft's Windows Home Server was to become the solution for all those computing concerns, and more.

Once code-named Quattro, Windows Home Server stood tall at one Consumer Electronics Show

### WHS USERS SLAGGED MICROSOFT FOR NOT BRINGING BACK DRIVE EXTENDER

after the next; for years it was a fixture. Perhaps it was too complicated, or too expensive, or consumers just weren't interested in its features (remote access, centralized backup, media streaming, expandable storage, and so on) but things aren't looking good for Home Server these days.

Microsoft declined to directly comment but said that it is committed to the platform. Although sales figures for the OS and prebuilt servers aren't available, the number-one vendor of WHS boxes, Hewlett-Packard, decided to up and quit the game late last year. You generally don't do that if a product is selling like hot cakes. Microsoft



**HP, once Windows Home Server's premiere hardware partner, made award-winning boxes like this Data Vault that it hoped would help run your home.**

also ran into a buzz saw of bad publicity when consumers learned that the best feature of WHS—Drive Extender—was pulled from the latest version. Drive extender allowed end users to simply add drives as the space filled up in the servers. Additional drives would be added to a pool and could

either add space or back up the existing data.

Many WHS users say that without Drive Extender, there's simply no point in even running the OS anymore. On Microsoft's blog announcing the release candidate of Windows Home Server 2011, WHS users slagged the company for not bringing back Drive Extender.

"It boggles my mind that this team has decided to kill this product and tick off its core user base. We've spoken, yet this team, and/or its management, has failed to listen. This product, at the home consumer level, will fail," one person wrote.

Tech analyst Rob Enderle agreed that the situation is looking pretty dire.

"It does look like Home Server no longer has a home in the home," Enderle said. He said there's always been some resistance to Windows Home Server from the average consumer. "The home consumer has never wanted to be an IT manager."

So far, 2011 isn't looking like the year Windows Home Server will catch on. Will Microsoft slam it into the same bin as Clippy, Bob, and Windows Me? Will the company realign its server focus to the more traditional business arena? No one knows at this point, but it's not often that an enterprise-level company stands behind a losing product for a very long period of time.

## Intel Asks for Do-over on Sandy Bridge Chipset

Sets aside cash to fund replacement of affected systems and boards

**W**ant to buy a Sandy Bridge-based motherboard or system? Good luck finding one. Intel hit the stop button on all 6-series chipsets after it confirmed that the chipset's SATA ports could "degrade" over time.

The good news: Intel said it is setting aside \$700 million to help pay for the replacement of boards, systems, and notebooks with the bad chipset.

The chipset's first two SATA 6Gb/s ports, 0 and 1, are unaffected. But ports 2-5, the SATA 3Gb/s ports, could start generating errors over time and eventually fail. Increased thermal and electrical loads on the ports can exacerbate the problem, the company said. Intel's best estimate on how many will fail is based on the higher temperatures that notebooks are exposed to—and by that measure, Intel said 5 percent of the ports could fail over a three-year period.

Intel noted that the data on the hard drive is not in danger and simply switching to another port should correct the issue. The company also said that many notebooks will never see the problem because they usually have just two SATA ports in use and those are typically ports 0 and 1, which are unaffected.



The SATA 3Gb/s ports on the Intel 6-series chipsets could fail over several years of use.

Nonetheless, the company said it's not taking any chances and is producing a new spin of the chipset, B3, which will incorporate a fix. It's also working with OEMs and board makers to replace bad boards in systems. The final cost to Intel will total more than \$1 billion.

Most PC vendors and board makers have already announced replacement programs or other options for consumers. If you have a Sandy Bridge system, you are encouraged to check with your vendor for further instructions.

The biggest problem may be for consumers looking to build a Sandy Bridge system. Intel will put 8 million chipsets in the garbage can and will have to spool up production all over again. The blip is expected to make it difficult to find Sandy Bridge boards and systems for possibly two months. —GU

## WIRELESS ISPs vs. FCC

### Net neutrality order sparks revolt

**D**espite the relatively loose reigns the FCC's new net neutrality order puts on wireless providers, two of those companies are taking the commission to court. First, Verizon brought a case to a federal appeals court, asking that the new order be overturned. While proclaiming its commitment to an open Internet, Verizon said of the FCC's order, "We believe this assertion of authority goes well beyond any authority provided by Congress, and creates uncertainty for the communications industry, innovators, investors, and consumers."

In its effort to have the net neutrality order declared null and void, Verizon has tapped attorney Helgi Walker, the same attorney who successfully represented Comcast in its case against the FCC. In that case, Walker persuaded a judge that the FCC overstepped its authority and she plans to do the same here. Days later, MetroPCS filed its own lawsuit against the net neutrality order, seemingly as a preemptive strike against FCC scrutiny of a new tiered-service plan for its 4G network. —KS

## FAST FORWARD



## Windows on ARM: It's About Time

**M**icrosoft is the latest slow-moving behemoth to realize that the gravitational center of personal computing is moving from desktops to pockets. Intel sensed the shift about four years ago and developed the lower-power Atom processor. Now, Microsoft is porting the next generation of Windows to run on low-power processors based on the ARM architecture.

Of course, neither Intel nor Microsoft is a total newbie to mobile computing. Intel even acquired some ARM-compatible processors in the 1990s before foolishly selling them and starting over with Atom. For even longer, Microsoft has sold a stripped-down version of its operating system for ARM (Windows CE) and more recently has struggled to establish another ARM-compatible Mini-Me mutant (Windows Phone) in handsets. But for years, Intel ignored products smaller than notebooks while Microsoft reserved its full-fledged Windows for PCs.

Meanwhile, Apple has been growing rich on iPods, iPhones, and iPads that run a small operating system known as iOS on ARM-compatible processors. Mac OS X and Intel processors aren't found in Apple products smaller than the Macintosh Air because the x86 hasn't been able to match ARM's stingy power consumption.

Microsoft has a chance to restore its glory. By the time Windows 8 is ready (probably 2013), smartphones and tablets will be even more popular alternatives to traditional PCs and stronger ARM-compatible processors will appear. In two years, Apple's iOS might actually look weak against a full-strength ARM version of Windows.

Indeed, ARM processors could creep upward into PCs and servers even while x86 processors are creeping downward into smartphones and tablets. Software written in Microsoft's .NET languages or Java is easily portable to ARM. For other software, Microsoft could offer x86 emulation as a bridge. Apple successfully used software emulation to ease transitions from the 68000 to PowerPC in the 1990s, and from PowerPC to the x86 in the 2000s.

Future PCs might be docking stations for smartphones and tablets—docks that add processors, storage, and other resources. Today's distinctly different classes of PCs may disappear. Both Intel and Microsoft now understand they must adapt to this gravitational shift or face extinction.

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

## Chrome 9 Goes Stable

Google adds speed, 3D, and apps to the browser

There's a new stable build of Google's Chrome browser, and reportedly, it's the fastest build yet. But speed isn't the only addition. The latest Chrome version adds a couple of goodies previously only available in beta builds, including WebGL, Chrome Instant, and the Chrome Web Store, Google announced in a blog post.

"WebGL is a new technology that brings hardware-accelerated 3D graphics to the browser," Google said. "With WebGL in Chrome, you can experience rich 3D experiences right inside the browser with no need for additional software."

Faster browsing comes in the form of Chrome Instant, which begins loading frequently visited web pages as soon as you start typing the URL, provided you enable it in the Basics tabs of Chrome's options. And finally, Google said the Chrome Web Store is now open to all Chrome users living in the United States. —PL



At the Chrome Web Store you can buy apps, extensions, and themes for your browser.

## The Great Domain Debate

A new initiative being proposed by the Internet Corporation for Assigned Names and Numbers (ICANN) could allow world governments to veto future top-level domains—the next wave of suffixes that will join .com, .org, etc.—and this has critics worried about free speech and unjust control over the Internet.

At stake are more than 100 proposed new top-level domain names, including .nyc, .movie, and .gay, which is intended to bring awareness and solidarity to the LGBT community.

The process for applying for new top-level domains is currently up in the air. Many believe ICANN (with oversight from the U.S. government) has been doing a fine job. But some point to recent moves by U.S. government agencies to seize domains as evidence that a new system is in order. —RW

## GAME THEORY



## Feel the Fear and Play It Anyway

Fear is subjective. What scares one person might not scare another. For instance, in the last week, I watched both *Dead Snow* and *The Host*, but the most terrifying thing I saw was an episode of *Dirty Jobs* in which Mike Rowe crawls through a tunnel swarming with cockroaches. The movies have faded from memory, but those damn roaches haunt my dreams.

Some classic horror movies aren't even scary. *Dawn of the Dead*, for instance, is not scary. The original version of *The Haunting*, on the other hand, is terrifying. Horror, as a genre, encompasses a wide palette of emotions, from disgust to fear to unease, and two recent games show just how many chords it can strike.

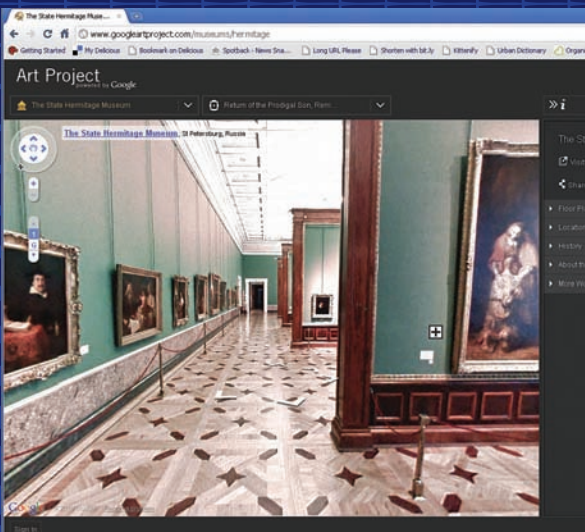
Let's start with *Dead Space 2*. Yes, it's frightening and horrifying, but it's funhouse fear and gross-out horror. Like much action/horror, it's patterned after theme-park rides. Tension is built gradually and then released in sudden bursts. It maintains a giddy intensity by providing a steady stream of violence and gore. The ride is wild, but it doesn't resonate.

Working the other side of the street is *Amnesia: The Dark Descent*. It begins like H.P. Lovecraft's "The Outsider," with a mentally disturbed man waking in a creepy castle crawling with all manner of threats, most of them unseen. You have no weapons and no ability to fight the threats you'll encounter. Thus, you spend much of the time alternating between the hunt for precious pools of light to stave off insanity (your character is afraid of the dark) and hiding in the shadows from monstrous threats. Gameplay is a matter of manipulating the environment and not dying. Yet its sustained atmosphere of absolute dread is unparalleled in my gaming experience. When it comes to true fear, rather than funhouse fear, *Amnesia* beats *Dead Space 2* cold. You may scream and laugh at the grotesque horrors of *Dead Space*, but when you turn out the lights at night and inky shadows crowd the corners of your room, it's *Amnesia* that will return to haunt you.

Thomas L. McDonald is an editor at large for *Games* magazine and blogs at [sopgaming.blogspot.com](http://sopgaming.blogspot.com). You can follow him on Twitter at [StateOfPlayBlog](http://StateOfPlayBlog).

## Get Your Art On

Street View tours world's museums



Google's new Art Project uses Street View technology to bring you art works, even some in 7,000-megapixel format, from 17 of the world's most renowned museums, including the Metropolitan Museum of Art and MoMA in New York, the Tate and National Gallery in London, and the Van Gogh Museum in Amsterdam. —KS

## Sound Oasis Sleep Therapy Pillow

If you like the idea of falling asleep with the sweet sounds of your favorite tunes or TV show in your ears, the Sound Oasis Sleep Therapy Pillow (\$50, [www.sound-oasis.com](http://www.sound-oasis.com)) fulfills that need nicely. Pockets within either end of the pillow contain a set of ultrathin stereo speakers, which connect to any device that accepts a 1/8-inch headphone jack. The sound quality is surprisingly good and the speakers don't impact the pillow's comfort in the slightest. —KS



## All Things Android

Google continues its push for mobile platform domination

Analytics firm Canalis reports that the Android platform dominated world-wide smartphone sales in the fourth quarter of 2010, with 32.9 million units sold, supplanting the former top-selling Symbian platform (on Nokia phones), as well as Apple's iOS and RIM's BlackBerry platform.

On the app front, where Android is much less a force, Google is reportedly

hiring developers, product managers, and UI experts to help shore up the app offerings. Here, Apple has an unequivocal edge, offering 350,000 apps to the 100,000 for Android. Google's recent extension of the Android Market to desktop browsers will make getting those apps easier—any apps you select can be automatically downloaded over-the-air to your Android device. —KS

## HP Redesigns TouchSmart

HP's popular TouchSmart series of all-in-one computers just became more versatile, with a new design that allows the display to slide along tracks into a 60-degree reclining angle. It's a big improvement over the picture-frame form factor of models past. The new models include the TouchSmart 610 consumer PC and the TouchSmart 9300 Elite business PC, both of which feature a 23-inch HD display. —KS



## Steam Makes \$1 Bil in 2010

If estimated sales figures published by Forecasting and Analyzing Digital Entertainment (FADE) are correct, Steam, the game-publishing arm of Valve Software, may be single-handedly keeping PC gaming alive. The big winners were Call of Duty: Black Ops (\$98.2 million), Modern Warfare 2 (\$39.4 million), and Valve's own Left 4 Dead 2 (\$36 million). According to FADE, over 180 titles surpassed \$1 million in revenue for the year. —GJ



QUINN NORTON

## Anatomy of a Chilled Internet

Imagine you got a letter that said you had to take down your blog or Facebook page, or spend thousands lawyering up. That sensation running down your spine? It has a name in the legal world. It's called a chilling effect. A legal threat doesn't have to go to court to be effective. Most would-be defendants don't want the hassle and expense of going to court, and so capitulate to threats, even invalid ones. In 1998, the Digital Millennium Copyright Act opened a whole new field of legal nastygrams. The DMCA takedown is particularly easy to send—it allows people who can fake vague legalese to take down just about anything on the U.S. Internet that's unguarded by a phalanx of lawyers, giving the trolls that discover it unprecedented power. With international treaties like ACTA, we're trying to bring this feature to everyone else's Internet.

After the DMCA passed, law professor Wendy Seltzer (then of the Electronic Frontier Foundation) decided to make a home for these nastygrams, and called it the Chilling Effects Clearinghouse. It was to help people understand the impact of legal threats, and help those who got them to understand their rights. "We've now posted more than 20,000 cease-and-desists, almost all of them DMCA complaints to Google," says Seltzer. In 10 years it's created a rich dataset, through which people can study how the law gets used. "Chilling Effects the project doesn't make value judgments about the letters it posts. Some of them target speech that's clearly lawful. Others, wholesale reproductions of copyrighted works; many others, something in between." The archive is available at <http://chillingeffects.org/>. She'd like to get more letters, in particular from companies like Facebook and Bing, where takedown isn't transparent.

Researchers working on the Clearinghouse data have found many takedowns aimed at hobbling business competitors, silencing critics, or in some cases, ranting nonsensically. But because we only get notices from Google, we can't really know how widespread fake-out takedowns are. We don't know how effective they've been at scaring ideas and businesses out of existence—probably too effective.

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

## 6 Technologies That Are Destined to Disappear...

### 6 Handheld Gaming Consoles

At some point in the near future, all of our kids will carry smartphones, and they'll find the notion of lugging around a second handheld device preposterous—and antiquated. If we were Nintendo, we'd start looking into Android and iOS development today.



### 5 Pre-Recorded Physical Media

Obsolescence has already cratered the CD. Soon, the media-swallowing black hole will demolish DVDs and Blu-ray discs. The only real question is how fast it will happen. Our call? Five years.



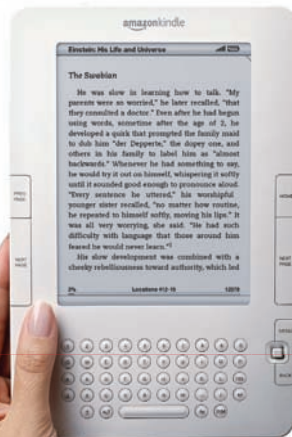
### 4 Consumer-Level Hard Drives

Solid-state and other memory-based drives are one threat for mechanical drives, but the bigger threat is the cloud. Our proof? Hard drives are crazy cheap these days—just like floppy drives and HD DVDs were when they neared extinction.



### 2 Ebook Reader

This one's a bummer, but it's true. Ebook readers are going to be swallowed whole by tablets and other multifunction devices that hopefully feature secondary e-ink displays. Amazon could fight this by incorporating web browsing and apps into the Kindle, but wouldn't that make it an, erm, tablet?



### 1 Keys

It might take a while and it won't be easy, but keys suck and they deserve to be banished forever. They're already being replaced by push-button ignition systems, keypads, biometric locks, and proximity-based systems.



### 3 Stereoscopic 3D TVs—with Glasses

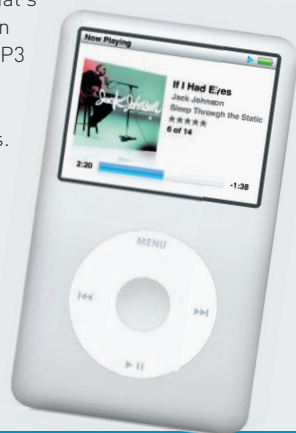
Wearing 3D glasses at home is a hassle, and in general, the technology feels like a temporary bridge to a point in time when we all have autostereoscopic TVs or holographic displays in our homes.



# ...and 6 Technologies That Will Stick Around

## 6 Media Players

Somehow, the portable MP3 player is one of the few gadgets to defy the pending one-device-to-rule-them-all convergence. Why? Smaller non-phone form factors, jogging, and simplicity, for starters. All we know is that Apple sold a whopping 17 million iPods in the fourth quarter of 2010, that's 3 million more MP3 players than iPhones.



## 5 Landline Telephone

More and more people are ditching their landlines, but they'll never go away entirely. Service is cheap, call quality is reliable, and given how easy it is to overload mobile networks, they'll probably work better in case of an emergency. And we don't see businesses and corporations switching anytime soon.



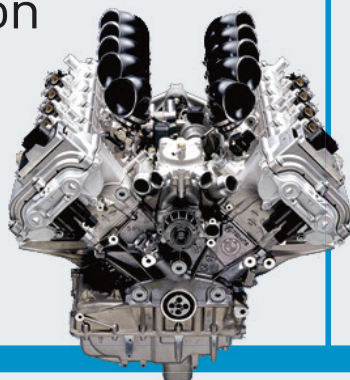
## 3,2,1 The PC, Keyboard, and Mouse

We lump them together because in our minds, they're a package deal. We hope we're not jinxing ourselves, but in some way, shape, or form, the desktop computer will continue to sit at the center of our technological lives for some time to come.



## 4 Internal Combustion Engine

Hybrid tech is intriguing, but it's a stop-gap measure that, ultimately, is still gas-powered. With lots of oil left on the planet, slow-moving auto makers, and no good fuel alternative, we're going to be driving internal combustion engines for a long, long time.



# DEATHMATCH

## UEFI vs. BIOS

As the first bit of code that's run when you hit the power button, the PC's Basic Input/Output System (BIOS) is responsible for ticking the other pieces of hardware awake, checking their condition, and then finally passing control over to the operating system. It's also ancient and dates back to the very first PC. But there's a new sheriff

in town, finally. Called Unified Extensible Firmware Interface (UEFI), it's meant to update one of the oldest legacy technologies in personal computing. As we know, newer is not always better. This month we rank the major factors in both technologies and determine which you should have in your next PC. —GORDON MAH UNG



### ROUND 1

**FEATURES** The BIOS is written in Assembly, cannot be translated to another CPU architecture, runs in 16-bit real mode, and can only address 1MB of RAM. UEFI, on the other hand, is written in C, supports both 32-bit and 64-bit, and even has network access. UEFI also promises faster boot times over the BIOS, although we have yet to see it in our Lab. **WINNER: UEFI**

### ROUND 2

**PARTITION LIMIT** The BIOS would likely continue to be supported if not for its most glaring problem: its inability to support partitions beyond 2TB (2.2TB to be specific). UEFI, on the other hand, will support up to 9.4ZB, or 9.4 billion terabytes. **WINNER: UEFI**

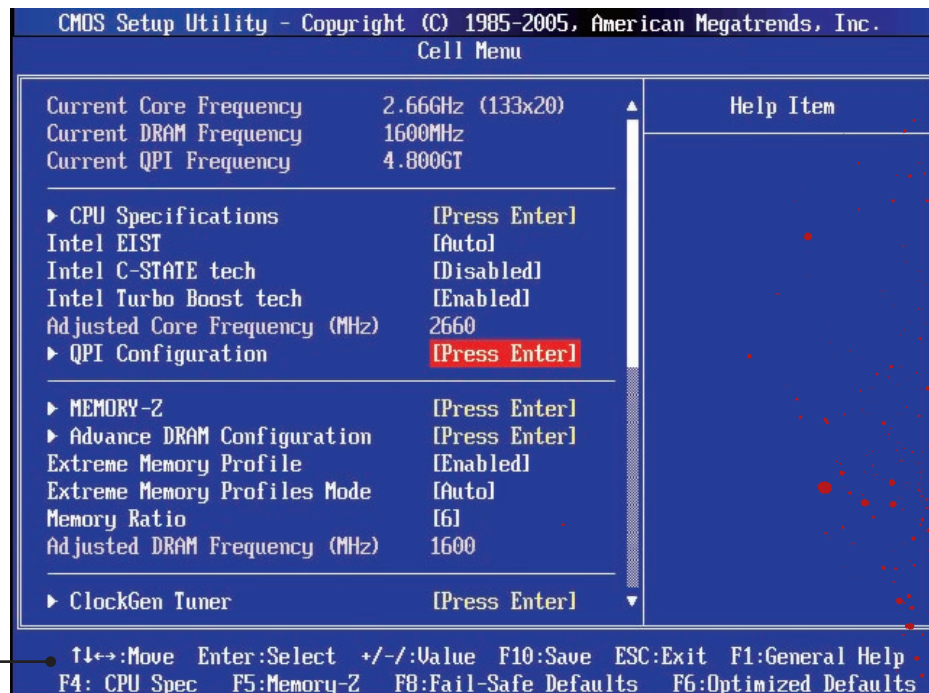
## ROUND 3

**INTERFACE** If you went back in time and sat down in front of your PC and booted into the BIOS, you wouldn't be able to tell if it was 1989, 1995, or 2010. Yeah, it's that freaking creaky. Peep a UEFI board and you know you're not in Kansas anymore. Of the ones we've seen, Asus's implementation (pictured on the previous page) is particularly striking. Not all UEFI interfaces are pretty, though. Intel's UEFI boards and Gigabyte's P67 boards, for example, are based on UEFI but still use a standard BIOS interface. Nevertheless, the possibilities with UEFI make it the clear winner. **WINNER: UEFI**

## ROUND 4

**PRONUNCIATION** Rightly or wrongly, we pronounce BIOS as buy-ohs and everyone knows what we mean. UEFI, though, is a tough one. You can truncate it C-3PO (3PO) style to EFI or effy, but we're leaning toward oofy, as in Goofy without the g. Either way, the winner is clear. **WINNER: BIOS**

BIOS



## ROUND 5

**EASE OF USE** The BIOS has been with us so long, you'd think that most of us could drive it in our sleep. Unfortunately, it's not always that easy. Every board maker has its own BIOS interface and they are often as difficult to set as a digital watch sometimes. UEFI's graphical interface promises greater ease of use, and, indeed, Asus's drag-and-drop interface for boot devices is evidence of that. Still, some UEFI settings are as difficult to decipher as those in the BIOS, but it's only going to get easier and better from here. **WINNER: UEFI**

## And the Winner Is...

Change is difficult for many. It's like making the switch from Office 2003 to Office 2010, or getting rid of your favorite mouse—many regret it immediately. But moving from the BIOS interface and its legacy underpinnings is more akin to finally getting rid of your 15-year-old skivvies—you know, the ones with

worn-out elastic. Yeah, they work, but would you really miss them if they were gone? That's the way we feel about the BIOS at this point. If you're against change, deal with it. UEFI is the future and we're only at the beginning.

This month the Doctor tackles...

# ▶ Powerline vs. Wi-Fi

# ▶ RAID Defrag

# ▶ Retrieving Data



## Best Case Scenario

About eight years ago, I purchased the parts for and built my first custom computer. It has been updated many times, but I am now in a position to replace my computer entirely and start from scratch. I am finding it very difficult to give up my silver, all-aluminum Lian Li PC-65 windowed case. Is it possible to use this case for a modern rig? I can drill holes in the side window and mount a fan for more ventilation if necessary. It currently has four 8cm case fans: two in front, one on top, and one on the back—all of which are two years old. My primary concern is that my motherboard tray has no cutout where the CPU goes. Is this necessary for modern mobos or just nice to have? Will my front USB ports work at current USB speeds? If I can't use this case I may cry a little. It cost me \$300 in 2002.

—Kernica

Provided your new rig can physically fit in the enclosure—graphics cards, power supplies, and CPU coolers, in particular, have gotten a lot larger in the past eight years, while the basic size of hard drives, optical drives, and ATX motherboards hasn't changed—we don't see a problem. That is, if your 8cm fans provide enough airflow for today's hotter-than-ever parts.

The CPU cutout in the mobo tray isn't essential; it's just so CPU coolers with

motherboard backplates can be installed without removing the motherboard from the case. As for the front USB ports, it's hard to say. In 2002, some front-panel USB ports were individually pinned out, while others used standard headers. If you're worried and you don't mind giving up an optical drive slot, you can always use a front-bay adapter with modern USB 2.0 ports on it—or USB 3.0, if your new motherboard supports it.

## Fire Firefox's AutoUpdater

I have some issues with Firefox and hope you can resolve them for me. First, Firefox updates when it wants to regardless of what I want. I've missed out on some significant eBay auctions because of this. How can I prevent this? Second, Firefox seems to store what it wants in the navigation tool bar. How can I store what I want in the navigation tool bar? I'm tired of having bad URLs, mistakes, and trash I don't need in this toolbar. Please help!

—Jesse Stewart

Fortunately, all of these things are preventable, Jesse. (Note: All the following tips were tested using Firefox 4 Beta 8). To change Firefox's update settings, go to Tools > Options. Click the Advanced tab, then the Update subtab. You'll see an option to "Automatically check for updates to," with

checkboxes for Firefox, Add-ons, and Search Engines. Uncheck these and Firefox will stop checking automatically. Or, if you still want Firefox to check for updates, but want to choose when to install them, look just below this menu for the setting that says "When updates to Firefox are found." Click the radio button that says "Ask me what I want to do." This should stop Firefox from auto-updating when you're in the middle of an eBay auction. If you do disable auto-updating, be sure to check for updates regularly, or your computer won't be as secure as it ought to be.

For your second question, we can't tell if you're talking about the navigation toolbar (where the address bar, search bar, and back arrow typically are) or the bookmarks toolbar, which holds bookmarks. If it's the former, just right-click any empty space on the toolbar and select Customize from the menu that pops up, then just drag away anything you don't want on the toolbar. For the bookmarks toolbar, just right-click bookmarks you don't want and click Delete. Firefox doesn't populate this bar by itself, but sometimes you can accidentally add bookmarks to this bar by drag-and-dropping page elements or links onto it. Just delete these with the right-click context menu if that happens.

## House of Flying Platters

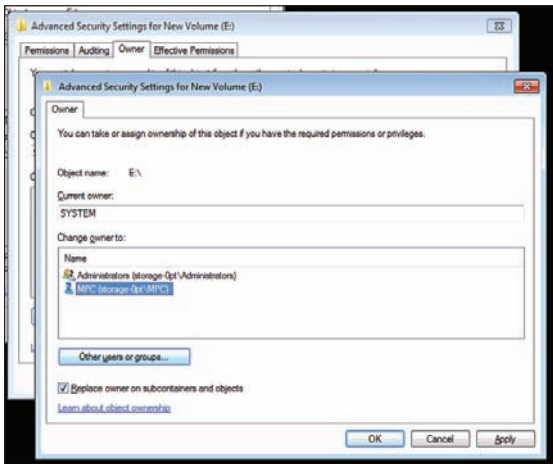
I have several RAIDs on my home PC—a RAID 0 for my OS and programs and a RAID 1 for my data and documents. Should I be defragging these? What about a RAID 5?

—Gareth Barnett

Well, Gareth, provided you're using standard mechanical drives and not SSDs, the answer is yes. Windows' file system doesn't see the physical disk layer; it can't tell if a partition is on a single disk, or striped, or mirrored. All it knows is which data goes in which sectors. It's up to the RAID to split those up (or mirror them) between drives. In RAID 1, one drive is mirrored to the other, sector by sector, so defragging is as valuable as it is in a single drive. In RAID 0, data is striped across two (or more) drives, but the OS still sees one drive table, so defragging is useful here, too. RAID 5, same deal. Bottom line: Defragging improves performance on mechanical drives (though your OS might be defragging automatically—Vista and Win7 do so by default).

