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How to get your messy computer cables **UNDER CONTROL!**

Ed Word



Managing Maximum Expectations

Please send feedback and heirloom tomatoes to will@maximumpc.com.

It's not easy being a *Maximum PC* editor. Sure, there are terrific days—like the time I benchmarked the first DirectX 9 videocard, and the day we took our first dual-core Opteron for a spin in the Lab. But we don't get saucy new hardware every day, and there really are unpleasant downsides to the gig. First and foremost, when you're a *Maximum PC* editor, you're saddled with expectations. Sure, my Athlon 64 4800+ gaming rig was OK, especially with a GeForce 8800 GTX. But a *Maximum PC* editor needs to run the very best, and so, with you guys in mind, I hit Newegg and ordered only the finest, most dreamworthy upgrade parts for a new build. Such are the trials we face.

Then there's the home network situation. Listeners of our No BS Podcast know that I'm moving into a new house. They also know that I didn't think a mere wireless network would be up to *Maximum PC* spec. So I was resigned to wire the whole house with Cat5e. My home has a crawlspace, so I didn't need to brave the attic (there are wasps up there!), but, unfortunately, the crawlspace is inaccurately named. At 24-inches high, it's more of a monkey-crawl-like-they-do-in-

WWII-movies space. After a full day of squirming from one end of my home to the other, I managed to pull cables into every room in the house—even the bathroom. You can get the full report (including goofy photos of me in the crawlspace) here: <http://tinyurl.com/36smed>.

Sure, I probably could have survived with Wi-Fi, but I didn't want to let you guys down.

And then there's the fatiguing hassle of prerelease hardware. Next month, I'm reviewing Toshiba's sweet, new ultra-portable notebook; it weighs three pounds and is one inch thick—and I've got a serious problem. After I send the review sample back to Toshiba, I'll be forced to go back to my underpowered 10-pounder. So I'm going to have to trot out and buy one of these new lightweights. Not for me, but for you. I just don't want to disappoint the *Maximum PC* faithful.

So, as I sit back on the couch, watching high-def streaming video and barely noticing the weight of my new laptop, don't feel sorry for me. Just know how much I care.

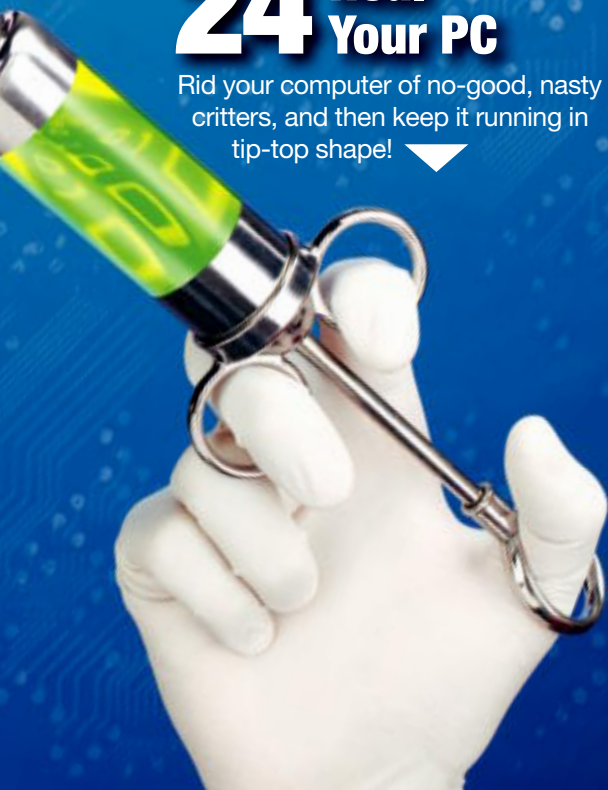
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Gaming

Is Your DX10 Card Already Obsolete?

It's been barely a year since DirectX 10 debuted, and even less time since it's been supported through Vista, but Microsoft has already released a revision of the spec



Development of the GeForce 8800 series began too late for inclusion of DX10.1 features.

It didn't take long after Microsoft demonstrated DirectX 10.1 at the graphics show SIGGRAPH for the grouching to begin.

"The new 10.1 update to DX10 makes the current videocard crop obsolete.... I'm sure that it's backward compatible with DX10, but why on earth would MS do that?" complained one person in the Internet peanut gallery. And that grouser wasn't alone. Far and wide, the complaint machine cranked away, with most of the panic coming from those who had plunked down cash for pricey DX10 cards. Would those cards now be obsolete?

Absolutely not, Sam Glassenberg, lead programmer for DX10.1, told *Maximum PC*.

"The updated API provides full support for all existing Direct3D 10 hardware and upcoming hardware that supports the extended feature set," Glassenberg said. "The API is a strict superset. No hardware support has been removed in DirectX 10.1."

The update itself, as its name implies, is mostly incremental. Besides supporting all of the features of DX10, DX10.1 now makes several formerly optional features mandatory, including 4x AA and 32-bit floating-point filtering. Microsoft's rationale for this was driven by its experience with DX9. Because many hardware features were not mandatory with that spec, graphics vendors cherry-picked which elements to support. This was particularly troublesome for developers who had to write multiple render paths that targeted specific videocards.



The DX10.1 update will not impact your ability to play Crysis on today's cards.

Other new features in DX10.1 seem aimed at increasing performance. The spec supports blendable SNORM formats, which will reduce the number of rendering passes a graphics card must make when layering effects in a scene. The updated API also supports indexable cubemaps, which will negate the need for CPU intervention (and should increase performance) when switching from one cubemap to another.

Still, why didn't the features get rolled into the original DX10 cards instead of dribbling out a few months later after Vista launched? Nvidia's Ken Brown explained that the DX10.1 spec wasn't available when GeForce 8800 development started more than four years ago. "API owners are always adding new features, but hardware

has to be finalized to meet production schedules," Brown told *Maximum PC*. He was also quick to calm those folks who fear instant obsolescence. "Regardless, DX 10.1 is a minor update that provides support for only a few new features. DX 10.1 fully supports DX10 hardware; it's basically an update to DX10 that extends the hardware functionality slightly."

Graphics industry analyst Jon Peddie agrees that the fear by users is unrealistic, as DX10.1 will be compatible with DX10. He also said the people who rushed out to buy \$600 graphics cards aren't exactly the kind of folks who use the same GPU for three years. Peddie said the update is mostly good because it helps make the platform more uniform.

FAST FORWARD



TOM
HALFHILL

The Future of CPU Integration

For years now, AMD has been crowing about the integrated DDR controller in its processors—something Intel's chips don't have. Integrating the memory controller with the CPU definitely has performance advantages, but what's the next step in CPU integration?

For clues, consider Sun Microsystems's new server processor, the UltraSPARC T2 (code-named Niagara 2). The first thing everyone notices about this "server on a chip" is that it has eight 64-bit processor cores—twice as many cores as the best server processors from AMD and Intel. In addition, each core can simultaneously run eight threads of execution—four times as many threads per core as the best Hyper-Threading processor ever shipped by Intel.

With eight processor cores per chip and eight threads per core, the UltraSPARC T2 can simultaneously execute 64 threads. Using Sun's virtualization extensions, a single chip can run 64 different operating systems (or 64 instances of the same operating system) at the same time. Because each core runs at 1.4GHz, Sun likens the chip's aggregate CPU performance to a single-threaded chip running at 89.6GHz—a stretch of the truth, but impressive nonetheless.

However, I consider the chip's other integrated features even more impressive. The UltraSPARC T2 has *four* integrated memory controllers, two 10-gigabit Ethernet controllers, an eight-lane PCI Express controller, and eight cryptography accelerators. Each dual-channel memory controller supports Fully Buffered (FB) DIMMs. The Ethernet controllers are multithreaded independently of the processors, so their actual throughput should handily beat an external Ethernet solution. The PCI Express interface runs at 2.5GHz, nearly twice as fast as the processor cores. The eight crypto engines support the most common security algorithms (such as DES and AES) and are much faster than general-purpose CPUs at this kind of number crunching.

Sun isn't exaggerating much by calling the UltraSPARC T2 a server on a chip. And despite its unprecedented level of integration for a server processor, it consumes less than 100W and starts at less than \$1,000. But the most interesting thing about the UltraSPARC T2 is what it foretells about x86 PC processors in terms of multicore integration, massive multithreading, and peripheral integration. Eventually, I believe, AMD and Intel will go with the flow of this Niagara.

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

Universal Tests DRM-Free Tunes

World's largest recording company will try watermarking to track songs

Could DRM be making an exit? Universal Music Group recently announced that it will sell DRM-free MP3s through a variety of vendors, including Amazon, through January 2008, as an experiment.

One place you won't be able to get the unencumbered music tracks, though, is iTunes. Universal says it's using Apple's store as a control group, but we think the test could prove whether it's possible to break Apple's dominance over digital distribution.

Universal will use digital watermarks to identify songs that have been downloaded via the service; the watermarks won't contain a unique user identifier but will presumably be used to see which of the songs are shared by P2P users.

We hope Universal's experiment will convince the company that it's more profitable to ensure fair use than it is to treat its customers like criminals.



Google Ponders Spectrum Plans

When the FCC announced it would auction off a chunk of the 700MHz wireless spectrum—useful for its powerful signal and ability to pass through walls—Google pledged to bid at least \$4.6 billion for it if four open-access standards for the spectrum were met.

Of Google's conditions—open networks, open applications, open devices, open services—the FCC has adopted just the latter two, which will give users greater freedom in choosing hardware and software. But the winner of the auction will not be required to allow spectrum access to its competitors, which Google views as essential to ensuring that "customers, along with service providers of all shapes and sizes, will have a seat at the table."

According to Google's Adam Kovacevich, the search provider is "currently evaluating the FCC auction rules and [has] not made any decisions about participating in the auction."

Maximum PC Online!

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GAME THEORY



THOMAS
MCDONALD

Game/Art

“Games are not art.” I said as much, rather pompously, in this spot many years ago. It generated as much reaction as I ever received, oddly enough. Gamers want to believe their passion is more than just a diversion—that it could aspire to greatness, even transcendence. A friend of mine, a game designer, insisted that games were merely awaiting their Orson Welles. In other words, the medium merely needed an auteur to come along to create and refine a new vocabulary for this form that would lift it to the realm of capital A Art.

The games-as-art debate got a bit of a jump start recently with a back-and-forth between film critic Roger Ebert and author/director Clive Barker. Ebert made the case that games can't be “high art” and Barker said that they can. Ebert was a bit of a snot, but he's right for the wrong reason. He claims that interactivity, what Barker called the “malleability” of the forms and narratives of games, removes it from the realm of high art.

That's only half right, and BioShock made it a little clearer to me just why that's the case. If any game can make a claim to be Art, it's BioShock, which deals with weighty issues, is beautifully stylized, and breaks the bounds of the medium. Even its use of Randian Objectivism as the source of its dystopia is strikingly original and persuasive. It is clearly the product of artists: writers, visual artists, musicians, sound artists, and designers.

But it's not, in the aggregate, Art, for a simple reason. Gamers are not lining up to play BioShock for its Objectivist discourse: They are lining up to play, to explore, to solve puzzles, to shoot things. The main purpose of a work defines it as Art, not the incidentals. The main purpose of a game is to be played, like football or poker or kick the can. However rich a narrative, whatever depths of philosophy or human nature or character are explored along the way, these are not the point of the game. They may be central concerns of the creator (artist?), but they are incidental to the gamer: fine wallpaper for the abattoir.

Thomas L. McDonald has been covering games for 17 years. He is Editor-at-Large of Games Magazine.

DisplayPort Finally Cometh

Computer users will see VESA's new video interface in shipping products (we mean it this time)



Samsung's next 30-inch LCD will feature DisplayPort.

It's been a long time coming, but once the Video Electronics Standards Association (VESA) approved the DisplayPort 1.1 specification in April, it became all but certain the digital interface would replace DVI and VGA in computer products. After all, the interface standard—which is capable of meeting the demands of high-def video and copy-protected content—has the blessing of many PC industry heavyweights.

Those companies are now stepping up with announcements about forthcoming products that will feature the

new connector. First, there was word of Dell's prototype half-inch-thick LCD that uses DisplayPort and which is rumored to be shipping late this year. Now Samsung has stated its plans to use DisplayPort (as opposed to Dual-Link DVI) in its next 2560x1600 30-inch panel. And AMD, as well, says, “We will begin shipping native DisplayPort interfaces on our graphics products in early 2008.”

Console Games Borrow a PC Page

Epic Games brings third-party mods to console weenies

In the grand world of videogames, console and PC titles share and share alike. Whether it's an engine here or a concept there, the divide between the competing platforms is shrinking.

Epic Games is doing its part to make the console experience more PC-like by allowing console players—specifically, those on the PS3—to compete online with other gamers using user-created third-party mods. To load mods on your PS3, you'll need to download them to your PC first, then send them to your console across your home network. Unreal Tournament III will ship for the PC and PS3 this holiday season, with an Xbox 360 version following later.



Unreal Tournament III will allow PS3 gamers to Monster Kill using a keyboard and mouse and play third-party mods.

WORD WATCH

Cyberchondriac

Definition: A person who's convinced he or she has a particular medical condition based on information found on the Internet.

Surely, the last thing a doc wants to see is a patient clutching a fistful of printouts, but the Internet's vast store of health-related information is proving irresistible to web surfers. A recent Harris Poll found that the number of adults who've gone online for medical info has increased 37 percent in the last two years.



Program, Optimize Thyself

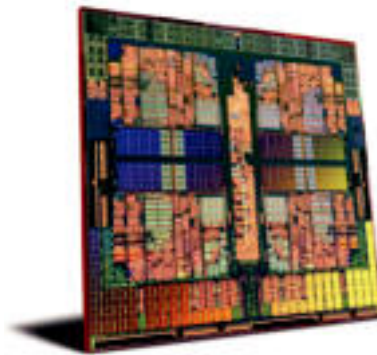
AMD proposes psychic extensions for CPUs

AMD is floating a set of new instructions that could make it easier for programs to tune themselves. Called Lightweight Profiling (LWP), the new instructions would become part of AMD's AMD64 instruction set.

LWP would add little overhead yet give applications direct feedback from the CPU on how a process for the application is running. If the process is generating excessive cache misses, branch mispredictions, or thread locks, the app—with real-time feedback from the CPU—would, in theory, correct the problem and run faster.

LWP could help programmers in the daunting task of optimizing for the increasing number of execution cores in PCs. That number is predicted to reach from eight to 16 within a year or two. AMD hasn't said when LWP will be inte-

grated into its CPUs, but it will apparently not be available in upcoming quad-core Opteron and Phenom FX CPUs.



Programmers wary of multiplying cores will appreciate AMD's Lightweight Profiling.

Malicious Wiki Edits Exposed!

WikiScanner reveals who's been cleaning up their own pages and slamming the competition

Someone at the BBC seems to think Dubya's middle name is Wanker. A new program called WikiScanner (<http://wikiscanner.virgil.gr/>), which automatically matches Wikipedia edits to the IP addresses they came from, reveals instances of vandalism, whitewashing, and trickery by everyone from the FBI to the Vatican to the BBC.

While most of the edits are mild and quickly rectified, others are more insidious. Users from Exxon, Microsoft, and the Turkish government have been caught removing references to, respectively, the ecological impact of the Exxon Valdez spill, Xbox 360 failure rates, and the Armenian genocide.

WikiScanner, which was written by grad student Virgil Griffith, shows that not all users of the peer-edited encyclopedia have transparency in mind. Thankfully, finding these conflict-of-interest edits just got a whole lot easier.

FUNSIZE NEWS

JOURNALISTS SUE HP

It's been a year since Hewlett-Packard officials were caught spying on company board members and journalists to root out a media leak, but the issue is getting renewed attention. Several journalists from the Associated Press and News.com are filing suit against HP, citing invasion of privacy and violation of California's business code. HP had earlier offered the affected parties a financial settlement, which they rejected.



ABC.COM STREAMS HD

ABC.com is stepping up its online strategy by now streaming many of the network's shows in HD. The site's HD channel is still in beta, but theoretically, a person with a monitor capable of high-def resolutions (at least 1280x720), a broadband Internet connection, and the affiliated media player by Move Networks can view entire television shows, such as *Lost*, *Ugly Betty*, and *Grey's Anatomy*, in HD for free over the web.



VISTA DISSED, AGAIN

Windows Vista won't be taking top honors in the 2008 Olympic Games. Lenovo, the official sponsor of the event, has decided to run Windows XP on all of the Games' mission-critical PCs, citing the need for "mature, stable technologies." Vista will still make a showing as the OS for the computers in the athletes' Internet lounges.



LIMEWIRE GOES LEGIT

Following the leads of Napster and BitTorrent, LimeWire is looking to put its peer-to-peer prowess toward the service of good. The company, whose eponymous P2P software has been popular with content pirates, hopes to gain a more wholesome following with a new online portal that offers only legal content. A stand-alone website, which will eventually be accessible via the LimeWire software, will connect people to legitimate DRM-free music for a competitive price. So far, LimeWire has struck deals with two indie music publishers.



Our consumer advocate investigates...

✓ Flaming Batteries ✓ Creative Marketing
 ✓ Vista-Only Notebooks

● *Sadie, watchdog of the month*

BOO ON VISTA!

Apparently, the practice of swapping out Vista for XP on a new machine is quite widespread. The Dog has heard from numerous readers who wanted to chime in on Bob M.'s problem trying to get sound to work on his Toshiba notebook after rolling the OS from Vista back to XP (September 2007). Rich Deger said, "My colleague assured me she had Vista restore CDs, so I figured we had nothing to lose, as she hated Vista so much she had used the computer only once or twice in the four or so months she had it." To get the sound to operate properly, Deger downloaded RealTek's reference drivers and all is well.

Reader Randy Word said it's not just audio that can be a problem when switching from Vista to XP. Although AMD claims the reference drivers available on its website support XP, Word still encountered issues with his AMD 200M-based Toshiba notebook PC. He explains, "When I tried to install the drivers, it said 'operating system not supported.'" Word said trying to install XP on an Acer notebook was even more problematic.

Finally, Timothy Conard, a Deputy of Counter Intelligence for Geek Squad Precinct 175, said the problem may also be XP: "I would like to let your readers know that almost 100 percent of the time, the problem is with the High Definition Audio Bus package for Windows XP. It must be installed *before* you can install the modem or sound drivers on a Vista machine that was downgraded to XP. I personally perform the downgrade on a normal basis for customers who need WinXP on their new Vista computers. On Microsoft's website, Knowledge Base article KB888111 can be accessed for more information on this patch. The problem is that Microsoft doesn't make the KB888111 patch available on its website directly, you have to hunt for the Windows XP SP2 version of this file. Once the

Recall Alert

■ Toshiba is recalling additional notebook PC batteries that may overheat and catch fire. The Sony-manufactured batteries were sold with some Satellite A100/A105 and Tecra A7 notebook PCs and had part numbers PA3451U-1BRS or PA3399U-2BRS. If you have one of the offending notebooks and the matching battery pack, go to <http://tinyurl.com/29z39t> and download the company's BatteryCheck Utility to see if your cell is defective. You may also call Toshiba directly at 800-457-7777 to see if your battery is bad.

Toshiba is recommending that consumers remove the bad batteries immediately; however, the computers may still be safely used without the batteries while you wait for a replacement to arrive.

Speaking of Sony, the company is advising that certain Cyber-shot DSC-T5 cameras may inadvertently cut you when a portion of the metal coating peels away. The problem affects cameras with serial numbers between 3500001 and 3574100. Sony will provide free service to replace the part or reimburse consumers who have already paid for the repair. For more information, contact Sony support at 877-573-7669 or visit: <http://tinyurl.com/23dh5u>.



patch is installed, it will bring up the Audio Device on High Definition Audio Bus and Modem Device on High Definition Audio Bus in the device manager, where you can easily install the correct modem and sound drivers. Until KB888111 is installed, you simply cannot install the audio drivers." Thanks, Tim. Woof.

I CAN'T BELIEVE I'M NOT IN THE STUDIO!

I, like many people in the music profession, have been amused by some of the recent Creative X-Fi marketing. The Xmod and other soundcards with the 24-bit Crystalizer supposedly make MP3s sound better than CDs to give you an experience that is "beyond studio quality." That's amazing. So, basically, if I buy these products, they will make my MP3s and CDs sound better than the mastered studio recordings? I'm confused.

—Mark

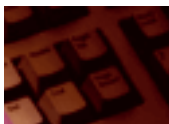
question, the Dog pinged a spokesman who said: "In the U.S., we've marketed the Xmod and other products as 'making your MP3s sound better than CDs.'

"This, of course, refers to the fact that CDs are 16 bit and the 24-bit Crystalizer provides outstanding audio playback for MP3 music. As you have pointed out, some of our global marketing materials have communicated the different message of 'beyond studio quality.' This is in reference to the CMSS-3D virtual surround sound. The Crystalizer takes it to 24-bit 'studio quality' and the CMSS-3D takes it 'beyond.' Thanks for the opportunity to explain this."

In other words, if you viewed Creative's marketing materials from a certain point of view, the company is technically correct. A CD will not give you the faux surround sound of CMSS-3D and most agree—*Maximum PC* included—that the Crystalizer actually makes many MP3s sound better. In fact, we gave the Xmod a verdict of 9 (June 2007).

But is it beyond studio quality? Unless you subscribe to Creative's rather tortured definition, no way. **[MP3]**

Your sarcasm sounds clearer than a 24-bit, 196KHz audio sample, Mark. To let Creative take a shot at answering your



Got a bone to pick with a vendor? Been spiced by a fly-by-night operation? Sic the Dog on them by writing watchdog@maximumpc.com. The Dog promises to answer as many letters as possible, but only has four paws to work with.

INPUT DEVICES

Gaming Keyboard **vs.** Standard Keyboard

We've long considered gaming keyboards the PC equivalent of spinning rims and ground effects—they're pointless accessories that deliver no performance benefit but cost a ludicrous amount of money. Initially, keyboard manufacturers did nothing more than slap a special button or two and a fancy color scheme on a \$10 board and then jack up the price 1,000 percent. At *Maximum PC*, we won't stand for those shenanigans. Sure, we have no problem spending a bunch

of cash to eke out a 10 percent increase in 3DMark, but blinging out our PC isn't worth the extra cash.

However, gaming keyboards have advanced beyond their original cash-grab origins and now come with tons of gaming-specific extras. The question in our minds is, do they deliver enough value to make up for those exorbitant prices? And are the features they boast actually useful?

BY WILL SMITH

round 1 PERFORMANCE

For the most part, a keyboard's a keyboard's a keyboard. You press a key, a signal travels at nearly the speed of light, and then the computer registers the command. From the free keyboard that comes with your Dell to one of those \$3,000 gold-plated, diamond-encrusted jobbers, the time the signal takes to travel from your finger to the PC is the same.

But there's an exception. In unusual circumstances, you can press enough keys on a normal keyboard at once to lock it up—that is, prevent it from registering additional key-presses. Some gaming keyboards, such as the Razer Tarantula, purport to allow you to press every key at once, but many normal keyboards will allow seven or more simultaneous key-presses.

However, typical gamers will never need this feature. Unless you play RTS games competitively in South Korea, this is something you need not be concerned with.

WINNER: TIE



GAMING KEYBOARD
Ideazon Merc Stealth
\$90, www.ideazon.com

round 2 AESTHETICS

We love cool, sci-fi-looking keyboards with flashing lights. Even though we can touch-type, and even though we usually work in well-lit rooms, we like backlit keys—especially now that said lights are actually bright enough to illuminate all keys, regardless of their proximity to the actual light source. That's right, we're looking at you Esc.

And sure, there have been some backlit keyboards built for nocturnal types who don't also happen to be gamers, but those planks have universally sucked due to poor ergonomics or unusual key layouts.

WINNER: GAMING KEYBOARD

round 3 ERGONOMICS/COMFORT

In much the same way that the last round went to the gaming planks, this round is a definite win for standard keyboards. The vast majority of gaming keyboards we've tested are ergonomic nightmares. At best, their uncomfortably flat designs force you to bend your wrists in unnatural ways. At worst, they include extra buttons in odd places that make you hold your keyboard and mousing hands so far apart you'll suffer shoulder and neck discomfort as a result. There are exceptions, but as a general rule, gaming keyboards aren't as comfortable for extended typing sessions as standard keyboards.

WINNER: STANDARD KEYBOARD

round 4 SPECIAL FEATURES

Here's where the gaming keyboards really shine. There's a gaming keyboard with every feature you could possibly desire—from info-tastic secondary displays that constantly feed you in-game telemetry to macros that automate mundane tasks in games like World of Warcraft. Hell, there are even keyboards customized for certain games. These keyboards offer so much more than the simple media playback and application launch buttons on less-advanced typing implements.

But in many cases, these features aren't perfect. The software to create macros is frequently difficult to use, especially if you want to get the timing between spell casts *just right*. Other features are underutilized, or may not work in your favorite game. While the Logitech G15's secondary screen is undoubtedly cool, it only works in a few dozen games.

WINNER: GAMING KEYBOARD

round 5 VALUE

At heart, even the most advanced gaming keyboard is still just a keyboard. With the exception of the fancy macro functionality and some blingy backlit keys, it performs

supplied free keyboard or a moderately priced aftermarket ergonomic board, yet gaming keyboards cost as much as \$100. Unless you're really going to use the hell out of that macro functionality, the value proposition for gaming keyboards is pretty bleak.

WINNER: STANDARD KEYBOARD



STANDARD KEYBOARD
Keytronic LT Designer
\$60, www.keytronics.com

And the Winner Is...

The relative merits of gaming keyboards is a topic that's divided the *Maximum PC* staff. Some editors feel strongly that gaming keyboards represent nothing more than the keyboard industry's attempt to add \$3 worth of hardware to a product in order to justify a massive price markup. Others feel that the extra price is justified by the game-friendly

features that specialized keyboards deliver. Most don't care either way and just want everyone to shut the hell up already. In the end, our **two entrants split the categories right down the middle**, but only you can decide whether you'd rather have a more comfortable typing experience or some extra in-game functionality. The choice is yours. ☐☐



HEAL AND INOCULATE YOUR PC



BY PAUL LILLY

A terrifying number of computers are infected with viruses, spyware, Trojans, rootkits, and other malicious software. We show you how to clean out even the most troubled PC—and protect it from future infection!

Remember the excitement you felt when you bought your first car? Before the dealer even handed you the keys, you made a vow to keep your new set of wheels in tip-top shape, to lovingly wash it, change the oil every 3,000 miles, and even maintain the proper tire pressure. You wanted to keep your new car looking and running its very best. You understood that the consequence of not doing this would be costly repair bills at best, and at worst, a car that no longer ran as it should.

Owning and maintaining a PC really isn't so different than owning a car. Only with a PC, there's no maintenance schedule outlined in your user's manual, leaving it up to you to keep your smoking-fast rig from turning into a stuttering compilation of unresponsive parts. And worse yet, now more than ever PCs are highly susceptible to all kinds of nasties, from keylogging viruses to performance-hampering spyware to everything in between. Even simply surfing the web can be enough to turn your dream machine into a nightmare experience if



you don't take proper precautions.

But fear not, because we're going to show you how to set up safeguards to keep your rig humming along as fast as it was on the day you built it. Not only that, but we'll also walk you through the steps of fixing a system that's already suffering from neglect, so the next time you hear cries of frustration emanating from your neighbor's apartment, you can swoop in and save the day, *Maximum PC* style!

HEAL YOUR PC

With a careful, systematic approach, you can restore your rig to like-new condition, without having to resort to a clean install

Sometimes a PC becomes so badly infected that nuking your Windows install and starting fresh seems like the only viable option. Or maybe your computer hasn't yet reached a state of virtual undead but has been running sluggishly, betraying the high-end components inside. No matter which scenario you find yourself in, there is hope. Put away that towel—we won't be throwing it in quite yet.

FIVE-MINUTE FIXES

Whether your PC's performance problems are severe or just mildly annoying, a simple series of fixes could have it running like new.

1: BLAST THE BLOATWARE

Just as the name implies, spyware is a malicious program designed to mine personal data from your machine and spy on your computing habits. The information collected is then used to harass you with ads in the



Looking to clog up your browser and infect your system? Install toolbars and desktop buddies to do both in one fell swoop!

form of pop-ups, redirected web searches, a browser homepage you can't change, and other annoyances. And here's the kicker: You could have installed the offending pro-

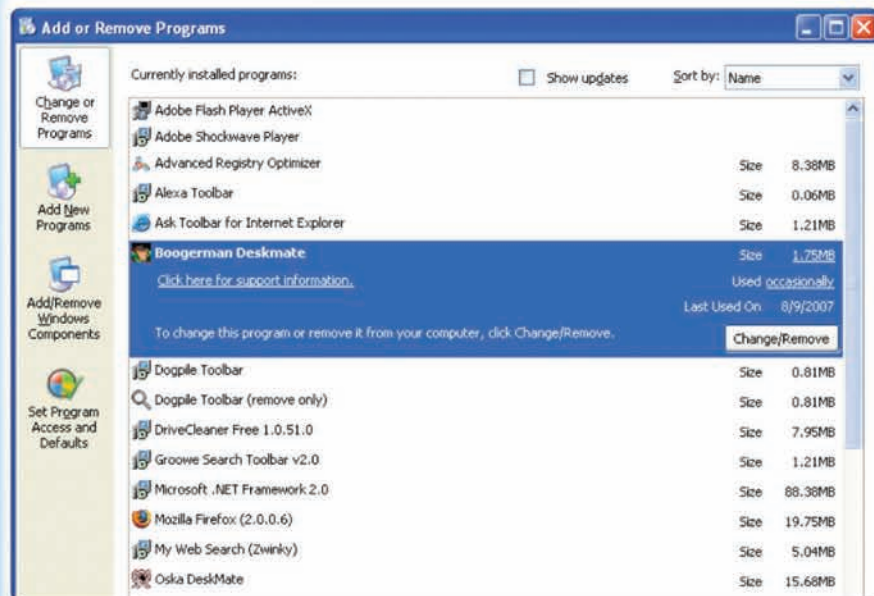
grams yourself! But don't feel bad if you've been bamboozled; spyware often masks itself behind seemingly legitimate software, most often browser toolbars and desktop buddies. Rid your system of these bloated add-ons and watch your PC's performance improve right away.

Close any open browser windows; then open up your Control Panel and navigate to Add or Remove Programs. Scroll down the list and uninstall any browser toolbar, desktop buddy, or search helper.

2: GET WIDGETY WITH IT!

Now that you've uninstalled all the honest, easy-to-uninstall bloatware, it's time to hit the local watering hole and call it a day, right? If only it were that easy! Once installed, some spyware detaches from the host program it shipped with, and other programs simply reinstall themselves, continuing to load every time you boot into Windows. To put the kibosh on these persistent pests, we're going to tell Windows to skip over them when loading startup programs, and we're going to do it with the help of Microsoft.

If you're running Vista, you already own Windows Defender, and XP owners



We love small critters, just not those of the virtual variety. Rid your system of desk-mates and consider buying a real pet instead.



Top 5 Deadliest Viruses

Viruses have existed for decades and number in the thousands, but these five variants stand out as the nastiest of the bunch

1 MYDOOM One of the fastest-spreading worms of all time, MyDoom, and the variant MyDoom.B, set its sights on SCO and Microsoft, prompting both companies to offer a \$250,000 bounty to anyone who identified the people responsible for its creation.

2 NIMDA Just days after the September 11 attacks, PCs worldwide were hit by the Nimda virus, prompting speculation among conspiracy

theorists that the virus was part of a terrorist attack. No link has ever been made between the two events.

3 CODERED You've heard of the drink, but the CodeRed virus had a thirst for computers running Microsoft's Internet Information Systems (IIS) web server, attaching the phrase "Hacked By Chinese" to websites. One of the targets included the White House.

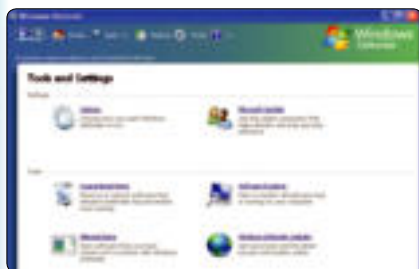
4 SLAMMER Can a worm infect 75,000 PCs within minutes of going live? It can, and it did! Slammer's small footprint (365 bytes) played a big role in its ability to double its infection rate every 8.5 seconds.

5 ILOVEYOU Love hurts, and in the case of the ILOVEYOU virus, it stung for over \$5 billion in damages. Some of those scorned include Ford Motor Co., the Pentagon, and the British Parliament.

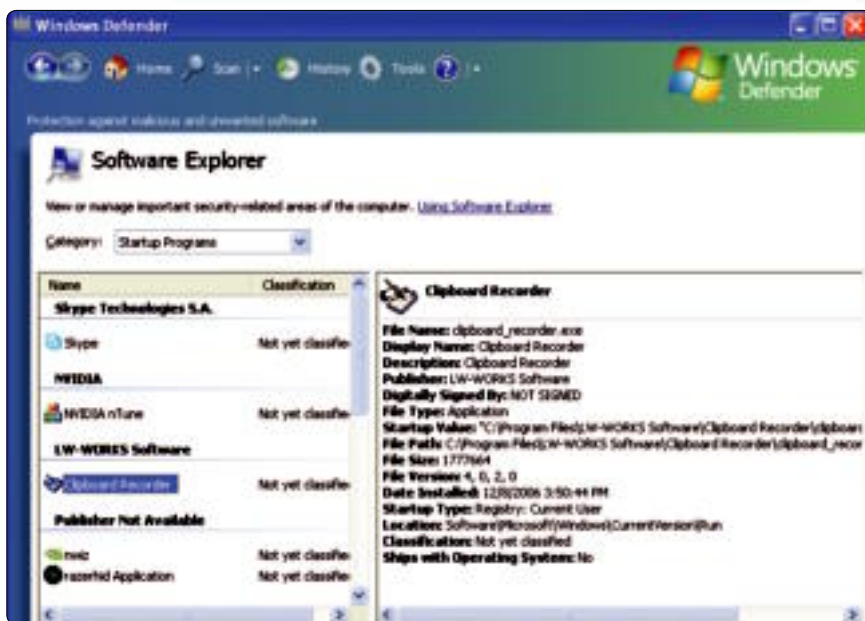
can download the free scanner at <http://tinyurl.com/47cus>. Once installed, click the Tools tab and then select Software Explorer. This handy widget lists all the startup programs that load with Windows, along with a wealth of potentially incriminating information, such as the date a program installed, file location, file type, and whether or not it shipped with your OS. In the left-hand pane, highlight any dubious entries and click the Remove button. After you've cleared all of the startup scourge, reboot your system to a clean start!

3: SCAN FOR SCOUNDRELS

Windows Defender isn't good at just customizing startup programs; it's also a very capable spyware scanner. On the main screen, you can choose between a full



Microsoft has yet to release a version of Windows immune to malware, but in the absence of such an impenetrable OS, Windows Defender kicks up the protection several notches.



You'll want some programs to load with Windows, so choose only the items you want to rid from your system.

scan, which looks in all files and currently running programs, or a quick search that uncovers vermin in their most common hiding spots. Run the full scan for a thorough scrub, and then let Defender remove any infections it finds.

4: GET A SECOND (AND THIRD) OPINION

New variants of spyware are released into

the wild at an alarming rate, and it's impossible for any single program to keep up with them all. For this reason, we run at least two different scanners on an infected system, or more if the infection is especially bad. Other programs we've had success with in the Maximum PC Lab include A-Squared (free, <http://tinyurl.com/2gb93>), Spybot S&D (free, www.safer-networking.org), Ad-Aware (free, www.lavasoftusa.com),



AVG Anti-Spyware (free, <http://free.grisoft.com>), and Spy Sweeper (\$30, www.webroot.com). Regardless of the tool you use, double-check the URL for typos and be sure you're downloading directly from the source (rogue sites often try to pass off infected software as authentic spyware scanners). Above all else, always update your spyware definitions to detect the latest threats.

5: LOOK CLOSER WITH HIJACKTHIS!

Even after running several anti-spyware scans, you might still have a lingering infection. HijackThis! (free, <http://tinyurl.com/huyrw>) takes a fine-tooth comb to your system, targeting methods commonly used by hijackers. Because HijackThis! doesn't zone in on specific infections, most of the reported entries will be legitimate, and disabling them could do more harm to your system than good. Highlight only entries that you've previously tried removing but that keep showing back up. For example, if you've uninstalled Bonzi Buddy and removed any related entries from the startup queue, you can safely highlight any references to the program that HijackThis! finds and then click the Fix Selected button. For all other selections, either leave them alone or carefully use the online tutorial (<http://tinyurl.com/2et7nb>) for detailed steps on discerning between good and bad entries. You can also submit your logs to Help2Go Detective (<http://tinyurl.com/etujk>) and HijackThis Security (www.hijackthis.de/en) for automated analysis.

6: VACCINATE YOUR RIG

When you're sick, you generally make it a point to avoid others, lest you infect them with your ailment. But when your com-



Firefox has many tricks up its sleeve, but ActiveX support isn't one of them. To run a Panda scan, you need to use Internet Explorer.



Spyware loves to hide, but HijackThis! makes an even better seeker, uncovering the leftover residue that managed to elude traditional scans.

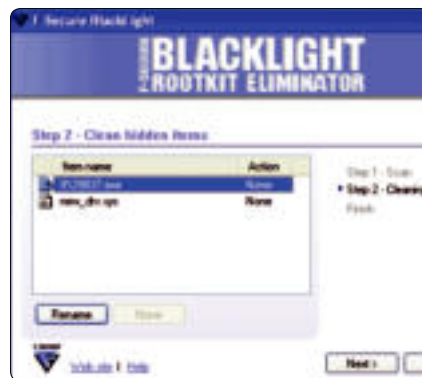
puter contracts a virus, it looks to spread the disease to as many other PCs as it can, turning each one into a remote-controlled zombie. The nefarious do-badder can then wage a DoS (Denial of Service) attack on a website, making thousands of PCs repeatedly request pages, until the site's server can't take the load and the site goes down.

But that's not all viruses are capable of doing. They can record your keystrokes, including passwords and bank account information, and pass the information along to people who are up to no good. Other viruses wreak havoc on your hard drive, erasing data, altering critical system files, and even causing permanent physical damage in the form of bad sectors. Heck, viruses can even be used to install more spyware and viruses.

To rid your system of viruses, you need to perform a sweeping scan. If you don't have antivirus software installed, we recommend you start with Panda Security's web-based AV app (free, www.pandasecurity.com/usa) and scan your PC right from within Internet Explorer. It will also detect spyware, rootkits, and dialers, but will only disinfect viruses. Just click the Total Scan button, install the ActiveX control, and let Panda do the rest.

7: PERFORM A ROOT(KIT) CANAL

You've rid your system of spyware and nuked any lingering viruses, but your PC isn't quite yet eligible for a clean bill of health. You need to check for rootkits, a particularly nasty variant of malware that burrows deep within the OS, where it's



Rootkits are designed to conceal software, including malicious code, but Blacklight's able to discover otherwise undetected spyware.

difficult to detect with conventional scanners. Signs of infection can be subtle, or even nonexistent, thanks to a rootkit's ability to integrate with your OS's kernel. Whether your system displays symptoms or not, if you've recently discovered any spyware or viruses, your next step is to initiate a rootkit scan.

Because rootkits are tightly integrated with critical system files, back up any important data right away. Next, head over to F-Secure and download Blacklight (free for now; will be part of a \$79 security suite, www.f-secure.com/blacklight). This handy executable needs no installation, just double-click the icon and watch as it probes your system. We also recommend running AVG's Anti-Rootkit program (free, <http://tinyurl.com/2mqb6n>) for a second opinion.

CHANGE YOUR BOOTS

Severe infections can render a normal Windows install completely unusable, but we have a couple of tricks up our sleeve for infiltrating a broken OS.

1: BOOT INTO SAFE MODE

Sometimes you need to attack malware before it has a chance to load, and by the time Windows boots to the desktop, it's already too late. It might be that your system no longer responds to your input or does so with a sluggishness that makes even accessing the Start menu a time-consuming chore. Or it may be that the infection's interfering with your AV and spyware scanners, shutting them down



before they can run. It may seem dire, but by booting into safe mode, you can frequently squash the scourge wreaking havoc on your PC.

Reboot your system and hit F8 before the Windows splash screen comes up. This takes you to the Windows Advanced Options Menu, where you can select Safe Mode with Networking using your keyboard. Windows will proceed to load with only basic drivers, allowing you to disinfect your system while the offending programs lay dormant. Perform any scans as you normally would, and make sure to update your virus or spyware definitions beforehand. Because you chose the Networking option, you'll have Internet access in case you need to download additional programs.

2: MAKE YOUR OWN BOOT CD

When all else fails, enlist the help of Bart. No, not Bart Simpson, BartPE. Bart's Preinstalled Environment is a bootable live CD that every tech should carry in his toolbox. Sometimes a system gets so mucked up, you can't even get into safe mode. Booting off a BartPE CD allows you to access the infected hard drive and run diagnostics, scan for viruses and spyware, or in more extreme cases, extract data in preparation for a fresh install.

To get started, grab your original Windows installation CD. Download the self-extracting installer (free, <http://nu2.nu/pebuilder/>) and install it on a clean system. The app will prompt you for the location of your Windows CD, and you'll

want to check the Burn to CD/DVD radio button. Next, click the Plug-ins button, bringing up a list of optional add-ons to include on your CD. Many of the entries are outdated and some are second-rate programs, so we're going to add our own. Head over to <http://tinyurl.com/3bg68a> and download the Spybot S&D plugin. Unpack the RAR file and move the contents to C:\pebuilder3110a\plugin, or wherever you installed BartPE. Next we need to find a working, up-to-date virus scanner that's easy to install, and the open-source ClamWin fits our criteria. Download the plugin from <http://oss.netfarm.it/winpe/> and extract the contents to the same location. Now return to the BartPE window and hit the Refresh button. Both of your new plugins should be displayed, and if they're not enabled by default, highlight each one and click the Enable/Disable button. Finally, close the window and click Build.

Insert your new BartPE CD into the infected system and in your BIOS configure the PC to boot from the optical drive. You do this by hitting the delete key during POST (if that doesn't work, try F1, F2, or ESC). Dig around for the boot device priority menu and make sure the optical drive is listed before your Windows hard drive. Hit F10 to save and exit, and the computer will take over from there.

After BartPE loads, you'll be greeted with a snazzy GUI similar to Windows's, complete with a Start menu alternative. Click the Go menu and select Programs to access the plugins you installed.

Spybot can be run right away, but for ClamWin to work, you first need to select "Unpack Current Virus Definitions to Ramdisk," then proceed to scan your system. By default, ClamWin only reports the infections it finds. To quarantine viruses, select Preference from the Tools menu and select the Quarantine option under the General tab. If you need to browse or extract data from your hard drive (and now would be a good time to do that), navigate to Programs and select

"A43 File Management Utility," which will look familiar to anyone who's ever used Windows Explorer.

RESTORE AND REPAIR

You cleaned your system of malware, but did the infections leave your system broken? Let's fix it!