## Data Recovery on the Cheap

I had a laptop running Windows XP that expired due to a fried motherboard. The tech that looked at it said he could transfer all the files to my new Windows 7



**Taking ownership of documents from an old computer is just a few clicks away.**

computer, but that option seemed a little pricey. How can I do this on my own and on the cheap?

—Name Withheld

There's no reason you should have to pay a technician to move files from one functional hard drive to another. The first step is to remove the hard drive from your laptop. Many laptops have hard drive access doors (usually secured with a few Phillips-head screws); for others, you'll need to partially disassemble your laptop in order to remove the drive. Check your laptop manufacturer's website for instructions on how to access the hard drive on your specific model.

Once your drive is out of the old system, take a look at its interface. Unless your laptop is really old, it's likely a SATA drive, in which case you can either hook the drive directly into a spare SATA port on a desktop computer, or use a USB-to-SATA converter. Those can be as

inexpensive as \$20 or so. If your laptop has an older parallel ATA drive, fear not; USB adapters are available for those interfaces as well. Attach the drive to the USB adapter and plug it into your new computer.

Once your old drive is connected to your new computer, you need to reclaim the drive. Go to My Computer, right-click the drive, and click Properties. Go to the Security tab, hit Advanced, and then Owner. Select Edit. You might be prompted for your XP machine's old password. From here, select your username on your new PC (whatever user you're logged in as). Be sure to check "Replace owner on subcontainers and objects." Click OK. You should now be able to drag-and-drop files from your old XP drive to your new drive. Total cost: About \$20 for the adapter (or none, if your new computer is a desktop with a spare SATA port).

## Putting It All Together

I have a number of electronic components that have Internet functionality—TV, Xbox 360, laptop, desktop, and Blu-ray player. Most all of them are wireless- and wired-Internet capable. It isn't feasible to have all these components hard-wired to my router or modem. There is an investment required either way to achieve Internet access—either a wireless adapter for each component, or power-line Ethernet equipment. My question is: In general, which is a faster Internet solution—wireless or power-line Ethernet? I have read many articles and reviews on each of these technologies, but haven't seen anything comparing the two together.

—Ryan Garrett

To be totally honest, that's like asking, "Which is faster,

third solution that you didn't mention: MoCA (Multimedia Over Coax) promises throughput up to 175Mb/s.

The absolute best solution is to string CAT5e cable to all of your devices. If you don't have enough ports on your router's switch, a good eight-port gigabit switch will set you back \$30 to \$40 (we rock a 24-port switch at Maximum PC Lab North). If you don't want to go that route, determining which no-new-wires solution is best for you depends on the environment inside your house. Wi-Fi is the easiest and cheapest due to the plethora of hardware—unless the signal can't reach the client (because of too many thick walls or floors, for example). Power-line is a good solution unless your electrical wiring is very old, you have a lot of in-wall dimmers that inject noise into the wiring, or you live in a condo or apartment

## DON'T PAY A TECHNICIAN TO MOVE FILES FROM ONE FUNCTIONAL HARD DRIVE TO ANOTHER

a snowmobile or a motorcycle?" The answer depends on the environment in which you're using the device. A motorcycle will dust a snowmobile on the street, but race the two machines in the snow and you'll see a very different outcome. On paper, some 802.11n routers can deliver wireless TCP throughput of 300- to 450Mb/s, while HomePlug AV 2.0 devices are claiming throughput speeds up to 500Mb/s. There's also a

where your wiring is not isolated from your neighbors'. MoCA is a newer solution; it uses the same coaxial cable you use for cable TV, but it doesn't coexist well with some satellite TV installations.

The Doc suggests you place your notebook in each spot where you want to use these other devices on your wireless network and measure its performance there. If you get satisfactory results, buy a Wi-Fi adapter for that device. If you don't get good results, try a power-line adapter or MoCA. ☺



**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](mailto:doctor@maximumpc.com) for advice on how to solve your technological woes.



Cooling the Piggy PC's ceramic chassis was a little harder than we had anticipated.

# THE CHEAPSKATE'S GUIDE TO Power Computing

Our guide shows you how to live a frugal, fast, and free PC existence

BY PAUL LILLY, LOYD CASE, NATHAN GRAYSON, AND BRUCE ATHERTON

Cheapskate. Some folks say it with a snarled upper lip and a curt, terse emphasis on the final syllable, like it's some kind of awful, horrible moral failing. Puh-leeze. More often than not, cheapskates aren't ripping off anyone. But the cable, satellite, software, and phone companies sure are.

In a day and age when everyone is trying to upsell, premium-ize, and shake us down on a weekly basis—often under the guise of saving us money—we actually view cheapskatism as a sign of higher intelligence and reason. If approached the right way, of course.

Over the next nine pages, we're going to show you how your PC can save you thousands of dollars every year—without compromising the computing lifestyle you're accustomed to. What you do with all those pennies saved is entirely up to you.

ILLUSTRATION BY ADAM BENTON



# Live Free(ware) and Prosper

Our top picks for awesome alternatives to popular and pricey commercial software

You just dropped a wheelbarrow full of cash upgrading your videocard and CPU, leaving only a little bit of pocket lint leftover for software. Relax, Bobby, it's going to be fine. The truth is that software is mother-lovin' expensive. Seven hundred smackers for Photoshop? Pshaw! Thankfully, free and powerful alternatives to the most popular apps abound. Put your PayPal card away and follow along.

## GIMP YOUR PHOTOS, NOT YOUR WALLET

GIMP, or GNU Image Manipulation Program if you can't stand acronyms, is a popular open-source alternative to Photoshop. Don't let the fact that it's free fool you; even though it's not quite as polished or feature-rich as Photoshop, there's a lot you can do with GIMP beyond just resizing and re-touching. A robust set of integrated tools and an extensive plugin library make it a more-than-capable image manipulator, not just an editor. GIMP is also platform-flexible in that it supports Windows, Mac OS X, and of course, Linux.

**FREE**, [www.gimp.org](http://www.gimp.org)

## MICROSOFT ANSWERS THE CALL FOR FREE ANTIVIRUS

What started off as Windows Live OneCare eventually morphed into a capable and free antivirus solution known as Microsoft Security Essentials. Surprisingly effective for a relative newcomer, the latest version adds heuristic scanning and improved Firewall integration. Just be sure you're rocking a legit copy of Windows.

**FREE**, [www.bit.ly/9ikpqC](http://www.bit.ly/9ikpqC)

## USE PHOTOSHOP FOR FREE (LEGALLY)

Don't need the feature-rich complexity of GIMP? No problem. Most photo-sharing sites, like Flickr and Photobucket, let you make basic changes, but the cool thing about Adobe's online Photo Express Editor is that it aggregates your photos from those and other portals, including Facebook, and neatly organizes them. You can also upload up to 2GB of photos for free.

**FREE**, [www.photoshop.com](http://www.photoshop.com)

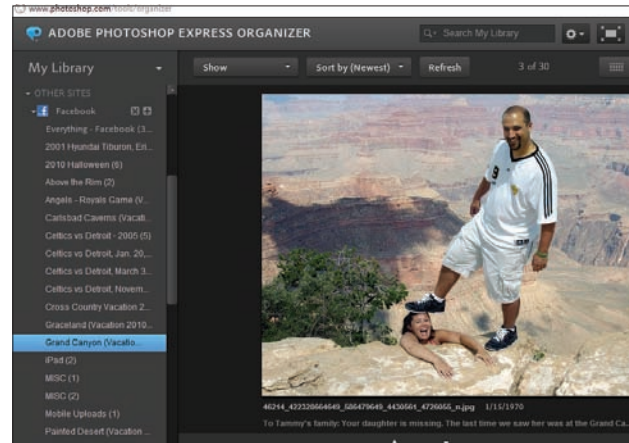
## KICK MALWARE IN THE NADS... TWICE

Microsoft Security Essentials does an outstanding job at beating back viruses, but sometimes you need an extra bodyguard or two to keep things in line. Unlike antivirus software, which digs deep into your OS, antispyware applications can be run in tandem. Malwarebytes and SuperAntiSpyware provide a potent one-two punch combo, oftentimes catching what the other doesn't. Combined with Microsoft Security Essentials, you'll have a three-headed monster that loves to munch on malware.

**FREE**, [www.malwarebytes.org](http://www.malwarebytes.org) and [www.superantispyware.com](http://www.superantispyware.com)

## VIVA LA LIBREOFFICE 3.3!

We love a good Cinderella story, and that's what we have with LibreOffice. You see, when Oracle took over Sun Microsystems, it created a near-instant riff with the developers of OpenOffice, whose open-source ideology



Adobe's Photoshop Express Organizer is great for managing and editing photos from multiple sites, including Flickr and Facebook.

didn't mesh with Oracle's proprietary mindset. Several key programmers jumped ship and went on to create LibreOffice, a fork of OpenOffice with the backing of several industry bigwigs, including Canonical, Google, and Red Hat. Ready for the clincher? You can save documents compatible with Microsoft Word (including .docx) sans the heavy price tag!

**FREE**, [www.libreoffice.org](http://www.libreoffice.org)

## LINUX: LEARN IT, LIVE IT, LOVE IT WITH UBUNTU

Whether you're rocking a desktop, server rig, or a netbook, there's a version of Ubuntu designed just for you. Ubuntu is perhaps the easiest of all Linux distros to use, providing a pain-free way of cutting those costly Windows shackles. What about games, you ask? If a title isn't supported natively, use WineHQ, which lets you run Windows

software in Linux.

**FREE**, [www.ubuntu.com](http://www.ubuntu.com) and [www.winehq.com](http://www.winehq.com)

## SUGARSYNC BRINGS SWEET FILE SHARING TO THE DESKTOP AND BEYOND

We still adore Dropbox, we really do. It's just that SugarSync is a tad more flexible. It offers cloud-based file syncing, just like Dropbox, and you can easily share files between PCs. But SugarSync goes the extra mile by letting you sync multiple folders across multiple systems. We also appreciate its robust mobile platform support (iPad, iPhone, Android, BlackBerry, Windows Mobile, and Symbian devices) and remote access from any web browser. You get 5GB for free, and 500MB for every successful referral (if they sign up for a paid plan, you both get an additional 10GB).

**FREE**, [www.sugarsync.com](http://www.sugarsync.com)



## CLONING MADE FREE AND EASY

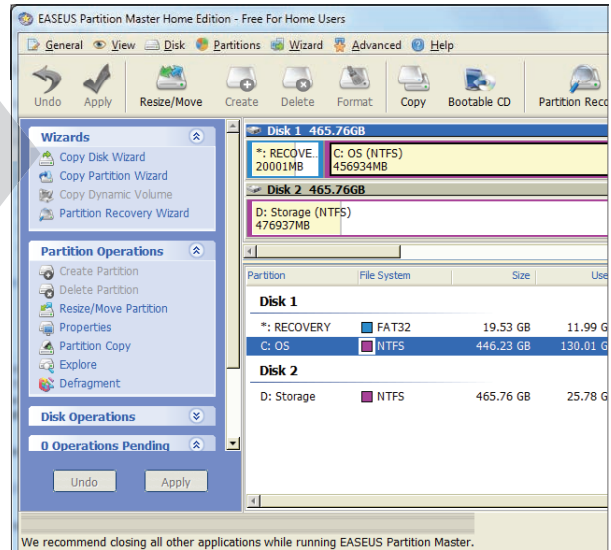
Let Professor Penny Rich and Doctor Deep Pockets debate which is better, Norton Ghost or Acronis True Image. Both are great, but both will set you back at least \$50. Sir Save-a-Lot's solution? Macrium Reflect, a no-cost cloning program that works with XP, Vista, and Windows 7 in both 32-bit and 64-bit form. With it you can create a disk image even while running Windows, a rare trick for free cloning software. There's a built-in scheduler and you can even image to a network, USB, or FireWire drive, as well as optical media.

**FREE**, [www.macrium.com/reflectfree.asp](http://www.macrium.com/reflectfree.asp)

## PARTITION LIKE A PRO

Microsoft continues to improve upon Windows' built-in partitioning tool, but sometimes it's not enough. Easeus Partition Master Home Edition comes to the rescue with a robust partition manager priced at 100 pennies less than a buck. It supports hard disks as small as 2GB and as massive as 4TB, and it also works with removable devices. The list of tricks is long, including the ability to extend a system partition; resize, move, merge, split, and copy partitions; redistribute free space; scan a disk for bad sectors; support hardware RAID; rebuild the MBR; convert FAT to NTFS; convert partition types; secure file deletion; and more.

**FREE**, [www.partition-tool.com/personal.htm](http://www.partition-tool.com/personal.htm)



Easeus packs a surprising amount of functionality into its Partition Master Home Edition program, which is free for non-commercial use.

### THE CHEAPSKATE GAMER

## 7 Sources for Frugal Gaming

→ **STEAM** Valve's digital marketplace has become almost insidiously proficient at coaxing gamers into opening up their wallets. Try resisting the savings-scented aroma of a massive Steam seasonal sale. We dare you. [store.steampowered.com](http://store.steampowered.com)

→ **1UP.COM'S FREE GAME LISTS** 1UP.com has been compiling absurdly large lists of PC gaming's best freebies for so long that it's nearly built a compendium. If you're looking for tons of games for no money, this is the place to start. <http://bit.ly/hSmmOQ>

→ **FREE-TO-PLAY MMOS** Sure, MMOs like Champions Online, Lord of the Rings Online, and DnD Online give you the option to spend money, but why would you go and do a silly thing like that? [www.champions-online.com](http://www.champions-online.com), [www.lotro.com](http://www.lotro.com), [www.ddo.com](http://www.ddo.com)

→ **ONLIVE** If you absolutely must have high-end games but simply can't afford a decent rig, there's always OnLive. You pay for individual games, and the cloud gaming service takes care of the heavy lifting. It has a Netflix-style pricing model as well. [www.onlive.com](http://www.onlive.com)

→ **QUAKE LIVE** id Software's multiplayer classic is roughly two clicks away so long as you have a PC that wasn't made in 1963. Just go to the URL, hit the big "play now" button, and frag away. [www.quakelive.com](http://www.quakelive.com)

→ **CHEAP ASS GAMER** Cheap Ass Gamer keeps track of pretty much every gaming-related deal out there—PC or otherwise. If you love games and hate spending money, this one's a no-brainer for your bookmark list. [www.cheapassgamer.com](http://www.cheapassgamer.com)

→ **MODS** Who needs to break the bank on new games when the Internet's bursting at the seams with content for your old favorites? Mods are free, generally easy to install, and frequently creative. It's a win-win-win.



# How to Build Your Own Home Phone Server

Using Asterisk in conjunction with Google Voice will help you dramatically reduce your landline phone bill

Google Voice. Skype. VoIP-to-PSTN providers. SIP-to-SIP calls. All of these technologies and products allow you to make calls that are either free or much cheaper than on your landline. Wouldn't it be great if you could escape the clutches of your Telco and connect your home phone to these services? A phone server like Asterisk can help you realize this dream.

Short for Private Branch Exchange, PBX is a telephone exchange that is often used by businesses or offices. If you work a 9-to-5, chances are that your phone system is PBX-based. The short definition is that it's essentially a network of phones connected to a main public switched telephone network (PSTN) that functions in a similar manner to a data network. In fact, in many instances today, the voice network is actually a VoIP-based network operating over data lines.

There's a cheap and fairly simple way that you can ditch Ma or Pa Bell. The trick entails using an old PC to set up your own PBX in your home, and then connecting this PBX to Google Voice.

We're going to show you how to set up your own home PBX server, how to connect it to Google Voice, and how to connect your landlines to the entire network.

Let's get started.

## STEP 1 INSTALL ASTERISK

The best way to run Asterisk is on a separate computer. Fortunately, Asterisk does not require much horsepower, which means that you can use any old computer you have lying around. Many people actually prefer to run it on their wireless router using OpenWRT, a custom Linux distribution devised for embedded devices.

The easiest option for installing Asterisk is to use a Linux distribution designed for it. There are many available but if you want to integrate Google Voice you should make sure your distribution supports Asterisk 1.8.\*.

We'll use PBX-in-a-Flash (PIAF) burned on a CD. Go to <http://bit.ly/VG9n>, where you can download PIAF and find instructions for installation. Please note that the installation will reformat all drives including USB, so make sure you back up all critical information. After the initial install, there is a reboot; make sure you get the PIAF CD out or you'll end up reinstalling. When prompted, pick the PIAF Purple install to get version 1.8 of Asterisk. It is stable enough for home use. Finally, make sure your root password is secure because if it is not, your phone bill could suffer.

You may be surprised to discover there is no GUI. This is because a phone server needs to process audio in real time. GUIs

require CPU and their own real-time processing for the mouse cursor, so Asterisk distributions avoid them, and instead rely on command line and web applications for configuration and monitoring.

```

System Information
Asterisk = ONLINE | Dahdi = ONLINE | MySQL = ONLINE
SSH = ONLINE | Apache = ONLINE | Iptables = ONLINE
Fail2ban = ONLINE | Internet = ONLINE | Ip6Tables = ONLINE
BlueTooth = ONLINE | Hidd = ONLINE | NTPD = ONLINE
SendMail = ONLINE | Samba = OFFLINE | Webmin = ONLINE
Ethernet0 = ONLINE | Ethernet1 = N/A | Wlan0 = N/A

PBX in a Flash Version = 1.7.5.5
FreePBX Version = 2.8.0.4
Running Asterisk Version = Asterisk 1.8.2.2
Asterisk Source Version = 1.8.2.2
Dahdi Source Version = 2.4.0+2.4.0
Libpri Source Version = 1.4.11.5
IP Address = 192.168.145.110 on eth0
Operating System = CentOS release 5.5 (Final)
Kernel Version = 2.6.18-194.26.1.el5 - 32 Bit

```

Don't be intimidated; connecting Google Voice to your own home telephone line using Incredible PBX just takes a few configurations on this screen.

## STEP 2 CONFIGURE ASTERISK

We now have a base installation of Asterisk, and are ready to begin configuring it. We're going to use Incredible PBX for Asterisk 1.8 to integrate Google Voice onto our custom PBX server.

The Incredible PBX package will give us an advanced configuration that supports Google Voice. Log in as root and you'll see a status screen that shows that Asterisk is running. Record the IP address that is shown. You may want to consider switching to a static IP, but it's not essential.

It's worth noting that the Incredible PBX code base changes over time. See <http://bit.ly/aBKJiF> for the latest instructions. Currently, you need five pieces of information to make it work:

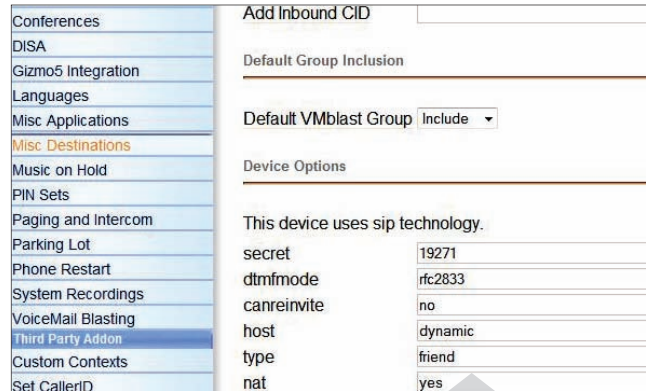
- A Gmail account other than your regular Gmail account
- The password for this Gmail account
- The phone number assigned to this account by Google Voice. (Make sure your GV account is set to forward to Gmail Chat and that call screening and call presentation are off.)
- Your regular Gmail account
- A secure password such as the root password

Enter the following commands into the command line at the bottom of the screen:

```
cd /root
wget http://incrediblepbx.com/incrediblepbx1b.x
chmod +x incrediblepbx1b.x
./incrediblepbx1b.x
```

Answer the prompts and wait for the install to finish. While the script is running, open a browser on another machine and open UDP port 5222 in Windows and on your router. Point it to the Asterisk IP address. Google Voice uses this for incoming calls.

Once done, set your passwords by typing `passwd-master` into the command line. Use the same password you did in the previous script.



This PIAF setup screen will allow you to monitor, test, and customize your personal PBX.

## STEP 3 PERFORM INITIAL TESTS ON YOUR INSTALLATION

OK, you've successfully set up your PBX server and you've also connected it to Google Voice. Now we need to make sure that it works before we go any further. To do this, open up a web browser on another machine, go to: [http://\[Asterisk IP Address\]/](http://[Asterisk IP Address]/).

You should see the PIAF webpage. Monitoring and configuration can be done here. In the lower-left corner, click the Admin button. Click the FreePBX Administration button. This gives you access to the main tool for configuring Asterisk. In the left menu under the Basic section, click Extensions. Select 701 from the right menu. Scroll down until you see the Secret field. This is your SIP phone password for extension 701.

You may also want to check the Asterisk console on the server. Press `Ctrl + Alt + F9` to access it. All phone activity will display here. Type `HELP` to see all the commands available. Press `Ctrl + Alt + F1` to return to your login session.

The easiest way to test Asterisk is with a softphone—a program that behaves like a traditional telephone. We prefer X-Lite as a good option to

work in Windows. You can download it at <http://bit.ly/10pol>. Once you've installed it and gotten it running, go to the Account Settings screen.

Set User ID to 701, the domain to the IP address of the Asterisk server, and the password to the SIP phone password that was in the Secret field. When you press the OK button, the softphone should register itself and show its status as Available. Please note that Windows Firewall may require you to unblock X-Lite in order to make it work.

OK, let's make a call. Make sure you have a headset connected or your speakers on. Dial 3366 and press Call. This runs the DEMO voice menu. If you hear Allison, the voice of Asterisk, then everything is working fine.

Now try phoning your home or cell phone number. The call should go out over Google Voice, the not-so-secret sauce that will save us hundreds of dollars per year thanks to Google making all calls to numbers in the United States and Canada free. (Thanks, Google.)

Finally, try using another phone to call the Google Voice number that was assigned. If all goes well, you should receive the call on your softphone.

### MORE COWBELL

## Other Awesome Asterisk Tricks

While our how-to focuses on using Asterisk in its most basic manner, it barely scratches the surface. The truth is that Asterisk can do all kinds of amazing tricks:

→ **MAKE SKYPE CALLS** In the same way that we're hooking up Asterisk to Google Voice, you can perform a similar connection to Skype. NerdVittles.com has an excellent tutorial at <http://bit.ly/9ve4Uk>.

→ **GET A CHEAP VOIP TO PSTN PROVIDER** Google Voice and SkypeOut already allow you full-fledged access to public switched

telephone networks to make calls, but redundancy is cheap. Pay-as-you-go plans are particularly worthwhile as you can make a small payment into an account and forget about it until your usage is large enough that you have to top it off. You can find a massive list of providers at <http://bit.ly/g8ogzc>.

→ **ORDER EXTRA PHONE NUMBERS** Direct Inward Dial (DID) numbers are available cheap or even free at <http://bit.ly/Hg4lf> or <http://bit.ly/qmPy0>. Is there someone you talk to regularly in a foreign country? Get a DID there and they can make cheap local calls to you.

→ **RUN MULTIPLE GOOGLE VOICE ACCOUNTS** Other members of your family can have their own unique phone numbers, and calls on the number can be directed to specific phones. <http://bit.ly/eAuBMo>

→ **AND MORE!** Get voicemail emailed as an attachment, or email a dictated message to someone. Customized music on hold. Voice menus. Video voicemail. Conference calls. Hotel-style wake-up calls. Text-to-speech. Customized caller ID. Numerous options await you on Asterisk.

## STEP 4 CONNECT YOUR REAL PHONES TO YOUR PBX SERVER

Softphones are fine, but isn't the point of this exercise to connect the handsets in your house to your new personal PBX? Yes it is, and although it sounds confusing, it's actually a pretty straightforward process.

To hook up your existing phones to Asterisk, you can get an analog telephone adapter (ATA). These convert plain old telephone system (POTS) lines to work with a VoIP protocol like SIP or IAX2. An ATA can be a stand-alone device or built into a router. They have one or more ports that can connect to a phone extension or an incoming landline. Make sure you get one that is unlocked.

To connect a phone you need an FXS port on the ATA. To connect an incoming phone line, you need an FXO port on the ATA. One of the best choices for an ATA is the Cisco Linksys SPA3102. It has both an FXO and an FXS port as well as a router.

Connect the ATA either at a wall plug or at the point where your phone service comes into the house (called the demarcation point). Plug an RJ11 line from the incoming line or wall plug into the FXO port, a phone into the FXS port, and an Ethernet connection into the WAN port. The LAN port is only needed if you want to use the ATA as a router.

Pick up the connected phone and dial \*\*\*\*, listen to the prompt, and dial 110#. Listen to the IP address read out to you. Enter 7932# then 1# and 1 to allow web access from the WAN side. If you are connecting from the LAN side, the IP address is 192.168.0.1.

Enter the IP address of the ATA in a browser to get the web interface. Click Admin Login and then Advanced. Detailed setup instructions for

configuring the SPA3102 with Asterisk are at <http://bit.ly/9hUgu7>. There are a lot of steps but they are quite straightforward.

### SIP PHONES

Another option is to replace your old handsets with SIP phones. These connect to your home network through Ethernet, or sometimes wirelessly. A good option for a SIP phone is the Cisco SPA941, or the SPA942 if you want to share the Ethernet port with a computer or use Power over Ethernet (PoE). Each allows up to four line appearances. Here's how to set it up.

Go into the menu on your phone and scroll to and select Network. Record the Current IP address. Go there in a web browser to configure the phone. Click Admin Login. Select the Ext 1 tab. Enter your Asterisk IP address in the Proxy field, your name in the Display field, your desired extension (701 to 715 are already set up in the PBX) in the User ID field, and the secret for that extension in the Password field. Submit the changes and your phone will reboot. Go back to the page and you should see "Ext 1 is Registered." You can now make and receive calls on your phone. See <http://bit.ly/gLYBe> for further refinements.

You are now officially up and running. The only thing left to do is call your Telco and tell it to take a hike.



**One of the best choices for an ATA is the Cisco Linksys SPA3102. It has both an FXO and an FXS port, as well as a router.**

# The Cheapskate's PC

Here's how to build or upgrade a killer PC without breaking the bank

Building a system from scratch or upgrading an existing PC doesn't have to be a budget-breaking proposition. With a little careful shopping, willingness to compromise, and the sure knowledge that prices will drop in the future, you can build a system that's powerful enough for today's games and applications, and capable of lasting well into the future.

The trick is to keep an eye to the future. While it may be seductive to buy last generation's components as they drop in price, you might end up with a dead-end system. On top of that, sometimes last year's gear isn't all that great a deal. For example, Core i5 architecture based on last generation's Lynnwood CPUs actually cost more than faster Core i5s built using Sandy Bridge

technology.

We'll get into the lists of individual components shortly, but it's worth remembering that sometimes you can find good combo deals at major reseller websites, like Newegg and Amazon.

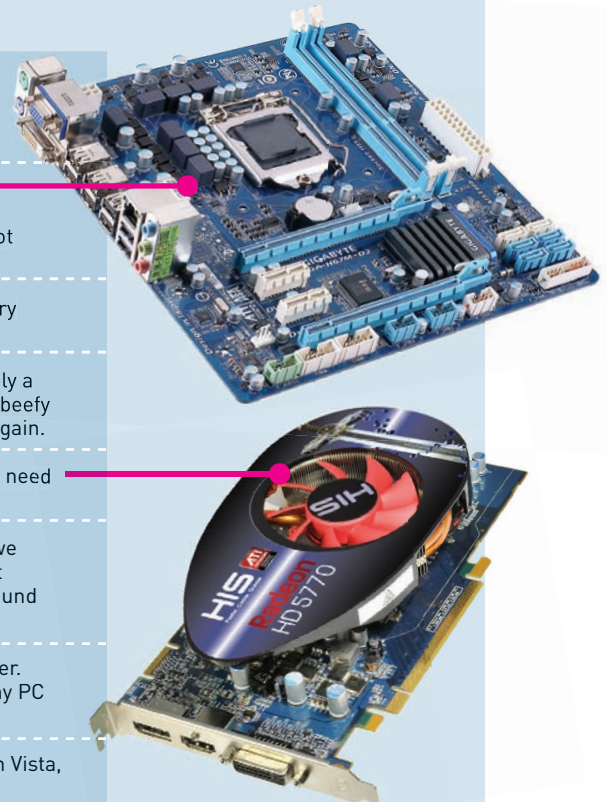
OK, let's take a look at a \$600 from-scratch build, and an upgrade of a classic rig.

## THE \$599 DO-ALL PC SYSTEM

Building a PC for \$600 is an exercise in compromise and balance. You'll have to give up some performance, but it's possible to build a forward-looking system that can accept beefier parts in the future—and still afford a copy of Windows 7. Let's dive into the ingredients.