1: CHECK FOR ERRORS

By and large, the majority of malware writers are amateur programmers who create sloppy code that can do more damage than originally intended. Maybe your hard disk suddenly makes a clicking or grinding noise, or perhaps Windows told you it found corrupt files and suggested running the check disk utility. That's good advice to follow anytime you've finished a malware disinfection, even if there



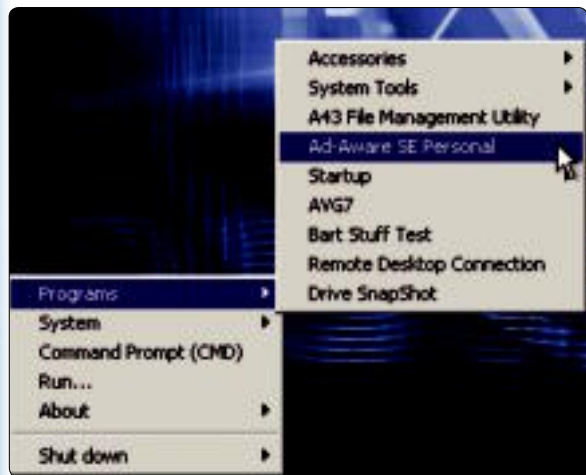
Watching a check disk scan is like watching paint dry, only without the fumes. Unless you're entertained by the latter, we suggest finding a diversion while your disk scan completes.

are no visible symptoms of disk corruption.

Under My Computer, right-click the hard drive that contains your OS (presumably the C: drive) and select Properties. Click the Tools tab and then the Check Now button under the Error-checking section. A new window will open with two check boxes asking if you want the utility to automatically fix file-system errors and scan for bad sectors. Check both of these boxes and click the Start button. Because of the deep access needed, you can't run this scan while logged into Windows; another window will pop up asking if you'd like to schedule the scan to run the next time you reboot. Select Yes, and then restart your system. The larger your hard drive, the longer the scan will take, so now would be a good time to grab a bite to eat or clean out the garage.

2: FIX A BROKEN BOOT

We've all had that sinking feeling in the pit of our stomachs when Windows suddenly



From within BartPE you can even run anti-spyware apps like Ad-Aware.



Top 5 Virus Hoaxes and Pranks

Viruses are no laughing matter, but some of the hoaxes and pranks making the rounds are good for a giggle

1 GOOD TIMES Users were warned that simply opening an email with Good Times in the subject line would erase their hard drive, destroy their processor, demagnetize any nearby electronics, and kill their dog.

2 48 HOURS This relatively recent hoax claimed that hovering your mouse cursor over the infected email was enough to activate it, wiping out not just your hard drive, but your rig's BIOS too.

3 LIFE IS BEAUTIFUL Emails circulated warning of a PowerPoint presentation called Life is Beautiful that, if clicked, would erase your hard drive and give the sender your username, email, and password.

4 HONOR SYSTEM This email contained no payload, instead asking recipients to manually delete all files on their hard drive and to forward the message to everyone in their

contact lists. Participation, of course, was completely voluntary.

5 LION'S DEN Aptly named, Lion's Den originated from a porn site looking to draw hits. The email warned of a new deadly virus, providing a link for more information. Instead, recipients got an eyeful.

refuses to load. At first you're in denial, and then panic sets in as you realize that no amount of hard resetting is going to bring about the desired result. To add insult to injury, Windows may taunt you with the dreaded "NTLDR is missing" error message. It's likely that a virus corrupted either your boot sector or master boot record, but there's an easy fix.

Grab your Windows CD and boot from it, just as you would if you were installing Windows from scratch. But instead of performing a fresh install, XP owners will hit R to bring up the recovery console. At the prompt, type `fixboot` and hit Enter; then try rebooting your system. If Windows still won't load, go back into the recovery console and type `fixmbr`. Vista owners needn't fuss with any commands—simply boot from the install DVD, select Repair, and follow the prompts. Vista will automatically fix boot errors and may restart several times before it finishes.

3: REINVIGORATE WITH RESTORE

Earlier, we promised we wouldn't throw in the towel, and we meant it. Instead, we'll try heroic measures to return Windows to a state that predates any damage caused by malware infestation.

The first method uses Windows's built-in System Restore utility, which works best when run from within safe mode. If you're running XP with Service Pack 2 installed, make sure your Windows install CD has SP2 already integrated onto the disk. If it doesn't, you'll need to first create a slip-

Windows XP Professional Setup

Welcome to Setup.

This portion of the Setup program prepares Microsoft® Windows® XP to run on your computer.

- To set up Windows XP now, press ENTER.
- To repair a Windows XP installation using Recovery Console, press R.
- To quit Setup without installing Windows XP, press F3.

Have you forgotten all those DOS commands you haven't used in decades? Head over to <http://tinyurl.com/hs5m8> for a quick refresher!

streamed copy; you can do this by following the steps at <http://tinyurl.com/4n7y5>.

Restore is like having a virtual time machine, without all that expensive flux capacitor upkeep. Best of all, using System Restore won't cause you to lose any saved documents or emails. How's that possible? System Restore takes snapshots of key parts of your system at various times—for example, just before installing unsigned drivers or software—allowing you to undo changes that may have caused your PC to malfunction. To roll back your installation, navigate to the Start menu > All Programs > Accessories > System Tools and select System Restore. Follow the prompts, and be sure to go back to the last time your PC operated correctly.

If you disabled System Restore or don't have a snapshot that represents a healthy system, you still have one more

option at your disposal: a repair install. A repair install does just what it says; it fixes Windows by restoring critical system files from the install DVD, but it won't overwrite your installed programs, saved data, or system settings.

To initiate a repair install, boot from your Windows CD. Do NOT choose the option to repair from within the recovery console; instead hit Enter to install XP. After accepting the user agreement, you'll be asked to select the installation of Windows you wish to repair (you'll only see one unless you're dual-booting). Select the install you need to repair, and then sit back and let the CD work its mojo. When it's finished, you should have a functioning copy of Windows, albeit an unpatched one. Head over to Windows Update and plug up all those security holes again, just



PROTECT AGAINST FUTURE ATTACK

By practicing tried-and-true preventive measures, you can keep your PC running like new and save

Unless you live far from civilization, you wouldn't dream of leaving your house unlocked, your windows wide open, or your car keys dangling from the ignition. By doing so, you're just asking for trouble, inviting mischievous ne'er-do-wells to violate your property. So why then, would you treat your PC any differently? When you connect to the Internet, you're throwing your system in the midst of a thriving online metropolis no matter where you live, and instead of occupying dark alleys, the bad guys brazenly roam freely in search of new victims. Don't become one of them!

We're going to show you how to set up a strong defense that will have no-goodniks moving on to easier targets. Combined with our tips for safe computing habits, your PC will be primed to travel the web without fear of infection.

BUILD A WALL

Bad guys won't attack what they can't see; use a variety of defensive measures, including a firewall, to make your rig invisible to online probes.

1: SURF SECURELY WITH FIREFOX

You're only as secure as the vehicle you're traveling in, and coasting along with Internet Explorer is like putting a sign in your back window that says, "Hey, steal from me!" If you haven't made the switch to Mozilla's Firefox (www.mozilla.com/firefox/), then drop what you're doing and download this superior browser. Now.

Not only does Firefox render pages faster than IE7 and come with a massive array of extensions for customizing your experience, but security threats are also less prevalent. It's not that digital thieves skip over the browser entirely, but until Firefox can close in on IE's market share,



Spy Sweeper maintains a list of sites known for their spyware affiliation and blacklists them from dialing in to your PC.

hackers' energies are better served by targeting Microsoft's browser.

After installing Firefox and upping your geek cred, head over to <http://tinyurl.com/2z5qmt> for a comprehensive guide on how to optimize your new browser and recommended extensions.

2: SHIELD AGAINST SPYWARE

No matter which browser you use, you're still susceptible to spyware. Earlier, we pointed out several candidates for rooting out and zapping miscreant programs, but not all anti-spyware software actively monitors and protects in real time. We want to catch spyware before it has a

chance to install and run, and for that, we turn to Webroot's Spy Sweeper (\$30, www.webroot.com)

Spy Sweeper includes a fairly straightforward GUI, making it easy enough for inexperienced users to navigate, but more savvy individuals will appreciate the utility's many included tools and safeguards. Spy Sweeper calls these safeguards shields, which alert you when a potentially unsafe program attempts to alter system files, execute processes on your PC, or behave in some other suspect manner. The shields won't check for keylogging activity by default; you'll need to manually enable that feature for the added layer of protection.



Click the Shields button on the left-hand side, click the Keylogger entry, then put a check mark in the box to enable it. Be warned: The anti-keylogger feature does tend to trigger a number of false positives—it's even fingered the *Maximum PC* disc as a keylogger in the past (don't worry, we don't record your keystrokes). You've now erected a wall of defense to thwart spyware before it has a chance to breach your system.

3: INSTALL A VIRUS SCANNER

With thousands of viruses in the wild, the question isn't whether to run an antivirus program, but which one to choose. There are dozens of options to choose from, with three standouts worthy of consideration: AVG (free, <http://free.grisoft.com>), Avast! (free, www.avast.com), and AntiVir (free, www.free-av.com). While you could pay for an AV program with more features, the protection remains virtually the same when combined with our computing safeguards.

While it can be beneficial to have more than one anti-spyware program on your PC, you should limit yourself to just one AV package. Because of the deep access needed by these programs, multiple AV apps can interfere with each other and cause major slowdowns and weird problems. But you are free to test different ones before committing to a long-term relationship. In the end, we prefer AVG for its ease of use and email scanning, but if you're hell-bent on paying for protection, Kaspersky (\$60, www.kaspersky.com) combines excellent protection with one of the most feature-rich packages around.

4: HIDE BEHIND A FIREWALL

Attackers constantly ping the web for unprotected systems, and without a firewall installed, your PC will become compromised within minutes of connecting to the Internet.

If you're installing a version of XP that predates Service Pack 2, then stay disconnected from the Internet until you can get a firewall up and running, especially if your router lacks a built-in firewall. Download the firewall to a USB thumb drive before you install Windows! For those running SP2 or Vista, Microsoft's basic firewall will be enabled by default, but it doesn't monitor outbound traffic. For outbound monitoring, we recommend Zone Alarm (free, <http://tinyurl.com/296pwe>). The free version moni-



AVG is fast, easy to use, effective, and free. How many antivirus programs can claim that?

tors both inbound and outbound traffic, so if an infection does happen to slip through, you'll be notified when it tries to dial home with your personal data and given the option to deny the connection.

CHANGE YOUR HABITS

Implement these safe computing tips into your daily regimen and you'll never fall prey to hackers again!

1: AVOID UNEXPECTED ATTACHMENTS!

When it comes to unexpected email attachments, we follow one simple rule; don't open them. It doesn't matter how tempting or innocent the file name may be, or who it's from, the contents inside could contain nasty code. Why would someone you know send you malware? Chances are, it wasn't intentional, but rather the sender is a victim also and the virus is attempting to spread. Many virus writers rely on uninformed users to spread their diseases, but without your help, they're stopped dead in their tracks.

2: DON'T BE BAITED

It's not just attachments you have to worry about with email, but hyperlinks too. You

may receive a seemingly legitimate-looking email from your banking institution, PayPal, or eBay stating that there's a problem with your account and prompting you to sign in to resolve the issue. Clicking the link appears to bring you to the appropriate site, but you're about to be duped. In an attempt to steal your username and password, hackers set up fake websites that look identical to the originals, which they use to harvest your personal info, from login information to your social security number. The practice is called phishing, and



It doesn't matter how legitimate an email appears to be, you should never trust the links inside it; type URLs directly into your browser.



Top 5 Security Myths

Misinformation can be just as hazardous as a virus. Here's the lowdown on five popularly held computing myths

1 ONLINE SHOPPING Scared to shop online? Don't be. The danger lies with having an unsecured PC combined with poor computing habits. Address those issues and you can safely shop from reliable vendors.

2 FIREWALLS ARE FOR SISSIES Without at least some basic protection between your PC and the Internet, you're not just vulnerable, you're screwed, and it will happen in less time than it takes to eat your lunch.

3 XP SERVICE PACK 2 SUXORS Fearful of looming incompatibilities with programs, there remain some staunch holdouts against this now 3-year-old service pack. But the majority of these issues were addressed long ago, and SP2's security features make it a must-have.

4 I'M SECURED WITH WEP Employing WEP with your wireless router is better than nothing, but not by much. Cracking the security protocol takes minimal effort. If your

hardware's compatible, run WPA2. And if not, consider upgrading.

5 THE PENGUIN PROTECTS ME We'll admit, a Linux-based PC is far less susceptible to attacks than one running Windows, but don't be lulled into a false sense of security. Install any applicable updates and practice safe computing habits no matter which OS you're sporting.

the worst part is you may not even know it has happened. The more sophisticated phishing sites will return that familiar "incorrect username/password" error message indicating a typo, then redirect you to the real site so that subsequent login attempts will prove fruitful, keeping you in the dark about what just transpired.

Telltale signs of this scam include typos and poor grammar, but that's not always

the case. Avoid being phished by never clicking hyperlinks in your email. Instead, type a site's URL directly into your browser (not the URL given to you in an email but, rather, the main address for a site). If there's a problem with your account, you'll be notified when you sign in.

3: DOWNLOAD RESPONSIBLY

Back when the online music revolution was just beginning, Napster made peer-to-peer (P2P) file sharing mainstream. Suddenly, everyone with an Internet connection was swapping files, both legally and illegally, and that trend continues today.

We're not pooh-poohing legal file-sharing; we ourselves have fired up our BitTorrent clients to download Linux distros and other large files from trusted sources. But we discourage folks from downloading cracked commercial software, otherwise known as warez. Not only is this stealing, but oftentimes these cracked programs include something extra—malware. Hackers know that one of the easiest ways to

spread a virus is to slap the word "keygen" on the malicious file and then throw it on a peer-to-peer network.

RAGE WITH A VIRTUAL MACHINE

Why hose your OS when you can experiment on a virtual machine without risking the health of your main system?

It's not always easy to tell the difference between legit software and attachments from harmful files. Maybe your brother really did find time on his honeymoon to email you a zip file of pictures from Hawaii, but do you want to take the risk and open it? You're right to be cautious, but with a virtual machine, you can afford to live dangerously—without putting your system at risk.


To get started, download and install Microsoft's Virtual PC 2007 (free, <http://tinyurl.com/2jr7a7>); then follow the prompts to set up a virtual hard disk. Pop your Windows CD into your optical drive, fire up your VM, and install Windows. Once it's up and running, install the Virtual Machine Additions package (found under the Action menu), which will let you move seamlessly between your VM and main system. You're ready to go. Use your new sandbox to surf those, uh, adult-friendly websites or to experiment with suspicious programs. **MPC**



Virtual PC 2007 doesn't cost a cent, but you will need a separate license for any OS you plan to install.



R



Learn how to perfect a multidrive setup with our encyclopedic guide to the most common RAID configs

BY DAVID MURPHY

Like the eponymous bug spray, RAID gets results. But in this case, the active ingredient isn't a deadly poison, but hard drives—or, to spell out the acronym, a redundant array of independent (or inexpensive) disks.

RAID represents a storage schematic, a way to use multiple hard drives to accomplish wondrous achievements in automation and capacity. You can chain a number of drives together to create one large super-volume, you can have one drive automatically replicate the contents of another, you can do it all!

So where do you start? With this guide, because while RAID may sound simple, the actual practice of setting up an array is mildly daunting. But before we start attacking the various con-

figuration options that smack you in the face with every RAID setup, we'll start with the easiest part first, the shopping list.

To set up a RAID, you'll need at least two items: a motherboard with the ability to create and manage RAID volumes and some hard drives. The exact number of drives will depend on the flavor of RAID you choose, the level of performance you hope to achieve, and your budget, but the drives should be of an identical make and capacity, as your RAID configuration will always be limited by the speed and size of the slowest drive. If you're planning to string together more than four drives, you'll likely need to invest in a RAID controller card as well (check your motherboard manual for details about its integrated RAID support).

RAID DONE RIGHT



RAID 0

The RAID variant that offers the fastest speeds and most capacity also comes with the biggest worries

A RAID 0 setup is commonly known as a striped array. Instead of writing all of your data to a single drive, this configuration allows a file to be broken up into smaller chunks, or stripes, which are then written across all the drives in the array. The more drives you add to a RAID 0 config, the faster the overall performance of the array. After all, by adding drives, you're just spreading out the workload.

To really get the most from RAID 0, you'll want to play with the stripe sizes. We say play, as there's no concrete way to gauge what stripe size will be best for your particular setup—short of testing its performance with the apps you'll be using.

If a file is a pizza, then a stripe is a slice. Slap a 50KB file onto a four-drive array with a 16KB stripe size, and three hard drives will have full 16KB stripes while the fourth will have just 2KB. The sizes affect RAID performance because using smaller stripe sizes often spreads the simultaneous writes and reads across multiple drives, which improves transfer performance for larger files. Using larger stripe sizes allows a single file to be split across fewer disks and, if your RAID controller allows it, will free the unused disks for other access operations. This improves the ability of the drive heads themselves to get to the part of the drive platter with the data.

HANDS ON

We used four Western Digital Raptor drives in our RAID 0 testing, with a fifth Raptor for the Windows partition. We experimented with stripe sizes ranging from 4KB to 1,024KB, measuring performance with the HD Tach and PCMark05 benchmarks. We achieved

the best results with a 128KB stripe size. Using this size, we compared the performance of both a two-drive and four-drive RAID 0 config to that of a single Raptor.

As you'd imagine, the four-drive RAID 0 setup produced the fastest speeds in our benchmark tests. But even striping two drives together gave us a pretty awesome advantage over a single drive. The PCMark05 scores weren't as much of a blowout as the HD Tach benchmarks, but they nevertheless show that our RAID array is faster than a single drive in every single benchmark the program has to offer.

This immense power, however, comes at a great cost—namely, the safety of the data stored on the array. For if a single drive in your setup fails, that's it. Your data's gone. On a two-disk array, striping doubles your chance of data loss due to drive failure. And that risk only increases as you add more drives to the mix.

	HD TACH				PCMARK05			
	Burst (MB/s)	Average Read (MB/s)	Average Write (MB/s)	Score	XP Loading (MB/s)	App. Loading (MB/s)	Virus Scanning (MB/s)	File Writing (MB/s)
RAID 0 (FOUR)	414.1	208.7	180.2	11,954.0	23.19	9.07	131.52	272.87
RAID 0 (TWO)	358.5	156.2	158.36	8,949.3	15.80	6.07	102.22	266.76
SINGLE DRIVE	452.1	78.0	102.7	6,329.0	10.42	4.93	77.88	160.51

Best scores are bolded.

TWO TERABYTES? DENIED!

Wait! Before you start building a super-array of drives, know that Windows XP does not support partitions greater than two terabytes. It's just not happening. If you want to, say, chain four terabyte drives together, you're going to need Windows Vista and a fifth hard drive, because even Vista can't boot into the partition scheme you'll need to set up, unless you have an EFI motherboard.

GPT, or the GUID Partition Table, is an

updated version of the Master Boot Record partitioning scheme that will let you break through Windows's 2TB limit on disk sizes. Install the OS on your separate hard drive, then set up your RAID 0 config. When you initialize the disk in Vista's Computer Management window, make sure you select the GPT partition style instead of MBR.





RAID 1

Making a spare copy of your data will impact performance, but by how much?

Otherwise known as disk mirroring, RAID 1 maximizes protection between two disk drives. Unlike a RAID 0 setup, two drives linked in a mirror configuration don't double the total capacity of a single new volume. Rather, the capacity of the volume is determined by the size of the smallest drive in the array.

The benefit of mirroring two drives together is obvious; just consider the name of the array. Whenever data is written to a single hard drive, it is instantaneously written to the other drive in the array as well. If one drive fails, you'll have a copy of all your data. You can then boot off of the sur-

vivor by itself or replace your busted drive in the array with a working drive. Your RAID controller will rebuild the array without interrupting normal file operations and return everything to full working order.

This kind of setup is ideal for those who are more concerned about protecting their data than increasing performance. However, don't misconstrue the benefits of RAID 1 for a data backup solution. A mirrored array is more designed for those, "Oh crap, the hard drive just died randomly" scenarios. A mirrored array won't protect you from accidental file deletions or malicious software that wipes out your drive (see the sidebar below).

HANDS ON

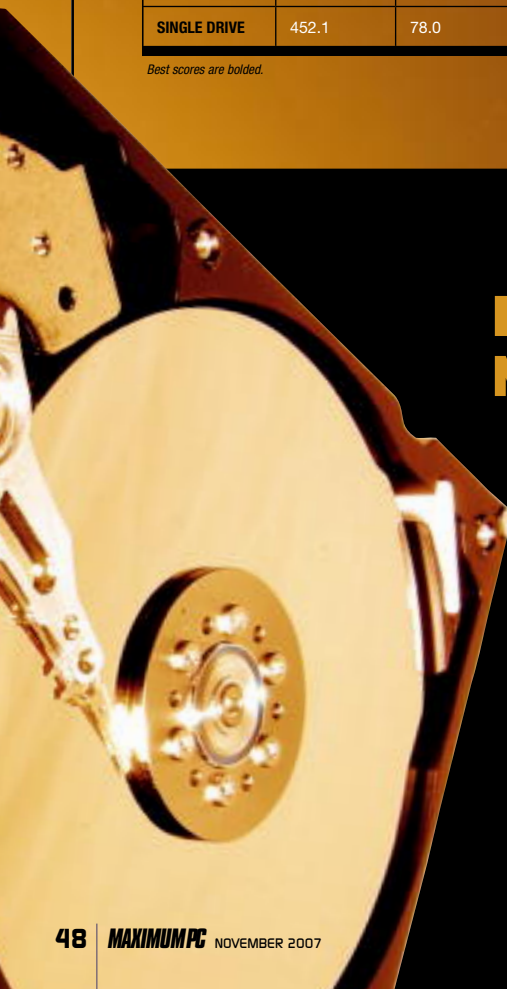
Due to the extreme differences between RAID 1 and RAID 0, we expected to see dramatically different

results in the relative speeds of the two formats. After all, you're trading storage speed for sustainability. What we were unsure about was the performance difference between a mirrored setup and a single identical drive in a stand-alone configuration.