- ✓ **CPU INTEL CORE I3 2100** This is the baby sister of Intel's second-generation Core (Sandy Bridge) lineup. Built on socket 1155, it hums along at 3.1GHz and runs up to four threads. You can find it for **\$135**.
- ✓ **MOTHERBOARD GIGABYTE GA-H67M-D2** This is the low end of Gigabyte's H67 motherboard lineup, but it's capable of supporting the entire LGA 1155 line of CPUs. It's probably not wise to overclock with this **\$95** board, though—this is not the GA-H67M-DS's strong suit.
- ✓ **MEMORY CORSAIR TW3X4G1333C9 DDR3-1333 KIT** The remarkable fall in memory prices means you can have 4GB of fast, reliable DDR3 for **\$42**. Yes, **\$42!**
- ✓ **CASE AND POWER SUPPLY COOLER MASTER 534 WITH 460W PSU** This is definitely a compromise. The case is actually decent, although the included PSU won't handle beefy graphics cards. But you can always swap it out in the future. At **\$69**, it's quite a bargain.
- ✓ **GRAPHICS HIS RADEON HD 5750** Gives you DirectX 11 on a **\$110** budget, but you'll need to run at modest resolutions with some of the eye candy dialed down.
- ✓ **HARD DRIVE SEAGATE 7200.12 160GB** The hard drive space is a little tight, but we wanted a better CPU and graphics than a larger HDD would have allowed. But at **\$36**, it's a steal. And you probably have a couple of high-capacity drives lying around anyway, right?
- ✓ **OPTICAL DRIVE LG GGH22NS50B DVD BURNER** Sixteen smackers for a DVD burner. Soon, you'll be able to get one free with a Happy Meal. The fact that you can get any PC component for **\$16** still feels shocking.
- ✓ **OS WINDOWS 7 HOME PREMIUM X64 (OEM)** It's stable, less of a memory hog than Vista, and runs DX11. It's still the go-to OS for PC gamers. **\$100**.

**TOTAL PRICE \$596** Not bad for a Windows PC, right? Granted, this price doesn't include taxes and shipping. But what you have in the end is a platform suitable for upgrading to more robust components in the future without having to rebuild from scratch.



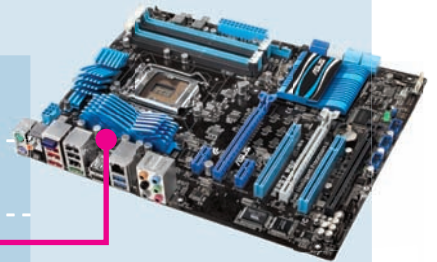
## OVERHAULING A CLASSIC

A few years ago, the classic sweet-spot gaming PC was built around an Intel Core 2 Quad Q6600 CPU and a GeForce 260 GTX.

Upgrading this classic really means a complete overhaul: motherboard, RAM, and graphics. Thankfully, if you've been running this system, you've already got the case and power supply to handle the update.

Let's take a look at the components for our overhaul.

- ✓ **CPU INTEL CORE I5 2500K** The spiritual successor to the venerable Q6600. This processor is easily overclockable and can handily run any game on the market. **\$225.**
- ✓ **MOTHERBOARD ASUS P8P67 PRO** This **\$150** board sits in the middle of Asus's P67 line, so you'll be safe overclocking with it, as long as you don't push too hard.
- ✓ **MEMORY CORSAIR 4GB TW3X4G1333C9 KIT** It's entirely possible that the old Q6600 system you're running uses DDR2 memory. If so, you'll need to upgrade to DDR3. This Corsair kit is a great deal at **\$42.**
- ✓ **GRAPHICS MSI GTX 560 TI TWIN FROZR II** The sweet spot for graphics cards has always been the \$250–\$260 price point, and the **\$260** MSI GTX 560 Ti is a perfect example.
- ✓ **HARD DRIVE WD1002FAEX** The new generation of high-density platters might make an HDD upgrade worthwhile. If so, the WD1002FAEX is one terabyte, two platters, and costs less than **\$90.**
- ✓ **OPTICAL DRIVE BC-08B1LT** If Blu-ray is your thing, this Asus drive is a good choice at **\$68**, and even comes with the software for playing BD movies.
- ✓ **CASE COOLER MASTER HAF912** OK, you don't need a case. But we can't resist the urge to recommend one anyway. If you *did* want to move into a more modern case, but at minimum cost, the HAF912 is just **\$60**, and has some nifty amenities like a CPU cutout for easy installation of high-end CPU coolers, and tool-free installation of storage devices.
- ✓ **POWER SUPPLY SEASONIC S12 620** Again, there's no need for a PSU if you already have a good one, but if you want something a little more modern, Seasonic's S12 620W unit is quiet and efficient—and it's only **\$70.**
- ✓ **OS WINDOWS 7** If you upgraded your old classic PC to Windows 7, you're set. But if you're still limping along on Windows XP, then it's time to bite the bullet and pick up the 64-bit version of Windows 7 Home Premium (OEM) for **\$100.**



### FRUGAL BUYING ADVICE

## How to Save Money on PC Hardware

→ **PACKAGE DEALS** Some resellers will bundle motherboards, CPU, and memory, or graphics cards and PSUs. These deals can save you some money, but make sure you know the components in the bundle.

→ **REFURB OR NOT?** Sometimes open-box or refurbished deals can be good, but be wary. Gear refurbished by the manufacturer itself can also be a good deal.

→ **TRY TO BUY FROM ONE RESELLER** You may find yourself saving a few bucks here and there by purchasing components from different sites—but you may lose all those

savings in shipping costs. Many e-tailers will waive shipping costs if you buy above a certain dollar amount.

→ **SELL YOUR OLD STUFF!** Considerate builders will often hand down gear to family members, but you can also finance your PC-building hobby by selling old gear on eBay. You'd be amazed at how much you can get for an old motherboard or graphics card.

→ **WATCH AND WAIT FOR PRICE REDUCTIONS** When Nvidia launched the GTX 560 GPUs recently, AMD dropped the prices on a number of its products. A spiffy new GPU

might be expensive when it first launches, but at the same time, a competitor's products might be a steal. Best of all, these components are often still part of the current generation.

→ **CPU PRICE-DROPS** Intel (and AMD to a lesser extent) cuts CPU prices regularly—as often as quarterly—as new processors hit the streets. Even current-generation CPUs will drop in price after a quarter or two.

→ **STOCK UP ON MEMORY** DDR3 prices are amazingly cheap currently, so buy more than you originally think you need. Get 8GB instead of 4GB, or 12GB instead of 6GB.

# Entertain Yourself on the Cheap: Ditch Cable or Satellite

Got broadband? There's no need to shell out your hard-earned cash for movies and TV shows

Cable and satellite TV deliver a lot of shows and movies, very conveniently... and very expensively. If you want features like DVR and high-definition cable TV and a few extra channels, your bill could easily hit \$100 or more a month. That's a cool \$1,200 a year. If you're a sports junkie, count on adding another few hundred bucks a year to follow your favorite team, player, or sport.

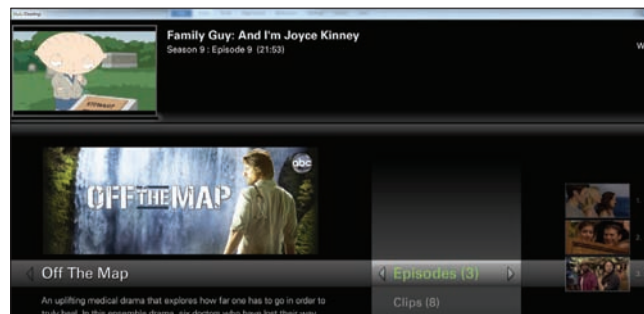
Is it possible to satisfy your TV and movie jones while ditching the cable/satellite bill? Sure it is—the secret lies in that broadband connection you already pay for every month. Let's look at ways to fulfill our couch-potato cravings for fewer dollars.

## NETWORK AND CABLE TV SHOWS

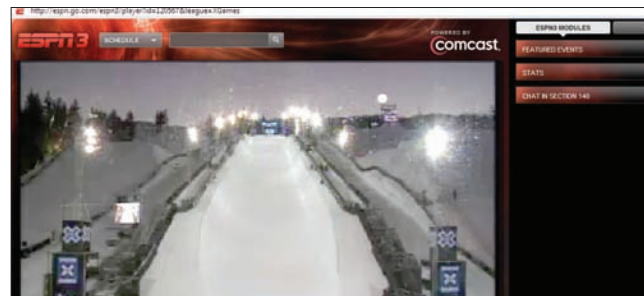
Whether you're a hardcore fan of a particular TV series or you just like the occasional episode, you can find the current episode of most of your favorite TV shows online. If you know the network or cable

channel, you can go directly to those sites and watch recent episodes. Few of these are real-time streaming—in other words, you may have to wait a few hours or days after the show airs to catch it online. Aggregator sites, particularly Hulu.com, also offer recent episodes of many series. The base Hulu service is free, but coverage of shows is spotty. It's also in standard definition, and you can only technically watch it on a PC. Hulu Plus, which costs \$7.99 a month, is Hulu's premium service. Hulu Plus adds high-definition support, more shows, and compatibility with a variety of different devices, including Apple iOS devices, the PS3, and certain Internet-enabled TVs. But even with Hulu Plus, coverage can be spotty; sometimes this service leaves out a couple of episodes of a given season.

Netflix Watch Instantly, at a minimum cost of \$7.99 for the streaming-only service, offers an increasingly large array of shows, plus access to a huge



Hulu's desktop app is more convenient than the web version.



ESPN will stream less well-known sports live and keep archives for future viewing, but video quality is an issue.

variety of movies. What we like the most about Watch Instantly, though, is ample access to shows not commonly available on Hulu, such as documentaries and BBC miniseries.

## OVER-THE-AIR HDTV

Windows Media Center, built into Windows 7 Home Premium and Windows Ultimate, also contains an Internet TV streaming service. Coverage of shows is inconsistent, however, so you may only see samplers of various TV series with just a few episodes to give you a taste. Our preference—and one of the hidden secrets of HDTV—is to add a high-definition, over-the-air TV tuner to our

HDTV or our HTPC. This is particularly useful if you live in a metropolitan area with a large media market.

Free OTA high-definition plus Windows Media Center gives you full DVR capability for local stations, without added cost. You don't need Media Center, of course. Third-party applications like SageTV ([www.sagetv.com](http://www.sagetv.com)) also support HDTV tuner cards and have similar scheduling software built in.

## MOVIES

Film buffs have a rich array of online services to choose from when it comes to great content at low cost. We've already mentioned Netflix Watch Instantly,



Night of the Living Dead—free and legal on Entertainment Magazine Online ([www.emol.org](http://www.emol.org)).

at \$7.99 a month, which is probably the best deal on the planet right now. Other streaming services, like Amazon.com's Video on Demand and CinemaNow charge per movie, either for renting or for owning a DRM'd version. That can get pretty pricey pretty fast. If you're happy with standard definition on your PC, Hulu offers a variety of free movies, although advertisements are present.

A variety of "free" movie aggregator sites exist, but the legality of many of these are questionable. These sites don't actually host movies, but stream from other sources, including offshore sources and BitTorrent sites. Our guidance here? Approach with caution.

If you really want free *and* legal, a number of old movies, documentaries, and shows are now in the public domain. Sites like Entertainment Magazine Online ([www.emol.org](http://www.emol.org)) offer tons of free, legal movie downloads, albeit of older films. EMOL also aggregates links to TV network and studio sites that offer free streaming of their shows.

## SPORTS

Watching your favorite teams online is usually not a bargain. You can watch some less-popular sports events at sites like ESPN.com, but major sports, like the NFL, Major League Baseball, and NASCAR can't be found legally, unless you're willing to pay substantially. In a pinch, we've used aggregator services, but these sites exist in a gray area. For example, [www.atdhe.net](http://www.atdhe.net), one such popular aggregator service, had its domain seized by the U.S. government for copyright infringement during the course of us writing this story.

If you do follow a single sport, then the cost might still undercut cable. An NFL all-season pass, for example, is \$14.99 a month. But that's not exactly cheapskate territory.

The two best deals around are the NBA and MLB. Both offer affordable season passes, and both allow you to watch games across different devices—your PC, smartphone, and, in the case of MLB, your PS3. ⏻

## STREAMING AUDIO

# Rating the Online Music Services

At first blush, 99 cents for a song doesn't seem like much, but it sure adds up fast. Streaming music services are popping up all over the Internet, offering features like playlists, recommendation engines, and more—all for free. Note that many of these are simply aggregators for Internet radio. We'll skip those and look at services that focus on streaming the music of your choice.



Pandora doesn't give you a lot of leeway to choose individual songs; it's a recommendation engine at its heart. The more song titles you add to the seed, the more the music will be to your liking. You can upgrade to an ad-free account for \$36 per year.

### USEFUL IF

- You're looking for music similar to what you already like
- You're willing to live with ads (in the free version)
- You like a little randomness in your music

### ON THE OTHER HAND:

- It's difficult to build a playlist of specific songs
- The ads are jarring
- The user interface is a bit obtuse



## playlist.com

You can create playlists of your songs, and even upload your favorite music—bearing in mind that it can be deleted if the song isn't from one of the publishers who have a deal with Playlist. Building a playlist is simple and straightforward, but the audio quality can vary a bit.

### USEFUL IF

- You want to build a playlist of specific songs
- You don't mind variations in audio quality
- You're willing to live with a somewhat limited song selection

### ON THE OTHER HAND

- Doesn't have deals with all the studios, so song selections are limited
- Pushes ringtone sales at you



This is another recommendation engine. You can build exportable playlists, but you can't really stream them. If you want to play via the iPhone or Android app, you need to pay a subscription, which also removes ads.

### USEFUL IF

- You're looking for music similar to what you already like
- You're willing to live with ads (in the free version)
- You live in the United States, Germany, or the United Kingdom

### ON THE OTHER HAND

- Playlists aren't very useful
- The ads are jarring
- The user interface is a pain



Audiolizer actually lets you upload your iTunes playlist, then constructs an online library based on that. The UI is very sparse, and not all songs may be available. Also, song titles don't always seem accurate.

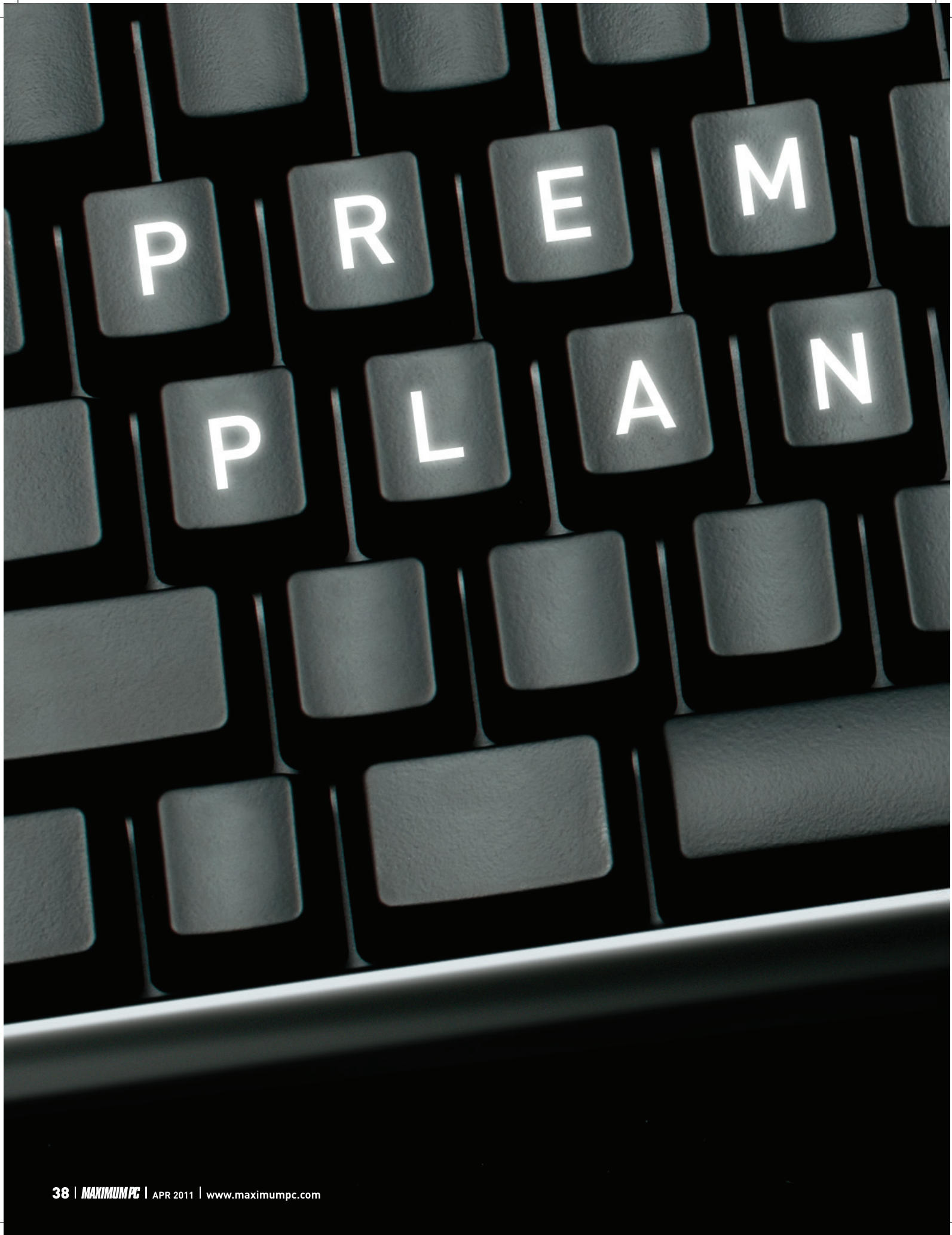
### USEFUL IF

- You want to build a playlist of specific songs
- You're willing to upload your iTunes playlist
- You want music videos of the songs played at the same time

### ON THE OTHER HAND

- Sparse user interface
- Music videos are only thumbnail size and must be on YouTube
- Titles can be inaccurate





BY  
ALEX  
CASTLE

## Torture-tested: 8 high-performance keyboards

What's the most important part of your PC? Is it the processor? The videocard? The motherboard? How about the keyboard?

Don't scoff—your keyboard is the part of your computer that you get up close and personal with. It's the conduit between you and the PC, and having the right one can make you faster, more comfortable, and give you an edge in games.

Because of that, we want to help you pick the plank that's just right for you. There are a lot of contenders out there, but we've narrowed the field to eight boards that we think offer a solid cross-section of the options available in high-end keyboards, whether they focus

on gaming, comfort, or speed. There are some boards that we've reviewed before in this list (and they'll keep their original verdict—it's only fair) and some that are a year or two old, but that's what it takes to give you a look at the best of what's available to you today.

We know that everyone is looking for something different in their keyboard, so don't think of this roundup as a winner-takes-all contest—we're judging every keyboard on its individual merits, including comfort, build quality, and the unique features that it brings to the table, er, desktop. So keep reading—you owe it to your hands.



## Razer BlackWidow Ultimate

### Two great tastes in one

Gaming keyboards typically fall into one of two categories. You have those that cram in as many gaming-specific features as possible, including extra buttons, remappable keys, on-the-fly macro recording, and backlit keys. And then there are the mechanical keyboards that tout hyper-responsive key action above all else. These latter boards tend to feel great, but generally share a very similar, very austere design, with almost no features that you wouldn't find on an IBM model M.

The BlackWidow is the first keyboard we've reviewed that gives you the best of both worlds—a whole bevy of gaming features coupled with a top-notch mechanical keyboard. It isn't perfect (it's made of fingerprint-exhibiting glossy-black plastic, and is very loud) but it's definitely the best we've tested. We hope more companies will follow Razer's lead and get more creative with their mechanical boards.

For the budget gamer, Razer offers a non-Ultimate version of the BlackWidow that's \$50 cheaper and only missing the USB pass-throughs and light-up keys.



**RAZER BLACKWIDOW ULTIMATE**  
\$130, [www.razerzone.com](http://www.razerzone.com)

VERDICT

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## Razer Anansi

### MMO misfire

The Anansi is Razer's MMO keyboard, a companion to the company's Naga MMO gaming mouse. Functionally, it's very similar to the BlackWidow Ultimate—both have fully rebindable keys, with five additional macro keys along the left, backlighting, and on-the-fly macro recording. Unlike the BlackWidow, the Anansi does not have mechanical keys, instead opting for more traditional dome-style keys. They're not as responsive as mechanical keys, but are definitely at the high end of the dome-spectrum, with a satisfying amount of resistance and travel.

The main selling point of the Anansi (and what makes it an MMO keyboard) is the broad panel of flat buttons right below the space bar. These seven keys act as modifiers, septupling your total number of available key combinations. Makes sense in theory, but hitting the top five (smaller) modifiers along with a number key, single-handedly, while playing a game is very challenging. Moreover, for an MMO, we really would have preferred a larger selection of dedicated macro keys, such as the 12 keys found on the Logitech G11 or G19. The Anansi has a thin profile but is long enough (including two seemingly unnecessary wings) that it could accommodate a few more keys.



**RAZER ANANSI**  
\$100, [www.razerzone.com](http://www.razerzone.com)

VERDICT

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### BENEATH THE KEYS

## The Difference Is in the Switch

There are three main varieties of key you're likely to encounter in a keyboard. They are as follows:

### DOMES SWITCHES

In a dome switch, the keytop presses down on a rubber (or sometimes metal) dome, which collapses under the pressure, allowing a graphite pad mounted inside the dome to complete a circuit. This is the technology most commonly used in desktop keyboards.

### SCISSOR SWITCHES

A variant on the dome switch, scissor switches use a small plastic mechanism to allow for shorter travel on the key. As a result, this style of keyswitch is good for low-profile boards, such as those found in laptops. And because less force is required to depress a key, these boards are usually more quiet.

### MECHANICAL SWITCHES

Mechanical keyboards use an actual

physical switch beneath each key top to complete the circuit, resulting in greater responsiveness. Most high-end mechanical keyboards use the Cherry MX switch, which comes in three varieties (known as the Black, Blue, and Brown MX switch) with differing response profiles. (For an intimate look at a mechanical keyboard's innards, check out our autopsy on page 55.)

## Thermaltake Challenger

### Too gimmicky for its own good

The Challenger (ThermalTake's entry into the gaming keyboard market) is the kind of keyboard that's looking to set itself apart. It does this most noticeably with a tiny fan that can be plugged in on either side of the keyboard to blow cool air across your hard-working hands and a set of custom, red keycaps that can be swapped in for the WASD and arrow keys. Do either of those features sound like something you can't live without?

Gimmicks aside, the challenger has a decent-but-not-fabulous set of features, including custom profiles, macro keys (but no on-the-

fly recording), and some pretty slick red backlighting. Unfortunately, the one place the Challenger really falls flat is in the quality of its keyboard. Low-profile keys make it feel like a laptop keyboard, and the dome switches provide very little travel. As the cheapest gaming keyboard in this roundup by far (it's available online for \$60), the Challenger is a good value proposition, but we wouldn't recommend it for power gamers.



**THERMALTAKE CHALLENGER**  
\$80, [www.ttesports.com](http://www.ttesports.com)

VERDICT

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## SteelSeries 7G

### Light on features, but heavy-duty

The 7G was the first of the current crop of heavy-duty, mechanical keyboards to hit the market, and in our opinion is still one of the best. With clickless Cherry MX Black switches that combine responsiveness and a long, satisfying travel and construction quality that's absolutely second to none, the 7G is still very easy to recommend more than two and a half years after its release.



**STEELSERIES 7G**  
\$150, [www.steelseries.com](http://www.steelseries.com)

VERDICT

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Our only problem with the 7G has always been that it has very few gaming-specific features (especially for a keyboard that can run \$150, if you're able to find one). There's no customizable keys, no profiles, no nothin'. It does have two USB pass-throughs, and a headphone and microphone jack. The keyboard uses a PS/2 connector, though it does come with a USB adaptor. The ancient connector is quaint, but it does allow for

N-key rollover (see sidebar on page 44), making the 7G one of two keyboards in this roundup with no limit to the number of keys that can be pressed at once.



### UNDER THE WHEEL

## The SteelSeries Endurance Test

We've always said that the SteelSeries 7G is the toughest keyboard around, but we've never really put it to the test. In the interest of scientific inquiry, we took an old 7G we had lying around the Lab and decided to see what it would take to break it.



Your average dropping, punching, and stomping tests didn't do much to faze the 7G.



So we decided to give it the ol' truck test. After the test, the 7G could still type. As long as all you wanted to type were the "!", ".", and "|" symbols.

## Logitech G19

### Retains the feature crown

The G19 is the oldest keyboard in this roundup, but it didn't seem right to leave Logitech's ludicrously feature-packed board out of contention. And it's still available. In brief, here's what makes the G19 awesome: 12 macro keys, on-the-fly programmability, custom backlighting, USB pass-throughs, media controls, and—of course—a built-in 320x240 color display. (You can read our full review, which originally ran in the September 2009 issue, online at <http://bit.ly/hVYZgM>).

Suffice to say, it's an amazing feature set, and one we especially like for MMOs (those 12 extra keys are a godsend!), but the keyboard's keys feel decidedly mushy compared to some of the more recent models.

It's worth considering that since the original release the selection of games with support for the G19's auxiliary screen has increased dramatically, and you can now find this luxury board for closer to \$150 (though the MSRP is still \$200), making it a tempting buy.



**LOGITECH G19**  
\$200, [www.logitech.com](http://www.logitech.com)

VERDICT

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## Microsoft Natural Ergonomic Desktop 7000

### The king of ergo keyboards

The Microsoft Natural Ergonomic Desktop 7000 is like a Cadillac—huge, bulky, and unhip, but it's the smoothest ride around.

Ergonomic keyboards aren't as popular as they once were, and Microsoft is the only company still making a real play for the market. As a result, there hasn't been much in the way of innovation lately—the keyboard in the Microsoft Natural Ergonomic Desktop 7000 is essentially the same as that in the Microsoft Natural Ergonomic Keyboard 4000, which was released in 2005.

Still, if you type a lot and you're looking for something comfortable to rest your hands on, you're not going to do any better than the Ergonomic Desktop 7000. It's got a great ergo split-keyboard shape, big, cushioned wrist-rests, and a stand that lets you adjust the keyboard's angle forward or backward to your liking. It's wireless, and it comes with a wireless, ergonomic laser mouse that is, unfortunately, no good for gaming.

The crappy tie-in mouse dragged our original verdict down to a 7 (<http://bit.ly/f8ATJO>), but the keyboard itself is as comfortable as they come.



**MS NATURAL ERGONOMIC 7000**  
\$120, [www.microsoft.com](http://www.microsoft.com)

VERDICT

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### BEHIND THE FEATURE

## Ghosting and the N-key Rollover

A lot of keyboards advertise various “anti-ghosting” technologies—but what exactly does that mean? It has to do with how keyboards detect key-presses. Because it would be cumbersome to have each key on a keyboard connected to its own electric circuit, most keyboards rely on a wire matrix to more economically detect which key is pressed. Unfortunately, there's a downside to this technique, which is that it's not well-suited for detecting more than two key-presses at once, and ad-

ditional presses can result in erroneous “ghost” key-presses being registered. When you're in the middle of a fierce fire-fight trying to crouch, reload, strafe, and retreat at the same time, the last thing you want is bogus key-presses going off.

Certain key combos are more likely than others to cause ghosting—among the least likely are the modifier keys, such as Shift, Control, and Alt, which is why these keys are frequently used for important tasks in computer games. Quality

gaming keyboards integrate anti-ghosting technology, which increases the number of keys that can be pressed at once by using a more advanced wire matrix. An extreme version of this technology is N-key rollover, which allows any number of keys to be pressed at once. A downside to N-key rollover is that it (currently) is only implemented in keyboards using the PS/2 connector, such as the SteelSeries 7G and the Das Keyboard Ultimate S.

## Das Keyboard Ultimate S

### Puts your touch-typing to the test

The Das Keyboard has two things going for it. One, it's awesome. It has no labels on the keys. When you type on it, you look like a ninja. That's awesome.

The other thing is that it feels great to use. It's a mechanical keyboard, and even though it uses the same switches as the SteelSeries 7G, we prefer the feel of the Das Keyboard. If you want the smooth typing experience without the no-label keys, there's a model called the Das Keyboard Professional, which is just that.

For people just looking for an awesome typ-

ing experience, the Das Keyboard Ultimate S (or Professional) is an excellent choice, provided you don't mind spending \$130. For gamers, this one's a toss-up—it's essentially identical to the SteelSeries 7G, but a little better-looking, and without the headphone jacks and insanely heavy-duty construction. If you like the Das Keyboard's aesthetics, buy with confidence—you won't be disappointed by the way this one performs.



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VERDICT
9

**DAS KEYBOARD ULTIMATE S**  
\$130, www.daskeyboard.com

## SteelSeries Shift

### Takes customization to a new level

Lots of gaming keyboards have the ability to set up different profiles, which let you change what key does what, depending on what game you're playing. The SteelSeries Shift is the only keyboard (not counting the original ZBoard, which the Shift is based on) that allows you to go one step further and not only swap your profile, but your entire keyset to match the game you're playing.

In addition to custom faceplates, the Shift has a respectable lineup of gaming features, including on-the-fly macro recording, a head-

set pass-through, and a top-notch software suite with profile setup and statistics tracking.