As it turns out, the mirrored array actually performed better than a single Raptor. We attribute this to our RAID controller's ability to select which drive to read data from—it can use one hard drive for one data task, while simultaneously accessing a different data request with the other. Not surprisingly, the mirrored array's write speeds weren't as impressive but still bested a single Raptor drive by about 7MB/s.

	HD TACH				PCMARK05			
	Burst (MB/s)	Average Read (MB/s)	Average Write (MB/s)	Score	XP Loading (MB/s)	App. Loading (MB/s)	Virus Scanning (MB/s)	File Writing (MB/s)
RAID 1	465.9	99.46	109.63	8,085.3	14.90	6.24	82.96	221.53
SINGLE DRIVE	452.1	78.0	102.7	6,329.0	10.42	4.93	77.88	160.51

Best scores are bolded.



RAID 1 AS A BACKUP SOLUTION? NO WAY!

If one drive's contents are always replicated on another drive in a mirrored RAID configuration, RAID 1 is the perfect backup solution, right? Wrong. Using a mirrored RAID as your de facto backup solution works wonders in certain disastrous occurrences, like if one of your hard drives spontaneously explodes. But RAID 1

doesn't prevent any of the more malicious (or user-created) data loss issues. If you have a virus on one drive—guess what?—it's been replicated on the second drive. Or if you accidentally perma-delete a file, it's gone on both drives. Grab a third-party backup program for your files and let RAID 1 take care of the act of God-type situations.



RAID 1+0

The best of both worlds, the RAID 1+0 combination approach yields great results! Right?

The mix-and-match of RAID setups, RAID 1+0 offers a unique combination of RAID 0 performance with RAID 1 data protection. It's one of the proud members of the "nested" category of RAID configurations. Like peanut butter on bread, a nested RAID uses one RAID configuration as the base for a second RAID. This hybridization gives you a chance to reap the benefits of both setups, although you'll never achieve the ultimate benefits of either.

Each RAID controller will handle the setup of the RAID 1+0 config differently, and some won't even support such fancy

storage dreams. Whether the controller defaults to RAID 1+0 or forces you to create an array on top of an array, the basic premise is still the same.

You'll need at least four hard drives to create a RAID 1+0 setup. Logistically, the drives are split into two pairs. Each pair operates as a mirrored array, or RAID 1. The two pairs are then chained together in a RAID 0 configuration. This gives you data redundancy on the micro level, while still giving you speed and storage benefits on the macro level. You're safe from data loss as long as you lose only one drive per mirrored pair. You'll face the same data loss problem that plagues individual RAID 0 arrays if both drives in either of the mirrored pairs suffer an untimely demise.

HANDS ON

RAID 1+0 performance is far superior to that of a single Raptor drive. But that's

like saying ice cream is tastier than cat food. Two Raptors in a RAID 0 configuration still dominated in the average write portion of our HD Tach benchmarks.

And that makes complete sense, as the mirroring portion of the RAID 1+0 array reduces its performance.

RAID 1+0's average read speeds, on the other hand, are higher than those of two Raptors in RAID 0, but that's not so much an issue of technology as it is one of scalability. Just for giggles, we fired up four Raptor drives in a striped RAID to get a true, four-drive showdown. The four-drive RAID 0 mercilessly decimated the benchmarks of our RAID 1+0 setup. Average read speeds were 38MB/s faster and average write speeds were 43MB/s faster. If you're willing to risk catastrophic data loss, RAID 0 is still a speed demon's friend. But you certainly won't suffer, speedwise, with a RAID 1+0 array.

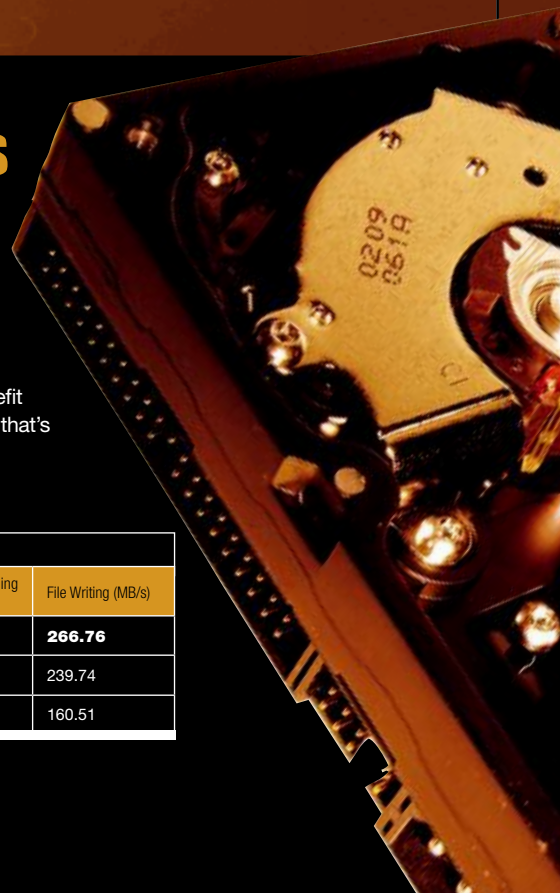
	HD TACH			PCMARK05				
	Burst (MB/s)	Average Read (MB/s)	Average Write (MB/s)	Score	XP Loading (MB/s)	App. Loading (MB/s)	Virus Scanning (MB/s)	File writing (MB/s)
RAID 0 (FOUR)	414.1	208.7	180.2	11,954.0	23.19	9.07	131.52	272.87
RAID 0 (TWO)	358.56	156.2	158.36	8,949.3	15.80	6.07	102.22	266.76
RAID 1+0	334.1	170.73	137.8	10,307.7	22.43	7.90	106.22	225.33
SINGLE DRIVE	452.1	78.0	102.7	6329.0	10.42	4.93	77.88	160.51

Best scores are bolded.

MAKE A RAID WITH WINDOWS

If you want the size benefits of a striped array but don't feel like setting one up using your motherboard's controller—or if your motherboard doesn't include a RAID controller—you can actually create a large, striped drive in Windows itself. Just head over to your computer management screen (you get to it by right-clicking Computer in the Start Menu and selecting Manage). Convert the drives you want to stripe to dynamic disks,

then create a new volume and select "striped" for the configuration. *Voila!* The speeds of the array won't be nearly as fast as those of a controller-based striped array, but they're still noticeably faster than a single Raptor's, with the added benefit that your data isn't tied to a controller that's soldered onto your motherboard.



	HD TACH			PCMARK05				
	Burst (MB/s)	Average Read (MB/s)	Average Write (MB/s)	Score	XP Loading (MB/s)	App. Loading (MB/s)	Virus Scanning (MB/s)	File Writing (MB/s)
CONTROLLER RAID	358.56	156.2	158.36	8,949.3	15.8	6.07	102.22	266.76
WINDOWS RAID	N/A	N/A	N/A	8,107.5	13.6	5.63	100.82	239.74
SINGLE DRIVE	452.1	78.0	102.7	6,329.0	10.42	4.93	77.88	160.51

Best score are bolded. HD Tach measures hardware-based volumes and cannot run benchmarks on software-based RAID solutions.



RAID 5

Parity makes a world of difference and barely hurts speeds

Like RAID 1+0, a RAID 5 configuration is a hybrid combination of data safekeeping and speed. But unlike the former, RAID 5 doesn't rely on mirroring to preserve your information. It instead uses an alternative method of data redundancy found in RAID setups—parity.

To get into the fine nuances of how parity works would require Excel charts, lots of binary code, and acronyms—lots of acronyms. So we'll generalize. The mathematics of parity dictates that if you have four drives in an array, the RAID will split each piece of data into three stripes. Each stripe will go to a single hard drive, as it would in a RAID 0 configuration.

The controller then creates a parity stripe based on the three stripes of data. A parity stripe is a logical calculation that allows the controller to re-create any individual stripe that becomes corrupt (or in the case of a drive failure, nonexistent). Similar to mirroring, the lost data is made available to the host machine instantaneously. But the loss of a single drive puts the entire array at risk. Should an additional drive fail—making that two of the four drives dead—all the data on the array is lost. A parity stripe works wonders, just not miracles.

HANDS ON

RAID 5 gives you the best combination of speed, size, and data savings. Our RAID 5 and RAID 1+0 arrays scored similar speeds, with the RAID 5 squeezing 15 additional MB/s in our HD Tach average read test.

The bonus comes in the fact that

our RAID 5 array gave us an additional drive's worth of space to play around with—450 total gigabytes as opposed to the RAID 1+0's 300GB of total capacity.

Admittedly, a RAID 1+0 array gives you better data redundancy on paper, but the additional mirroring seems like overkill. In essence, you'd be performing the same maintenance tasks you'd be performing in a RAID 5 array. If a drive goes out in a RAID 1+0, it would be in your best interest to stop what you're doing and immediately replace the dead drive; the same goes for RAID 5. While the next drive that goes out in your RAID 1+0 array might not be the one to destroy a mirrored pair and consequently your data, do you really want to roll the dice? We wouldn't, and we'd much rather have the performance and size benefits a RAID 5 array brings.

	HD TACH				PCMARK05			
	Burst (MB/s)	Average Read (MB/s)	Average Write (MB/s)	Score	XP Loading (MB/s)	App. Loading (MB/s)	Virus Scanning (MB/s)	File Writing (MB/s)
RAID 5	457.7	185.3	136.46	1,0510.0	20.85	7.71	126.48	256.36
SINGLE DRIVE	452.1	78.0	102.7	6,329.0	10.42	4.93	77.88	160.51

Best scores are bolded.



WHY USE A CONTROLLER?

All of the benchmarks in this feature were completed using Adaptec's RAID 31605 controller (\$1,000, adaptec.com). In our initial tests, we found that our EVGA 608i chipset-based RAID speeds simply paled in comparison. Thanks to an onboard 800MHz processor and 256MB of DDR2 cache memory, the con-

troller was able to output an average read speed of 211.7MB/s in a simple HD Tach benchmark of a four-drive, striped array. The motherboard-based RAID topped out at 118.9MB/s.


RAID controllers also offer more options and safety features than a motherboard-based chipset, and the motherboard RAID itself is limited to the number of free SATA ports you have. In contrast, our controller supports up to 16 SATA drives. [MPC](http://MPC.com)

	HD TACH			PCMARK05				
	Burst (MB/s)	Average Read (MB/s)	CPU Use (MB/s)	Score	XP Loading (MB/s)	App. Loading (MB/s)	Virus Scanning (MB/s)	File Writing (MB/s)
MOTHERBOARD	234.5	118.9	2.0	10,525.0	25.54	12.61	82.53	129.05
CONTROLLER	473.3	211.7	2.0	12,162.0	23.76	9.08	132.57	282.73

Best scores are bolded. Arrays were tested using a four-drive RAID 0 configuration.

CLEAR SKIES FOR 802.11n?





We're still months away from a final IEEE 802.11n standard, but the clouds over the latest draft are finally dissipating—and we have future-compatible hardware in hand

Router manufacturers have behaved like deluded prophets for the last three years, shouting, “The N is near! The N is near!” to any customer willing to give them the time of day. We’ve looked at a number of pre-N and draft-N products but haven’t issued a firm “buy” recommendation because we couldn’t be sure these products would be compatible with the final standard.

It’s taken IEEE members much longer than anyone could have imagined to agree on a final 802.11n standard; in fact, they still haven’t settled *all* the details. But the Wi-Fi Alliance has reversed its previous stance and decided that 802.11n draft 2.0 is close enough that they can begin certifying chipsets and final products.

Products bearing the alliance’s Wi-Fi Certified 802.11n draft 2.0 logo have been tested for interoperability (meaning your network won’t be limited to products from a single vendor), support for the WPA2 (Wi-Fi Protected Access) security protocol, and backward compatibility with any 802.11a/b/g products that the alliance has previously certified.

The 802.11n draft 2.0 standard makes some big promises, including faster speeds, greater range, and much improved security. Do the latest routers and adapters live up to the hype? We torture-test five contenders to find out.

BY MICHAEL BROWN

BUYERS GUIDE

Don't be put off by the marketing hype. Here are the essential features to look for in an 802.11n draft 2.0 router

CHANNEL BONDING: Wireless networks based on 802.11 standards can use 20MHz channels to communicate. Channel bonding combines two of these 20MHz channels to create a single channel with double the bandwidth (40MHz).

Networking gear based on the 802.11b, -g, and -n standards all operate in the 2.4GHz spectrum band, which has only three non-overlapping 20MHz channels. Operating your router in channel-bonding mode, therefore, has the potential to disrupt your neighbor's wireless network. Some routers have an auto feature that will turn off channel bonding if they detect another wireless network operating nearby; others give you the option of toggling between the two modes.

MIMO: The concept of multiple inputs, multiple outputs forms the very heart of the 802.11n standard. Multipath distortion—radio signals that bounce around objects in the environment and create echoes that arrive at their destination at different points in time—used to be wireless networking's greatest weakness. MIMO turns that limitation into a strength by combining the

echoes into a single, coherent stream to significantly increase the network's range and overall throughput.

MIXED MODE: All the routers we tested allow you to connect 802.11b, 802.11g, and 802.11n gear to your network, but some of them also allow you to constrain your network to particular protocols. By running your network in 802.11g/n mode, for instance, you can mix "g" and "n" gear while limiting your network's lowest data-transfer speed to "g" speeds.

QUALITY OF SERVICE (QoS): Online gaming, VoIP, and audio and video streaming have very low tolerances for dropped or delayed packets, packets that are delivered out of order, and jitter (packets arriving at their destination with different delays). A router with QoS features can assign different delivery priorities to different classes of data so that all applications enjoy optimal conditions on the network.

SECURITY: In order to be Wi-Fi Certified, an 802.11n draft 2.0 router must support WPA2 Personal (Wi-Fi Protected Access) security. WPA2 uses TKIP encryption to secure data transmitted over the network, and it prevents unauthorized access to the network through the use of a preshared key. Most routers that support WPA2 also give you



An Ethernet switch is integrated into each of these routers; some deliver Gigabit Ethernet, others support only Fast Ethernet.

the choice of using stronger AES encryption instead of TKIP. A few routers offer additional security in the form of WPA2 Enterprise, in which network users are verified through a separate authentication server.

Some older wireless products support only the first WPA standard. Even older products might support only the exceedingly weak WEP (Wired Equivalent Privacy). We strongly discourage installing WEP-only products on your network since they put your entire network at risk.

WIRED CONNECTIONS: Don't assume your wireless network will never have hard-wired connections. Each of the Wi-Fi routers in this roundup is equipped with a four-port wired Ethernet switch. Some support only Fast Ethernet (10/100Mb/s), but some support Gigabit Ethernet (1Gb/s). Don't underestimate the value of support for the faster standard.

HOW WE TEST

A Wi-Fi network's worst nightmare

We're not exaggerating when we say we tortured these wireless routers and adapters: The office environment in which we tested them is much less friendly than most people's homes. For starters, our IT department runs two of its own 802.11g wireless networks, with access points deployed throughout the building. Shutting those networks down for a few days so we could test ours wasn't an option.

The structure is a typical midrise office building, with concrete floors and aluminum-stud and sheetrock partition walls. We set up each router in the Lab on the shelf above our test bench, about six feet from the floor. We installed each manufacturer's matching PC-card adapter in a generic laptop PC and measured TCP throughput using Ixia's Qcheck utility.

We set up the laptop in three locations: Environment 1 was within the confines of the Lab, 15 feet from the router. Although no walls separated the client from the host, there is a large

amount of metal inside the Lab, including exposed steel I-beams that support the ceiling, the steel test benches, and other PCs that weren't part of the test.

Next, we moved to Environment 2, our employee lounge, 40 feet from the router and separated by two interior walls. This room contains a refrigerator and two vending machines. Our final test location, Environment 3, was the employee kitchen—a large open room 120 feet from the router, with eight interior walls in between. We plugged the laptop into an AC outlet for the other two tests, but left it running on battery power for this one.

We tested each router in mixed mode without security, in mixed mode with WEP security, in mixed mode with WPA2 security, and then—if the router supported it—running in 802.11n-only mode with WPA2 security. We then tested backward compatibility by repeating our first scenario after bringing an 802.11g device into the mix.

D-LINK DIR-655 XTREME N GIGABIT ROUTER

We call this one The Long Ranger

D-Link's DIR-655 was one of the fastest routers in this roundup, and it proved best-in-breed in terms of range. But speed and range aren't the only reasons to like this product. If you enjoy fine-tuning your network's performance, the Xtreme N offers more control over more settings than anything else we tested.

The DIR-655 includes a robust QoS (Quality of Service) engine that you can use to prioritize network traffic, so applications such as online gaming, media streaming, and VoIP are given priority over web browsing. D-Link's WISH (Wireless Intelligent Stream Handling) technology delivers more traffic-prioritization features, enabling you to configure the router to give A/V streams originating from Windows Media Center higher priority than traffic that's less sensitive to delay—such as file transfers. You'll need to access the router's firmware to configure these and other settings.

Don't enjoy twiddling with your gear? D-Link bundles a 30-day-evaluation copy of Pure Networks's newb-friendly Network



D-Link's DIR-655 Xtreme N Gigabit router won't win any beauty contests, but it's got good bone structure.

Magic software. It doesn't give you any additional configuration or monitoring options, but it does make tasks such as printer sharing, security, and network-activity monitoring a lot easier. If you don't buy the full version within 30 days, the software will shut off access to its advanced features, leaving you with the free version that you can get anywhere.

One of the first things we noticed when we unpacked the D-Link was the included package of drywall anchors, for use if you want to mount the router to your wall. Several of these routers have mounting holes on the bottom for this purpose, but only D-Link provides its customers with a means for actually doing it. Also, the CD jacket includes a space for you to write down the network's SSID (Service Set Identifier)—the name and password. Sure, these things are minor, but such

thoughtful touches show D-Link's commitment to customer satisfaction.

Like most consumer router manufacturers, D-Link encourages the use of its browser-based installation wizard for router setup. Experienced users can skip this step without hesitation, but novices will appreciate the wizard's thoroughness. This doesn't mean D-Link leaves knowledgeable users to their own devices—there's plenty of sound advice and tips in the router's onboard help file. Set the router to use WEP, for instance, and it warns that your network will not run in 802.11n mode because that standard does not support WEP. This is to be expected, of course, but TCP throughput with WEP enabled was considerably slower on the DIR-655 than it was with competing routers. On the other hand, the DIR-655 delivered nearly three times faster scores at maximum range without WEP enabled than did the next contender. More important, it also delivered much higher speeds at range with WPA2 security enabled. (See page 70 for benchmark details.)



The DIR-655 delivers more QoS options than most routers in its class.

D-LINK DIR-655 XTREME N
\$135, www.dlink.com

9

BELKIN N1 (F5D8231-4)

Slick, sexy, and slow as tar

Belkin's N1 router looks gorgeous, and the company has put a lot of thought into making it easy for greenhorns to build a home network, but the N1 was the slowest in this field and it delivered very poor range.

This is the router to buy for your technophobe friends or relatives if you can't be there to set it up. Belkin's instructions start on the outside of the box: There's a big "Open Here" label right on top. The first thing you see when you follow that command is an oversized, illustrated quick installation guide. A series of large LED-backlit icons on the router light up in



The N1's firmware interface is as user-hostile as its installation wizard is user-friendly.

sequence, providing comforting visual reassurance that each step in the process has been successfully completed.

Despite all this hand-holding, however, the installation routine doesn't prompt the user to establish any type of wireless security. Perhaps Belkin figured that the user will become curious as to why the router's "security" LED isn't lit up and then delve into the digital user manual to find out. One thing's for sure: The router's built-in help is absolutely useless in this regard, referring to features that aren't built into the device.

We're also disappointed with the N1's paltry selection of operating modes: You can run the router in mixed mode (802.11b/g/n) only. You can set 20MHz/40MHz channel bonding to auto, on (40MHz only), or off (20MHz only)—and that's it. There are no QoS provisions, either.

At close range, the Belkin N1 was significantly slower than three of the five routers we reviewed. What's worse,



Beauty is literally only skin deep on Belkin's N1 router—a little coarse language is all it takes to scratch its glossy surface.

we couldn't connect to it at all in our longer-range tests. We suspect that the N1 would perform better in a more typical residential environment, but then so would the rest of the field. (See page 70 for benchmark details.)

The competition would do well to follow Belkin's lead in making wireless networks easier to set up and monitor, but Belkin needs to make this router more robust. And how about upgrading that chintzy Fast Ethernet switch to Gigabit while you're at it?

BELKIN N1 (F5D8231-4)

\$110, www.belkin.com

4

MEDIA STREAMERS: THE MISSING LINK

The 802.11n standard provides awesome range and plenty of bandwidth, so where are the A/V streamers?

We've seen at least three waves of Wi-Fi routers and adapters based on drafts of the IEEE 802.11n standard, but to date, no one's shipped an A/V streamer. When you consider how much bandwidth high-definition video and surround-sound audio consume, you'd think the market would be flush with such products.

In fact, D-Link's DSM-750 MediaLounge Wireless Media Player is the only such device we've heard any inkling of. Announced at CES back in January, the DSM-750 promises to stream high-definition H.264 and VC-1 video streams, music, and digital photos from a PC connected to an 802.11n router.

The DSM-750 will feature an HDMI connector along with component, composite, and (we suspect) S-video connections. Music (in MP3 and WMA format) and other audio that doesn't stream over the

HDMI connection can be output in either analog form or digital. USB 2.0 and Fast Ethernet ports round out the configuration. D-Link has not announced pricing or availability for this product.

We suspect streaming high-def won't become a big need until the consumer-electronics industry ends the Blu-ray/HD DVD standards war. In the meantime, you don't need the fat pipe that an 802.11n network provides to stream standard-definition video. You might benefit if your network is consistently saturated by other traffic. 802.11n is definitely overkill for streaming music; in fact, our current favorite audio streamer—the Sonos Digital Music System—doesn't rely on your Wi-Fi network at all. It creates its own based on a proprietary flavor of 802.11g. Other excellent music streamers, such as Logitech's Squeezebox, run just fine on an 802.11g network.