In our experience, the swappable keyplates don't offer a whole lot of individual value, and the key quality suffers to accommodate them, but if it's something that appeals to you, the build quality and feature set of the Shift won't leave you wanting. 😊

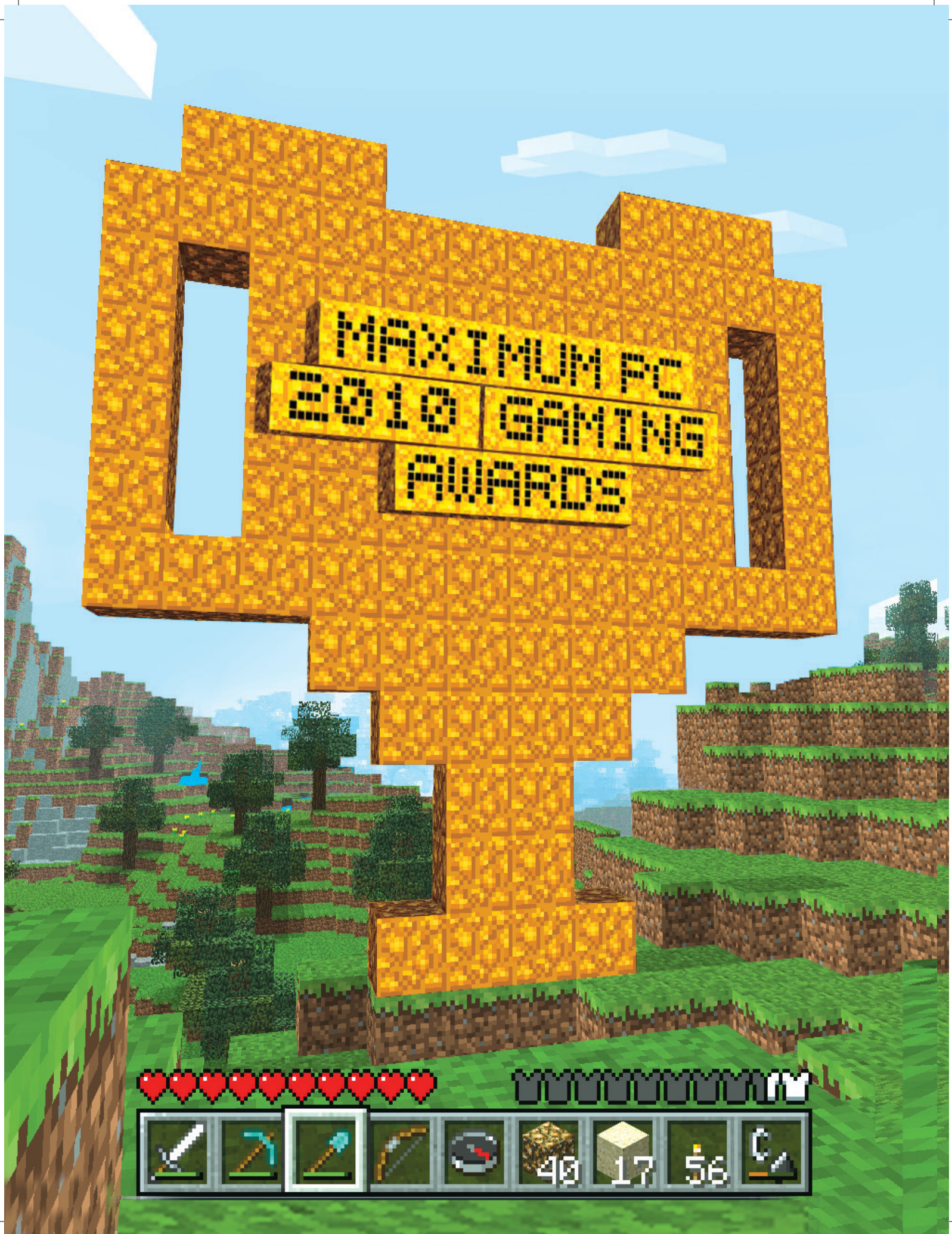


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VERDICT
8

**STEEL SERIES SHIFT**  
\$90, www.steelseries.com

## DARE TO COMPARE

|                             | Razer BlackWidow Ultimate   | Razer Anansi | SteelSeries 7G               | ThermalTake Challenger | Logitech G19         | Microsoft Ergonomic Desktop 7000 | Das Keyboard Ultimate S | SteelSeries Shift      |
|-----------------------------|-----------------------------|--------------|------------------------------|------------------------|----------------------|----------------------------------|-------------------------|------------------------|
| <b>Switch Type</b>          | Mechanical (Cherry MX Blue) | Dome         | Mechanical (Cherry MX Black) | Dome                   | Dome                 | Dome (Cherry MX Black)           | Mechanical              | Dome                   |
| <b>Connection Type</b>      | USB                         | USB          | PS/2 with USB adaptor        | USB                    | USB with power brick | Wireless USB                     | PS/2 with USB adaptor   | USB                    |
| <b>Anti-Ghosting</b>        | 6-key                       | 6-key        | N-key rollover               | 6-key                  | 6-key                | 6-key                            | N-key rollover          | 6-key                  |
| <b>Macro Keys</b>           | 5                           | 5            | None                         | 10                     | 12                   | None                             | None                    | 8                      |
| <b>On-the-Fly Recording</b> | Yes                         | Yes          | N/A                          | No                     | Yes                  | N/A                              | N/A                     | Yes                    |
| <b>Pass-throughs</b>        | 2 USB, mic, headphones      | None         | 2 USB, mic, headphones       | 2 USB                  | 2 USB                | None                             | 2 USB                   | 2 USB, mic, headphones |



MAXIMUM PC  
2010 GAMING  
AWARDS



# And the Winners Are...

Another year passes, and PC games continue to deliver a healthy dose of shock and awe, sometimes in surprising forms. The advent of DirectX 11 is making games look better than ever. But this year's Game of the Year delighted us not with spectacular graphics, but the nostalgic look and feel of a 32-bit console. We played through hundreds of titles collectively, and after heated debates, secret meetings, and clever-award-title brainstorming, we're proud to share our favorite titles from 2010.

BY THE MAXIMUM PC STAFF



GAME OF  
THE YEAR

## Minecraft

Minecraft isn't our Game of the Year because it's an indie success story—although, it is. It's not our Game of the Year because of its cute low-res textures and block-based worlds. No, it's our Game of the Year because it perfectly encapsulates what PC gaming is capable of. Minecraft is a sandbox game in the truest sense of the word—your character spawns in a massive, randomly generated world, explores it, punches its cows, fights its zombies, spiders, and creepers, harvests its raw materials, and uses those materials to build *anything*—like the very award trophy that honors its greatness. Minecraft's million-plus users have constructed everything from huge castles to scale models of the *Enterprise* to working computational engines—all in the game. Even if your ambitions are more modest, you can spend dozens of hours just exploring your world (usually accidentally), from cloud level to the depths of the earth. Minecraft is successful because it's *good*, and its success bodes well for PC gaming.

[www.minecraft.net](http://www.minecraft.net) ESRB: E

If Nathan Edwards had known that our Art Director would re-color his fancy Glowstone trophy, he wouldn't have spent so much time mining ore in Nether.





THE DAVID HASSELHOFF AWARD

## The Settlers 7: Paths to a Kingdom

Like The Hoff himself, The Settlers games get a lot more love in Germany (and other parts of Europe) than they do here in the U.S. of A. *Unlike* with David Hasslehoff, we can see exactly why the Germans love The Settlers 7—it's a complex, nuanced, and utterly charming game of real-time economic strategy.

This is the latest in the series and arguably the best, with great graphics and a huge single-player campaign. Getting past the game's steep learning curve can be tough, but for anyone who likes thoughtful strategy games, it's absolutely worth it.

[thesettlers.us.ubi.com/the-settlers-7/](http://thesettlers.us.ubi.com/the-settlers-7/) ESRB: E10+



THE MONEY TREE IN FULL BLOOM AWARD

## World of Warcraft: Cataclysm

Let's face it: WoW players are a captive audience. If it wanted to, Blizzard could place in each World of Warcraft: Cataclysm box a single, unpolished turd and still rake in piles and piles of crisp, green cabbage. But alas, it doesn't. Each of WoW's expansions has built onto the core game in meaningful ways, and Cataclysm is the best one yet.

In addition to new races, new zones, new dungeons, a new profession, and all the other usual trappings of a WoW expansion pack, Cataclysm's release sees an extensive renovation of the original World of Warcraft zones, updating each for a much smoother and more engaging early-game experience. Six years after its release, there's never been a better time to play.

[www.worldofwarcraft.com/cataclysm](http://www.worldofwarcraft.com/cataclysm) ESRB: T



THE SON, DO YOU KNOW HOW FAST YOU WERE GOING? AWARD

## Need for Speed: Hot Pursuit

When you're screaming down a desert road at 180 miles per hour in a black Lamborghini, deploying lethal spike strips and smashing other jacked-out, exotic cop cars into trees and off cliffs, it doesn't take long for you to realize that you're having a damn-good time. Hot Pursuit combined an awesome career mode, pulse-pounding visuals, and one crazy-ass, competitive online network that had us going back to race again, just to see who topped the Speed Wall.

With the exception of our Lotus-owning Editorial Director, it also made us feel like we drive highly inadequate and underpowered vehicles in real life.

[www.needforspeed.com](http://www.needforspeed.com) ESRB: E10+





THE PIP BOY AWARD

## Fallout: New Vegas

Ah, VATS. How we love you so. Stopping time. Letting us line up that wonderful head shot so we can marvel at the gore volcanoes you make out of the neck stumps of our fearsome foes. *Fallout: New Vegas* took a tried-and-true formula full of action, upgrading, and all the pertinent RPG elements needed to engineer a life-sucking addiction, and placed it in *freakin' Las Vegas*. Annoying and unintentionally hilarious bugs aside (many of which have been fixed in various patches), *New Vegas*, particularly Hardcore Mode, which essentially turned the game into a simulation, had us hooked instantly, and left us waiting and eager to return to the personality-packed wasteland of the post-apocalyptic, nuclear world.

[fallout.bethsoft.com](http://fallout.bethsoft.com) ESRB: M



THE STRIP MINING IS ONLY ONE OF THE SERVICES WE OFFER AWARD

## Mass Effect 2



Surprised delight, human. *Mass Effect 2* removed our socks, shoes, and every usable resource from our solar system. Building on the story (and your character's decisions) from the sci-fi RPG *Mass Effect*, the sequel upped the ante in every direction: Better graphics, tighter combat, a much-improved inventory, and an expanded cast were all welcome, but we stayed for the story. Poignant, exhilarating, and funny in equal measure, *Mass Effect 2* enthralled us. We do miss the MAKO, though.

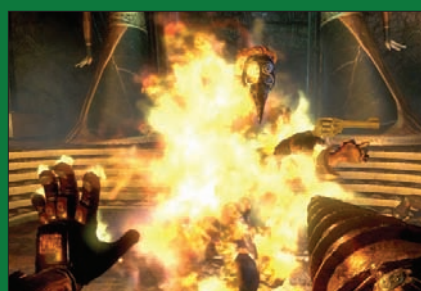
[www.masseffect.com](http://www.masseffect.com) ESRB: E10+

# The Hall of Passable Sequels 2010

2010 was a sequel-heavy year, and for good reason. Games like *Fable*, *Dead Rising*, and *BioShock* all created memorable and intricate worlds, many of which spun stories that actually encouraged a sequel. The games in this list weren't bad games by any means, they just weren't groundbreaking like their earlier iterations.

*FABLE III* felt a lot more like the original *Fable*, which we liked, but man did it take a while to get going. *DEAD RISING 2* also had us juiced at the get-go, though

like its predecessor, it began to feel stale after the thousandth zombie had been slain. We were thrilled initially to play as Little Sister or Big Daddy in *BIOSHOCK 2*, but found ourselves kind of shrugging our shoulders after a few hours—the underwater world of Rapture was humorous, and dark as ever, but we'd been there before, and yearned for a new world (Irrational Games, it seems, agrees—the early footage from *BioShock: Infinite* is \$#@!ing mind-blowing, and on a whole new world in the freakin' sky, no less).



It's not that we don't enjoy telepathically lighting someone on fire, then horrifically boring into them with an enormous, oversized drill in *BioShock 2*. It just got cumbersome after awhile, is all we're saying.



THE UNDERDOG AWARD

## Transformers: War for Cybertron

We hope we can be excused for having low expectations for Transformers: War for Cybertron—a game developed by a completely unknown studio, and based on a franchise that



has had a rocky (to put it kindly) couple of years.

One of the year's most pleasant surprises was the fact that War for Cybertron did *not* suck, and was, in fact, a pretty bitchin' third-person shooter. It's not the best action game of the year, but everyone loves an underdog story, and we're glad that Transformers came out on top. [www.transformersgame.com](http://www.transformersgame.com) ESRB: E10+

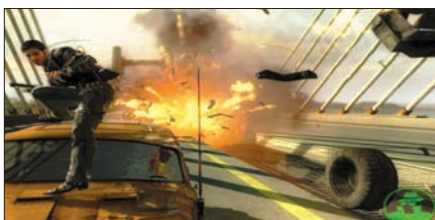


THE GRAND THEFT EVERYTHING AWARD

## Just Cause 2

Take everything that made the Grand Theft Auto series great: the huge environments, the dozens of drivable vehicles and scads of weapons, plus the engaging plot, great voice acting, and character development. Now, throw away the plot, script, and characterization and replace them with a grappling hook and an infinite supply of parachutes. That's Just Cause 2. Square Enix blew the entire budget on making the fictional archipelago of Panau into a living, vibrant, hijackable, easily explodable paradise, and it worked. It's the most mindless fun we had all year.

[www.justcause.com](http://www.justcause.com) ESRB: M



THE I CAN'T BELIEVE IT'S NOT STALKER AWARD

## Metro 2033

Metro 2033's action might not have been anything to write home about, but exploring the game's hauntingly beautiful vision of a post-apocalyptic future felt like an otherworldly vacation. Whether we were tip-toeing down a pitch-black train tunnel—in fear of waking one of its monstrous denizens—or catching our breath in a musty, dusty, surprisingly bustling underground town, the overall effect was absolutely stunning. Tiny details like this brought every environment to life.



From the random clothesline hanging in the middle of a ramshackle pub to the rusty playground standing all alone on an irradiated surface, Metro did an amazing job of capturing the feeling of barely-clinging-to-life desperation that so many other games only talk about. Honestly, it was a post-apocalyptic vision that seemed downright plausible—not that we want it to actually happen, mind you. Nor do we fully expect it to occur after something goes horribly wrong in the Lab. Er, we fear we've said too much. [www.metro2033game.com/us](http://www.metro2033game.com/us) ESRB: M



THE SOON I WILL DOMINATE THE... HOLY CRAP, IT'S 3:30 IN THE MORNING?! AWARD

## Civilization V

At *Maximum PC*, we have an unstated rule that any game that makes us neglect our families, our hygiene, and/or causes us to lose track of entire weekends deserves an award. Last year's release of Civ V took some risks and changed up a couple of tried-and-true Civilization formulas, largely to great effect. The improved combat, enhanced diplomacy, and new RPG-style elements make for some interesting and memorable moments. The end result is one of the most playable interpretations of one of the best series in PC gaming history.

[www.civilization5.com](http://www.civilization5.com) ESRB: E10+





#### THE LITERAL AND PROVERBIAL MEAT GRINDER AWARD

## Super Meat Boy

A punishing, retro-looking platformer with tight controls and a near-instant respawn time, Super Meat Boy pleased on a visceral level. Navigating our meaty protagonist (and a cast of guest stars with their own powers)



through hundreds of levels filled with spinning saw blades, piles of salt, missiles, pools of blood, and other hazards, meant dying thousands of times, but every death made us a little bit better. Team Meat's indie chutzpah and 16-bit charm took some of the sting out of the constant failure.

[store.steampowered.com/app/40800](http://store.steampowered.com/app/40800) ESRB: T

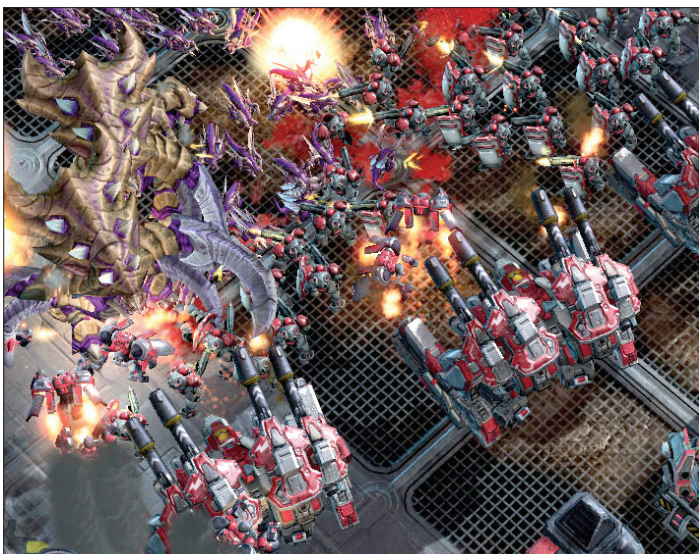


#### THE OVERDOG AWARD

## StarCraft II: Wings of Liberty

In the PC gaming world, rooting for Blizzard is kind of like rooting for the Yankees. No, scratch that, it's kind of like rooting for the Harlem Globetrotters to beat the Washington Generals. Point is, it's the overdog—the company that's got everything going for it—and it hasn't screwed up yet. With StarCraft II, Blizzard delivered a game that's every bit as polished and fun to play as you'd expect from a sequel that was 10 years in the making.

[us.battle.net/sc2/en/](http://us.battle.net/sc2/en/) ESRB: T



# The Biggest Games to Look Forward to in 2011

### DEAD SPACE 2

The stakes are higher than ever as you step back into the armored boots of engineer Isaac Clarke, using an array of high-tech weaponry to navigate the horrifying set pieces of the Sprawl. **Release:** January 25, 2011

### RAGE

The newest iteration of Carmack's 3D engine mastery is beautiful indeed. With RAGE, noted developer id thrusts you into a post-apocalyptic (think *Mad Max*) world full of mutants and deadly, tattooed bounty hunters. **Release:** September 13, 2011

### DUKE NUKEM FOREVER

It's finally going to happen. 2011 will be the year of the Duke, as Mr. Nukem and his illustrious Boom Stick return for hours of mindless violence and mayhem. **Release:** May 3, 2011

### PORTAL 2

Is the \$#ing cake real?! Recent gameplay footage from Portal 2 showcases some awesome new power-ups that should only add to the mind-bending quirkiness of one of the most innovative franchises out there. **Release:** April 21, 2011

### ARKHAM CITY

In Arkham Asylum, the baddies in Gotham took over the nut house and it was up to Batman to clean it up. How do you up the ante? How about having them take over a city? We can't wait to don the cape and cowl once more for some nameless-henchmen head-bashing. **Release:** September 30, 2011

### F.E.A.R. 3

Day 1 Studios is ready to scare the pants off you, and in more ways than one. In fact, early reports showcase a potentially awesome co-op multi-player mode. In addition, Day 1 Studios claims the game will be a different experience every time you play through. **Release:** March 22, 2011

### CRYSIS 2

New benchmark! Seriously, this is going to be one GPU-intensive game, offering some of the best graphics we've seen to date, anywhere. Nano-suit up, and get ready to lay some serious foot to alien ass in March. **Release:** March 22, 2011

# WHITE PAPER

## Near Field Communication

Spawned from RFID and embraced by smartphone makers, NFC uses electromagnetic induction for two-way data transfer. Here's how it works —BILL O'BRIEN

You're house-hunting and walk up to a home with a "For Sale" sign. You take out your NFC-enabled cell phone or tablet, point it at the sign, and without any further input quickly receive the property's lot size, square footage, layout, and asking price, as well as a deferred link to an online 3D showcase of the property and its salient features.

Near Field Communication is a short-range, high-frequency wireless communication technology that is quickly working its way into mobile devices across the planet. Apple just announced that the iPhone 5 and iPad 2 will both support the emerging wireless protocol. Nokia, HTC, and LG have also announced plans to support NFC.

We'll explore how NFC's underlying technology works, evaluate its prospects for future deployment, and assess the potential security risks involved.

### MORE COMPLEX THAN RFID

Radio-frequency identification (RFID) is the most frequent point of comparison for Near Field Communication. Both provide information from a tag to a reading device, but RFID is an identifier technology, while NFC is an instigator. RFID tags essentially say, "This is what I am," and present specific information. NFC says, "Here's some data, and here's where to go for more." Or, in the case of NFC payment transactions, "I have your data, now I'll go process the transaction for you."

Both RFID and NFC operate in the unlicensed 13.56MHz frequency band. Both use electromagnetic field induction as a means of communication. Think about how electrical wires work. When you send a current through a wire, it generates a magnetic field around the wire. When you bring another wire into proximity of the first, that magnetic field acts on it and engenders the second wire with the same electrical characteristics as the first.

If you use a loop of wire instead of a single strand, the increased surface area makes

the magnetic field even stronger. Using an equal number of loops in the two adjacent wires preserves the transferred electrical characteristics, while using a different number of loops on each side causes a change in the transferred electrical characteristics roughly in ratio to the loop count between the transmitted side and the receiving side.

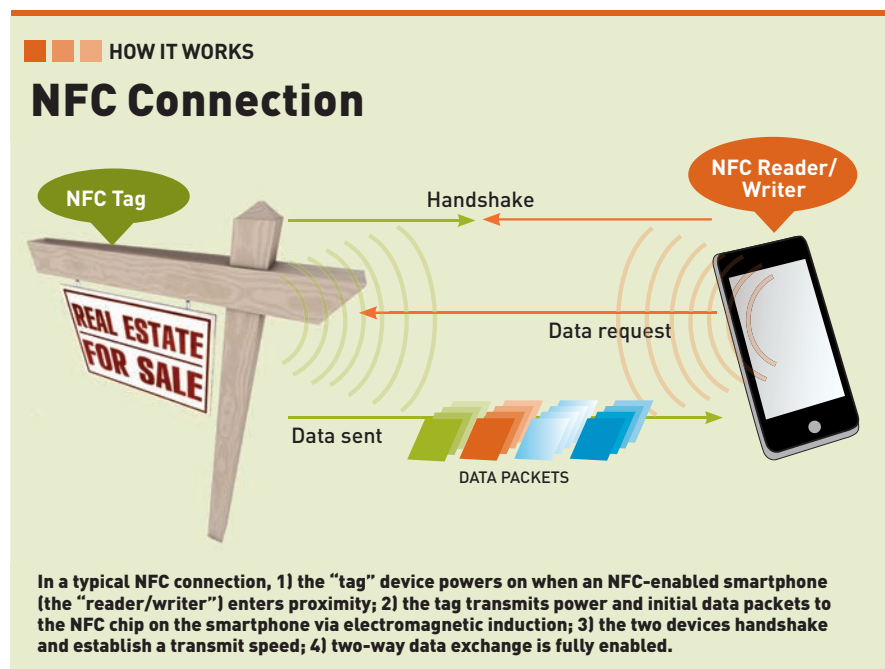
This works well for digital data transmission because it is grouped as a series of 101010...- data packets where, typically, a "1" is "on," or the presence of voltage, and a "0" is "off," or the lack of voltage (with "voltage" often called "signal" in terms of its use as a communications source).

Current thinking is that the NFC "tag" should power the NFC "reader/writer"—typically, a cell phone or tablet, where the device's own power supply is necessary primarily for running the device. This is the reverse of RFID.

### MAKING THE CONNECTION

In our example above, when your smartphone (the reader/writer) enters the proximity of the "For Sale" sign (the tag), the NFC chip embedded in the sign enters active mode and immediately begins sharing power and data with your phone through its loop antenna. When the magnetic field created by this data transmission enters the near field—about one wavelength from the sign—it excites the loop antenna on your smartphone and induces the data onto it.

In a simple transfer of data from the tag to the reader, this could be as simple as, "Are you a compatible device?" "Are you ready to receive information?" and, "Here it is." The incoming data could also include references to websites and other small data sets. If the connection is made to initiate a payment for goods or services, the tag can add a wait period for a response from the credit organization and then a confirmation



# SteelSeries 7G

After this month's keyboard roundup (page 38), we couldn't resist the temptation to take apart a high-end keyboard to see how it works. Here's the SteelSeries 7G—a top-notch gaming keyboard with mechanical switches and powerful anti-ghosting capabilities—in all its disassembled glory.

that the payment was either accepted or declined, and a transaction number and date.

The beauty of NFC is that there's no need for anyone to activate a pairing. It automatically happens whenever the appropriate devices are within proximity of each other. No activity can proceed, however, unless the reader confirms that the communication is wanted.

The downside is that the data transfer rates are slow. Currently, the range of rates is limited to 106Kb/s, 212Kb/s, and 424Kb/s, which makes 802.11b's 10Mb/s feel blazingly fast. For now, this is more than adequate for the type and quantity of information that is typically passed between NFC devices.

## SECURITY CONCERNS

Because the distance required to connect two devices is so small and because NFC is still developing, security concerns are minimal—for now. Possible threat vectors include: faux tags that can snag data from your smartphone, or reader devices that can steal data from the tags on your credit cards or key ring.

Device owners would have to approve a conversation between their reading device and the faux tag for the first breach to happen. The latter example is far more likely to occur—someone would have to breach your personal space while holding an NFC reader in hand to swipe your data. For public transit commuters in urban environments, this is an everyday experience.

Regardless, the possibilities and interest in NFC is great enough that we'll see widespread adoption within two years. And it has the very real potential to dent the revenue of commerce transaction companies like VISA and MasterCard. In a world where you pay for everything by smartphone, who needs Visa to handle the transactions?

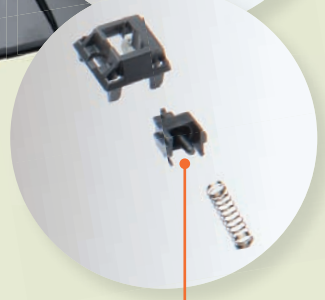
To defend its turf, Visa has been conducting an NFC trial program for the last six months in the Spanish resort town of Stiges to investigate the viability of making VISA payments using NFC-based smartphones. By all accounts, both the company and the 1,500 trial users liked the result. MasterCard has performed similar tests with similar results. ☺

### LEDS

Three LEDs illuminate the Num-, Scroll-, and Caps-lock indicators on the keyboard.

### KEYCAPS

The most recognizable part of the keyboard is the simplest— injection-molded plastic caps with a cross-shaped slot in the bottom for the Cherry MX switches and (unless you're talking about the Das Keyboard) letters printed on the top.



### CONNECTIONS

This daughterboard has connections for the USB and audio pass-through cables, as well as the PS/2 cable that actually carries the keypress information to your PC. A PS/2-to-USB adaptor is included with the 7G, but N-key rollover (unlimited simultaneous key-presses) only works with a PS/2 connection.

### WIRE MATRIX (NOT EXPOSED)

A matrix wired onto a circuit board handles the inputs from the key switches. With a traditional keyboard, the matrix can only reliably detect 2-4 keypresses at once. Gaming keyboards use more advanced matrices to allow for more keypresses, or (in the case of the 7G) an unlimited number of simultaneous presses.

### MECHANICAL SWITCH

Most (if not all) mechanical keyboards use switches from a single company—Cherry. There are three varieties of Cherry MX switch, with different amounts of tactile feedback and click, but all use a similar spring mechanism to complete the circuit. Gold contacts prevent oxidation and extend the key's lifespan.



**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](mailto:comments@maximumpc.com).

# HOW TO

## Step-by-Step Guides to Improving Your PC

### THIS MONTH

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**60 PRINT FROM ANY DEVICE WITH GOOGLE CLOUD PRINT**

**62 CREATE A TORRENT FILE**

### SUPERCHARGE YOUR KEYBOARD

This month, I've been thinking a lot about high-end keyboards. A nice gaming keyboard should not only feel better than a regular keyboard, it should incorporate new functionality to make your life easier. Even if you're stuck with an old, standard keyboard, there are a few things you can do to improve its functionality:

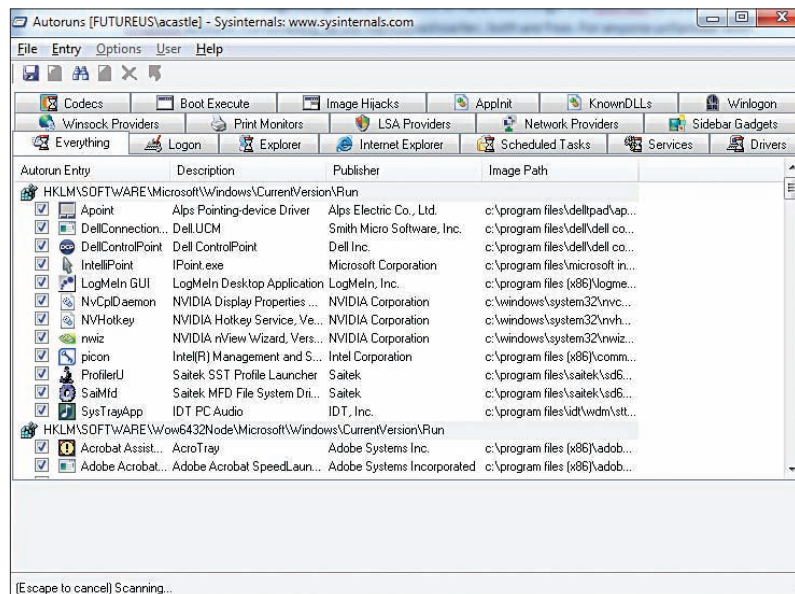
**Disable the Windows key:** Nothing's as frustrating as accidentally minimizing your game mid-frag. To disable the Windows key on a regular keyboard, hit the Microsoft support page at <http://bit.ly/9D7uDe> and click the link for the automatic registry changer.