NETGEAR RANGEMAX NEXT WIRELESS N GIGABIT EDITION WNR854T

Just a couple packets short of a full load

Netgear's WNR854T was faster than any other router in this roundup in our close-range tests, lost the least amount of potency while running WEP security, and came in second in our 40-foot test, bested by D-Link's DIR-655. But Netgear's entry was several times slower than D-Link's in our 150-foot test. (See page 70 for benchmark details.)

The WNR854T also lacks the DIR-655's ample provisions for manually tweaking quality-of-service settings. We also found it to be inflexible when it came to configuring its other wireless settings. Where D-Link lets you choose between running in 802.11b-, g-, or n-only modes; mixed 802.11b and -g modes; or mixed 802.11g and n modes, Netgear limits your choices to three speed ranges: "up to 54Mb/s," "up to 145Mb/s," and "up to 300Mb/s." The router doesn't explicitly state which 802.11 mode the router will actually be running in.

It won't matter much to anyone with experience putting together a network—or to novices with typical DSL or cable-modem service, for that matter—but Netgear's installation wizard was the only one of the five we reviewed that failed to successfully install the device. The wizard detected that we'd plugged the router into an upstream Gigabit

switch and flat-out refused to proceed, forcing us to configure the router manually.

Netgear hides the router's three dipole antennas inside its enclosure, which should make the box more appealing to fashionistas who don't care for geek chic. We thought that these fixed antennas might explain the router's relatively poor long-distance performance, but the Belkin N1 and Buffalo WZR2-G300N routers both have adjustable antennas, and they totally failed to communicate with our notebook PC at 150 feet.

If you have a large home or there are a lot of walls between your router and your target devices, you'll need to augment your network

with one or more wireless access points to cover your entire house. Unlike several of the other routers reviewed here, you can't configure the WNR854T to act only as a wireless access point, and the street price for Netgear's WN802T 802.11n dedicated wireless access point—which doesn't have an integrated router—is \$40 to \$50 higher than that of the WNR854T.

Unlike the Belkin, Netgear built a four-port Gigabit Ethernet switch into its draft N router—as we said before, you shouldn't underestimate the importance of fast wired connections. If you

Netgear hides the WNR854T's three dipole antennas inside this shiny plastic case. Could this explain the router's weak range?

connect a media server to an 802.11n router with only a Fast Ethernet connection, the hard-wired connection has the potential to run slower than the wireless connection. If you don't value the greater speed, Netgear's WNR834B is basically the same router, but with a 10/100Mb/s Ethernet switch. Its \$115 street price is about \$25 cheaper than that of the WNR854T.

We dig the WNR854T for its good looks, its Gigabit switch, and its screamin' speed at close range. But if you need coverage over a wide area, D-Link's DIR-655 is the better choice.



The WNR854T has an excellent built-in configuration utility, but we lament its lack of QoS settings.

NETGEAR WNR854T **8**
\$130, www.netgear.com

BUFFALO NFINTI WZR2-G300N

Where's the beef?

From the get-go, Buffalo's Nfiniti WZR2-G300N installation routine prompts you to establish a new password for accessing the router's firmware. Considering all the legitimate concerns about network security, why is this step the exception rather than the rule for router-installation wizards?

Unfortunately for Buffalo, this is one of the few aspects of this product



A tip o' the hat to Buffalo for prompting inexperienced network builders to enable their router's security features.

to impress us. The company's AOSS (AirStation OneTouch Secure System) is supposed to make installation a one-step process. Once you've installed the wireless network adapter's device driver and client manager software on your notebook PC, you're supposed to be able to press a button on the router, click the mouse on your notebook, and presto, your network is set up. After several failed attempts at using AOSS, we reverted to Buffalo's installation wizard.

Here again, Buffalo's installation routine prompted us to choose which encryption method we'd like to use to protect our network, and it warned us that without encryption, it would be possible for unauthorized users to access our network. No other router's installation routine bothered to do that.

The WZR2-G300N took fourth place in our close-range TCP throughput test with WPA2 security, averaging a mediocre 34.9Mb/s (a fraction faster than the Belkin N1, which averaged a mere 34.3Mb/s). The router performed much better when we limited it to operating in 802.11n mode,



Flip a switch on the back of Buffalo's WZR2-G300N and you can convert it from a wireless router to a wireless access point to extend your network's range.

averaging 46.5Mb/s at close range to take second place behind the Linksys WRT350N, which averaged 46.9Mb/s.

But Buffalo's router fell apart at long range. As with the Belkin N1, our notebook outfitted with the company's wireless adapter card was unable to communicate with the network when we tested it at 40 feet and then 120 feet from the router. It seems the WZR2-G300N just doesn't like competing with lots of other wireless networks operating in the same vicinity. (See page 70 for benchmark details.)

BUFFALO WZR2-G300N

\$85, www.buffalo-tech.com

6

OPERATING A MIXED NETWORK

What happens when you add an 802.11g client to an 802.11n network?

Interoperability between brands isn't the Wi-Fi Alliance's only test criteria for wireless networks, it also makes sure that the new standards maintain backward compatibility. But making sure that 802.11n networks can operate with 802.11b and 802.11g equipment comes at a price: speed.

When an 802.11b/g device takes up residence on your 802.11n network, the router will drop down to 802.11b/g speeds to accommodate it. We tested each router by setting it up to run in 802.11b/g/n mode and then connected one client running with an 802.11n adapter card and a second with an onboard 802.11g adapter. In the exceedingly crowded environment we tested in, some routers

performed better than others.

Buffalo's Nfiniti WZR2-G300N lost the least amount of throughput, dropping by less than one percent, but that's not saying much because its performance in 802.11n-only mode wasn't much to speak of in the first place. Netgear's otherwise excellent WNR854T and Belkin's N1 suffered the biggest drops in performance—their throughput dropped by more than half with both 802.11g and -n clients attached.

BENCHMARKS

	BELKIN N1 F5D8231-4	BUFFALO WZR2-G300N	D-LINK DIR-655	LINKSYS WRT350N	NETGEAR WNR854T
TCP THROUGHPUT, ENVIRONMENT 1 802.11N CLIENT ONLY (Mb/s)	34.3	34.9	52.8	54.8	66.9
TCP THROUGHPUT, ENVIRONMENT 1 802.11N AND -G CLIENTS (Mb/s)	15.6	34.7	34.2	35.0	29.5
DROP IN THROUGHPUT TO 802.11N CLIENT	119.58%	0.56%	54.38%	56.52%	126.55%

LINKSYS WRT350N

The champagne of 802.11n routers

You can never have too much speed or too much storage, and the Linksys WRT350N makes it easy to have both. This router took first place while running in 802.11n-only mode and second place while running in mixed 802.11b/g/n mode. (See page 70 for benchmark details.) And its Storage Link feature enables you to plug in any USB storage device to add NAS functionality—the only router in this roundup to offer such a feature.

Linksys's installation wizard prompts you to change the router's password, and it encourages you to change its SSID and to set up Wi-Fi security, but it doesn't push the issue or warn networking green peas of the consequences of not setting up security. The firmware-based help files were among the most comprehensive of any of the routers we reviewed, but inexperienced users will likely become lost if they rely on them to configure some of the router's more advanced features.

Linksys supports not only WPA2 Personal security, but also WPA Enterprise, WPA2 Enterprise, and RADIUS (Remote Authentication Dial-In User Service) security. This is overkill, since



Plug a drive into the USB port on the back of Linksys's WRT350N and you can add NAS functionality.

most people will never go beyond WPA2 Personal, and if it's at all responsible for this router's steep street price of \$195, it's not worth it. The presence of a four-port Gigabit Ethernet switch inside its shell certainly doesn't explain the price tag, because the far cheaper D-Link, Netgear, and Buffalo routers are all equipped with Gigabit switches.

Setting up the router to function as a NAS box is as easy as plugging a drive into the router's USB port and configuring access. You can format a blank disk (but only as FAT32), create partitions, and establish share permissions so that other network users can access the attached storage. The router has a built-in media server, too, enabling it to stream music, video, and digital photos from the attached storage to media adapters compatible with Universal Plug and Play. This is great for stream-

ing music you've purchased or ripped from CD, but it won't be of much use if you have a music-subscription service, such as Rhapsody, which requires you to use its player.

You can also set up the router and its attached storage to function as an ftp server, granting access to individual folders, selected partitions, or the entire disk. Unlike Asus's innovative WL-700gE 802.11g router (reviewed February 2007), however, the Linksys will not function as an independent BitTorrent client.

The WRT350N delivered very good speed at range, beating even the mighty D-Link DIR-655 when operating in mixed mode with the client 120 feet from the router. We thought this range could be attributed to the Linksys's odd fly-swatter antenna, but the DIR-655 surpassed it in terms of long-range speed when both routers were running in 802.11n-only mode.

The WRT350N's Storage Link feature is cool, but we're not sure those factors justify this router's premium price tag.



Linksys's WRT350N should be bulletproof, since it includes support for WPA Enterprise, WPA2 Enterprise, and RADIUS security.

LINKSYS WRT350N

\$195, www.linksys.com

9

BENCHMARKS AND SPECIFICATIONS

Thousands of words distilled into a handful of charts—the numbers reveal the winners and losers; the categories and specs help explain the whys and hows

BENCHMARKS

MIXED MODE (802.11b/g/n) NO ENCRYPTION	BELKIN N1 F5D8231-4	BUFFALO WZR2-G300N	D-LINK DIR-655	LINKSYS WRT350N	NETGEAR WNR854T
TCP THROUGHPUT, ENVIRONMENT 1 (Mb/s)	34.3	37.1	38.3	52.1	57.4
TCP THROUGHPUT, ENVIRONMENT 2 (Mb/s)	N/C	N/C	14.7	15.2	26.7
TCP THROUGHPUT, ENVIRONMENT 3 (Mb/s)	N/C	N/C	11.2	6.6	5.5

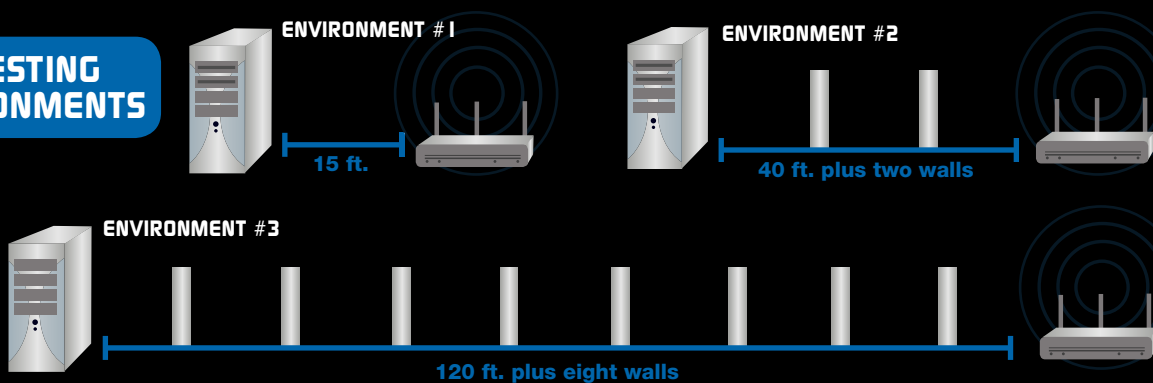
MIXED MODE (802.11b/g/n) WEP ENCRYPTION	BELKIN N1 F5D8231-4	BUFFALO WZR2-G300N	D-LINK DIR-655	LINKSYS WRT350N	NETGEAR WNR854T
TCP THROUGHPUT, ENVIRONMENT 1 (Mb/s)	27.5	38.3	19.3	27.6	43.6
TCP THROUGHPUT, ENVIRONMENT 2 (Mb/s)	N/C	2.8	15.1	7.6	26.9
TCP THROUGHPUT, ENVIRONMENT 3 (Mb/s)	N/C	N/C	14.0	5.8	5.6

MIXED MODE (802.11b/g/n) WPA2 ENCRYPTION	BELKIN N1 F5D8231-4	BUFFALO WZR2-G300N	D-LINK DIR-655	LINKSYS WRT350N	NETGEAR WNR854T
TCP THROUGHPUT, ENVIRONMENT 1 (Mb/s)	34.3	34.9	52.8	54.8	66.9
TCP THROUGHPUT, ENVIRONMENT 2 (Mb/s)	N/C	N/C	36.7	9.1	20.0
TCP THROUGHPUT, ENVIRONMENT 3 (Mb/s)	N/C	N/C	11.8	13.4	5.1

802.11n-ONLY MODE, WITH WPA2 ENCRYPTION	BELKIN N1 F5D8231-4	BUFFALO WZR2-G300N	D-LINK DIR-655	LINKSYS WRT350N	NETGEAR WNR854T
TCP THROUGHPUT, ENVIRONMENT 1 (Mb/s)	N/A	46.5	31.6	46.9	N/A
TCP THROUGHPUT, ENVIRONMENT 2 (Mb/s)	N/A	N/C	20.7	9.0	N/A
TCP THROUGHPUT, ENVIRONMENT 3 (Mb/s)	N/A	N/C	13.9	6.0	N/A

Best score in each test environment is bolded. See How We Test (page 58) for details. N/C denotes no connection.

OUR TESTING ENVIRONMENTS



SPECS

	BELKIN N1 F5D8231-4	BUFFALO NFINITI WZR2-G300N	D-LINK DIR-655	LINKSYS WRT350N	NETGEAR WNR854T
802.11n CHIPSET	Atheros Xspan	Ralink MIMOblivity	Atheros Xspan	Broadcom Intensi-fi	Marvell TopDog
ETHERNET SWITCH	Fast Ethernet	Fast Ethernet	Gigabit	Gigabit	Gigabit
NETWORK SECURITY	WEP, WPA/WPA2 Personal	WEP, WPA/WPA2 Personal	WEP, WPA/WPA2 Personal, WPA/WPA2 Enterprise, RADIUS	WEP, WPA/WPA2 Personal, WPA/WPA2 Enterprise, RADIUS	WEP, WPA/WPA2 Personal
NAS FUNCTIONALITY	No	No	No	Yes	No
CONVERTIBLE TO SIMPLE ACCESS POINT?	Yes	Yes	No	No	No
CHANNEL-WIDTH SETTINGS	20MHz, 20/40MHz	20MHz, 20/40MHz	20MHz, Auto, 20/40MHz	Auto, 20MHz, 40MHz	User cannot configure manually
WIRELESS MODES	802.11b/g/n	802.11b, 802.11g, 802.11n, 802.11b/g, 802.11b/g/n	802.11b, 802.11g, 802.11n, 802.11b/g, 802.11n/g, 802.11b/g/n	802.11b 802.11g 802.11n 802.11b/g 802.11b/g/n	Up to 54Mb/sec Up to 145Mb/sec Up to 300Mb/sec
STREET PRICE	\$110	\$85	\$135	\$195	\$130

Organize Your Computer Cables

Can't stand looking at a tangle of ugly cables every time you sit at your desk? Control your unwieldy wiring problem without breaking a sweat!



WHAT YOU NEED

- SCISSORS
- CABLE TIES
- CABLE CLAMPS
- NARROW COLORED TAPE (OR MASKING TAPE)
- PEN
- NAILS/SCREWS
- HAMMER/DRILL



Cables suck. But it's not your fault. You spend an hour or so arranging your desk, moving your monitor, setting up your speakers—the last thing on your mind is cable management. When it comes time to plug everything in, you just want to fire up your rig and commence fragging, or movie watching, or minesweeping. You don't want to get arm-deep in the mucky muck you've created behind your computer. What you can't see won't hurt you, right?

Wrong. Given time, sloppy cable management always rears its ugly head. It never improves by itself, and, in fact, it gets worse with each new device you wire into your rig. But you don't have to get crazy to get clutter free and connected. We've broken cable management into four easy steps, and you probably already have all the tools you need!

BY DAVID MURPHY

1 Untangle Your Cables

The back of your computer can look bad enough if you're a simple PC user; if you're a gadget geek, it turns into a mythological nightmare. First, there are the must-have cables: a power cable for the computer itself, video and power cables for the monitor, a cable for your mouse and keyboard, and a network cable. Sound enthusiasts will add a few more to the mix, as a typical 5.1 setup comes with cables for all five satellites, a power cable for the subwoofer, and possibly an additional cable for an external volume control.

Get a little fancier and you can throw in a USB headset for gaming, two cables to power and con-

nect an external drive, USB and power cables for a printer, and a USB cable for a webcam. That puts us at 19 separate cables, all undoubtedly going to a single tower and surge protector.

Before you start tidying, you need to start untangling. And to untangle, you must first unplug. Going with the clean-slate approach is the best way to start managing your cable catastrophe. It's impossible to make order out of a chaotic mess of wires. You'll save far more time by disconnecting all your cables and carefully laying them on the floor next to your workspace. If you're over-ambitious, you can organize the cables by type—speaker, USB, power—but no matter how you do it, you'll want to have a game plan.

It goes without saying, be sure your computer is off before you start yanking every cable in sight. And pull gently.

2 Label Your Cables

You can certainly tell some cables from others by sight alone, but what about all of those black USB cords you have? Or your speaker wires?

Labeling your cables is just as important as tying them together because you don't want to have to trace through a tangled web of cords to find out what's what. You can buy fancy labels

from the store or do what we did—use colored tape to label cables by type (USB, power, etc.), then write their purposes on the tape itself.

Don't use a Sharpie to label cables—it will surely make a mess. Thin-tipped markers are your friends.



3 Protect Your Power

Most computer-based cables are thin, efficient, and tidy. By comparison, power cables are large, unwieldy, and irritating. And they take up a ton of room when they're all jacked into a single surge protector.

Just throwing a surge protector on the floor is the surest way to begin a cable nightmare. Concealing wires is an art form, and you can start your magnum opus by making sure your surge protector stays in one place. We used screws, but you can also use Velcro strips to mount your power strip. Some good target locations include baseboards, the underside of your desk, or even the back of a desk leg.



Make a rough measurement of the distance between the anchoring holes before you start drilling or nailing. It'll save you a trip to the store for some wood putty.

4 Clamp Your Cables

Now that you have laid the framework for your masterful movement toward cable happiness, it's time to get to the nitty-gritty. Grab your zip ties, roll up your sleeves, and start bunching cables together. Be sure to combine like-minded cables as much as possible. For example, speaker wires shouldn't go alongside USB cords, as your speakers might pick up interference when you use a USB device. The same is true for network cables and

power cords—consider them the oil and water of your wiring setup.

Start at the back of your motherboard and work your way toward each major area in your workstation: desk, subwoofer, and so forth. Keep the overall line tight by throwing on a new tie every six inches or so. And once you're done, you can use cable clips to conceal these larger cable mash-ups along the underside of your desk. [MPC](#)



Tie, tie, tie. You can never use enough cable ties, trust us. They're easy to cut off if you make a mistake, just don't nick a cable along with the tie.



Ask the Doctor

Diagnosing and curing your PC problems

A 5.1 SWITCHEROO

Ever seen a device that can switch between 5.1 components?

I have 5.1-capable headphones with an attached mic and 5.1-capable speakers. I want to be able to easily switch between the speakers and headphones, but I currently have to physically disconnect my speakers and then connect the headphones, which is very tedious. Logitech speakers have a desktop controller/volume control that accepts headphones, but it has only a single input.

—Chris Ramirez

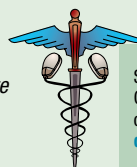
The Doc has never seen the type of analog 5.1-channel switcher you're describing, but he suggests you take a look at Turtle Beach's Ear Force HPA2. This headset delivers 5.1-channel surround sound and has a boom-mounted mic, but it also comes with a splitter cable that enables you to plug in a set of 5.1-channel speakers. You can switch between the two outputs without having to unplug any cables from your soundcard. The Doctor realizes that's not an ideal solution, but he's listened to both the Turtle Beach phones and the Razer HP-1s you're using and much prefers the Turtles.

DUAL CARD DOESN'T WORK

I recently bought a Dell XPS 710 with an XFX GeForce 8600 GTS videocard. I am running dual Dell 2007WFP 20-inch monitors. I want to install a second XFX GeForce 8600 GTS card, so I can run a third Dell 2007WFP, maybe even four monitors. I haven't had any luck installing the second card.

When I bought the XPS 710, the salesperson said Dell could spec the XPS 710, with two videocards. If he was correct, the two cards should work. Dell did have to replace the motherboard last week for a different reason. When the technician changed the board, she tried installing the second card but was also unsuccessful. Any suggestions?

—Frank Fugate



Never content to leave well enough alone, Dell customizes the XPS 710 with what it calls "Dell's OEM Implementation of Nvidia nForce 590 SLI." If Dell's tech-support staff can't get SLI to function on its own product, you should explore returning the system and getting your money back.

TOUCHSMART, TOUCHSMART, SAY THAT YOU LOVE ME

I bought an HP TouchSmart PC in March 2007 (my first mistake in this venture). I have had keyboard issues since day one. The keyboard is wireless and it works intermittently. I look at the keyboard, not the screen when I type, so when I look up, half of my letters are missing and a third of the others are duplicates. Other times the keyboard works well.

After calling HP support, I was sent a replacement keyboard. That did not resolve the issue. So I called back and was sent another. Same problem. I noticed that it uses 2.4GHz for its comm signal. Since my wireless router (Linksys WRT54g) is in close proximity, could that be interfering? Should I switch the router to a different channel?

The HP help desk wants me to reinstall the operating system. I refuse to do that because it took too much time to set up.