**Use keyboard macros:** Gaming keyboards frequently provide custom macro keys. Even if you don't have dedicated keys for the purpose, you can record your own macros with AutoHotkey, a great piece of free software available at [www.autohotkey.com](http://www.autohotkey.com).



**ALEX CASTLE**  
ONLINE MANAGING  
EDITOR

### WINDOWS TIP OF THE MONTH



## Master Your System Startup

Any PC power user knows that you can use the Microsoft System Configuration utility (msconfig.exe) to configure what runs when you start your computer. What you might not know is that there's a much more powerful utility available from Microsoft for the same purpose called Autoruns. Download it at <http://bit.ly/9DrH>—you'll never go back to msconfig again.



**SUBMIT YOUR IDEA** Have a great idea for a How To project? Tell us about it by writing to [comments@maximumpc.com](mailto:comments@maximumpc.com).

# Secure and Sync Your Passwords Online

Keeping a list of complex hacker-vexing passwords is an absolute must for every computer user's security plan. It's also a royal pain in the neck. As we visit more and more sites, we consequently collect more login credentials, making for a motley collection of username and password combinations. In a bid to save their sanity, some PC owners opt to use the same login information for every site they frequent. Others resort to recording all of their login information on a piece of paper or pasting it into a Word document. With insecure stop-gap measures like these for keeping track of the keys to your digital kingdom, you may as well send hackers your personal information via email and be done with it.

Fortunately, there is a free, easy-to-implement solution to all of your password-management woes. It involves KeePass—an open-source password manager—and Dropbox. Thanks to these two awesome freebies, not only will you be able to back up all of your online login credentials, software serial numbers, and a wide array of other information, you'll also be able to easily synchronize that data across any number of computers. Interested? Of course you are! Let's get started. —SEAMUS BELLAMY

## 1 GET THE BASICS

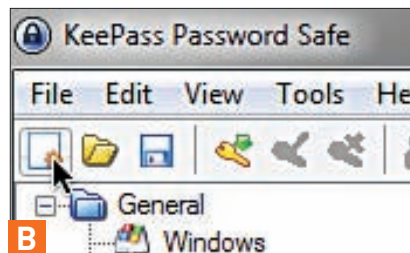
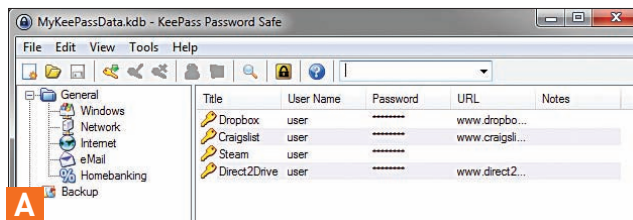
To work your way through this guide, you'll need to have two things: the KeePass software and a Dropbox account. Fortunately, as we mentioned earlier, both are free. For anyone unfamiliar with Dropbox, it's an easy-to-use cloud synchronization service that lets you upload and share any kind of file under the sun. If you don't already have it, go to [www.dropbox.com](http://www.dropbox.com) and sign up for a free Dropbox account, and follow the site's prompts to install the service's desktop client. The whole process shouldn't take you more than five minutes. Once that's done, direct your browser to <http://keepass.info> and download a copy of KeePass. Be sure to download the desktop version of the installation file and not the application's portable iteration. Work your way through the KeePass installation wizard.

As part of the installation process, you'll be asked whether or not you want to visit the KeePass Plugin and Extensions gallery.

You'll want to accept this invitation, as the page offers an impressive array of add-ons to augment the application's already impressive suite of features. If you finished your KeePass installation without taking a detour to the Plugin and Extension gallery, don't panic, you can still check it out by browsing to <http://keepass.info/plugins.html>. It's worth mentioning, however, that while the majority of the extensions and plugins available via the gallery are reliable, none of them are reviewed by KeePass's development team, meaning that the plugins could be buggy, out of date, or worse, contain viruses and malware.

## 2 SET UP KEEPASS

KeePass is designed to maintain a database of all of the computer and Internet login credentials you use on a regular basis (image A). Once you've entered the credentials you want the application to keep track of for you, you can call upon KeePass to enter the login information for any of the websites you frequent by entering a single user-chosen master password. When it comes time to create secure passwords for new login credentials, KeePass has your back there too, as the program also offers a built-in



complex-password generator, to ensure the highest level of security possible. Best of all, the program's archive is protected by very respectable AES 256-bit encryption, making it a tough nut to crack.



To get started with KeePass, you'll need to set up a new KeePass database, and in order to do that, you will be required to set a master password. Click the New icon found in the top-left corner of the KeePass interface (image B). You'll be greeted by a pop-up window requesting that you enter a master password (image C). This is the one password you will have to remember, and will also unlock all of your other passwords, so pick one that's memorable but follow the rules of good password construction. (See box on next page for password-creation advice.)

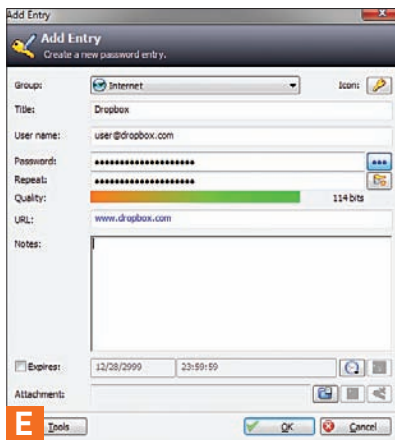
Once you've confirmed your password, click OK.

Now, it's time to start adding some entries. Look for the Add Entry icon—it can be found in the same row as the button you just clicked to set up your master password (image D). For each new set of login credentials that you

enter into KeePass, enter your username and password information. KeePass also offers you the ability to categorize the entry under a number of subheadings, along with the ability to enter notes or attachments to each entry (image E).

As your journeys around the Internet find you needing to create new login credentials, you can rely on KeePass to generate them on the fly. Just open the application's New entry dialogue, and KeePass will do the random-password encryption for you. Pro tip: The Notes field is a great place to store software serial numbers for posterity's sake.





### 3 BACK UP YOUR KEEPASS DATABASE

If you've been wondering where Dropbox comes into all of this, your patience is about to be rewarded. Now

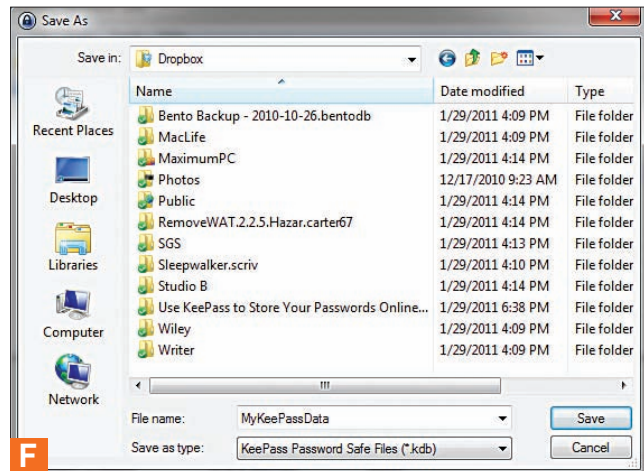
that you've created a KeePass database, it's time to back it up. From the program's menu bar, click File and then Save As. Enter a name for your database, and then save it to your Dropbox folder or a subfolder nestled inside of it (image F). By doing so, you'll not only be backing up an off-site copy of your KeePass database, you're also making it possible to connect and synchronize with that database from any number of other computers, be they virtual machines, off-site, or across the room from you.

In order to utilize your database on another computer, install Dropbox and KeePass to the system. After opening KeePass, look to the button bar at the top of the application window. Click the Open Database button (located next to the New Database button), and navigate to your Dropbox folder, selecting the KeePass Database as your source. Presto: You now have access to all the KeePass information that you entered on the first computer.

Conversely, any new login information you add to the database while using the second computer will be available to use on the first computer.

As with all files synchronized to your Dropbox account, your KeePass database will also be available for download via Dropbox's web portal, and can be used offline when no Internet connection is available, ensuring that you'll never have to go without access to your secure library of password information.

Not too shabby for freeware, huh?



#### BEST PRACTICES

## What Makes a Password Secure?

You might have heard the guidelines for creating a good password before, but they bear repeating. A good password can make the difference between a hacker getting easy access to your account or leaving disappointed. Here are three basic rules to follow:

**1 MAKE IT LONG** The simplest thing you can do to make a password more secure is to make it longer. Even though a service might only require a six-letter password, you should use a password that's at least 10 characters for anything you care about.

**2 DON'T USE WORDS** Any word found in the dictionary is inherently easier for a cracker to guess, so try to come up with a random-seeming string of characters. Try using the first letter of each word in a sentence you can remember, then add numbers and symbols.

**3 MAKE IT COMPLEX** That means upper- and lower-case letters, and symbols, and not just at the beginning or end.

# Print from Any Device with Google Cloud Print

We've waited a long time for Google Cloud Print, and it's every bit as convenient as we had imagined. The new service from Google makes it possible for PC users to wirelessly print to a networked printer from smartphones, laptops, and tablets capable of supporting Google services, such as Gmail or Google Docs. To get your own Google Cloud Print party started, follow these simple steps. —SEAMUS BELLAMY

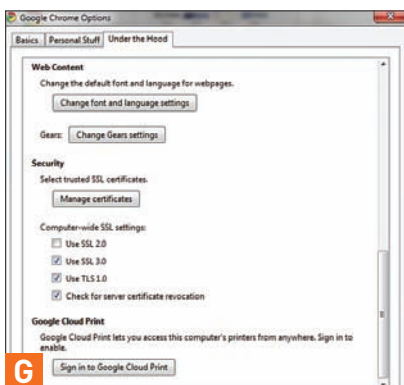
## 1 DOWNLOAD GOOGLE CHROME BETA 4

Google Cloud Print supports a number of flavors of Windows, including XP, Vista, and Windows 7. No matter which version of Windows your rig is rocking, you'll need to have Google's zippy Chrome browser installed on your PC in order to leverage Google Cloud Print. You can find it at [www.google.com/chrome](http://www.google.com/chrome).

The computer on which you install Google Cloud Print needs to be connected to the same network as the printer you want to print from. Before moving on to Step 2, open Chrome and turn on your printer. You will also need a Google account to continue, which you can create at [www.google.com/accounts](http://www.google.com/accounts).

## 2 LET THE WRENCH BE YOUR GUIDE

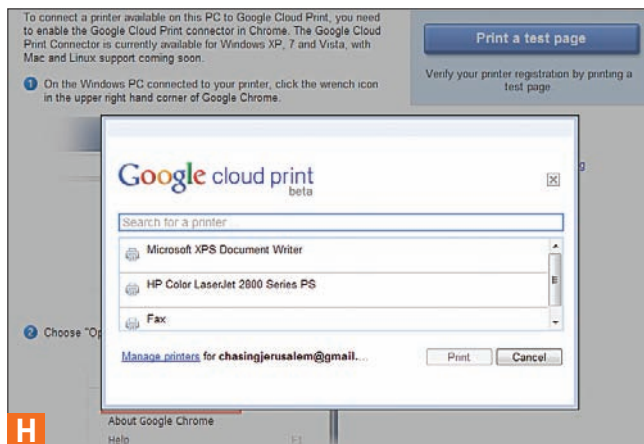
Look for the wrench icon in the top-right corner of the Chrome window. Click it, and from the menu that opens up,



select Options. This will open the Options pane. From the Options pane, click the tab labeled Under the Hood and scroll to the bottom of the available options (image G). Click the button marked—you guessed it—Sign in to Google Cloud Print. Now, sign in using your Google Account credentials.

## 3 PRINT A TEST PAGE

If everything goes according to plan, you'll be rewarded with a window telling you that the operation



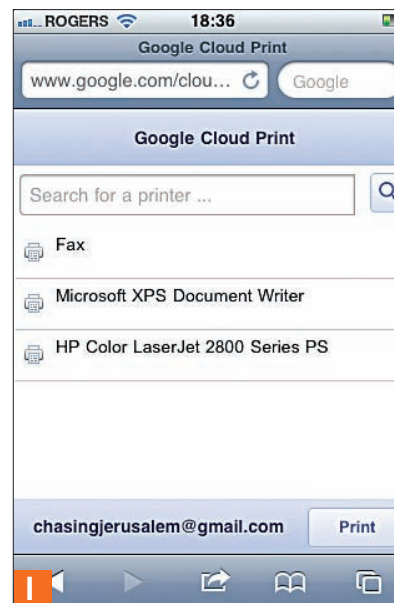
is a success. That same window has a button prompting you to print a test page. Give it a click. In doing so, Chrome will open a new browser window that prompts you a second time to Print a test page. Select a printer or a service and click Print (image H).

## 4 TAKE THE SHOW ON THE ROAD

Now that you've set up Google Cloud Print on your home computer, you're ready to start printing on the fly from your smartphone or other Internet-connected mobile device. Grab your mobile computing device of choice and navigate to Google Docs. Select a file. From the menu bar at the top of your Google Docs interface, click the Option button (located to the left of the Refresh

button), and then tap the Print link. Doing so will open a new browser window that reflects the same printer options as were offered on your networked computer back at home (image I). To print your Google Docs file, select a printer, set your print options if need be, and watch as Google Cloud Print does its thing. Provided you left your computer at home on with Chrome up and running, your print jobs will be sent from mobile device back to your computer to be turned from bits of data into slabs of dead tree. Magic!

If you turned your computer off before leaving home or the office, turn it back on when you return and open Chrome. Your documents will be sent to the printer of your choice in short order.

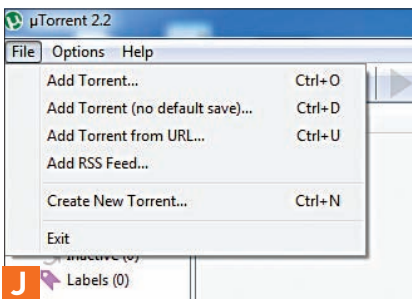


# Create a Torrent File

What do you think of when you hear the word “BitTorrent”? For a lot of people, the word connotes illegal activities. But if you ever need to lawfully host a large file for others to download and don’t have the bandwidth to let them download it directly, BitTorrent—which reduces the strain on your own hosting by allowing users to help upload the file at the same time as they download it—is a great way to distribute it. Here’s how you can create your own BitTorrent file. —DAVID MURPHY

## 1 DOWNLOAD UTORRENT

First off, you’ll want to grab the torrent client uTorrent ([www.utorrent.com](http://www.utorrent.com)) for the purposes of this demonstration. There are plenty of other methods you can use to create torrent files, but this is our preferred method. Once you have it installed and open, click the File menu and select Create New Torrent (image J).



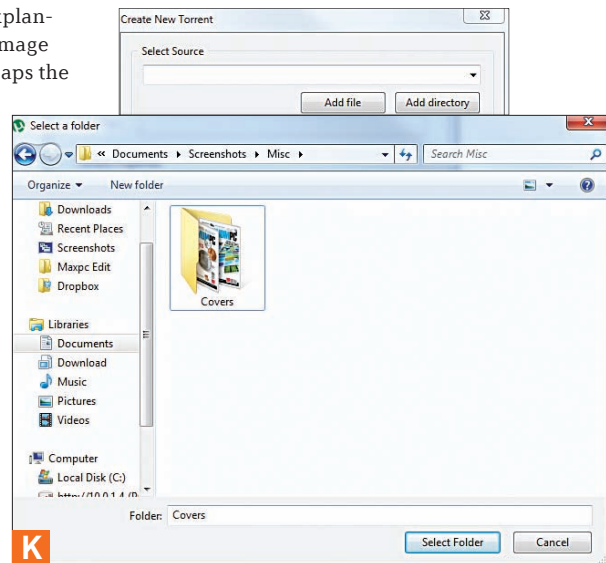
## 2 CONFIGURE YOUR TORRENT FILE

You’ll start by selecting which file or directory you want to share with the world (image K). If you opt for a directory, you can select to exclude files using three different wildcard parameters: an asterisk (matches any text of any length), a question mark (matches any character), or a vertical pipe (used as an “or” statement). So, to use an example, excluding files that match “maxim?m?\*PC” would remove anything from the torrent file that starts with “maxim?m,” where the question mark is any potential character, as well as any file that ends with the letters, “PC.” Just below the Skip Files box, the

Trackers field is both self-explanatory and mission-critical (image L). uTorrent automatically slaps the trackers for OpenBitTorrent and PublicBitTorrent in place for your ease-of-use. Both of these sites’ trackers are completely free, though the sites request that you don’t use their trackers to distribute copyrighted works—which you aren’t doing anyway. Neither site features an index, so other users won’t be able to download your torrent file and connect to whatever it is you’re offering. If you’re looking to get your files distributed across a wide spectrum of people, find an indexing site, submit your torrent to its listing, and use its tracker instead.

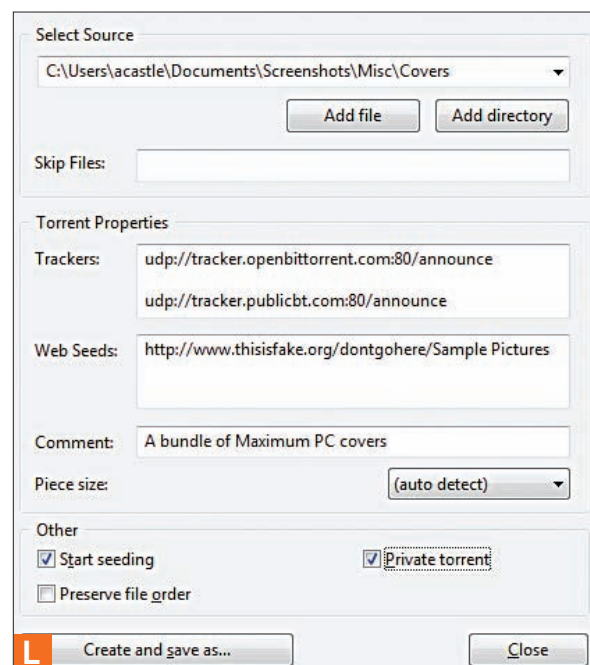
If the file or directory you’re looking to share happens to have an http mirror, feel free to enter that in the Web Seeds box—the full file path for a file, and the directory path for a directory. This will allow users to download chunks of the file from your hosting server rather than from other users, when needed, which will keep your swarm (the group of people downloading and uploading the file) buzzing along smoothly.

Don’t adjust the “piece size” number, as recommended by the uTorrent crew. If you’d like to keep your files from being automatically searched for by others—in case you upload a file that you suspect has a common hash tag already shared within the BitTorrent world—then check the Private box to disable DHT. (DHT is the decentralized distribution system that allows peers to find new seeders to download from without the need of an actual torrent tracker.) And, finally, click the “Start seeding” button if you want



to immediately seed your file or directory after uTorrent creates the torrent file.

And there you have it! Click “Create and Save as” to make the file, then distribute it however you see fit—as more people begin to take note of your share, your connections will rise, and you’ll feel a general sense of accomplishment for having fed the hungry Internet community with whatever it is you sought to give them. ⏻



LENGTH OF TIME  
3 HOURSLEVEL OF DIFFICULTY  
ADVANCED

# BUILD IT

## Experiments in Water-Cooling

### Can an off-the-shelf cooling loop out-cool a custom-built system?



**DAVID MURPHY**  
CONTRIBUTING WRITER

**THE MISSION** I'm taking a standard midrange computer with a Core-i7 930 CPU (stock speed: 2.8GHz) and clocking it up to 4GHz. That'll up my CPU's heat output, and I'll need better cooling. Water-cooling can be quieter and more effective than air, but isn't necessarily cheap or easy to install.

How much time and money do you need to spend to get good cooling? To answer this question, I'm testing three build options: a basic off-the-shelf liquid-cooling loop (Corsair's H70), an all-inclusive Swiftech DIY kit, and finally, a custom-built water-cooling setup of my own configuration. How can I get the best performance for the least money, time, and aggravation?

### INGREDIENTS

#### THE COMPUTER

|  |                |
|--|----------------|
| ✓ <b>Case</b> Cooler Master HAF X<br><a href="http://www.coolermaster.com">www.coolermaster.com</a>                | \$200          |
| ✓ <b>PSU</b> Antec TruePower Quattro 850<br><a href="http://www.antec.com">www.antec.com</a>                       | \$125          |
| ✓ <b>Mobo</b> Asus P6X58D Premium<br><a href="http://www.asus.com">www.asus.com</a>                                | \$285          |
| ✓ <b>CPU</b> Intel Core i7-930<br><a href="http://www.intel.com">www.intel.com</a>                                 | \$300          |
| ✓ <b>RAM</b> Corsair TR3X6G1600C7 DDR3/1600 6GB kit<br><a href="http://www.corsair.com">www.corsair.com</a>        | \$125          |
| ✓ <b>Optical Drive</b> Lite On iHAS424-98 DVD burner<br><a href="http://us.liteonit.com/us">us.liteonit.com/us</a> | \$25           |
| ✓ <b>Hard Drive</b> 1TB Western Digital Caviar Black 7,200rpm<br><a href="http://www.wdc.com">www.wdc.com</a>      | \$80           |
| ✓ <b>GPU</b> AMD Radeon HD 5850 GPU<br><a href="http://www.amd.com">www.amd.com</a>                                | \$180          |
| ✓ <b>OS</b> Windows 7 Home Premium 64-bit<br><a href="http://www.microsoft.com">www.microsoft.com</a>              | \$99           |
| <b>Total</b>   | <b>\$1,419</b> |

#### COOLING OPTION 1

|   |       |
|---|-------|
| ✓ <b>Off-the-Shelf</b> Corsair Cooling Hydro H70 all-in-one liquid cooler<br><a href="http://www.corsair.com">www.corsair.com</a> | \$110 |
|---|-------|

#### COOLING OPTION 2

|   |       |
|---|-------|
| ✓ <b>All-inclusive DIY</b> Swiftech H20-320-EDGE liquid-cooling kit<br><a href="http://www.swiftech.com">www.swiftech.com</a> | \$339 |
|---|-------|



### COOLING OPTION 3

|   |              |
|---|--------------|
| ✓ <b>Reservoir</b> EK-Multioption RES X2-400 Advanced<br><a href="http://www.ekwaterblocks.com">www.ekwaterblocks.com</a>   | \$70         |
| ✓ <b>Pump</b> Swiftech MCP655<br><a href="http://www.swiftech.com">www.swiftech.com</a>   | \$105        |
| ✓ <b>Water Block</b> Koolance CPU-370<br><a href="http://www.koolance.com">www.koolance.com</a>   | \$85         |
| ✓ <b>Radiator</b> XSPC RX360<br><a href="http://www.xspc.biz">www.xspc.biz</a>  | \$95         |
| ✓ <b>Fans</b> 3 x Scythe Gentle Typhoon 12cm, 1,850rpm<br><a href="http://www.scythe-usa.com">www.scythe-usa.com</a>  | \$48         |
| ✓ <b>Connections</b> 6 x 1/2-inch VL3N-MG male threaded connectors;<br>6 x 1/2-inch VL3N-F13-19S female threaded connectors<br><a href="http://www.koolance.com">www.koolance.com</a> | \$144        |
| ✓ <b>Tubing</b> Tygon R-3603 1/2-inch ID lab tubing<br><a href="http://www.tygon.com">www.tygon.com</a>   | \$11         |
| <b>Total</b>  | <b>\$558</b> |



Big thanks to the following companies for providing the water-cooling parts used in this build: Corsair (Corsair H70); Swiftech (H20-320-EDGE system, MCP655 pump); Koolance (Quick Disconnect parts, CPU-370 water block); and especially Frozencpu.com (everything else).

## Choices in Water-Cooling

Part of the problem with water-cooling (as opposed to, say, conventional air-cooling) is the depth of the market. At the shallow end are closed-loop systems like Corsair's H70, which you just slap into your case and go. Next come DIY kits, like Swiftech's H20-320-EDGE, which include everything you need to water-cool your CPU—pump/reservoir/radiator unit, tubes, fittings, water block, and fluid—but require some assembly. Finally, the completely custom option: All you have to do is figure out

the best radiator, pump, reservoir, fluid, tubes, fittings, and water block, then put them all together. Making sense of this last option has long been a source of pride and true geek-cred.

Herein lies the real challenge of this month's build: Given the widespread availability of off-the-shelf cooling loops and systems, from entry-level to boutique, does building a custom water-cooling loop even make sense these days? We're gonna find out.

### OPTION 1: CORSAIR HYDRO H70 ALL-IN-ONE

Installing an all-in-one liquid-cooling kit like Corsair's Hydro H70 is about as easy as water-cooling is ever going to get. It's a great first step for those looking to push beyond the limitations of air, but who are terrified of the destruction wrought by the unintended marriage of liquid and active electronics.

Thankfully, Cooler Master's HAF X comes with a 14cm rear exhaust fan by default, but also has mounting holes for 12cm fans—perfect for the fans on my Corsair H70.

In attaching the H70 to the rear of the case, I first removed the 14cm rear exhaust fan that ships with the HAF X—the H70's radiator and fans mount to that space, which also includes 12cm mounting holes. I arranged the device's two 2,000rpm fans in a push-pull format. I set up the exterior fan to deliver cool air into the radiator from outside the chassis while its companion, the interior fan, was tasked with accelerating the process by sucking this air through the radiator as fast as possible.

The H70, like many mainstream all-in-one setups, includes a pump built right into the cooler's CPU water block. After adding thermal paste to the CPU itself, I fit the water block underneath its retention mechanism, and then twisted a screwdriver a few times on each of the four screws that run through the retention mechanism into a backplane behind the motherboard.

To lock the water block into place, I twisted it ever-so-slightly to the left so that notches built into its frame fell underneath the corresponding locking elements on the retention mechanism. I then tightened the retention mechanism into the board by turning its four screws (gently) until I could twist no longer—a tight connection is important, but you should never force it. I then connected the fan cables to the CPU fan header and the pump cable to another 3-pin header on the motherboard.

In my tests, the H70 performed adequately in its cooling benchmarks, drawing an idle temperature of 35.3 C on our 4GHz overclocked system. Kicking the system up to 100 percent CPU use across all four cores brought temperatures to an average of 74.3 C, with a maximum average recorded temperature of 75.5 C. Not too shabby... but not great, either.



You can't hand-tighten it, but the mounting mechanism for Corsair's H70 is one of the easiest to use of the many water-cooling blocks we've installed. Don't forget the thermal paste!



Tightening the screw on a water block is an art: Make sure you're applying enough force to keep the water block firmly adhered to the CPU, but not enough that you're hurting your motherboard.

## OPTION 2: SWIFTECH H20-320 EDGE ALL-IN-ONE

To say that Swiftech's H20-320 Edge liquid-cooling system is an all-in-one kit is a bit of a misnomer. This radiator/block combination delicately straddles the line between a true all-in-one design and a completely customized build-it. But because of that, it's an excellent intermediate step in the liquid education process. It doesn't force newbies to configure a *full* setup all on their own, but it still makes them cut tubes, fit hoses, and—gasp—pour their own liquid.

### THE RADIATOR

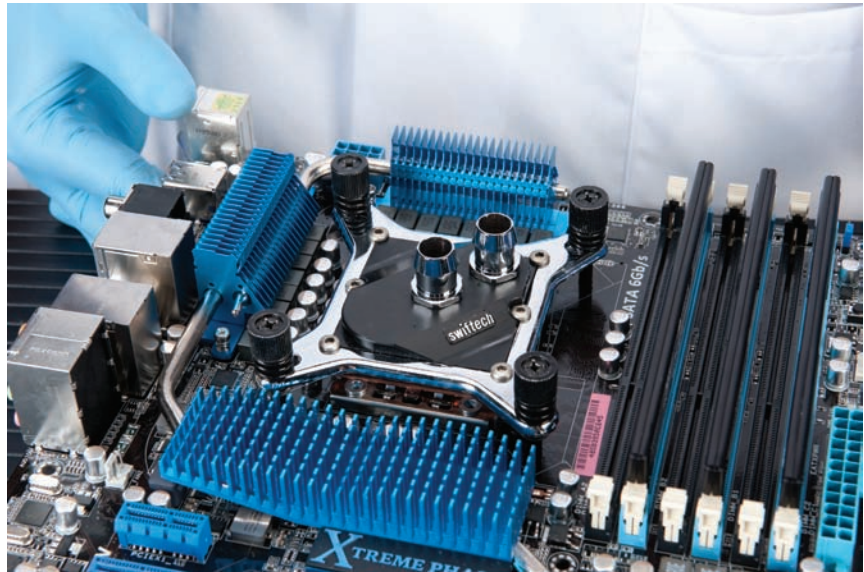
The three-bay radiator that comes with the kit is actually one of Swiftech's MCR320-Drive reservoirs, which combines a small reservoir, three-fan radiator, and a Swiftech MCP35X pump into a single, cohesive unit. Its two fill ports sit on the opposite side of the MCR320's two 1/4-inch holes used to transfer liquid to and from the contraption. Twisting on the barbs that attach to the included 1/2-inch-diameter tubing (inside diameter, that is) is as easy as it sounds. Installing the radiator was not.

Because of peculiarities with the HAF-X's fan holes, the screws included with the MCR320-Drive were not long enough to successfully penetrate fan, case, and radiator. In this instance, I had to use smaller (included) screws to attach the bottom of the three included 2,000rpm fans to the radiator, and turn to plastic pins (also included) to attach the fans' tops to the steel of the chassis.

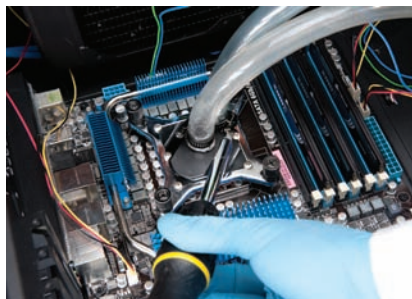
### THE WATER BLOCK

The specifics of attaching a water block to a CPU vary with each product, but all—including Swiftech's Apogee XTL, which was included with the kit—tend to follow a common installation process: You hold a backplane to the rear of the motherboard and tiny threads extend out of the four holes surrounding the CPU socket. Dab and spread some thermal paste on the CPU, gently set the water block on top of the CPU, align the screws with the threads, and twist screws (thumbscrews, in this case) to create a tight pairing between the two without breaking anything.

Attaching the 1/2-inch tubing came next. I started by attaching two tubes to the radiator's input and output, then matched the output of the radiator with the input of the water block and vice versa. It's as easy as pushing the tubes onto the matching barbs I previously installed into the radiator and CPU water block. One caveat here: I also checked to make sure that the four matching clamps—one per tube/barb connection, used to hold the tube close to the barb and prevent leaks—were already ringed the tube. Once



Thumbscrews with springs make water-block installations easy: Hand-tighten until you can tighten no more.



**Secret Tip:** When you're attaching your clamps to the tubing, make sure you align the screws so you can easily tighten them if you're, say, trying to do this all inside of your case.



**Now's a good time to remind you that the first real act of filling your fluid loop should happen outside of your case.**

each tube was in place, I tightened the clamp over the matching indentation in the barbs. For cheaper, plastic clamps, you have to mash its two halves together until they click-lock. In this case, tightening the clamp involved tightening the tiny screw that, itself, pressed the clamp closer and

closer against the tube and barb.

### THE WATER

You can't have water-cooling without the water. In the case of Swiftech's all-in-one, that comes in the form of a bottle of green additive that gets mixed with a liter of distilled water—distilled, because the minerals and ions found in tap water would corrode the kit's parts. After I mixed this concoction, I filled the system by priming the pump, a delicate process helped out by the Antec Digital PC Power Tester I happened to have on-hand. This allowed me to start the power to my power supply without booting the rest of the motherboard/system. When you're priming a pump, the last thing you want to subject your poor motherboard to is three-second bursts of on, off, on, off, on—you get the picture.

Priming a pump involves getting it to the point where you've created a continuous loop of liquid: Water is passing around your setup with nary an air bubble in sight. To get this to happen with Swiftech's kit, I filled the reservoir, tilted the case about 30 degrees toward the "pump" side, flipped on just the power supply, and let the pump run for a few seconds. I then flipped the power supply off, refilled the reservoir to make up for all the coolant now slowly making its way through the loop, and repeated the process until the tubes were full of sweet, continuous fluid.

And that's it! Temperatures on the Swiftech kit hit an average of 36.5 C degrees for the overclocked system when idle, and an average of 68 C on full burn (with a maximum average recorded heat of 69.8 C degrees).

## BUILD 3: THE CUSTOM BUILD

After testing a few water blocks on an identical water-cooling setup (Swiftech's), I determined that Koolance's brand-new CPU-370 water block was dishing out the lowest system temperatures. I used this as the cooling basis for my custom-build system, and it was the first thing to go atop the motherboard—using the same installation process as the coolers previously mentioned, of course.

### CONNECTING THE PARTS

Next into the case went the reservoir. Since I'm from Ohio, and we do love our tornados in the Midwest, I was hoping to evoke a similar look and feel for my system's insides by using EK's Multioption RES X2-400 Advanced Reservoir—essentially, a giant vertical cylinder—to house all the liquid that was going to get sucked out into the tubing loop by one of Swiftech's MCP655 pumps (317 gallons per hour to the MCP35X's 285). I slapped this into the corner of the case, attached some of Koolance's amazing Quick Disconnect fittings to connect it (and all the parts in the system—see sidebar), and ran a single small tube from the bottom of the reservoir to the top of the pump (mounted sideways next to the reservoir) to wedge both components into place against the case's frame. Yes, wedged: the mounting clips for the reservoir didn't work at all.

Figuring that more reservoir space is a positive thing, I did my best to sandwich XSPC's 12.4x6.3x40-centimeter RX360 radiator into the top of the HAF-X. Using the same tricks to mount the Swiftech all-in-one, I just barely got this behemoth of a radiator to stay in place. I opted to use three Scythe Gentle Typhoon fans to connect the reservoir to the chassis—1,850rpm fans, mind you—in an effort to balance heavy cooling with relative quiet.

I used 1/2-inch Tygon tubing to finish connecting the various parts in this flow order: reservoir, to pump, to radiator, to CPU, to reservoir. This, in theory, allows the chilliest possible water to flow into the CPU (as pumps tend to add a little



If you're going to use the same Koolance Quick Disconnects that we did, make sure the drilling of the water block's 1/4-inch holes are compatibly placed.

bit of heat into the equation during pumping).

### PRIMING THE SYSTEM

I primed the system a little differently than before, as the super-huge reservoir (nearly extending from the bottom of the case to the bottom of the radiator) made it unnecessary to do much priming at all. I poured my mixture of Swiftech additive and distilled water into the acrylic tube of a reservoir—to the brim—then sealed the lid and turned the pump on. It took but one refilling of the reservoir (to less than the brim this time, just to be on the safe side) to get the system up and running.

My custom overclocked system reached 36.5 C when idle and 71 C on full throttle, with an



Fluid going... vertical? It has to happen at some point, because you always want your pump to be one of the lowest elements in the entire loop—good luck priming the darn thing otherwise.



Koolance's Quick Disconnects meant we could literally remove and connect hoses at-will, fluid-filled or otherwise.

average maximum temperature of 72.3 C. Though this is higher than the Swiftech's average, it isn't necessarily a loss—remember, I swapped out quieter fans on the radiator. While Swiftech's default all-in-one might win the day in the temperature race by a scant few degrees, there is no way I would ever put a system with fans like that anywhere near my office, living room, or soundproof panic room. It's just too loud.

My custom build was as cool in temperature as it was in design, purring like a kitten while delivering excellent thermals—for all those times I'll be running my Intel Core i7-930 processor at 4GHz across all cores. It's pricey, but it's far better looking and sounding than the Swiftech system.

## QUICK DISCONNECTS

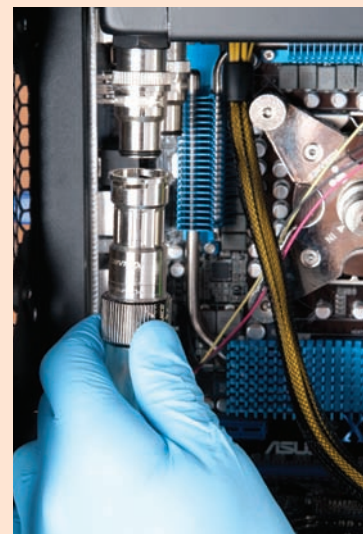
### The Greatest Water-Cooling Purchase Ever

They're expensive, but Koolance's Quick Disconnects are hands-down the greatest invention that the water-cooling world has ever produced. Here's why.

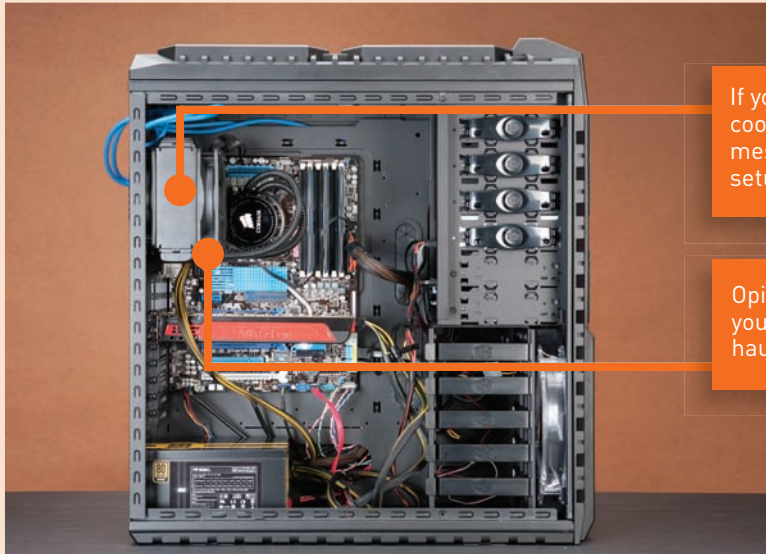
The old way of adding and adjusting parts in your rig was as follows: You connect tubes using the ever-annoying, leak-prone plastic or steel hose clamps. They're hard to get to with fingers or a screwdriver and even harder to take off. Modifying any part in the loop you've built forces you to drain the entire setup, which is as annoying as it is time-consuming.

With Koolance's Quick Disconnects, however, the male and female connectors effectively block every last bit of fluid from ever leaking out of its attached part, period. You can disconnect a tube that's completely full of fluid without spilling a drop; you can rip out a radiator, drain it on its own, and install a brand-new device with all the rest of the liquid sitting right there in your system.

And clamps? Pshaw. To connect the male and female parts, you just push one into the other and give it a little twist. Disconnecting is as easy as giving the male connector a little twist in the opposite direction and pulling it out. When I say that these simple little accessories saved hours of time and square feet of wet, stained carpet, I kid you not. I will never go back to barbs and clamps again.



## Corsair H70 All-in-One



If you want the advantages of water-cooling without the huge footprint or mess, a single-radiator all-in-one setup causes minimal disruption.

Opinions vary on whether to install your radiator fans as intake or exhaust. We prefer intake.

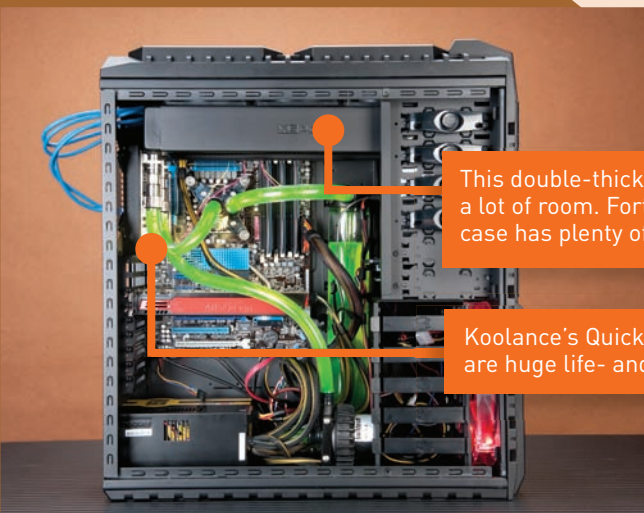
## Swiftech H20-320-EDGE



Swiftech's all-in-one H20-320-EDGE strikes a middle ground between the barely there H70 and our enormous custom loop.

Make sure your tubes are clamped down. Priming the pump, which is attached to the radiator, involves tilting the whole case forward.

## Custom Build



This double-thick XSPC radiator needs a lot of room. Fortunately, the HAF X case has plenty of room to spare.

Koolance's Quick Disconnect parts are huge life- and time-savers.



**SUBMIT YOUR IDEA** Have an awesome idea for Build It? Let us know at [comments@maximumpc.com](mailto:comments@maximumpc.com).



# The Five Most Important Facts about DIY Water-Cooling

If you don't have the skill or time to futz with building your own custom water-cooling setup, then hopefully our tests have shown you that all-in-ones can provide a competitive alternative in both cooling and price. This said, you can tap into considerable builder's satisfaction through the custom route. For some of us, this is the true joy of water-cooling. There are a crap-ton of parts that independently contribute to the success or failure of a given system.

I tested way more parts than I had space to mention here, but learned many important lessons. Here's what to watch out for to ensure that you have the best chance of reaching Maximum Chill if you want to try and beat the prebuilt kits at their own games:

**1. TUBING IS EVERYTHING** 3/8-inch-diameter tubes spiked our temperatures on 100 percent CPU use to an average of 81 C and a maximum of 83.5 C. The same cooling setup using 1/2-inch tubing hit an average of 73 C

with a maximum of 75.25 C. The more fluid you can move over your heat exchanger, the cooler the average temperature that fluid will be—that's why 1/2-inch tubing wins.

**2. GOOD WATER BLOCKS MATTER** We saw an average variance of 7 degrees on our 100 percent CPU burn tests on the three different top-tier water blocks we tested (EKWaterBlocks' Supreme HF, Swiftech's Apogee XTL, and Koolance's CPU-370), with the maximum tested temperature varying by around 4 degrees. The quality of the water block will impact your performance, but there's no quick way to spot what construction characteristics will make for an excellent block. Do your homework; research others' experiences before you buy!

**3. DON'T DOUBLE UP** One radiator might do a pretty good job cooling, but two radiators (with fans, of course) would do even better, right? Wrong. We saw just a 3- to 4-degree difference on our average and maximum "full burn" temperatures when strapping another 14cm radiator into the loop of our Swiftech H20-320 setup. The hassle—and the ugliness of having a radiator latched onto your case's butt—just isn't worth it. Note that while this is true for our CPU-only setup, larger loops (cooling multiple CPUs or GPUs) can benefit from more radiators—to a point.

**4. BIGGER ISN'T BETTER** Just because a radiator is huge doesn't mean that it's going to bring your system to the Ice Age. The statistic to pay attention to on a radiator is the number of fins it packs per inch of space: Radiators with higher FPI levels benefit most from fans that pump a lot of air through their frames, whereas radiators with lower FPI levels (like the XSPC RX360) are really geared toward lower-rpm fans—you just won't see as big a cooling difference if your fans go full-blast on an eight-FPI radiator.

**5. F%& FLUID** If you buy expensive fluid expecting it to be the elixir of the gods for your water-cooling setup, you'll be disappointed. In our tests, \$2 distilled water worked just as well as the most expensive water-cooling fluid we could find—\$50 a bottle. ☺



## BENCHMARKS

|                         | Overclocked Frequency (idle) | Overclocked Average Idle Temperature | Overclocked Frequency (100% use) | Overclocked Average Core Temperature (100% use) | Overclocked Maximum Average Core Temperature (100% use) |
|-------------------------|------------------------------|--------------------------------------|----------------------------------|---|---|
| <b>H70</b>              | 2,880MHz                     | <b>35.25 C</b>                       | 3,990MHz                         | 74.25 C   | 75.5 C  |
| <b>Swiftech H20-X20</b> | 2,880MHz                     | 36.5 C                               | 3,990MHz                         | <b>68 C</b>                                     | <b>69.75 C</b>  |
| <b>Custom Rig</b>       | 2,880MHz                     | 36.5 C                               | 3,990MHz                         | 71 C  | 72.25 C   |

Idle temperatures averaged across all four CPU cores after a half-hour of inactivity. "Burn-in" temperatures measured after a half-hour of 100% CPU use on the Intel Burn Test utility. Best temperatures are bolded

## NEVER BUILT A PC BEFORE?

Your case, motherboard, and cooler all come with useful instructions, but be sure to check out our most recent step-by-step guide at <http://bit.ly/bldcreed>.

# REVIEWS

## Tested. Reviewed. Verdictized.

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- **BEST OF THE BEST**
- **BREAKING TECH NEWS**
- **NO BS PODCAST**



# Digital Storm Black Ops Enix

System builds up, instead of out

Just how much power can you stuff into a small form factor rig? Ask that question of Digital Storm and the company will likely lay its fabulous Black Ops Enix on you.

Using Silverstone's wickedly cool Fortress FT03 case, the Enix is like your typical small form factor lunch-box design, turned on its head. This gives it a couple of big advantages. The most obvious one is as clear as a skyscraper: a footprint that's little larger than a piece of binder paper. The second advantage is thermals. Heat likes to rise, and with the GPUs' exhaust ports pointed straight up, hot air quickly passes through the system.

The hardware itself is top of the line: Intel's new 3.4GHz Core i7-2600K (more about that later), a pair of GeForce GTX 580 cards, 8GB of Corsair DDR3/1600, a 120GB Corsair SSD, a 1TB WD Black drive, a slot-load Blu-ray combo drive, and a 1KW power supply. Cooling is provided by a Corsair Hydro H70. We already know the Sandy Bridge processors overclock like a mother on air, but the water-cooling lets Digital Storm push the 2600K from 3.4GHz to 4.7GHz. To get a little more oomph, Digital Storm also adds a little Turbo Boost 2 to the mix. What this does is clock the processor from roughly 4.7GHz to 5.2GHz.

The extra boost in clock speed helps this rig squeeze by Falcon Northwest's Mach V that

we reviewed in the February issue. The Mach V had its 2600K clocked up to 4.7GHz but didn't push the Turbo Boost 2 to 5.2GHz. Thus, the smaller Enix edges by the Mach V in our Vegas Pro, ProShow, and Reference benchmarks by about 5 percent. In fact, the Enix is now the record holder in our ProShow Producer 4.0 benchmark. Not too shabby for such a compact rig. It also achieved Far Cry 2 scores about 9 percent faster than the Falcon's. The record, believe it or not, still belongs to the last Digital Storm machine we reviewed exactly a year ago. That rig, we must note, had three graphics cards.

Normally, small form factor machines are far from pleasurable for wrenching on. Usually, you're just happy you got it built and you never want to work on it again. The Enix's FT03 case isn't that bad. Sure, it's not as easy to work in as a full-tower case, but for a small form factor, it's not too painful. Our main complaint with the FT03 concerns the placement of the reset and power buttons—right on top, where there's a good chance of accidentally hitting them. The entire top of the case is one big exhaust grill, too, so if you're the kind of person who likes to store discs and other PC junk on top of the case, you can't.

Our final kvetch is noise. The processor is water-cooled but the GTX 580s run stock cooling. Push the CPU or GPUs hard, and it gets a little loud. Not shrill, small-fan loud,



Digital Storm's tower of power can keep up with bigger, heavier desktops.

but you'll know it's on. Compared to the Falcon, which has more volume to dissipate the thermals, the Enix is definitely louder. It's not a show-stopper, but we'd be remiss if we didn't mention it.

So let's break it down: The Enix essentially offers much of the performance of the Falcon Northwest Mach V shrunken down into a box that will nearly fit on a piece of binder paper. Frankly, that's impressive. Small form factor rigs are usually fairly compromised due to space and thermal limitations, but the Enix makes no apologies. This machine really blurs the line

between what you get in a desktop gaming rig and a small form factor PC. —GORDON MAH UNG

| SPECIFICATIONS |  |
|----------------|--|
| Processor      | Intel 3.4GHz Core i7-2600K (overclocked to 4.7GHz) |
| Mobo           | Asus P8P67-M Pro (Intel P67 chipset)               |
| RAM            | 8GB Corsair Dominator DDR3/1600                    |
| Videocard      | Two GeForce GTX 580 cards in SLI                   |
| Soundcard      | Onboard  |
| Storage        | 128GB Corsair SSD, 1TB Western Digital 7,200rpm    |
| Optical        | Optiarc BC-5640H                                   |
| Case/PSU       | Silverstone Fortress FT03                          |

| BENCHMARKS          |       | ZERO POINT |              |
|---------------------|-------|------------|--------------|
| Vegas Pro 9 (sec)   | 3,049 |            | 2,181        |
| Lightroom 2.6 (sec) | 356   | 268        |              |
| ProShow 4 (sec)     | 1,112 |            | 781          |
| Reference 1.6 (sec) | 2,113 |            | 1,508        |
| STALKER: CoP (fps)  | 42.0  |            | 86.1 (+105%) |
| Far Cry 2 (fps)     | 114.4 |            | 188.9        |

Our current desktop test bed consists of a quad-core 2.66GHz Core i7-920 overclocked to 3.5GHz, 6GB of Corsair DDR3/1333 overclocked to 1750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and the 64-bit version of Windows 7 Ultimate.



VERDICT **9**

DIGITAL STORM BLACK OPS ENIX

**+** TRUE GRIT

Small, fast, and almost affordable.

**-** WILD WILD WEST

Can get noisy; easy to accidentally hit buttons on top.

\$3,594, [www.digitalstormonline.com](http://www.digitalstormonline.com)

# G.Skill Phoenix Pro 60GB SSD

Another competent SandForce drive from a lesser-known manufacturer

In our quest to cover the latest and greatest technology, we're sometimes guilty of neglecting perfectly cromulent SKUs from smaller manufacturers. The Phoenix Pro series of solid-state drives is built on the same SandForce SF-1200 controller that powers top-of-the-line drives like OCZ's Vertex 2 series, Patriot's Inferno, and Corsair's Force. With new controllers on the way, SandForce drives, especially at lower capacities, will become good candidates for first-time SSD adopters. With that in mind, we'll take a look at G.Skill's 60GB Phoenix Pro. Can a company better known for gaming RAM deliver a compelling SandForce drive at a decent price point?

The chassis of an SSD is not worth remarking on, unless it's exceptionally good or bad. G.Skill's is cheaper than most—stamped metal held together with clips, rather than Phillips-head or even Torx screws. This isn't really a mark against it, as opening up your SSD tends to void the warranty, but it's still not the best-assembled

enclosure we've seen.

The Phoenix Pro's average sustained read and write speeds of 223MB/s and 207MB/s, respectively, are around what we'd expect from a top-tier current-gen drive. The average write speed is a little lower than we've seen from other SandForce drives, but still respectable. HD Tune 4KB random reads and writes are among the lowest we've seen from a SandForce drive (both sub-9,000 IOPS). On the other hand, IOMeter queue-depth 32 random writes exceed 40,000 IOPS, which is closer to the 48,000 IOPS we've seen from the fastest SandForce drives. It's certainly better than the 14,000 we got from Samsung's new 470-series SSD and most non-SandForce drives.

The G.Skill Phoenix Pro is a standard SandForce

SF-1200 drive, which means it performs with the fastest consumer SSDs on the market. That's good, if boring, from a reviewer's standpoint. Even when new controllers come out, this generation of SandForce SSDs will remain a solid deal, and under-exposed brands like G.Skill can offer real value. The Phoenix Pro is available in capacities from 40GB to 240GB. —NATHAN EDWARDS

## BENCHMARKS

|   | G.Skill Phoenix Pro | Samsung 470 Series | Patriot Inferno |
|---|---------------------|--------------------|-----------------|
| Capacity  | 60GB                | 256GB              | 100GB           |
| Controller                                      | SF-1200             | Samsung            | SF-1200         |
| <b>HD Tune 4.01</b>                             |                     |                    |                 |
| Avg Read (MB/s)                                 | 222.9               | 216.8              | <b>226.9</b>    |
| Random-Access Read (ms)                         | .1                  | .1                 | .1              |
| Burst Read (MB/s)                               | <b>226.4</b>        | 103.2              | 209             |
| Avg Write (MB/s)                                | 207.4               | 220.7              | <b>222.2</b>    |
| Random-Access Write (ms)                        | .1                  | .1                 | .1              |
| Burst Write (MB/s)                              | 202.4               | 110.0              | <b>205.4</b>    |
| 4KB Read (IOPS)                                 | 8,340               | 9,006              | <b>10,685</b>   |
| 4KB Write (IOPS)                                | 7,667               | <b>14,323</b>      | 10,480          |
| IOMeter Random-Write IOPS (4KB, Queue Depth 32) | <b>40,111</b>       | 14,743             | 10,724          |
| Premiere Pro CS3 (sec)                          | <b>320</b>          | 330                | 360             |
| PCMark Vantage HDD                              | <b>35,768</b>       | 27,016             | 33,889          |

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 the latest Intel ACHI drivers.



In mythology, the Phoenix represents resurrection and new life. We have no idea what it represents here. Maybe it just sounded cool.

VERDICT

8

G.SKILL PHOENIX PRO 60GB SSD

+ G. LOVE

SandForce controller reliable as ever; high random IOPS; competitive price.

- M. ITTEN

Cheap enclosure.

\$140, [www.gskill.com](http://www.gskill.com)

# Gigabyte GA-P67A-UD7

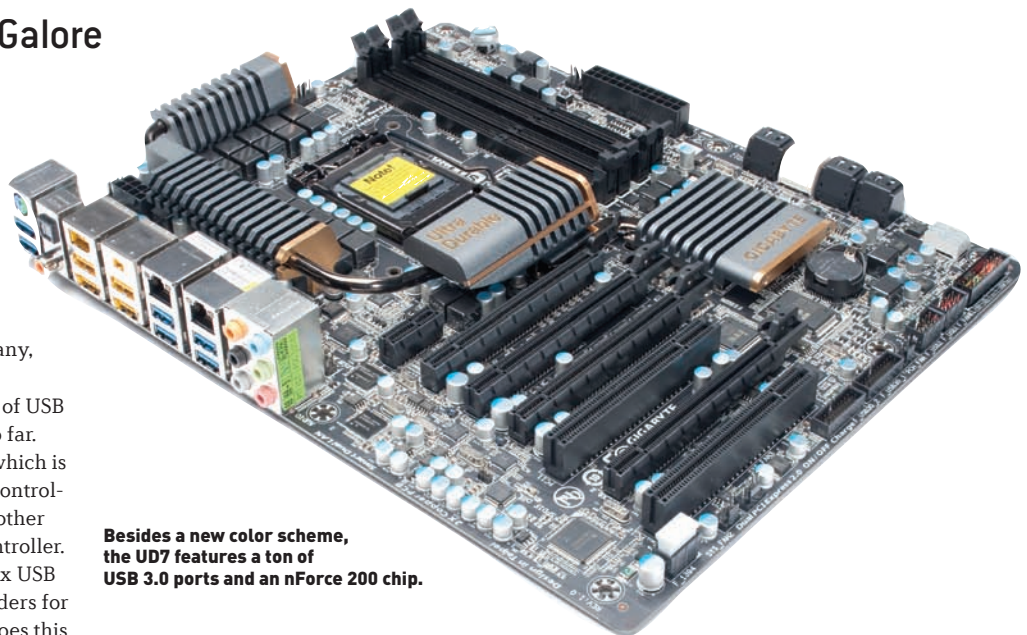
## Just call me USB 3.0 Galore

If there's one thing we know about Gigabyte, it's that the mobo maker loves USB 3.0. We mean, it *loves* USB 3.0. How much? The company has been pushing USB 3.0 as its premiere feature for a while now, and this tack has apparently worked. The company claims that it's the No. 1 USB 3.0 motherboard company, whatever that means.

The GA-P67A-UD7 is the pinnacle of USB 3.0 boards to make it into our hands so far. Most USB 3.0 boards sport two ports, which is the maximum a single NEC USB host controller will support. Newer boards add another two more ports with a second NEC controller.

Gigabyte goes plumb crazy with six USB 3.0 ports in back plus two USB 3.0 headers for a total of 10 possible ports. Gigabyte does this by using two VIA USB 3.0 hub controllers. To be fair, Gigabyte isn't the only company to do this—we saw a pre-production Asus board with the same hub chips. But this development still safely consolidates Gigabyte's position as the king of USB 3.0.

We're not just being smart asses, either. Despite using the same NEC controller, the GA-P67A-UD7 actually pulled in noticeably better USB 3.0 performance than both the MSI P67A-GD65 and Asus P8P67 Deluxe boards that we reviewed in March (180MB/s vs. 156MB/s). IO on the Marvell and Intel 6Gb/s ports was also better.



Besides a new color scheme, the UD7 features a ton of USB 3.0 ports and an nForce 200 chip.

In other benchmarks, the UD7 ran just about even with the Asus and MSI. As we've said before, the competition usually boils down to features and not pure numbers for boards using the same chipset. In features, the UD7 is a mixed bag. Boot the board, and you will not be greeted by a pretty-as-hell UEFI interface. Instead, it's what Gigabyte calls a "hybrid UEFI." It has UEFI underpinnings but the company said it stuck with its tried-and-true (and boring) BIOS interface. Whether you're into UEFI or not, the most important feature today is the support for booting from partitions larger than

2TB, and here the UD7 is fine—the board booted without issue from our WD 3TB Caviar drive.