—Steve Broudy

The HP TouchSmart IQ770 has a built-in Bluetooth transceiver for its mouse and keyboard, but soon after HP began shipping these machines, the company decided to augment it with a USB Bluetooth dongle. If you didn't receive a dongle with your machine, contact HP and ask them to send you one. After you've paired it with your keyboard, you should see a big improvement in keyboard performance. The Doctor certainly did after he added one to his TouchSmart. If you're still having trouble, the Doc prescribes moving your router—it could be interfering with the Bluetooth network. **MP3**

Spider Doctor. Spider Doctor. Does whatever a Spider Doctor does. Can he swing, from a web? No he can't, cause he's the Doctor. Look out! He is the Doctor. Solves your problems. If you send. An e-mail to doctor@maximumpc.com. Running out! Of space for song....

White Paper: Power Supplies

There's a lot going on inside a power supply—and no, the magic gnomes that turn your lights on when you hit that switch on the wall aren't powering your rig as well.

BY MIKE CHIN



A decade ago, there were few well-known power-supply brands for DIY computer enthusiasts. Some people sought out specific models normally sold in bulk to commercial system integrators, but none of these products was individually boxed. How dramatically things have changed!

Today, the DIY computer builder has a bewildering array of retail-packaged power-supply choices. Most of these companies source the power supplies from the actual manufacturers and then market and distribute them under their own brands.

So aside from colorful boxes, shiny paint jobs, blinking LED fans, fancy cables, and eye-popping four-digit power ratings, do the new retail power supplies offer any functional advantages over the plain gray boxes of old?

To answer this question, we're delving into the fundamentals: What are the real functions of a computer power supply?

RIDING THE RAILS

The Power Supply Unit (PSU) converts AC electricity into regulated DC voltages, which it then delivers to the components inside your computer. Several different DC voltages are needed, the main ones being +12V, +5V, +3.3V, -12V, and 5V standby. Each voltage rail has a specific set of functions:

▶ **+12V:** In recent years, this has become the main rail to power most of the computer's components. The motherboard uses DC-to-DC conversion of the 12V rail to provide the <1.5VDC needed for the CPU. It's also used to provide additional juice

It's important for a PSU to maintain a consistent voltage within a specific range; providing more voltage can lead to a shortened life span for the part.

directly to power-hungry videocards, with direct connection via 6-pin and 8-pin PCIe power connectors. +12V is also used to power hard drive motors and fans.

▶ **+5V:** The motherboard and many of its components use +5V.

▶ **+3.3V:** Used to run system memory, videocards, and other circuits.

▶ **-12V:** Provided for backward compatibility, mostly with some types of serial port circuits, typically with a current limit of <1A.

▶ **+5V standby (SB):** Always on as long as the power supply is plugged into AC and its main switch is left on, +5VSB is used to power the "soft" turn on/off circuitry in the motherboard that tells the PSU to power up or power down. It is also used for "self-powered" USB devices.

Each output voltage rail has a maximum current capability, expressed in amperes (A). Note that voltage multiplied by current equals power. Normally, the maximum power capability of each voltage rail should add up to total rated power, but this is not always the case. With no-name PSUs, false labeling is quite common; the rated power seems to always be greater than the sum of individual rail power. With quality brands, sometimes the reverse is true: The sum power of individual lines is greater than the PSU's rated power. This is because the maximum capability of each line cannot be delivered simultaneously without overloading the primary DC transformer. Look

for combined maximum current/power ratings.

The main output connectors on modern PSUs are

- ▶ A 24-pin or 20+4-pin main ATX for the motherboard
- ▶ A 4-pin ATX 12V or an 8-pin ATX 12V for the motherboard (the 8-pin versions is mainly for high-current CPU and dual-CPU boards)
- ▶ Two 12V 6-pin and two 12V 6/8-pin auxiliaries for high-power PCIe videocards
- ▶ A 4-pin "Molex" for IDE hard drive (and other peripheral) power
- ▶ A SATA hard drive power connector
- ▶ A floppy drive power connector

REGULATE THIS!

The ATX12V specification calls for a range of $\pm 5\%$ on the +12V, +5V, and +3.3V rails, and $\pm 10\%$ on the remaining lines. The voltage monitoring software in motherboards is not really accurate enough to check on VR; a multimeter with probes across the output terminals is needed. Many enthusiasts erroneously believe that higher DC voltage is always better; in reality, higher voltage can lead to early component failure. What's more important is that the voltage is kept within specified limits under all conditions.

240VA is a limit on some consumer electronics safety standards. The 18A current limit for 12V was intended to keep the VA in the

Peltier Water Cooler

The CoolIt Eliminator CPU Cooler utilizes thermoelectric cooling (TEC), rather than air, to chill its liquid coolant. Thermoelectric cooling relies on the Peltier effect; a current runs between plates made of two different metals to transfer heat from one side to the other, keeping your CPU cool while reducing condensation.

PSU output cables below that 240VA limit. This requirement is achieved by inserting a simple limiter to keep the current below 18A on any 12V line cable. With several cables, the total 12V current could exceed 18A, however. But marketing materials have exaggerated this technicality into “multiple 12V rails”; some PSUs are even advertised as having four or five “independent” 12V rails. In reality, most PSUs limit the current on each 12V cable to <20A, and virtually none have more than one 12V rail. All the 12V wires connect to the same 12V transformer. The exceptions are some extremely high-power units (~1kW), in which having two separate 12V circuits can actually make engineering-design sense.

POWER SHIFT

A desktop PC does not require a constant level of power. The power requirements depend on what the PC is being asked to do. Most home PCs remain in low or idle mode about a third of the time that they are powered on.

When the CPU or videocards are at full load (during intensive video or photo editing, serious number crunching, or extended 3D gaming), the power demand can jump to double that of idle load. In most cases, recommendations by manufacturers and technical magazines about how “big” a PSU should be are based on the maximum possible theoretical load of the system components, plus added headroom capacity. This results in unrealistically high power recommendations. The recommended PSU power rating is more than double that of maximum loads seen in real-life applications.

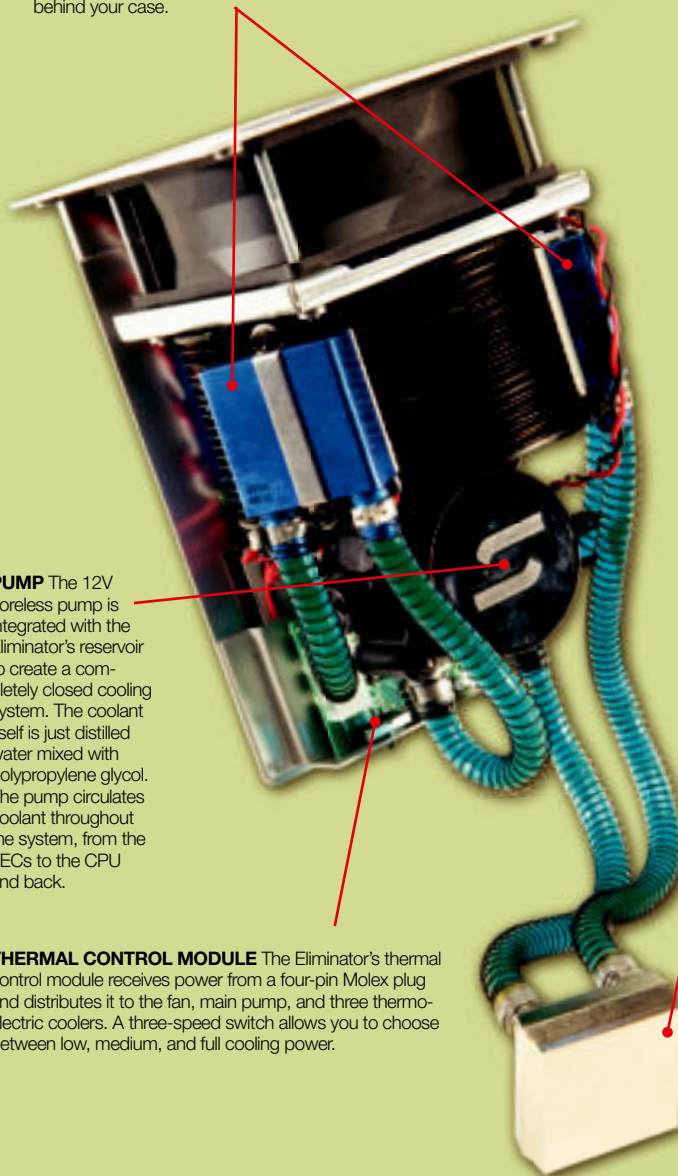
POWER CONVERSION AND EFFICIENCY

Computer PSUs are switching mode types, which means that the PSU switches on and off upwards of 100,000 times per second; this provide relatively high efficiency at low cost compared to linear (non-switching) power supplies.

The conversion from AC to DC always requires some signal filtration, and there’s some energy loss into heat; the lower the loss, the higher the efficiency. Efficiency is defined as the ratio between DC output and the AC input required for that output, and it is expressed as a percentage. Efficiency does not stay constant; it varies somewhat with power output. **MP**

Mike Chin is an editor at Silentpreview.com

THERMOELECTRIC COOLERS/FLUID HEAT EXCHANGERS A Peltier wafer sits between the fluid heat exchanger and the heatsink. The TEC chills the coolant flowing through the heat exchanger, and the resulting heat is dispersed through the heatsink, which is cooled by a 92mm fan, outputting warm air behind your case.



PUMP The 12V coreless pump is integrated with the Eliminator’s reservoir to create a completely closed cooling system. The coolant itself is just distilled water mixed with polypropylene glycol. The pump circulates coolant throughout the system, from the TECs to the CPU and back.

THERMAL CONTROL MODULE The Eliminator’s thermal control module receives power from a four-pin Molex plug and distributes it to the fan, main pump, and three thermoelectric coolers. A three-speed switch allows you to choose between low, medium, and full cooling power.

CPU FLUID HEAT EXCHANGER

A copper heat exchange sits atop a layer of thermal paste on the CPU. Fluid goes from the pump, to the CPU, to the TECs, and then returns to the pump.

Any requests? What hardware—new or old—would you like to see go under *Maximum PC*’s autopsy knife? Email your suggestions to hardware@maximumpc.com

DAVID MURPHY



Delves Into Less-Common Types of RAIDs

Here's the scoop on the RAIDs you may not have heard of



Adaptec's 31605 RAID controller costs a cool thousand bucks. But even it supports very few of the lesser RAIDs—only RAID 6, in fact.

Alas, if only we lived in a perfect world. A perfect world with twice the number of trees, because then *Maximum PC* would be able to print even more RAID details than what you just read in this month's feature (page 44). Because there's quite a list to go through, I'll skip with my usual meandering introductions and extended metaphors and get right to the heart of the matter—the lesser RAIDs.

RAID 2 It's the dinosaur of the RAID world. In a nutshell, it's dead; no modern motherboard supports it, no modern controller supports it, and if you happen to ever come across a method for using it, just don't. You'll need far more hard drives than you should be using, and this RAID type basically just reimplements error-correcting code that—surprise!—already occurs on your hard drive.

RAID 3 RAID 3 uses byte-size stripes to distribute data across a minimum of three drives. In this scenario, two drives hold the data while a third drive holds all of the parity information for the array. While a RAID 5 setup also uses parity to protect your data, it distributes the parity information across all drives in the array. Because of the stripe sizes and the constant need to access the parity drive, a RAID 3 array's speeds suffer.

RAID 4 Take exactly what you just read for RAID 3 and replace “byte-size stripes” with “block-size stripes.” The switch improves the array's random access performance and puts it more in line with the configuration of RAID 5. However, that dedicated parity drive still hurts the array's speeds, as every bit of data read and written to other drives in the array has to be matched against the accompanying parity information.

RAID 6 If you're worried about data loss in a RAID 5 array, then RAID 6 is the choice for you. It needs, at minimum, four drives—just like RAID 5—but the array uses two sets of parity information instead of one. You obviously lose some storage space with this config, but up to two drives can fail in the array before your data goes bye-bye.

Katherine Stevenson

On Nero CD-DVD Speed

This nifty, free utility is the secret to our optical drive reviews



When testing hardware, it's critical to eliminate as many variables as possible. That's why when I review optical drives, I eschew the applications that come with the drives and turn to Nero CD-DVD Speed. The utility comes bundled with the Nero ToolKit Utility Suite, but it can also be downloaded for free at www.cdspeed2000.com. It's updated on a regular basis to keep up with new hardware, and it supports all types of CD, DVD, Blu-ray, and HD DVD media.

In the course of evaluating a drive, I'll first use Nero CD-DVD

Speed to create a data disc. As the utility goes about filling the disc, a graph displays the drive's progress—what percentage of the disc has been filled, at what speed the data is being written, and even the write speed in relation to the disc's rotation speed. Once the write is complete, I conduct a read test, and following that, Nero generates a report detailing everything from average read/write speeds, to seek times, to spin times, to CPU usage. In other words, a very thorough picture of a drive's abilities.

I've found that often the software that comes bundled with a drive yields slightly better performance than Nero's app does—a Blu-ray drive might write to BD-R at +/- 46 minutes using CD-DVD Speed and +/- 44 minutes using Cyberlink's software. But my verdicts are based on the relative performance of the hardware itself, and I can only determine that by using the same application across the board. And, the big benefit of CD-DVD Speed is that it offers an amazing amount of granular detail.

How We Test

Real-world benchmarks. Real-world results

Computer performance used to be measured with synthetic tests that had little or no bearing on real-world performance. Even worse, when hardware vendors started tailoring their drivers for these synthetic tests, the performance in actual games and applications sometimes dropped.

At *Maximum PC*, our mantra for testing has always been "real world." We use tests that reflect tasks power users perform every single day. With that in mind, here are the six benchmarks we use to test every system we review.

SYSmark2004 SE: This is an update of the SYSmark2004 benchmark, which uses a suite of such common applications as Microsoft Word, Excel, PowerPoint, Macromedia Dreamweaver, Flash, and Winzip to test general performance. It isn't heavy in multithreading, but it does feature multitasking tests.

Adobe Premiere Pro 2.0: We finally ditched our old standard-def Premiere test for one that uses high-def source material. The test is multithreaded, uses the GPU for transitions, and is brutal. It takes about an hour on our zero-point to render a short two-minute, 46-second benchmark movie in the program.

Adobe Photoshop CS2: We start with a RAW photo shot with a Canon EOS 20D, and apply a crapload of filters and other tasks from CS2 to see just how fast a rig can chew through the workload. Because we use every filter we can, the test is more fair and balanced than the usual cherry picking of Photoshop tests.

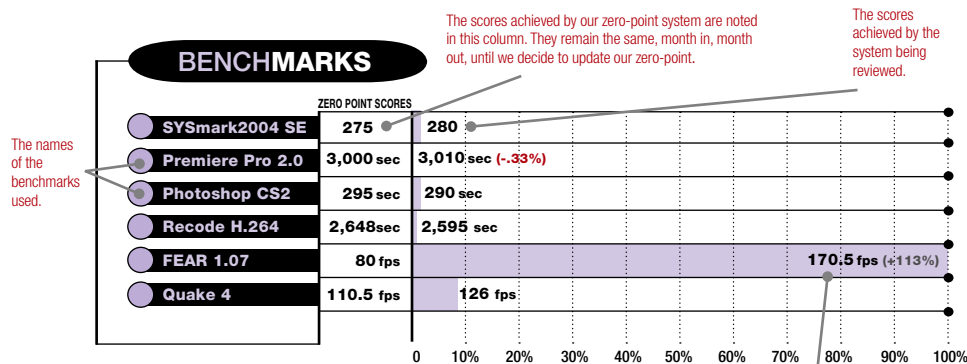
Ahead Nero Recode 2.0: Nero Recode 2.0 is one of the fastest video-transcoding utilities. We copy unencrypted VOB files to the hard drive, then convert the movie to an H.264 file formatted for the Apple iPod's screen. The version included with Nero 7.5, is the only multithreaded H.264 encoder we've found thus far and is optimized for dual-core CPUs.

Quake 4: Based on the Doom 3 engine, Quake 4 is a popular OpenGL game. We run our test at 1600x1200 with 4x antialiasing and 4x anisotropic filtering. Generally, more robust OpenGL drivers yield better performance. We use a custom timedemo recorded using the 1.2 patch, which supports Hyper-Threading and dual-core processors.

FEAR: Monolith's FEAR is a cutting-edge DirectX game that pushes PCs and graphics hardware to the limit. We run FEAR at 1600x1200 with soft shadows, physics, and audio acceleration enabled, using the 1.07 patch.

How to Read Our Benchmark Chart

Maximum PC's test beds double as zero-point systems, against which all review systems are compared. Here's how to read our benchmark chart.



Our current desktop test bed is a Windows XP SP2 machine, using a dual-core 2.6GHz Athlon 64 FX-60, 2GB of Corsair DDR400 RAM on an Asus A8N32-SLI motherboard, two GeForce 7900 GTX videocards in SLI mode, a Western Digital 4000KD hard drive, a Sound Blaster X-Fi soundcard, and a PC Power and Cooling Turbo Cool 850 PSU.

Every month we remind readers of our key zero-point components.

The bar graph indicates how much faster the review system performed in respect to the zero-point system. If a system exceeds the zero-point performance by more than 100 percent, the graph will show a full-width bar and a plus sign.

Our monthly category-by-category list of our favorite products. New products are in red.

High-end videocard

XFx GeForce 8800 Ultra

Midrange videocard

PowerColor HD HD2900 XT
512MB DDR3

Soundcard

Creative Labs X-Fi XtremeGamer
Fatal1ty Pro Series

Hard drive

Hitachi Deskstar 7K1000

External backup drive

Western Digital My Book Pro II

High-def burner

LG GGW-H10N

DVD burner

Samsung SH-203B

High-end LCD monitor

Dell 2707WFP

Budget LCD monitor

Samsung SyncMaster 206BW

Socket AM2 Athlon 64 mobo

Gigabyte GA-M59SLI-S5

Socket 775 Core 2 Duo mobo

Asus Striker Extreme

HD-based MP3 player

Apple iPod

Flash-based MP3 player

SanDisk Sansa Connect 4GB

5.1 speakers

Gigaworks S750

2.0 speakers

Audioengine 5

Midtower case

Antec Nine Hundred

Full-tower case

Cooler Master Cosmos
Big, screwless, and with better air-flow than our previous fave, there's a reason we used the Cosmos for the Dream Machine

Games we are playing

BioShock, Civilization IV, Guild Wars, World in Conflict Beta, Quake Wars Beta, Desert Conflict

Dell XPS 720 H2C

The desktop giant's latest giant desktop proves it can run with the specialty shops

Boom. Boom. Boom. The 800-pound gorilla has arrived. Dell's latest XPS system, the 720 H2C, packs some serious power and plenty of extras, but its balls-to-the-wall approach doesn't completely overshadow its proprietary roots.

The 720 H2C certainly doesn't lack for power. Intel's 2.93GHz Core 2 Extreme QX6800 quad-core processor, overclocked to 3.73GHz, runs alongside a pair of 8800 GTX Ultras and 4GB of Corsair Dominator DDR2 RAM clocked at 1,066MHz, all sitting on Dell's version of the nForce 680i SLI chipset. That's one fast gorilla.

But how fast is it? The XPS 720 cranked through FEAR at 168fps, which puts it behind only Overdrive PC's Core2.SLI (reviewed in August), which scored 173fps, and our Dream Machine, which reached 177fps. In our Quake 4 test, the XPS 720 scored a more than respectable 205fps, right up there with most of the big guys but 10 percent slower than the Falcon Northwest system we reviewed in June, which destroyed all the competition with a score of 226fps.

Dell is serious about making this machine more than just a gaming behemoth, though, and in our multimedia tests, the quad-core 720 H2C was faster than any

other rig we've tested. It blew through our Premiere Pro benchmark nearly 90 seconds faster than the previous record-holders, June's quad-core Falcon Northwest machine and the dual-core Overdrive. It finished our Nero Recode bench a full minute faster than the Dream Machine, which held the recording title for less than two months, and the 720 H2C bested the Overdrive by seven seconds in our Photoshop test.

Rounding out the 720 H2C's media capabilities are a 2x Philips Blu-ray burner, a 16x LG DVD+/-RW drive, and Dell's version of the X-Fi XtremeMusic soundcard. Our test system shipped with a 13-in-1 media reader and XP Media Center Edition, although the optional TV tuner and remote weren't included. Dell says it'll ship the rig with Vista or XP but won't support dual boots. That's a pity because the 320GB dual-Raptor striped RAID and 1TB Hitachi backup drive could easily have accommodated both OSes. You can do it yourself, of course, but for a machine that's otherwise meticulously put together, it feels like an oversight.

The 720 isn't all about brawn, though. Dell made this machine easy on the eyes, with a stunning all-black case and four sets of color-changing LEDs (two on the front, one in the back, and one inside the case), which can be

controlled separately from the BIOS or, in a nice touch, the included nTune software. They can also be programmed to respond to in-game or program-specific events. Snazzy!

Build quality is mixed: Components are solidly in place and the railed hard drive bays are easily accessible, but the wiring was sloppy. The case itself is solid and well made (and nicely Vaderesque), with a beautiful black paint job. The screwless side panel is easily removed.

Dominating the center of the case is the H2C unit, the centerpiece of Dell's foray into liquid cooling. The large windowed enclosure holds a high-powered pump, coolant lines, a CPU heat exchanger, a Peltier cooler, a fan, and a radiator. Oh, and one of the four sets of LEDs, albeit with fewer color options than the others. The H2C helps the 720 run fairly quietly—most of the time; under a heavy load the fans kick in, and then it gets crazy-loud.



It's big. It's fast. It's shiny. It's... a damn fine system in a sweet-looking case.