Overclocking on the board was straightforward. While the Asus board would only overclock via Turbo Boost multipliers, the UD7 was old-fashioned and allowed us to crank up the CPU multiplier and reboot. As with all P67 boards, we performed a mild overclock and took our 3.4GHz Core i7 2600K to 4.5GHz

using a stock heatsink. All went fine, and it's really hard to say which method works better. But we'd prefer options to do both.

Perhaps the most eye-opening feature of the UD7 is its nForce 200 chip. Standard P67 boards can't run more than two GPUs effectively, but using the Nvidia nForce 200 chip, you can run up to three GeForce cards. We tested the UD7 using three GeForce GTX 580 cards and we weren't disappointed. We actually found the three cards scale nicely if you run either brand-new, taxing DX11 games, or if you run older games at super-high resolution.

Despite its somewhat boring BIOS, there's little to dislike about the UD7. If we were to pick something to ding Gigabyte over, it's the lack of USB 3.0 dongles. Both MSI and Asus give you either additional rear USB 3.0 ports that plug into the onboard header or a front-bay adapter with ports. Gigabyte gives you neither. Considering its steep price of \$320, that's a bit of a burn. —GORDON MAH UNG

### BENCHMARKS

|  | Gigabyte<br>GA-P67A-UD7 | Asus<br>P8P67 Deluxe | MSI<br>P67A-GD65 |
|--|-------------------------|----------------------|------------------|
| PC Mark Vantage 64-bit   | 10,556                  | 11,250               | 10,388           |
| Everest Ultimate MEM Read (MB/s)                               | 16,501                  | 16,110               | 16,492           |
| Everest Ultimate MEM Write (MB/s)                              | 18,592                  | 16,757               | 18,602           |
| Everest Ultimate MEM Copy (MB/s)                               | 21,324                  | 25,128               | 21,628           |
| Everest Ultimate MEM Latency (ns)                              | 52.3                    | 35.8                 | 53.5             |
| SiSoft Sandra RMA Bandwidth (GB/s)                             | 15.6                    | 15.7                 | 15.8             |
| 3DMark Vantage Overall   | 14,471                  | 14,845               | 15,214           |
| 3DMark Vantage GPU   | 11,871                  | 11,947               | 12,287           |
| 3DMark Vantage CPU   | 53,670                  | 54,470               | 53,282           |
| Valve Particle test (fps)                                      | 178.0                   | 180.0                | 177.0            |
| Resident Evil low-res (fps)                                    | 131.3                   | 132.0                | 131.7            |
| HAWX low-res (fps)   | 234.0                   | 244.0                | 247.0            |
| HD Tune Pro Sustained Read (MB/s)<br>Marvell 6GB/s Controller  | 237.0                   | 208.0                | 202.4            |
| HD Tune Pro Burst Marvell (MB/s)                               | 174.0                   | 157.0                | 167.0            |
| HD Tune Pro Sustained Read on<br>Intel 6GB/s Controller (MB/s) | 267.1                   | 256.7                | 242.0            |
| HD Tune Pro Burst Intel (MB/s)                                 | 191.2                   | 170.0                | 204.0            |
| HD Tune USB 3.0 (MB/s)   | 180.0                   | 155.6                | 156.0            |

We tested all three boards using an Intel 3.4GHz Core i7 2600K, 4GB of Corsair DDR3/1333, a GeForce GTX 280, 64-bit Windows 7, and a WD Raptor 150GB hard drive. USB 3.0 performance test used an OCZ Enyo drive. SATA 6Gb/s testing used a Crucial C300 SSD.

9

VERDICT

**GIGABYTE GA-P67A-UD7**

|  |   |
|--|---|
| <p style="margin: 0;"><b>+ USB 3.0</b></p> <p style="margin: 0; font-size: 0.8em;">Tons of USB 3.0 ports; tri-SLI support.</p> | <p style="margin: 0;"><b>- FIREWIRE</b></p> <p style="margin: 0; font-size: 0.8em;">No UEFI; no USB 3.0 adapters.</p> |
|--|---|

\$320, [www.gigabyte.com](http://www.gigabyte.com)

# Palit GTX 570 Sonic Platinum

## Overclocked card turns heads but drinks power

Palit's high-end cards tend to be exercises in extravagance. That's certainly true with its GTX 570 Sonic Platinum. At first, we thought Palit shipped the wrong card, given the 8-pin power connector nestled adjacent to the 6-pin connector, just like a GTX 580. However, it's really a GTX 570—albeit with a core clock of 800MHz (versus the stock 742MHz) and the GDDR5 frame buffer clocking an even 1GHz (versus the reference 950MHz.)

Of course, pushing a GTX 570 that hard likely requires an extra current load, hence the 8-pin connector. In fact, our testing revealed that the Palit GTX 570 sucked a stunning 388W at full load, just shy of the EVGA GTX 580 SuperClock's 395W. The Palit's idle number is worse by comparison, though, at 161W—the worst of all the cards compared in our chart.

But don't assume that the Palit card is equivalent to a GTX 580 when it comes to performance. The Sonic Platinum fell short in the benchmarks compared to the GTX 580 SC. At \$370, though, it's also considerably less costly than a GTX 580. On the other hand, the Palit GTX 570 generally hammered the Radeon HD 6970 and generated frame rates about 5 percent higher than an Asus GTX 570 based on Nvidia's reference design—about equivalent to the price margin.

Palit uses a two-fan design to keep the card running cool under load. There's a perceptible fan spin-up under heavy load, and overall fan noise is pretty noticeable. It's an attractive card, and looks killer if you like running a case with transparent side windows.

Palit also adds a DisplayPort connector to the card, enabling easy connection to monitors using DisplayPort. Note that a single card still only drives two displays; you'll need to run SLI if you want three-panel surround gaming. Still, it's good to see Palit move forward with a more modern display connector.

Should you get one? If you've got the power supply to

### BENCHMARKS

|                           | Palit GTX 570 Sonic Platinum | Asus GTX 570 | XFX Radeon HD 6970 | EVGA GTX 580 SC |
|---------------------------|------------------------------|--------------|--------------------|-----------------|
| 3DMark 2011               | 5,631                        | 5,316        | 5315               | <b>6,105</b>    |
| 3Dmark Vantage Perf       | 22,289                       | 21,229       | 20,443             | <b>23,888</b>   |
| Unigine Heaven 2.1 (fps)  | 33                           | 30           | 27                 | <b>36</b>       |
| Crysis (fps)              | 35                           | 33           | <b>36</b>          | <b>36</b>       |
| BattleForge DX11 (fps)    | <b>70</b>                    | 65           | 47                 | <b>70</b>       |
| Far Cry 2 / Long (fps)    | 111                          | 105          | 94                 | <b>122</b>      |
| HAWX 2 DX11 (fps)         | 148                          | 144          | 81                 | <b>158</b>      |
| STALKER: CoP DX11 (fps)   | 53                           | 49           | 53                 | <b>58</b>       |
| Just Cause 2 (fps)        | 48                           | 46           | 41                 | <b>52</b>       |
| Aliens vs. Predator (fps) | 39                           | 36           | 40                 | <b>44</b>       |
| F1 2010 (fps)             | 61                           | 62           | 65                 | <b>72</b>       |
| Metro 2033                | 22                           | 21           | 22                 | <b>26</b>       |
| Power@ idle (W)           | 161                          | 144          | <b>139</b>         | 141             |
| Power@ full throttle (W)  | 388                          | 339          | <b>331</b>         | 395             |

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.

handle it, you'll certainly be pleased with the performance. After all, you're getting 90 percent of a GTX 580 for about 70 percent of the price. On the other hand, that power draw does give us pause—pushing a GPU this hard beyond its rated limits makes us worry a bit about the card's working life. Still, Palit has delivered one of the fastest GTX 570s around. —LOYD CASE



■ ■ ■
**VERDICT** 8

**PALIT GTX 570 SONIC PLATINUM**

|  |   |
|--|---|
| <p><b>+</b> <b>FIREFLY</b></p> <p>Excellent performance; attractive-looking card; DisplayPort connector.</p> | <p><b>-</b> <b>SPACE 1999</b></p> <p>Huge power draw; requires 8-pin connector; a little on the noisy side.</p> |
|--|---|

\$370, [www.palit.biz](http://www.palit.biz)

**Palit pushes the GTX 570 to its limit, but it sucks almost as much power as a GTX 580.**

# Corsair Cooling Air Series A70 CPU Cooler

## Corsair tries direct-contact heat pipes on for size

There was a time when your RAM (and maybe a thumb drive) was the only part of your rig likely to bear the Corsair mark. That time is long gone, and Corsair's triple-mast logo can now be found on power supplies, cases, speaker sets, SSDs, and water-cooling loops—and now, perhaps inevitably, on CPU air-coolers. Corsair's A50 and A70 air coolers adopt many of the most successful cooler conventions on the market—but how well do they cool?

Nearly all of the best air-coolers on the market today are skyscraper designs, in which four or more heat pipes rise from the heat exchanger into a stack of horizontal aluminum cooling fins. Corsair has evidently been taking notes on what works, because the A70 features direct-contact heat pipes like the Cooler Master Hyper 212+ and Thermaltake Contac, and dual fans like nearly every high-end cooler these days.

With both fans attached via their plastic mounting clips, the Corsair A70 is 6.25 inches tall, just over 5 inches deep, and 4.85 inches wide, and weighs in at a hair over 2 pounds. That's nearly 10 ounces lighter than Thermaltake's Frio, which otherwise has almost identical dimensions. The universal Intel mounting bracket consists of fewer parts than many similar coolers—just a backplate with attached mounting pins, four thumbscrews, and a plate that sits atop the heat exchanger and presses it against the CPU when tightened. The two fans have to be removed to mount the cooler, but their plastic clips are both sturdier and easy to attach and remove than the wire hooks on other coolers.

Despite having one fewer heat pipe than the Thermaltake Frio, the Corsair A70 performed nearly identically to that cooler—

beating the Cooler Master Hyper 212+ by around 4 C at full burn but lagging about 4 C behind the Prolimatech Armageddon with two 14cm fans. Attaching the two included resistor cables (which lower the fan speed from 2,000rpm to 1,600rpm), lowered fan sound but raised burn temperatures by one degree Celsius to a still-respectable 63.5 C.

The Corsair A70's MSRP of \$60 matches that of the Thermaltake Frio, but on the street the A70 goes for around \$46, while the Frio is still \$58. Given the steep street discount, and slightly quieter performance, it's hard not to give the Corsair A70 the edge here. —NATHAN EDWARDS

■
■

**VERDICT** 9

**CORSAIR COOLING AIR SERIES A70**

|   |   |
|---|---|
| <p><b>+ ACES</b></p> <p>Good performance for the money; easy-off fan clips; two fans; low street price.</p> | <p><b>- EIGHTS</b></p> <p>Noisy without resistor cables; high MSRP.</p> |
|---|---|

\$60, [www.corsair.com](http://www.corsair.com)



The Corsair A70's two fans are a bit noisy, but they get the job done.

### BENCHMARKS

|               | Corsair A70<br>(2 fans) | Prolimatech<br>Armageddon (2 fans) | CM Hyper<br>212+ |
|---------------|-------------------------|------------------------------------|------------------|
| Idle [C]      | 33.75                   | <b>33.25</b>                       | 34.25            |
| 100% Burn [C] | 62.50                   | <b>58.50</b>                       | 66.75            |

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 100 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. Temperatures taken with HWMonitor.

Patriot's PBO Core is quite pretty and very inexpensive, but the Fusion HD is a better value and the WD TV Live Hub includes Netflix support.



Some of the WD TV Live Hub's specifications should be consumed with a large grain of salt, but we still think it's the best network media player on the market.



We really dig the remote control that Nixeus provides with its Fusion HD.

## Variations on a Stream

### Network media players continue to evolve

If you're looking for the ultimate home theater experience, we still think a bona fide home theater PC, such as the AsRock 3D Vision we examined in the March 2011 issue, is the best solution (read our review at <http://bit.ly/fhZBE3>). But alternatives abound if you can't justify dropping a grand on an entertainment appliance, or if you just want something smaller and simpler.

Competition has forced network media-streamer manufacturers to innovate rapidly to stay ahead of the pack, adding support for additional media codecs and container formats, the ability to mount ISO images, connections to online media services, internal hard drives for local storage (optional in two of these three devices), and more.

We installed the Nixeus Fusion HD Media Player, Patriot Box Office Core, and Western Digital's WD Live Hub in our home theater to find out which delivers the best bang-for-the-buck entertainment experience. —MICHAEL BROWN

#### NIXEUS FUSION HD MEDIA PLAYER

The Nixeus Fusion HD Media Player is huge compared to its competition, but we like the reason for its hulking dimensions: You can drop a 3.5-inch hard drive inside its enclosure. Western Digital's WD TV Live Hub comes with a drive, and you can install one inside Patriot's PBO Core, but those boxes are limited to pricier 2.5-inch drives that currently max-out at 1TB. The 3.5-inch option lets you run far cheaper and far larger drives (up to 2TB.).

And if you really want to go nuts with attached storage, Nixeus is the only manufacturer of the three to include an eSATA port along with two USB 2.0 ports (plus a third USB Mini-B port, so you can transfer files to an installed hard drive directly from a PC). The back panel hosts a 10/100Mb/s Ethernet port, an HDMI 1.3 port, optical and coaxial digital-audio ports, and an 1/8-inch A/V port that provides analog stereo and composite video on a single cable (there is no component video out).

Most streaming boxes support a wireless

USB adapter in case a wired Ethernet connection is not practical in your environment, but Nixeus goes the extra step and includes an adapter in the box. The USB ports will also support a keyboard, which is vastly superior to a virtual keyboard when you're setting up passwords and logging into an online service. USB mice, however, are not supported.

All three devices support the most common file and container formats (see chart), but the Fusion HD is the only one of the three that also supports ASF containers. More importantly, it's the only one capable of playing the Motion JPEG files created by many, mostly older, digital cameras and camcorders. None of the three can display the menus in Blu-ray ISO images, but the Fusion HD is the only one of the three capable of passing both Dolby TrueHD and DTS-HD Master Audio bitstreams through its HDMI port for decoding on your A/V receiver.

The Fusion is the best choice among these three players when it comes to streaming unencrypted content on your local network. It also has a full web browser and support for



YouTube, ShoutCast, Flickr, and Picasa. But it isn't the best choice if you're looking to stream movies and TV episodes using such online services as Netflix or Hulu—even though it supports both Flash and Silverlight—because it relies on your purchasing and running the PlayOn media server (\$80) on another PC on your network.

**NIXEUS FUSION HD**  
\$180, [www.nixeus.com](http://www.nixeus.com)

## PATRIOT MEMORY PBO CORE

If aesthetics were our chief consideration, Patriot Memory's PBO Core would take the prize. Nixeus and Western Digital wrap their devices with copious amounts of cheap plastic; Patriot utilizes elegant brushed aluminum. And despite this media player's petite dimensions, it's large enough to accommodate an internal 2.5-inch hard drive.

But in a market this crowded, a media player needs more than style points to deserve our higher accolades, and Patriot needs to try harder. If you need additional storage, the PBO Core features the typical front and rear USB 2.0 ports. And like the Fusion HD, this device provides a USB Mini-B port for rapid file transfers from a host PC. The rear panel has an HDMI 1.3 port, an optical digital-audio output, analog stereo RCA outs, and a composite video output. There is no component video and no coaxial digital-audio output. The box connects to your network via either hardwired Ethernet (10/100Mb/s) or an optional USB Wi-Fi adapter.

The PBO Core's USB ports don't support a

keyboard or mouse, so you'll need to rely on Patriot's above-average remote control and quirky virtual keyboard for any data-entry chores. The onscreen keyboard is particularly annoying because it doesn't display the password characters you're entering, even for a fraction of a second. On the upside, this was the only streamer of the three that is equipped with a parental-controls feature that enables you to restrict access to the box. Patriot was also the only vendor to put an HDMI cable in the box, so that you'll have everything you need to integrate the device into your entertainment center when you bring it home.

The PBO Core supports more container formats than the Fusion HD and the WD TV Live Hub, including RealMedia and RealMedia Variable Bitrate, but it has more than a few shortcomings in other areas. It's not DLNA certified, for instance, it doesn't support Flash or Silverlight, and it can't pass through Dolby Digital TrueHD or DTS-HD Master Audio bitstreams to its HDMI port. And like the Fusion HD, the PBO Core relies on PlayOn to stream video from Hulu and Netflix.

**PATRIOT MEMORY PBO CORE**  
\$90, [www.patriotmemory.com](http://www.patriotmemory.com)

## WESTERN DIGITAL WD TV LIVE HUB

The feature-packed WD TV Live Hub is the clear all-around winner in this roundup, even without its 2.5-inch, 1TB drive. But it's not perfect.

Let's look at what Western Digital did

right, first. Given the choice, we'd much rather play an HD video file from local storage than stream it across our network—especially if our network is wireless and is being used for other tasks at the same time. Adding a 3.5-inch, 1TB hard drive to the Nixeus device will add at least \$65 to its price tag; adding a 2.5-inch drive to the Patriot device will cost even more. The WD TV Live Hub is street-priced at just \$200.

Unlike the other two boxes we tested, the WD TV Live Hub is capable of streaming Netflix video without the need to run PlayOn on another machine on your network. You can also use it to rent or purchase movies from Blockbuster On Demand (although you'd be nuts to buy DRM-laden movies from a company in the throes of a Chapter 11 bankruptcy). The WD TV Hub is compatible with a number of other online services, too, including YouTube, Mediafly, Pandora, Live365, Facebook, and—Western Digital promises real soon now—Hulu Plus.

The WD TV Live Hub is the only device among these three that supports analog component video output in addition to HDMI. It also has front and rear USB 2.0 ports, an optical digital-audio output, analog stereo RCA outputs, and a composite video output. The WD TV Live Hub will pass a Dolby Digital TrueHD bitstream through to its HDMI port, but Western Digital claims its licensing agreement with DTS bars it from doing the same with DTS-HD Master Audio bitstreams (DTS, according to Western Digital, limits this functionality to Blu-ray-class devices).

Transferring very large files takes time even on a wired network, but we were sorely disappointed in this device's file-transfer performance given that it's the first media player we've seen to boast Gigabit Ethernet. It took nearly two hours to copy a 9GB DVD ISO from our Windows Home Server machine to the WD TV Live Hub's internal hard drive, indicating a data-transfer rate of just over 10Mb/s.

The WD TV Live Hub supports all the important media containers and codecs, it supports the most important online media services, and it includes a 1TB hard drive at a price that's hard to beat.

**WESTERN DIGITAL WD TV LIVE HUB**  
\$200, [www.wdc.com](http://www.wdc.com)

| SPECS                      |   |  |  |
|----------------------------|---|--|--|
|                            | Nixeus Fusion HD  | Patriot PBO Core   | Western Digital WDTV Live Hub  |
| <b>Media Processor</b>     | Sigma Designs SMP8655   | Realtek RDT1073  | Sigma Designs SMP8654  |
| <b>Container Support</b>   | ASF, AVI, DAT, FLV, IFO, M2TS, M2V, M4V, MJPEG, MKV, MOV, MP4, MPEG, TP, TS, VOB, WMV | AVI, DAT, FLV, IFO, M2TS, M4V, MKV, MOV, MP4, MTS, RM, RMVB, VOB, WMV              | AVI, DAT, FLV, M2T, M2TS, MKV, MOV, MP4, MPEG, TP, TS, VOB, WMV  |
| <b>Video Codec Support</b> | AVI, h.264, M-JPEG, MPEG 1/2/4, VC1, WMV9, Xvid                                       | AVC, Divx, h.264, MPEG 1/2/4, Xvid   | AVC, h.264, MPEG 1/2/4, VC-1, x.264, WMV9, Xvid  |
| <b>Audio Codec Support</b> | AAC, Dolby Digital, DTS, FLAC, MP3, PCM, Vorbis, WAV, WMA, WMA Pro                    | AAC, ASF, Dolby Digital, DTS, FLAC, LPCM, MP3, PCM, RA, RM, RMVB, Vorbis, WAV, WMA | AAC, AIFF, Dolby Digital, Dolby Digital Plus, DTS, DVR-MS, FLAC, LPCM, MP2, MP3, LPCM, PCM, Vorbis, WAV, WMA |
| <b>DLNA Certified</b>      | Yes   | No   | Yes  |
| <b>BitTorrent Client</b>   | Yes   | Yes  | No   |

# MSI N560GTX-Ti Twin Frozr II OC Edition

MSI keeps it cool with its twin-fan GeForce GTX 560

Nvidia's engineering teams have been pretty busy lately, re-engineering and streamlining the previously inefficient Fermi architecture. We've seen the GTX 580 and GTX 570 released in recent months. Now it's the sweet-spot GPU, the GTX 460, getting the chip re-spin love. Dubbed the GeForce GTX 560 Ti, the new GPU is clearly Nvidia's attempt to recapture some of the thunder of the venerable GeForce 4400 Ti GPU from an earlier generation.

The new chip, code-named GF114, now sports a full 384 shader cores, 1GB of GDDR5, and pushes the reference core-clock speed up to 822MHz. During the product briefing, Nvidia noted that the GPU has plenty of headroom for overclocking, and we're seeing quite a few designs that push the clock speeds.

One such example is MSI's N560GTX-Ti Twin Frozr II OC Edition. The OC Edition pushes the core-clock speed to 880MHz and the memory clock to 1,050MHz. The twin-fan design has been updated from the original Twin Frozr; it's less bulky and heavy, plus it seems to be quieter than the original. MSI also claims that the board is less prone to warping when mounted in a vertical case, and uses "military grade" components in its construction.

We popped the card into our graphics test system and took it for a spin. The MSI board is priced at \$260, in the same range as competitive products. So just how well does the card perform versus the reference card and the earlier GTX 460? And how about against AMD?

The MSI N560GTX-Ti pretty much hammers the overclocked Asus Radeon HD 6870. It even performs credibly against the XFX Radeon HD 6950, which wins more of the benchmarks, but by small margins—and loses several to the MSI 560 Ti.

The twin-fan cooling system is about on par with the single-fan reference card we've been testing here, and a little quieter to our



MSI's Twin Frozr II cooler keeps the card running cool while pushing speeds 5 to 7 percent above reference clocks.

ears than the Asus twin-fan 560 Ti we're also busy benchmarking (see MaximumPC.com for our reviews of those two cards). At full throttle, power is a little higher than the HD 6870—but performance is also better. On the other hand, the MSI card only costs a little more than Nvidia's suggested price for reference cards. For a few dollars more, you get 5 percent to 7 percent upclocks, better performance, and a card that doesn't generate vast amounts of heat and noise. That's a good deal in our books. —LOYD CASE



VERDICT

9

MSI N560GTX-TI TWIN FROZR II OC

+ APPLE PIE

Impressive performance for the dollar and the watt; low noise level; bundled with 3DMark 2011 Advanced.

- TWINKIE

Warranty is limited; power plugs are a little hard to reach.

\$260, www.msicomputer.com

## BENCHMARKS

|                           | MSI N560GTX-Ti | Nvidia GTX 560 Ti Reference | Asus ENGTX 460 TOP 1GB | Asus HD 6870 DirectCU | XFX Radeon HD 6950 |
|---------------------------|----------------|-----------------------------|------------------------|-----------------------|--------------------|
| 3DMark 2011               | 4,519          | 4,042                       | 3,963                  | 4,314                 | <b>4,816</b>       |
| 3DMark Vantage Perf       | <b>19,482</b>  | 18,723                      | 16,226                 | 17,041                | 18,747             |
| Unigine Heaven 2.1 (fps)  | <b>26</b>      | 25                          | 18                     | 18                    | 24                 |
| Crysis (fps)              | 29             | 27                          | 23                     | 29                    | <b>32</b>          |
| BattleForge DX11 (fps)    | <b>54</b>      | <b>54</b>                   | 40                     | 42                    | 42                 |
| Far Cry 2 / Long (fps)    | 102            | 96                          | 83                     | 78                    | <b>105</b>         |
| HAWX 2 DX11 (fps)         | <b>127</b>     | N/A                         | 101                    | 77                    | 74                 |
| STALKER: CoP DX11 (fps)   | 44             | 44                          | 35                     | 34                    | <b>46</b>          |
| Just Cause 2 (fps)        | <b>42</b>      | 40                          | 35                     | 35                    | 37                 |
| Aliens vs. Predator (fps) | 32             | 30                          | 21                     | 26                    | <b>36</b>          |
| F1 2010 (fps)             | 52             | N/A                         | 43                     | 54                    | <b>59</b>          |
| Metro 2033                | 17             | 16                          | 15                     | <b>20</b>             | <b>20</b>          |
| Power @ idle (W)          | <b>130</b>     | N/A                         | 133                    | 140                   | 138                |
| Power @ full throttle (W) | 305            | N/A                         | 298                    | <b>252</b>            | 270                |

Best scores are bolded. Our test bed is an Intel 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 7. All games are run at 1920x1200 with 4x AA.

# MSI E350IA-E45

## Fusion lands, but is it enough?

It's a little difficult to review MSI's new Fusion-based E350IA-E45. Normally, our motherboard reviews consider the CPU as an adjunct to the board, since consumers may populate the board with one of numerous CPUs.

That's not so with the Mini-ITX MSI E350IA-E45, which, as its name implies, incorporates AMD's brand-new 1.6GHz E-350 with AMD's Radeon HD 6310 graphics part in the same die. The chip is soldered to the board, so you'd better be happy it.

Fortunately, AMD's new Accelerated Processing Unit has a lot going for it. For those who don't know, the APU integrates a dual-core x86 core with a fairly powerful graphics core.

The x86 side of the E-350 chip is nothing to write home about. It's essentially a slightly narrower iteration of an Athlon 64 core, which will outperform or underperform an equivalent Athlon 64 depending on the application being run. More exciting is the graphics core, which features 80 Radeon cores—all at a very low temperature and low power consumption. How low? At idle—with a very ungreen WD Raptor drive and a USB optical drive attached—the entire system drank 28 watts. Watching 1080p video on YouTube pushed it to about 35 to 38 watts at the wall.

In a preview of the Fusion part late last year, we were impressed by the graphics capability and our official Lab tests didn't change our minds. Before you get too excited, you need to lower your expectations about five notches and then climb down into the basement if you're expecting GTX 580 graphics and a Sandy Bridge to boot for \$130.

The E350IA-E45 is capable of Blu-ray playback, and played 1080p content on the Internet without issues. But what about gaming? Here we're conflicted. We think Fusion is a great alternative to Intel's weak Atom line of processors and integrated graphics in notebooks and netbooks. In a desktop computer, however, you're not as confined as you are with mobile. With that said, the Fusion and MSI board combo does give you playable performance in *The Sims 3*, and somewhat acceptable frame rates in *Left 4 Dead 2* as well as *Call of Duty 4: Modern Warfare*. In *Call of Duty: Black Ops*, however, we found it wanting. When we say playable, we mean at low resolutions, such as 1024x768. So, while gaming

### BENCHMARKS

|                            | MSI E350IA-E45                                | Dell Inspiron Zino                                     | Polywell Giada Ion-100            | Zotac HD Zbox HD                     | Asrock Vision 3D                                |
|----------------------------|---|--|-----------------------------------|--------------------------------------|---|
| <b>Configuration</b>       | 1.6GHz E-350 with AMD Radeon HD 6310 graphics | 1.5GHz Athlon II X2 3250e with integrated 780G chipset | 1.6GHz Atom 330 with Ion graphics | 1.8GHz Atom D525 with Ion 2 graphics | 2.4GHz Core i3-370M with Nvidia GeForce GT 425M |
| <b>Photoshop CS3 (sec)</b> | 438   | 449  | 552                               | n/a                                  | <b>162</b>                                      |
| <b>MainConcept (sec)</b>   | 7,943   | 7,080  | 8,858                             | 8,070                                | <b>2,452</b>                                    |
| <b>3DMark 2003</b>         | 6,403   | 2,540  | 3,371                             | 7,504                                | <b>17,394</b>                                   |
| <b>Quake III (fps)</b>     | 193   | 192  | 118                               | 145                                  | <b>537</b>                                      |
| <b>Quake 4 (fps)</b>       | 43  | 29   | 29                                | 29                                   | <b>112</b>                                      |

Best scores are bolded. We tested the MSI E350IA-E45 with 4GB of DDR3/1333, a Western Digital Raptor 150, and 64-bit Windows 7 Professional.

is far improved over Atom machines with integrated graphics, you won't be playing at high-res. The board is perfect for someone building a low-power, quiet HDTV streaming or web box. It's also fine for someone building a miniature PC that will be tucked behind the monitor.

But, and you knew we would say *but*, our personal preference is for more heft. Say, a Core i3 with discrete graphics à la the Kick Ass (and super expensive) Asrock Vision 3D HTPC we reviewed last month. Or even a socketed AM3 processor part.

That's not to say the E350IA-E45 has no utility, but you need to calibrate your expectations. In the end, Fusion is clearly a better

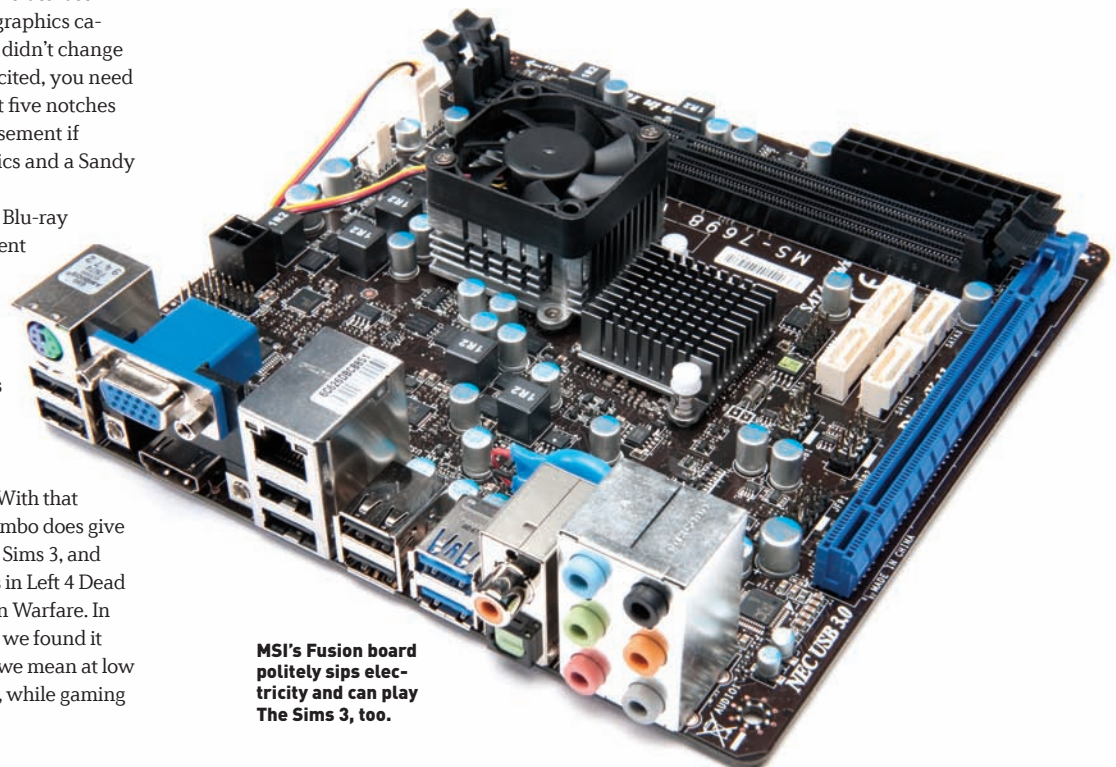
option than Atom with integrated graphics. It's not everything we wanted, but it's a good start.—GORDON MAH UNG

**VERDICT** 7

**MSI E350IA-E45**

|   |  |
|---|--|
| <p><b>+ FISSION</b></p> <p>Low power; low price; eats most Atom boards for lunch.</p> | <p><b>- FUSION</b></p> <p>Could not boot to a 3TB drive; perhaps a little off the power curve.</p> |
|---|--|

\$130, [www.msicomputer.com](http://www.msicomputer.com)



MSI's Fusion board politely sips electricity and can play *The Sims 3*, too.

# ViewSonic VX2258wm

It's got a touch screen... if you're into that sort of thing

**W**ith the widespread adoption of touch-screen displays, we figured it was only a matter of time before our desktop displays got in on the action. To that end, ViewSonic's VX2258wm is a solid enough, if unremarkable, touch-screen monitor with 21.5-inches of real estate, a 1920x1080 resolution, and a 5ms response-time rating.

The panel surface is hard-coated and has an anti-glare treatment, but is still extremely reflective and—like pretty much all touch screens—picks up fingerprints faster than the FBI's IAFIS. While the VX2258wm does swivel and tilt, it does not adjust to the point where typing on its surface ever feels comfortable or easy—this is definitely a hunt-and-peck experience. Far more disappointing is the lack of an HDMI or DisplayPort input; surprisingly, the VX2258wm relies entirely on DVI and VGA connections. Speakers and the menu buttons run along the bottom of the display, and the menu itself has a dated UI that reminds us of 1983—and not in the good way. The speakers are what you'd expect, and are serviceable in a pinch but thoroughly unimpressive.

The display offers multitouch capabilities courtesy of infrared technology, which uses a grid across the entire display and places infrared LED and photo detector-paired sensors along the edge of the screen. When the screen is touched, the infrared technology detects the disruption in the pattern of LED beams and the sensors pick up the location of the disruption, or touch. Infrared has the advantage of being able to detect any disruption or input, so even gloved fingers or styluses can be read. Another advantage of this system is that it doesn't require any patterning on the glass, which results in higher visual clarity.

So, how does this fancy infrared system work in practice? Pretty well, actually. The VX2258wm's touch works right out of the box (with Windows 7 only—sorry, XP fans), with no muss or fuss around installation or downloading drivers. The accuracy was fair-to-middling. It sometimes took an extra touch or two to find the specific location to close browser windows, and there was sometimes a split-second lag while the monitor processed the touch command.

While the multitouch does allow zooming via the familiar pinch-and-drag motion, it had limited gaming capabilities. Fooling around with touch-screen Solitaire or Bejeweled Blitz



**ViewSonic's VX2258wm touch screen works right out of the box—but only with Windows 7.**

was fun enough, and even *Plants vs. Zombies*, a mouse-based game, adapted well to the touch environment, but there was little functionality for full-fledged games like *Arkham Asylum*. That's not a huge surprise, as this display isn't designed for hardcore gaming. We're happy to report that the VX2258wm's touch screen is much more useful for the likes of Google Maps, Notepad, or short Word documents, as well as working with photographs.

Touch-screen capabilities aside, the VX2258wm held its own in side-by-side tests against one of our former favorites, the Gateway FHX2402L, which earned a 9 verdict for its sharp detail and near-perfect color reproduction. During our DisplayMate tests, the VX2258wm also produced exceptional detail in images and accurate colors, although the reds could have popped a bit more.

We did notice some slight problems with the ViewSonic's grayscale range; in the DisplayMate test that shows 128 shades of gray, the monitor revealed some banding in the darker end of the scale. We also found its black reproduction to lack richness and depth. We were likewise underwhelmed during the

Scaled Fonts and Multiple Intensity Tests, where we struggled to read smaller-size text. We tested movie viewing using *V for Vendetta*, and were again unimpressed with the black level but we didn't see any motion blur during the action scenes and the colors and details were up to snuff.

With so many touch screens in our lives, it was easy enough to adapt to using the VX2258wm's features to perform everyday tasks, although we'd like more tilt, please. If you're looking for a bigger-screen touch experience, you could do far worse than the VX2258wm. —AMBER BOUMAN

|   |  |                         |
|---|--|-------------------------|
|   |  | <b>VERDICT</b> <b>7</b> |
| <b>VIEWSONIC VX2258WM</b>   |  |                         |
| <b>+ CARROT CAKE</b>  | <b>- CARROT TOP</b>                                    |                         |
| Touch screen works out of the box; quality image detail and colors. | Menu UI is dated and unintuitive; lacking in features. |                         |
| \$360, <a href="http://www.viewsonic.com">www.viewsonic.com</a>     |  |                         |

# IoSafe SoloPro 1TB USB 3.0 Backup Drive

Fireproof? Waterproof? We'll just see about that

**W**e've seen things you people wouldn't believe. We've watched "rugged" hard drive enclosures shatter on the carpet after a 2-foot drop. All our documents lost in time, like... well, like something. What we're saying is that we're skeptical of any marketing materials that make a product out to be fireproof, waterproof, or anything-proof. So when we got the IoSafe SoloPro, which makes such claims right on the product packaging, we did the only logical thing. We set the dang thing on fire and then dunked it in a bucket of bay water.

Let's back up a few steps. The IoSafe SoloPro is 7 inches high, 5 inches wide, 11 inches deep, and weighs more than 15 pounds. It's the size of a large NAS, but contains only one 3.5-inch drive—in 1TB, 1.5TB, or 2TB capacities. We tested the USB 3.0 version; the SoloPro is also available with an eSATA/USB 2.0 interface. There's also an SSD version, which is available in capacities up to 512GB.

IoSafe rates the SoloPro against fire for up to half an hour at 1,550 degrees Fahrenheit (or 843 C), and against water intrusion for up to 72 hours in 10 feet of water. The SoloPro can also be secured with a Kensington lock or bolted to a table through two bolt holes in the back of the case. The front of the SoloPro contains an LED activity indicator and the rear has the USB 3.0 port, AC adapter port, and a 4cm fan for cooling.

The SoloPro comes with a year's worth of data-recovery services (a \$2,500 value; registration required) in the event of a fire or flood, and you can pay extra to upgrade that to three or five years.

Given that there's just a single hard drive in the case, what contributes to the SoloPro's huge size and weight? Ceramic insulation, for one thing—inches thick in every direction around the drive. The drive itself is wrapped in a waterproof, heat-resistant bag with a SATA pass-through cable going in one end. The cable runs from the rear USB-and-AC-to-SATA controller board through the insulation and pouch to the drive, so the drive is protected from the outside world.

Before we set it aflame, we used the SoloPro's USB 3.0 interface to transfer about 250GB of files to it—everything from a 20GB uncompressed AVI to a Minecraft save file (10,000 tiny files in 15MB) to an entire Steam directory to a folder full of photos. The USB 3.0 interface was fast enough that our transfer speeds were only limited by the speed of the physical hard drives in the SoloPro and our test bed—averaging more than 100MB/s.

We took our SoloPro out to the Brisbane marina, with its convenient coal grills, and grilled the SoloPro



**Mmmm, hot data. We grilled the SoloPro on high heat for 30 minutes.**

for half an hour over coals in the 1,200 F range. Then we dunked it into a bucket full of the finest San Francisco Bay water to cool it down. Then we opened it up to retrieve the drive.

Beneath the huge ceramic insulators and sealed bag, the hard drive was unharmed. We attached the drive to our test bench using a SATA-to-USB 3.0 dock and found all of our data intact.

With its fast USB 3.0 interface, powerful fire- and waterproofing properties, and the included year's worth of data-recovery service, the SoloPro seems like a valuable tool for the data-paranoid. It's no substitute for an offsite backup, but it should withstand minor natural disasters with aplomb. —NATHAN EDWARDS



VERDICT

9

IOSAFE SOLOPRO BACKUP DRIVE

**+** SAFETY DANCE

Fast USB 3.0 interface; fireproof and waterproof; includes one-year data recovery service.

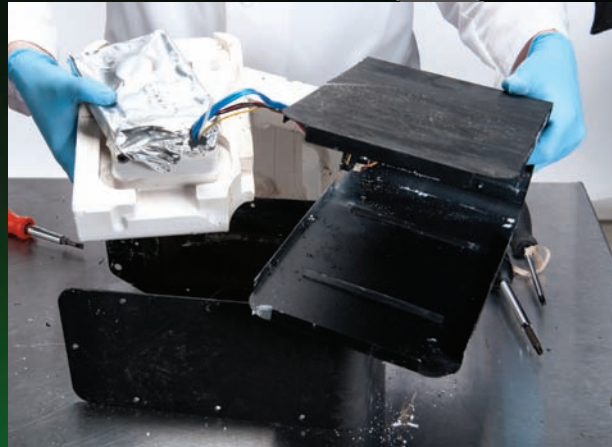
**-** ELECTRIC SLIDE

Data recovery after one year is extra; heavy.

\$250 for 1TB, [www.ioSAFE.com](http://www.ioSAFE.com)



Only the finest in fishy bay water for our water-submersion test.



Thick ceramic insulation and a sealed heat-resistant bag keep the hard drive safe.



The SoloPro is a behemoth of an external drive at more than 15 pounds. But is it enough to keep your data safe?

# Dead Space 2

So scary it's good, so good it's scary

At first glance, *Dead Space 2* doesn't seem all that special. There's some decent shooting, sure, but if you've helped one necromorph with his pesky "having legs" problem, you've helped 'em all. No, what truly rockets *Dead Space 2* from "good" to "fantastic" is the atmospheric, foreboding shell around the shooting's chewy, gore-soaked center. This is a game that's greater than the sum of its parts—but its parts aren't half-bad to begin with.

*Dead Space 2*'s premise is remarkably similar to that of the original. You're still Isaac Clarke, falling-apart-at-the-seams necromorphs are still invading, and you're still coping with visions of your corpsified girlfriend. The devil, however, is in the details, and that's where *Dead Space 2* really shines. For one, Isaac's no longer doing his best Gordon Freeman impression, and his struggle is much more cinematic as a result. The main plot isn't Oscar-worthy or anything like that, but its twists and turns will definitely keep you on your toes.

The real story guiding *Dead Space 2* is your timid crawl through the game's expertly arranged house of horrors. Make no mistake: *Dead Space 2*'s levels are designed and scripted light years beyond its predecessor's. The Sprawl's residential areas feel like places that could actually exist—unlike *Dead Space*'s sterile corridors—which makes seeing them populated by corpses all the more unsettling. The school, especially, is an amazing contrast, coating colorful classrooms in blood and an aural skin of eerie silence.

And that's where the scripting comes in. Yes, *Dead Space 2* is largely linear, but it uses



On this week's episode of *Extreme Home Makeover: Necromorph Edition*...

that to excellent effect. The game wields build-up and tension with a subtle mastery, dropping all sorts of unnerving sights and sounds into periods of "downtime." No joke—an in-game alarm clock went off and we nearly screamed. Sure, at the end of the day, most of the scares come down to variations on leaping out and shouting, "boo!" but the constant air of tension keeps the game from falling into a predictable rhythm.

When you finally come face-to-rotting-claw-appendage with your freaky foes, things are suitably intense. During our play-through, we were only really in danger of dying a few times, but it always felt like we were one tiny slip-up away from certain death. Again, it all comes back to the game's atmosphere, a combination of sound design and scripting that few games can claim to match. New enemy types like the swift, evasive Stalker spice things up nicely as well, but there's still not a whole lot of enemy variation. Similarly, new weapons like the proximity mine-launching Detonator are great, but old favorites hog


most of the spotlight.

More substantial, however, is the addition of multiplayer to the mix. All things considered, it's solid, but hardly revolutionary. Necromorphs come in four varieties and can spawn from vents all over each map, while humans are encouraged to work as a tightly knit team. Aside from a *Call of Duty*-style experience system, there's not much else to it. It's certainly decent, but it won't keep you hooked for more than a few days.

On the whole, though, *Dead Space 2* is really about scaring the space-pants off you, and it's damn good at it. The game is action-packed from start to finish, yet still manages to keep you dreading what's around the next corner. Sure, in some areas it's "Dead Space, but better" to a fault, but on the whole, that's far from a bad thing. —NATHAN GRAYSON



Just putting it out there: More games need guns that fire rusty saw blades.

|   |   |
|---|---|
|  <span style="float: right;">VERDICT <b>9</b></span> |   |
| <b>DEAD SPACE 2</b>   |   |
| <b>+</b> <b>NECROMORPHS</b><br>Fantastic atmosphere; meaty, satisfying shooting; great level design.                                      | <b>+</b> <b>ANIMORPHS</b><br>Sticks to <i>Dead Space</i> formula; unspectacular boss fights overall; multiplayer isn't special. |
| \$59, <a href="http://deadspace.ea.com">deadspace.ea.com</a> , ESRB: M  |   |

# LAB NOTES

## Mea Culpa

Standard Sandy Bridge parts *do* overclock



**GORDON MAH UNG**  
SENIOR EDITOR

In our February feature on Sandy Bridge, I gushed over the lineup's pair of K parts for their performance and pricing chops, but gave Intel a hard time for preventing overclocking on the non-K CPUs. It turns

out I got my wires crossed. You *can* actually overclock the standard Sandy Bridge parts—sorta, anyway.

I had reported that the overclocks are good for four bins, or 400MHz, but only on one core. Not much of a boost. But the standard Sandy Bridge parts actually overclock

by four bins over the standard Turbo Boost speed on all cores.

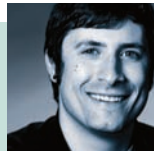
For example, a chip with a base frequency of 3.3GHz will normally Turbo up to 3.4GHz when all cores are active. By overclocking it, you can run that processor up to 3.8GHz on all cores, or 4.1GHz on single-threaded tasks. One other goof: Memory overclocking is not locked if you're using the right chipset. I said that the standard chip wouldn't overclock RAM beyond base speeds, but it's actually a chipset dependency. On an H67 chipset, you can't run the RAM past DDR3/1333. On the P67 chipset, however, you can clock the RAM up.

Does that change my opinion of the standard parts? Not really. For standard users, the non-K is fine. For enthusiasts, I'm still recommending one of the two available K chips.



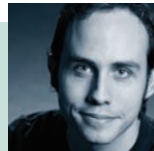
**AMBER BOUMAN**  
ONLINE FEATURES EDITOR

I'm spending a lot of time looking into switching ISPs, because my current service provider, the abhorrent beast known as AT&T, is apparently uninterested in providing me with consistent Internet service (or even a straight-forward answer about why I'm not receiving service). What's a girl got to do to keep her Internet functioning?! Those guys in *Battlefield* don't shoot themselves, you know.



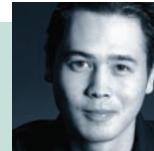
**NATHAN EDWARDS**  
SENIOR ASSOCIATE EDITOR

We're prepping for another one of our big Lab cleanouts. It's like the La Brea tar pits in there. I'm finding things from six or seven years ago, which is weird, because a) we haven't even been in the current office that long, and b) we did a full-on deep cleanse of the Lab last year, and I swear I've never seen half this stuff before.



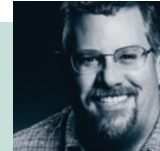
**ALEX CASTLE**  
ONLINE MANAGING EDITOR

I wasn't really sure what to think when I saw Google's new Chrome Web Store—the whole idea of "installing" an app when you're really just saving a bookmark seems sort of silly. All that changed when my dad told me to check out Audiotool, a music app that feels so much like a desktop application that it made me a believer. Thanks, Dad!



**ALAN FACKLER**  
ONLINE ASSOCIATE EDITOR

I just found out my neighbors of about five years (a lovely couple with an adorable kid) have been *Maximum PC* subscribers for the past couple of years. We had never really talked about anything before, so I'd like to take a brief moment to tell them this: Thanks for tolerating me and my roommates. It means a lot. And you'll never be short on magazines again.



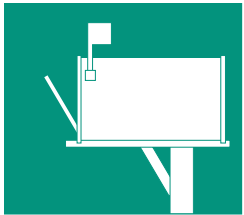
**MICHAEL BROWN**  
REVIEWS EDITOR

I never thought I'd be able to hear a difference between a digital audio bit stream transported via HDMI and converted by a midrange A/V receiver and one transported via USB and converted by a high-end outboard DAC. Benchmark's DAC1 HDR changed my mind (<http://bit.ly/eyMoMr>). Now I must purge that memory so I can be satisfied with gear I can afford: That little box costs \$1,895.



We tackle tough reader questions on...

▶ Rural Data Rates  
 ▶ PC Sound  
 ▶ Streaming Media



**Where'd You Get That CPU?**

I just read the article in the February issue about the sub-\$1,000 Sandy Bridge CPU. You stated that you bought the i3-2100 processor for \$117. You list Intel's website as the source. I checked the site and it says the product is not available at this time. I checked Newegg, and it doesn't have the part, either. So where did you get yours?

—Adam Smith

**Senior Editor Gordon Mah Ung Responds:**

We were probably a little early on the Core i3-2100 part. We've seen it at smaller e-tailers, but widespread availability seems limited. We would have predicted larger quantities of the part by the time you read this—but that was before the Sandy Bridge chipset fiasco. The bug in the initial Sandy Bridge chipset means that you won't even be able to buy a motherboard to put the Core i3-2100 in right now. That'll change as the fixed chip starts rolling out. For now, well, it's a mess.

**Rural Does Not Mean 'No Netflix'**

In last month's issue, Steve C.'s contention that media streaming in rural areas is not available because of slow rural IP service, is flat-out wrong. He cites 1Mb download rates. Yes, this is typical of rural cable modems—I, too, live in the sticks. But this is quite fine for Netflix streaming, as Netflix not only adjusts the rate of compression to the ability of the individual's stream, it also adjusts to the speed of the line in your home. My viewing on a 46-inch HDTV is fine, and through a Gigabit Cat5e feed will put out a great picture with 5.1 sound on movies where it's available. Now, if you want to stream your own movies and use compression such as H.264, (MKV, MPEG-4, etc.), then that's a different story.

—Jordon Berkove

**Whither PC Sound?**

What is up with the surround-sound market for the PC? In the February issue, there were two reviews for 2.1 media speakers, but where is the 5.1 system? I also haven't seen that many reviews for soundcards. Is everyone fine with onboard sound for their gaming experience, or with just wearing headphones? Do they just not know what they are missing?

—Marc Marceron

**Maximum Tech Reviews Editor Michael Brown Responds:**

Marc, I hear you (no pun intended) about the

sad state of the PC speaker market. M-Audio made my favorite surround-sound system of all time, but it discontinued that product several years ago. I think most consumers just don't want to

deal with running wires to the surround channels. The other reason is that so many gamers—especially multi-player gamers—are using headsets these days. Logitech's Z-500 5.1-channel system is

■ ■ ■ NOW ONLINE

**The 18 Best Games of 2011 That You Don't Know About**

At the start of the year, you're likely to read roughly 20 million identical lists from your old pal The Internet, telling you which games should have your clicking-fingers and WASD-claws aching with excitement. Here's the problem, though: You've heard it all before. Even without the aforementioned list avalanche, it doesn't take a rocket scientist to figure out when Call of Diablo: Crysis Effect 3 is dropping. That's why we thought we'd give you the scoop on some great-looking games that—prior to this very moment—were well on the road to passing you by. See the story at <http://bit.ly/g8nb9U>.



**CUTCOPYPASTE**

In the March issue, we mistakenly labeled our Best of the Best high-end motherboard as the EVGA Asus P8P67 Deluxe, when it is in fact the Asus P8P67 Deluxe motherboard.



one of the few good systems still widely available, although I must confess I haven't listened to a factory-fresh kit in several years.

### Previously, in Rapid Prototyping

Quinn Norton's article on personal rapid prototyping ("Ex Machina," February) was informative and enlightening. It was surprising to discover that one could buy a kit that would actually allow for creating ABS models. However, I believe she did the rest of the rapid-prototyping industry a disservice by leading readers to believe that nothing like this previously existed.

The article states that MakerBot founder Zach Hoeken "didn't have an answer" for people who wanted to print out objects that exist as software. Furthermore, nowhere does the article mention that there are literally dozens (if not hundreds) of companies that not only offer prototyping services, but that also sell the prototyping machines to anyone who would like to print their own parts. Models can be printed out of wax, plastic, paper, photo-sensitive resins, or even metal. Some prototyping machines are the size of a regular commercial printer and can sit on a table top.

While the founders of MakerBot deserve notice and accolades for what they have accomplished, please let the readers know that rapid prototyping has been

around for years, and that the technology itself is far from cutting-edge.

—David Murray

### Windows Home Server Questions

I have a few questions regarding your "Windows Home Server with Muscle" story (Build It, January 2011). First, can the H55ITX-A-E mobo use the Intel Core i3-540 instead of the 530, and which versions of the i5 and i7 family can be used in place of the i3? Second, should I be using 1.5v or 1.65v RAM?

—SPC Combs

### Contributing Editor Loyd

**Case Responds:** Any socket 1156 CPU will work, but 65W CPUs will run cooler and use the fan less. So, the 540 will be fine, but I would avoid the quad-core CPUs. Regarding memory, either 1.5v or 1.65v memory works, so you don't need low-voltage memory. However, low-voltage DDR3, like Kingston's LoVo modules, will use a little less power.

### Things Readers Would Like To See, Part 1

How about an article updating the April 2010 "Power Users' Guide to Google"? A lot has changed since then.

—James R.

### Editor-in-Chief George

**Jones Responds:** James, we're currently planning an update to last year's "Power User's Guide to Google." We're thinking June issue, but we'll know for sure next month.

### How to Best Record and Stream?

I'm a longtime user of Snapstream's BeyondTV system to record television using two tuner cards, stream to a BeyondTV Link system in another room, and then use my PS3 to stream to the living room. The system works—but it feels a bit outdated. Plus, I do not believe that Snapstream is actively upgrading its product any longer. What's a newer, more current *Maximum PC* solution to recording and streaming video?

—Clarence A. Reber III

### Maximum Tech Reviews

#### Editor Michael Brown

**Responds:** I've been ripping Blu-ray and DVD ISO images, storing them on a server, mounting the images on a HTPC, and using PowerDVD 10 to watch them using a hardwired Ethernet connection. That's a total brute-force but no-compromises approach, and I don't think it's exactly mainstream.

Unfortunately, it does look as though Snapstream has exited the consumer market. The only products listed on its website are for the enterprise market. For what it's worth, I'm testing Netgear's new WNHD3004 for wireless streaming now. I'll report back with my findings. It's also worth mentioning that next month, we're going to blow the lid off of ripping, storing, and streaming media in a massive feature story. Honestly, though, if all you want to do is stream TV shows that you've recorded, you don't need more than you already have. ☺

■ ■ ■ NEXT MONTH

COMING IN

**MAXIMUM PC'S**

PEPPER-CRUSTED,  
MAPLE-GLAZED

MAY  
ISSUE

## The Ultimate Guide to Media

We're going to show how to rip and encode all your media, store it properly, and access, play, and stream it from anywhere on the planet.

## Webcam Shootout

We're finding ourselves using Skype more and more these days, and notebook webcams suck. With this in mind, we're going to round up a bevy of HD webcams for your desktop.

## Antivirus Challenge

It's that time of year again. We're putting all the major paid and free antivirus software packages through their paces. Who's the best? Find out next month.



**LETTERS POLICY** Please send your questions and comments to [comments@maximumpc.com](mailto: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.

# MIDRANGE GPU

## MSI NGTX560 Ti Twin Frozr OC

Nvidia's been busy lately, re-engineering and streamlining the Fermi architecture. Now that the GTX 580 and 570 have been out for a little while, Nvidia has respun the GTX 460, its sweet-spot GPU, into the GTX 560 Ti. MSI's iteration of the GTX 560 Ti is overclocked from 822MHz to 880MHz and delivers performance that's 5 to 7 percent faster than a stock GTX 560 Ti. The twin fans keep the Twin Frozr OC cool as it outperforms AMD's Radeon HD 6870 and even holds its own against the Radeon HD 6950. [www.msi.com](http://www.msi.com)



### THE REST OF THE BEST

■ **High-End Processor**  
Intel 3.33GHz Core i7-980X  
[www.intel.com](http://www.intel.com)

■ **Midrange Processor**  
Intel 3.4GHz Core i7-2600K  
[www.intel.com](http://www.intel.com)

■ **Budget Processor**  
Intel 3.3GHz Core i5-2500K  
[www.intel.com](http://www.intel.com)

■ **High-End Motherboard**  
Asus P8P67 Deluxe  
[www.asus.com](http://www.asus.com)

■ **LGA1366 Motherboard**  
Asus Rampage III Extreme  
[www.asus.com](http://www.asus.com)

■ **AM3 Motherboard**  
MSI 890FXA-GD70  
[www.msi.com](http://www.msi.com)

■ **Price-No-Object GPU**  
EVGA GeForce GTX 580 SC  
[www.evga.com](http://www.evga.com)

■ **Performance GPU**  
Asus ENGTX570  
[www.asus.com](http://www.asus.com)

■ **Budget GPU**  
XFX Radeon HD 6850  
[www.xfxforce.com](http://www.xfxforce.com)

■ **Capacity Hard Drive**  
Western Digital Caviar Black 2TB  
[www.wdc.com](http://www.wdc.com)

■ **Performance Storage**  
OCZ Vertex 2 100GB SSD  
[www.ocz.com](http://www.ocz.com)

■ **Air Cooling**  
Cooler Master Hyper 212+  
[www.cooler-master.com](http://www.cooler-master.com)

■ **High-End Cooler**  
ProLimatech Armageddon  
[www.prolimatech.com](http://www.prolimatech.com)

■ **Blu-ray Drive**  
Plextor B940SA  
[www.plextor.com](http://www.plextor.com)

■ **Full-Tower Case**  
Corsair 800D  
[www.corsair.com](http://www.corsair.com)

■ **Wi-Fi Router**  
Netgear WNDR3700 V1  
[www.netgear.com](http://www.netgear.com)

■ **Speakers**  
Corsair SP2500  
[www.corsair.com](http://www.corsair.com)

■ **Gaming Mouse**  
Madcatz Cyborg R.A.T.7  
[www.cyborggaming.com](http://www.cyborggaming.com)

### Games we are playing

■ **Dead Space 2**  
[deadspace.ea.com](http://deadspace.ea.com)

■ **Civilization V**  
[www.civilization5.com](http://www.civilization5.com)

■ **World of Warcraft: Cataclysm**  
[www.worldofwarcraft.com](http://www.worldofwarcraft.com)

■ **Fallout: New Vegas**  
[www.fallout.bethsoft.com](http://www.fallout.bethsoft.com)

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

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