UNDER THE HOOD

BRAINS

CPU Intel Core 2 Extreme Quad QX6800 (2.93GHz overclocked to 3.73GHz)

MOBO Dell 680i SLI

RAM 4GB Corsair Dominator DDR2 (800MHz overclocked to 1,066MHz)

LAN Gigabit LAN (Broadcom)

HARD DRIVES Two 160GB Raptors (10,000rpm SATA) in RAID 0, one 1TB Hitachi DeskStar

OPTICAL Philips BD-RE BDD1001 Blu-ray burner; LG GSA-H31N DVD+/-RW drive

BEAUTY

VIDEOCARD Two 768MB Nvidia GeForce 8800 GTX Ultras in SLI

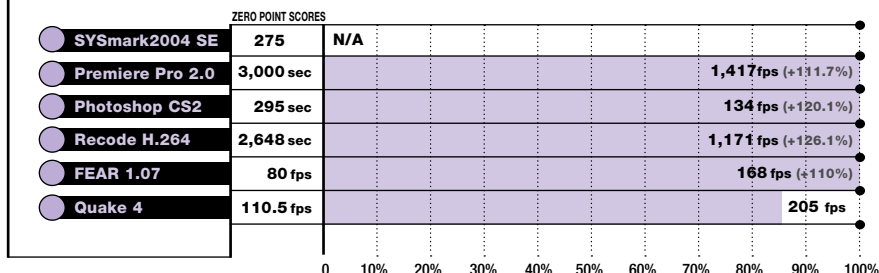
SOUNDCARD Sound Blaster X-Fi

CASE Dell XPS

BOOT: 48 sec.

DOWN: 7 sec.

BENCHMARKS



Our current desktop test bed is a Windows XP SP2 machine, using a dual-core 2.6GHz Athlon 64 FX-60, 2GB of Corsair DDR400 RAM on an Asus ABN32-SLI motherboard, two GeForce 7900 GTX videocards in SLI mode, a Western Digital 4000KD hard drive, a Sound Blaster X-Fi soundcard, and a PC Power and Cooling Turbo Cool 850 PSU.



The H2C cooler dominates the 720's case, but there's still room for two 8800 Ultras, an X-Fi soundcard, and a PhysX card.

Dell shipped a bushel of extras with our machine, including Razer's Tarantula keyboard and Copperhead mouse, as well as an Ageia PhysX card, which just seems silly to us. Sure, it's an optional component and dedicated physics processors may one day be awesome, but until there are PhysX games worth playing, the card just takes up a PCI slot.

We have only a few other quibbles with this machine. First, the front panel is composed of the same flimsy plastic lattice that's appeared on previous XPS models. Drive bay covers kept falling off their hinges, and the horizontal bars bend easily. Not a huge deal, but in an otherwise solid case, they feel cheap.

Speaking of solid, this machine is heavy.

Top-heavy, too—it comes with a stand, complete with backward-swept chrome "wings" to keep it from toppling over sideways.

Our big complaint with this machine is Dell's use of a proprietary motherboard and power supply. The BTX mobo means upgrading your system will be almost impossible, as Intel stopped development on the BTX standard more than a year ago. The power supply is also proprietary and features a non-standard power connection, which means you can only use a Dell power cord.

Overall, the XPS 720 H2C marks the first Dell we've seen in a while that can stand toe-to-toe with the baddest machines in the business. Its lightning-fast multimedia performance and sick gaming frame rates make it a good choice for gamers and media

gurus alike. And with a quad-core processor and 4GB of RAM, it should age well. Just be aware that the BTX formfactor will make it difficult to perform major upgrades. And don't lose your power cord.

—NATHAN EDWARDS

DELL XPS 720 H2C

+	ENCHANTED	8
Blazing-fast media and game performance. Looks good.		
-	SLANTED	8
Damn you, proprietary systems! And PhysX? Really?		

● \$6,810, www.dell.com

Diamond Viper Radeon HD 2900XT

Is a gig putting lipstick on a pig?

AMD's decision not to compete with Nvidia's best GPU left us puzzled, but the decision its manufacturing partners have made—to pair AMD's second-tier GPU with a full gigabyte of GDDR4 memory—has us totally stumped.

We concluded in our August issue that PowerColor's 512MB Radeon HD 2900XT is faster than Nvidia's 8800 GTS, so we weren't surprised to discover that Diamond's card is faster too. But our benchmark testing indicates that doubling the size of the frame buffer—even if it uses fast GDDR4 memory—doesn't improve performance by much, if anything at all. Frame rates certainly didn't increase enough to justify the \$100 price bump over 2900XT cards with 512MB frame buffers.

The GPU on Diamond's card is clocked at the same speed as PowerColor's entry (743MHz), but its memory is set to a cool 1GHz. With the

BENCHMARKS

	RADEON 2900XT, 1GB GDDR4	RADEON 2900XT 1GB, GDDR4 CROSSFIRE	RADEON 2900XT, 512MB GDDR3	GEFORCE 8800 GTS, 640MB GDDR3
3DMARK06 GAME 1 (FPS)	22.7	44.1	21.5	19.4
3DMARK06 GAME 2 (FPS)	21.0	46.6	20.6	17.8
QUAKE 4 (FPS)	86.2	146.8	75.7	65.5
FEAR (FPS)	64.0	105.0	63.0	52.0
SUPREME COMMANDER	28.2	38.7	28.0	26.2

Best single-card scores are bolded. AMD-based cards tested with an Intel D975XBX2 motherboard; Nvidia-based cards tested with an EVGA 680i SLI motherboard. Intel 2.93GHz Core 2 Extreme X6800 CPUs and 2GB of Corsair DDR2 RAM used in both scenarios.



Diamond's HD 2900XT with 1GB of GDDR4 memory is faster than cards based on Nvidia's 8800 GTS, but you can say the same about much-cheaper X2900XT cards with 512MB of GDDR3.

exception of Quake 4, however, we saw an average increase of just one frame per second in our benchmark numbers compared to the aforementioned 512MB card.

We suspect the significant boost in Quake 4 performance—which jumped from 75.7fps on the PowerColor card to 86.2fps on Diamond's—has more to do with driver improvements than frame buffer size. Performance increased along the same scale in CrossFire mode, with Quake 4's frame rate benefiting the most (increasing from 127.8fps on the PowerColor card to 146.8fps on the Diamond).

If you use your PC for other high-end applications—such as CAD or 3D modeling—the massive frame buffer *might* do you some good, but those aren't applications we focus on.

—MICHAEL BROWN

DIAMOND VIPER

\$500, www.diamondmm.com

7

Toshiba Portable External Hard Drive

We love the shiny blue button, but we need more

We'll get the bad news out of the way first. You aren't going to win any speed competitions with Toshiba's Portable External Hard Drive; we tested a 200GB version (the device itself comes in capacities ranging from 100GB to 200GB), and the resulting benchmark numbers are nothing for Toshiba to be proud of.

The drive on the inside is Toshiba's 2.5-inch MK2035GSS. Its rotational speed is a decent 4,200rpm, although that gives way to some glaring deficits in our benchmarks. The drive's average read speed of 29MB/s puts it well below what other all-in-one external units we've tested are capable of. We weren't expecting to see Raptor-quality performance in these miniature external units, but Toshiba's device was simply unable to outperform OWC Mercury's On-the-Go (reviewed in August) in any of our HD Tach tests.

Granted, the Toshiba unit provides 40 more gigabytes of storage than the OWC device, but there's something to be said for functionality. With Toshiba's external drive, you get a USB connection.

BENCHMARKS

	OWC MERCURY-ON-THE-GO	TOSHIBA PORTABLE DRIVE
HD TACH BURST SPEED (MB/S)	38	35.1
HD TACH RANDOM ACCESS (MS)	15	19.2
HD TACH AVERAGE READ (MB/S)	35.7	29

Best scores are bolded. Both drives were tested using their USB 2.0 connections.



On the plus side, this external drive is one of the slimmest you're going to find.

That's it. In fact, that's about all there is on the unit at all: no power button, no other connections. We suppose you could always unplug the device when you don't want to use it, but what about those who want to keep the device permanently connected to their rig? A power switch would be ideal.

We do, however, love that the Toshiba drive doesn't come with a power brick. All you need to run it are two free USB slots, a great benefit if you're on your laptop and not near a plug.

Loads of external drives offer FireWire support, an on/off button, one-touch backup—features the Toshiba doesn't have. We sure can't think of a compelling reason to pick up this device, as the Toshiba is as slow as it is featureless.

—DAVID MURPHY

TOSHIBA EXTERNAL HD

\$180, www.toshiba.com

5

Data Robotics Drobo

A novel concept stuck in a block of ice

Data Robotics was a bit concerned about its Drobo external enclosure being tested in the Maximum PC Lab. After all, the name of the game at *Maximum PC* is speed. We hate that which is not fast almost as much as we hate that which doesn't work out of the freakin' box.

Saying the Drobo is slow is like saying dry ice is cold or that the Buckeyes are just another football team. Running our HD Tach benchmark test on the Drobo was like waiting for water to boil, only to find that the burner wasn't even on to begin with.

Although Data Robotics swears the Drobo doesn't use RAID for data redundancy, the device's proprietary technology is basically a giant RAID in a box. You toss a hard drive into one of the device's four hot-swap-style openings, and the Drobo constantly auto-configures the array. It uses your biggest hard drive as a mirror backup of your data and runs like a RAID 5 when

BENCHMARKS

	DROBO (1 RAPTOR)	DROBO (2 RAPTORS)	DROBO (3 RAPTORS)	DROBO (4 RAPTORS)	RAPTOR (BASELINE)*
SIZE	150GB (68.70 free)	300GB (135.53 free)	450GB (271.80 free)	600GB (411.46 free)	150GB
HD TACH BURST (MB/S)	24.9	22.8	22.8	22.9	27.6
HD TACH RANDOM ACCESS (MS)	8.8	9.9	10	9.7	8.5
HD TACH AVERAGE READ (MB/S)	15.6	15.4	15.5	15.5	25.4

Best scores are bolded. Western Digital 150GB Raptor drives were used for all HD Tach testing. *A Raptor drive connected to a Kingwin KH350SEU enclosure via USB 2.0 was used for a comparative baseline.



Hands down, the Drobo's colorful exterior includes the prettiest functional display of any external enclosure we've tested.

you have three or four drives present.

Unlike a normal striped array, the Drobo doesn't limit your total array capacity to the number of hard drives you have multiplied by the smallest drive's capacity. If you want to use the Drobo to format a single drive that's already been chained to an array, you have to jam a paper clip into the Drobo's butt—the included software won't do it for you.

We wonder why the Drobo defaults to a protection setup when you have only one drive in the unit. Yes, the device is ideally designed for more than one drive, but there's no benefit to stashing away half a drive's contents for protection if the entire drive fails.

The Drobo has all the visual appeal of an Apple product, but in black. It also comes with enough usability issues to give a first-generation iPod room to laugh. We just can't forgive its unholy combination of interface annoyances and worthless speeds.

—DAVID MURPHY

DATA ROBOTICS DROBO
\$500, www.drobo.com

6

Atdec Visidec Freestanding Double

Let your two LCDs live as one

It used to be that simply having two monitors on your desk was enough to establish your power-user cred, but LCD prices being what they are these days, it's not uncommon for even regular folk to boast a multimonitor setup. Perhaps it's time you up the ante with a little monitor "modding," as it were.

The Visidec Freestanding Double lets you combine two VESA-compliant LCD panels on a single stand to create a dual display that's sure to get noticed. The unified screen setup not only looks sharp—especially if you're combining two identical displays—but also frees up a little desk space.

Assembly is straightforward—thanks to a minimum of parts, an all-inclusive "bits bag," and easy-to-follow instructions—but the process takes time and patience, nonetheless. The heavy black metal base sits atop a desk without the aid of any clamps or screws. It holds an upright pole to which you must attach two horizontal arms. Things get tricky when you have to hold parts in place and screw them in at the same time, particularly when you're tasked with securing the panels to each arm. It's possible to do this alone, but having a second set of hands helps tremendously. All told, it took us about an hour to assemble the stand.

Once we had painstakingly tightened all the necessary joints to hold the weight of our two 24-inch screens—the stand is spec'd for LCDs measuring from 12 to 24 inches—we were pleased with the results. The whole setup seemed stable, and we were able to tilt the screens forward and back to our liking as well as angle them in (although you must plan for the latter



Ball-joint mechanisms on the mounts give each display independent movement.

during setup). It's also nice that you can rotate the screens in tandem if you need to access the area behind the monitors. Height adjustability would be nice, but once you've positioned the arms on the neck, they're tightly screwed in place. That only somewhat offsets our appreciation for this product's subdued aesthetics, reliability, and price.

—KATHERINE STEVENSON

ATDEC VISIDEC
\$230, www.atdec.com

9

Pantone HueyPro

Wouldn't you like your prints to match the image you see on the screen?

You don't need to be a graphics professional to care about the color of your prints—even casual digital photographers take pride in their work. But what's a user to do when the image he sees on the screen bears little resemblance to the printer's output? Many screens provide manual control over individual color channels, but tweaking them to match your printer's color can be a tedious and time-consuming affair. An alternative is to color calibrate your monitor with a hardware/software package made for the task.

Pantone's Huey line of consumer calibrators promises professional-grade results with a price and user-friendliness that will appeal to even hobbyists. Both the standard Huey and the HueyPro function similarly: You load the calibration software, connect the cigarillo-size calibrator to your USB port, and then follow the software's simple steps, which take little more than a minute to complete.

For this review, we focused on the HueyPro because unlike the standard version, the Pro will calibrate more than one monitor on a single workstation. Per the software's instructions, we stuck the suction-cupped calibrator to our screen and watched as the device measured the screen's color temps with a show of LEDs. In the end, our screen took on a dramatically different appearance that was warmer and redder than its previous state—it's fun to toggle between the before and after results. The newly calibrated screen looked very unnatural to our unaccustomed eyes, so we compared it with a multicolored print that we ran off on our company's production-grade printer, which gets regularly serviced and calibrated. And sure enough, the calibrated screen was a much closer match to the print—nearly identical, in fact.



An included cradle gives the HueyPro a place to perch while it continually monitors your room's lighting.

The HueyPro lets you select from a few different white-point and gamma settings to suit your personal preference without disrupting the color balance. And you can opt for the device to measure the room's ambient light at all times (from its wee cradle) and make appropriate adjustments to your screen on the fly.

For folks who do a lot of color printing, this product is a real boon; the trade-offs are a screen that likely looks very different from what you're used to and a lag time whenever you boot and the color profile is reloaded.

—KATHERINE STEVENSON

PANTONE HUEYPRO

\$130 (\$90 for baby Huey),
www.pantone.com

9

Logitech G9

The latest Logitech G-series gaming mouse just doesn't stack up

It's difficult to improve on something that's already damn near perfect. That's the problem Logitech faced when designing the follow-up to the kick-ass G5 gaming mouse. The new G9 features an innovative, but not necessarily improved, design.

Sporting changeable shells, the mouse accommodates all hand sizes. The petite "ladyhands" shell is perfect for people with finer fingers, while the "meathooks" shell is big enough to accommodate everyone but the largest of giants. We continue to dig Logitech's weighting system, which lets you adjust the heft of your mouse. With room for four weights, you can add as much as 28g of mass to your rodent—not as much as the G5 allows but still more than enough to elicit a gliding action.

Logitech also added the MicroGear scroll wheel, which uses haptic technology to switch back and forth between super-speedy smooth scrolling and traditional detent-style scrolling. Unlike the Logitech MX Revolution, the G9 allows you to swap scroll modes by pressing a button on the bottom of the mouse, so switching modes won't cause problems in games that use mouse3 (the Revolution's toggle button).

That's what we like. We don't, however, like this mouse's physical design. The G9 is designed for gamers who hold the mouse with the tips of their fingers—Fatal1ty-style. The problem is that mice designed specifically for such claw-style players aren't particularly comfortable for day-to-day mousing, and they're not good for gamers who use a standard grip; the thumb buttons and sensitivity-adjustment buttons are located inconveniently for people who use a



The new G9 laser mouse includes some saucy features, including multiple adjustable shells, but it's not a worthy successor to the G5.

conventional grip.

The G9's sensor, like the G5's, is precise and perfect. The only real flaw that this mouse exhibits is its claw-friendly design. We just don't think that this grip-style is very popular. In a decidedly unscientific poll of 15 gaming editors of all ages, not one used the Fatal1ty-style grip. Maybe the G9 should be labeled "For Professional Use Only."

—WILL SMITH

LOGITECH G9

\$100, www.logitech.com

6

Data Drive Thru Tornado

The Tornado whips through data transfers like an F5, um, tornado

We've seen various USB transfer devices over the years, and for the most part they've been clunky and sloooow. Not so with Data Drive Thru's Tornado, which blew into our Lab and impressed the hell out of us. Essentially a coiled, flat USB 2.0 cable that retracts into a plastic housing, the Tornado works by plugging into the Hi-Speed USB ports of two PCs running a newer Windows OS (Millennium, 2000, XP, or Vista). A basic file-transfer application executes from a bit of flash memory in the device, which allows you to simply drag and drop files between the two rigs. Similar cables from other companies force you to install software to transfer files.

The snazzy part, though, is how fast data moves across the cable. We copied about 4.2GB of data from a Raptor X drive installed in our zero-point Athlon 64 FX-60 to a notebook PC in 3:28 (min:sec). Using a crossover cable hooked up to the Gigabit ports on both machines, the same transfer took an additional minute. The company claims that the Tornado is one of the few flat cables that can actually meet the Hi-Speed USB 2.0 specs for shielding, and thus, the device can burn up the data-transfer rates. Other flat cables actually leak enough data to cause speeds to plummet, as corrupted data must be resent. We tested this claim using generic retractable USB 2.0 cables and, indeed, a slew of transfer issues cropped up—but didn't occur with the Tornado.

The flat USB cable retracts into a case to make a nice, neat package. This design is our one complaint about the device though. The cable retracts so far into the case that it's difficult for people with stubby fingers to pull it out. Elven folk will have no such problem.

That's a minor complaint, though. The Tornado gives you easy and fast



Kiss your sneakeret goodbye.

file transfers without the need of additional software and should fit right into any tech's toolbox.

—GORDON MAH UNG

THE TORNADO

\$60, www.datadrivethru.com



Swiftech H20-120

Cool? Yes. Complicated? Yes²

A lot of the enclosed “for newbs” water-cooling kits we see at *Maximum PC* are pretty lame. You get a pump/heatsink combination that's mildly irritating to install, connected by tubing that's slightly wider than the veins in your arm. The tubing goes to a radiator that's often unable to handle the heat output of the processor—even with a noisy 12cm fan pushing more air through it than a jet engine. You spend half an hour installing the device for a whopping cooling difference of three degrees versus what you get from a stock air cooler.

Assembling and installing Swiftech's new H20-120 water-cooling setup will leave many on the brink of frustration, but if you're willing to trade an hour of your life for additional cooling relief, this device delivers. It cooled our test rig by an average of 6.5 degrees more than our stock cooler in both our idle and punishment CPU tests, outperforming most of the water-cooling kits we've tested.

Setting up the H20-120 is similar to building a DIY water-cooling kit. The pieces don't come assembled; you must do the grunt work. If you're running an AMD rig, you need to take apart the Intel-specific waterblock that's attached to the pumping mechanism

by default. Instructions are provided, but the process could be confusing for a liquid-cooling newbie.

In a perfect world, Swiftech would have taken



The H20-120 is a great cooler but faces strong competition from true DIY setups.

a note from its competitors and preassembled the entire kit. The company could close-loop the system and free everyone from having to double, double toil and trouble up a liter of coolant—of which the cooling kit uses very little. Small details, but absolutely crucial for inexperienced users that want a no-fuss setup.

The H20-120 functions great, but it straddles the line between the newbie and enthusiast markets. It's mildly complex for the former, and its lack of included water cooling for graphics cards will surely make the latter froth at the mouth. Consider this a practice run for your first piecemeal setup.

—DAVID MURPHY

SWIFTECH H20-120

\$160, www.swiftech.com



BENCHMARKS

	STOCK COOLER	SWIFTECH H20-120
Idle (C)	26	19
100% Load (C)	52	46

Best scores are bolded. Idle temperatures were measured after 30 minutes of inactivity, and full-load temps were measured after running CPU Burn-in for one hour.

Headset Hoedown

Finally, a pair of headsets that don't make us weep

One of the dangers of panning product after product in a given category, as we've done with headsets lately, is that other vendors get skittish about submitting *their* products to the buzz saw. These two companies had no such fears.

—MICHAEL BROWN

ROCKETFISH USB GAMING HEADSET

The gap between cheap and inexpensive widens to a yawning chasm when you're talking audio gear, which is why we're so pleasantly surprised with the Rocketfish gaming headset. We didn't realize this was a Best Buy private-label product until after we'd given it a listen, but we're glad we didn't dismiss it out of hand.

The Rocketfish headset looks much more expensive than its \$50 price tag belies, despite being fabricated primarily from plastic, thanks to earcups and a mic stalk that are wrapped in a matte black, rubber-like skin accented by glossy red stripes. The stalk is flexible, but non-removable (it pivots up out of the way when you don't need it).

The mic supposedly has noise-cancellation technology built in, but we weren't impressed with its filtering capabilities: It picked up plenty of both environmental and breathing noise. Despite that criticism, the

mic sounded better than those that came with some of the more expensive headsets we've reviewed lately.

The Rocketfish delivers surprisingly deep bass response, and it sounds much better than we expected from head-

phones in this price range. The oval earcups both pivot and spin, rendering them comfortable for long gaming sessions, and they do a good job of isolating your ears from outside noise. We found them to be just a bit small for our ears, but they still prevented audio from leaking out.

A volume control consisting of a thumb wheel and a slightly awkward slider switch for muting the mic is located on the generously long 9-foot USB cable. This is the best headset we've seen for gamers on a budget; in fact, the only feature on the Rocketfish that really passes for cheap is the cheesy elastic suspension headband.



Velvet-covered earcups and a suspension headband make Turtle Beach's AK-R8 very comfortable during long gaming sessions.

mic and a 1/8-inch analog output for a second set of stereo headphones. This same module also houses a DSP chip, a six-channel amplifier, and a built-in stereo microphone that can be used to monitor outside sounds—such as your significant other hollering at you to quit playing Supreme Commander long enough to take out the trash. Unfortunately, activating this mic turns on the boom mic (and vice versa).

A software front-end for the DSP runs on the host PC to provide a 10-band equalizer for each of the four speakers in each ear cup (front, surround, center, and subwoofer), plus separate ambiance controls for the front and surround channels. While by no means audiophile quality, Turtle Beach's gear has always sounded a cut above what the competition has offered—and the AK-R8 is no exception—but we're disappointed by the company's decision to follow the crowd and introduce a rumble effect into this product. Strapping a vibrator to your head might be fun in some situations, but it's just annoying when you're playing PC games. Fortunately, Turtle Beach's effect surfaces only when you significantly boost the frequencies routed to the subwoofer.

This is the best headset we've heard for gamers who prefer to roll without soundcards.



The Rocketfish USB Gaming Headset looks and sounds much better than what you'd expect from a \$50 product.

ROCKETFISH USB GAMING HEADSET



PIRANHA

Good looks; great price/performance ratio.



SNAKEHEAD

Cheap elastic headband; poor noise-cancellation.



• \$50, www.rocketfishproducts.com

TURTLE BEACH EAR FORCE AK-R8 HEADSET

One of the reasons we picked Turtle Beach's Ear Force HPA2 headset as one of the 19 awesome upgrades we recommended in our June 2007 issue was the fact that it's analog and can be paired with a soundcard. The new Ear Force AK-R8 is USB only, but this enables it to offer some compelling features in addition to fabulous surround sound.

An inline control module on the 8-foot cable, for instance, has SPDIF inputs and outputs, plus a 1/8-inch input for a stereo

TURTLE BEACH EAR FORCE AK-R8



LEATHERBACK

Good sound, packed with features.



SNAPPER

Juvenile rumble effect.



• \$150, www.turtlebeach.com

USB SPEAKERS ■ ■ ■



Yamaha NX-U10

We weren't surprised that the "U" in Yamaha's NX-U10 portable speaker system stands for "USB," but we were taken aback to discover that these tiny speakers can tap a USB port for power as well as digital audio.

The NX-U10's digital-to-analog converter sounds much better than the craptastic DACs found in most laptop PCs, but you'll enjoy a much better listening experience if you power the tiny speakers with four AAA batteries or the provided AC-over-USB adapter instead of relying solely on USB. A USB port delivers very little electrical power to the amp, which resulted in low volume levels in our listening tests.

We connected the diminutive speaker to both USB and analog audio output (the 1/8-inch stereo connector renders the system MP3-player friendly) and were surprised by how tight it all sounded. Yamaha developed a new means of reproducing bass for the NX-U10 that delivers a surprising degree of oomph from such a small cabinet (its dimensions are 9 3/4 inches wide, 3 15/16 inches high, and 1 5/16 inches deep). Dubbed Swing Radiator Bass, it consists of two panel-shaped diaphragms mounted next to the 1.5-inch drivers. Low frequencies cause these panels to swing back and forth, boosting bass response.

You'll never mistake the bass emanating from these wee speakers for a subwoofer, or even a conventional full-range driver, but at least it's tight. The main drivers, meanwhile, fulfill their mission with aplomb. But don't push the amp too hard: We experienced unpleasant distortion long before reaching the end of the volume wheel's range. Yamaha's \$180 suggested retail price, however, simply defies logic. We found the NX-U10 selling online in the more sensible price range of \$96 to \$108.

—MICHAEL BROWN

NX-U10 SPEAKERS

\$180, www.yamaha.com

7

STUDIO MONITORS ■ ■ ■

Blue Sky EXO 2.1

Studio-monitor manufacturers are increasingly crossing over into the consumer speaker market, giving consumer-oriented brands like Altec Lansing, Bose, Creative Labs, and Logitech a run for their money. Blue Sky International is one of the latest to jump into this segment with its EXO 2.1 system.

Unlike most pro gear in this price range, the EXO 2.1 system includes a wired module with separate gain controls for the satellites and subwoofer (a big improvement over putting the volume control on one of the speaker cabinets). The box has RCA inputs in back for connecting to a PC soundcard, but we were delighted to find a set of combo XLR/TRS (1/4-inch) inputs there, too. A 1/8-inch input up front allows you to connect an MP3 player, and there's a 1/8-inch output for headphones as well. All three inputs can be used simultaneously, eliminating the need to unplug one source to monitor another.

The amp, built into the hefty subwoofer cabinet, delivers 90 watts to the 8-inch sub and 35 watts to each of the magnetically shielded two-way satellites, each of which is outfitted with a large 3-inch midrange driver and a generous 1-inch dome tweeter.

When you think of studio monitors, you think of flat frequency response that doesn't color (emphasize any frequencies in) the source material. But the fact that studio monitors are designed as tools doesn't necessarily mean they sound boring. We thought the EXO would displace the subless Audioengine 5 to become our new favorite midrange audio system—and it would if we were scoring strictly on features; unfortunately, Blue Sky's chuffy subwoofer causes the package to fall just short of the mark.

—MICHAEL BROWN



BLUE SKY EXO 2.1

\$350, www.abluesky.com

8

SUBWOOFER ■ ■ ■



Anthony Gallo TR-2

We find ourselves as unimpressed with Anthony Gallo's A'Diva Ti satellite speakers as we are bowled over by the performance of the company's TR-2 subwoofer. Since you can buy one without the other, we've decided to base our verdict on the subwoofer alone.

We care much more about performance than price, and we've never hesitated to laud praise on pricey components—as long as they get the job done. But in our book, these satellites just don't earn their \$300-each price tag. The hefty stainless-steel orbs look impressive enough, but we've heard plenty of less-expensive speakers that sound better.

The A'Diva Ti's are not powered, so we connected them to a Denon AVR-3805 A/V receiver for our tests. Our disappointment stems primarily from their inability to deliver punchy highs. The satellites are tight and responsive, but we're just not impressed with their dynamic range.

Gallo's TR-2 subwoofer, however, could turn sweet cream into butter. Unlike most subs we've tested, which feature square wooden, vented cabinets, the TR-2's 10-inch long-throw woofer is sealed and acoustically suspended in a barrel-shaped shell fabricated from sheet metal. The TR-2 features a 250-watt class A/B amp, so we weren't surprised by how loud it could get, but we were blown away at how *tight* it sounded. Listening to the nasty bass lines in Betty Davis's "Your Mama Wants Ya Back" (from the funk diva's absolutely brilliant CD *They Say I'm Different*), we couldn't detect a puff of wasted air. Easily the best subwoofer we've ever tested, it justifies every penny of its \$700 price tag.

—MICHAEL BROWN

TR-2 SUBWOOFER

\$700, www.roundsound.com

10

MAXIMUM PC
KICKASS

Point-and-Shoot Shoot-out!

Good things come in small packages

The point-and-shoot pocket camera continues to evolve, with prices dropping and midrange devices including more and more features. We review offerings from Sony, FujiFilm, and Olympus that include the latest “must-have” digicam feature—face-recognition technology—which detects faces and adjusts focus and exposure to ensure that all the people in a group portrait look sharp. But is this new tech for real or just a bunch of bunk?

—STEVE KLETT

SONY CYBER-SHOT DSC-W80

Sony's 7.2 megapixel DSC-W80 boots quickly, and its 3x zoom lens focuses with minimal shutter delay. Plus, this cam includes a traditional, if tiny, optical viewfinder!

The W80's optical image stabilization—at low shutter speeds the camera will move a lens element slightly to compensate for hand shake—performed well in our tests. To further combat hand shake, Sony pairs this feature with increased ISO speeds, depending on shooting conditions, which served up mixed results due to high noise.



Sony's DSC-W80 allows picture playback at 1080i resolution on your TV (with optional accessories).

The W80 also sports the latest buzz in digicams—face-detection technology. This may sound like bunk, but it actually works. Enable face detection, and the camera will seek out and frame up to eight faces in a shot, ensuring they are in sharp focus. We did notice a significant improvement in group-portrait shots when using this feature.

Image quality was decent—shots were well exposed with good color saturation.

However, noise artifacts became quite obvious at 400 ISO and above, rendering the higher ISO settings all but useless.

SONY DSC-W80

\$250, www.sonymstyle.com

6

OLYMPUS STYLUS 780

Olympus's Stylus 780 packs a 7.1 megapixel sensor, a 5x optical zoom, a crisp 2.5-inch LCD, and face-detection technology into a weatherproof camera body that is slightly larger but more stylish than the Sony DSC-W80's.

Like the W80, the Stylus sports dual image-stabilization, pairing mechanical optic adjustments with optional faster ISO speeds when excessive hand shake is detected or lighting conditions are poor. Results were excellent in good lighting situations, but unlike the W80, this cam also performed well when lighting was less than ideal.

The 780 also includes shadow adjustment and panorama scene modes, which aren't offered on either the W80 or the FujiFilm F40fd (reviewed below). Shadow adjustment can be activated with a simple button press and will automatically change exposures to compensate for areas of high contrast or backlighting.

The 780's noise reduction also performed acceptably, delivering occasionally serviceable results up to ISO 1600 and reliably usable images at sub-800 ISO. The macro modes were also noteworthy for delivering nice, sharp images. Color saturation was good, as well; outdoor images, particularly, were bright and vivid.

Overall, however, image quality was not quite up to the standards set by Fuji's F40fd, but if you live in harsh climates or like to shoot pictures in the rain, the Stylus 780 is a rock-solid choice.

OLYMPUS STYLUS 780

\$350, www.olympus.com

8

FUJIFILM F40FD

If you are all about achieving the highest possible image quality (even at the expense of



The Olympus Stylus 780 has a cool built-in help system that camera newbs will appreciate.



FujiFilm's F40fd takes very nice pics, but where's the image stabilization?

other features), Fuji's F40fd is the camera in this roundup for you.

Images were noticeably sharper and slightly more vivid—with less noise at high ISO speeds—than those produced by the other cameras reviewed here. You can expect to get nice 5x7 prints at 800 ISO. This quality comes with a bit of a performance trade-off, as the F40 was more sluggish in shot-to-shot performance, and the 3-second startup time is nearly twice as slow as that of the other cameras reviewed here. And unfortunately, the F40 does not offer optical image-stabilization.

Like the 780 and W80, the F40 has effective face-detection. However, unlike those two cameras, the F40's may be used in playback mode as well—you can use it to take a quick look at up to 10 faces in a picture to make sure no one has their eyes closed or is sticking out their tongue.

Of the three cameras tested here, the F40 has the most solid-feeling construction. And the 2.5-inch LCD was the nicest, too. And, the F40 also lets you use both SD and xD memory cards.

Unfortunately, slow performance and the lack of image stabilization mar what is otherwise a very solid camera.

FUJIFILM F40FD

\$300, www.fujifilm.com

7

Apple iPhone

It falls short of the hype, but it's still a technological wonder

Hey did you hear? Apple came out with a mobile phone. Of course you heard—the only way you could've avoided the iPhone hype machine was to move to Antarctica, shut yourself in an igloo, and avoid all contact with other humans. But in case you've just crept out of your ice house, the iPhone is Apple's new gadget that combines a mobile phone, iPod, and Internet access into one handy bundle that fits in your pocket.

As a mobile phone, the iPhone is quite capable. Audio is clear and loud enough not to be drowned out by an arriving subway or boos at a Yankees game. Visual Voicemail is awesome, letting you pick and choose which voicemail messages you want to hear without listening to any tedious instructions. And after a couple of months, we have yet to experience one dropped call. But how can a phone this expensive not have voice-activated calling? Custom ringtones aren't available either, unless you decide to use a hack from the Internet.

It's also Apple's best iPod yet. There's no click wheel, but the iPod interface is just as easy to use, if not easier. Cover Flow, which uses album art to sort songs, is a fun way to sift through your music. The audio is iPod-esque—good midrange and midtone without bass that doesn't drop heavy. The stunning 3.5-inch LCD makes it possible to enjoy a full-length movie without squinting.

The iPhone's abilities as an Internet device may be the deal breaker. The problem is the EDGE data connectivity—to say EDGE sucks is putting it lightly. Even Steve Jobs was reported as saying that he prefers the faster 3G technology, but 3G is extremely power hungry and not as widely available as EDGE. Regardless, it's a treat to see full web pages on a mobile device, instead of



The iPhone sports a few fantastic features but lacks some standard ones.

stripped-down WAP versions, despite the fact that you can't view sites that rely on the ubiquitous Flash plugin.

The iPhone is far from the savior of mobile phones—third-party developers are restricted to simple AJAX web apps, firmware hacks are wiped out after each update, and the fixed battery has sparked litigation. But there's also the innovative multitouch touchscreen and sensible interface, the no-nonsense syncing and activating through iTunes, and the tough-as-nails screen and case (our test iPhone remains scratchless). If you've waited this long, you might as well keep waiting—iPhone 2.0 is bound to be what the iPhone should've been in the first place.

—ROMAN LOYOLA

APPLE IPHONE

\$500 (4GB), www.apple.com

7

HTC Mogul

A CDMA Windows Mobile 6 phone finally hits the street

To the surprise of some, companies continue to make handsets even after the Jobsian conception of the Jesus Phone, or, as it's more commonly known to PC users, the iPhone. Rather than proving itself to be the phone of phones (see review above), it is clear that we remain in a polytelephonic universe in which a number of devices, including HTC's Mogul, show themselves to be worthy mobile handset options.

With a 2.8-inch screen, speedy EVDO broadband compatibility (upgradeable to Rev A), and Windows Mobile 6, the Mogul is a solid choice for those who need to get work done while away from the office but don't necessarily always want to lug around a laptop. The included Office Mobile app and handy integrated keyboard allow users to edit and create Word and Excel files and view PowerPoint docs, and to stay connected, you can also access Exchange, POP3, and IMAP email accounts as well as send standard text messages (MMS, however, is not an option); the full slide-out keyboard is responsive with keys that are big enough to keep you from making too many typos, though you will have to use both hands to type. Overall, voice quality was good.

Accessing commonly used apps is easy thanks to the numerous buttons on the sides and face of the device. The Mogul allows for one-press access to email, Explorer, the camera, voice dialing, and the Comm Manager. A scroll wheel on the side and D-pad on the face also let you navigate menus. While the ease at which you can get to popular apps is a plus, the placement of the scroll wheel makes it easy to accidentally depress the power button.



The Mogul allows easy access to the apps you'll use most.

Although seemingly built as a work device, the Mogul also features a number of multimedia options, including a 2MP 2x-zoom camera with video capture, Windows Media Player, and digital media downloads from Sprint's music store. While it's nice to have these features, the Mogul won't supplant your camera and MP3 player.

The Mogul presents a good mix of power and portability. If you need access to Office apps while you're on the road but still want an array of multimedia options, it's a good, if pricey, choice.

—TOM EDWARDS

HTC MOGUL

\$550, \$300 with service plan, www.sprint.com

8

Microsoft Natural Ergonomic Desktop 7000

That's one beauty of a keyboard, but we don't like the mouse

We've long admired Microsoft's Natural Ergonomic Keyboard 4000; its combination of a downward tilting typing surface and a split layout is the perfect salve for our aching wrists. But we aren't as fond of the Natural Wireless Laser Mouse 6000, which is unfortunate, as the devices are paired in one bundle for the weak-wristed.

The wireless version of the Ergonomic Keyboard 4000 is virtually identical to the wired one, but it communicates with your PC via a 2.4GHz transmitter. The key action and layout of the two boards are the same; the only differences between the two are that the wireless board sports a slightly lighter color scheme and its status lights (for Caps Lock and its cronies) are replaced by software toggles to conserve battery life, which is good. The Ergo plank didn't run down its two AA batteries after two months of constant use.

The Natural Wireless Laser Mouse is another story. While we appreciate that the mouse allows for a neutral hand position, which lets you grip it in your hand's most relaxed position, we don't like the loss of precision that holding the device like a soda can engenders. Even after several weeks of use, we weren't able to consistently make horizontal mouse movements; the cursor invariably drifts down when you use your wrist to move the mouse from right to left. We also wonder why this mouse requires standard disposable batteries. Unlike keyboards, wireless mice need rechargeable batteries; they simply suck up too much power to use standard AAs.



Ergonomic keyboards are a good thing, but ergonomic mice leave something to be desired.

Although we were able to use the mouse for extended periods of time unassisted, we don't feel that this device is a significant improvement over a more accurate, traditional mouse paired with a good gel-covered wrist rest.

The keyboard is a good match for gamers, but we can't recommend the mouse for anyone who needs to make high-precision movements. Unfortunately, this wireless keyboard's score is brought down by its subpar companion.

—WILL SMITH

DESKTOP 7000

\$150, www.microsoft.com

7

Ghost Recon Advanced Warfighter 2

Now with even more advanced war-fighting technology

“If at first you don't succeed, try, try again.” Grin, the developer of Ghost Recon Advanced Warfighter 2, took this adage to heart after the original GRAW's abysmally poor squad AI and mediocre missions failed to woo PC gamers. Thankfully, the developer's efforts are clearly noticeable in the sequel, which impresses with both its improved AI pathfinding and new tactically sound team controls.

You again fill the boots of Scott Mitchell, who has been sent to Mexico to support loyalist troops defending against a violent rebellion. Your tasks of keeping the peace, rescuing captured pilots, and recovering stolen nuclear weapons are eased by the support of your Ghost squad, which exhibits deft tactical skill. The improved team intelligence is a welcome necessity, as we found enemy soldiers to be proficient sharpshooters able to pick us off if we rushed too eagerly into a firefight. GRAW 2 definitely rewards the patient planner over the fighter with an itchy trigger finger.

To prepare for infiltration missions and engagements at haciendas and hydro-electric power plants, we were given fun new toys with which to manage assaults. An overview map let us plot recon paths and cover positions for individual team members in real time, which was very reminiscent of the effective pre-planning feature in the classic Rainbow Six games. After executing carefully designed attack routes, we could also direct the action from cameras mounted on teammates' shoulders. This Cross-Com



It's always a good idea to send teammates to scout around corners to avoid being sniped in the head.

system worked wonders for adjusting tactics on the fly, especially when the team was spread across different points on a map.

But as fun as the action gets, it's all over a bit too soon. The game's 10 campaign missions don't add up to more than six hours of gameplay, and we spent most of that time in the three ultra-difficult levels of the last act. Addictive multiplayer modes are a redeeming factor and round out a very satisfying package that's indubitably worth your time.

—NORMAN CHAN

GHOST RECON 2

\$50, www.ghostrecon.com
ESRB: T

8

Medal of Honor: Airborne

It's raining soldiers

Dear Mom and Dad,

I signed on with the 82nd Airborne because it promised that its new approach to fighting the war would be the best way to serve my country in this terrible crisis. It's been a tough three years over here in Europe, but the Airborne has proved that it can take the good fight for freedom to new heights. Over the last six operations in my tour, I've really done my part to stop Jerry!

Before I jumped out of a C-47 for the first time over Italy, I had some serious doubts about being a paratrooper. I had heard the horror stories from the battlefield—this seemingly never-ending war has worn down many good soldiers who are now just sick of the constant stress of battle. Thankfully, from the moment I jumped out of that plane, I was engaged in one of the most intense adventures of my life. Dropping onto a rooftop in the village of Adanti, I was overzealous and botched my first landing. Luckily, none of the Italian Blackshirts saw me, and I quickly took out several enemy defensive positions.

After meeting up with some fellow paratroopers, we stormed the mayor's residence from the rear to seize control of the building and demolish some anti-aircraft guns. I then led the way to other objectives, facing stiff resistance from Ratz soldiers along the



Taking out pillboxes overlooking the beaches of Normandy was one of our favorite missions.



Getting the drop on enemies isn't always easy. Troops evaluate their situation and fall back to new positions if necessary.

way. Even though I chose this sequence of attack, I had the freedom to carry out my directives in any order. It's also reassuring to know that if I am ever taken out of commission in battle, another eager soldier will be ready to parachute down and take my place to continue the fight.

Some of the more difficult skirmishes came in later missions, such as Operation Neptune. By then, we had moved up through Italy to France, where we supported the invasion of Normandy with an inland assault. The Nazis we faced were smarter here, working together to flank our sides and falling back to new cover positions whenever we pushed too close. They'd jump through windows and blind-fire over sandbags to counter our attack, often with such fluidity and gritty determination that I couldn't help but admire their resolve. That isn't to say all the foot soldiers we fought were well trained. Looks like Hitler recruited some numbskulls as well—idiots who would repeatedly run to stationary MG42 machine guns while I sniped them from afar.

I also want to let you know that the military has recognized our efforts, rewarding us with a steady flow of

weapon upgrades. My trusty Thompson submachine gun is now outfitted with three improvements, decreased recoil, a larger magazine drum, and a pistol grip for increased accuracy. Earning these improvements through proficient use of my weapons felt gratifying, and the extra boost definitely helped when I was sent to assault a monstrous flak tower. We lost a lot of men in this brutal mission, many of whom died at the hands of the MG42-wielding Nazi elites.

But now that my tour of duty is complete, I feel I could've done more. My six missions were challenging, but they flew by. Of course, I can always practice airdrops with other members of the Airborne in simulated war games, but the 12-person participant limit is a little disappointing. I know this is a terrible thing to say, but sometimes, I wish the war wasn't over. Being a part of the Airborne has brought an exciting new dimension to combat, making me often wish I was back on the front lines.

Your loving son,
Boyd Travers

—NORMAN CHAN

MEDAL OF HONOR: AIRBORNE

+ GREASED LANDING
Parachuting into battles grants more freedom and adds vertically to combat.

- BOTCHED LANDING
The six missions are over too quickly, and the AI is inconsistent.

9

● \$50, www.ea.com/moh, ESRB: T



We tackle tough reader questions on...

- ✓ Vista SLI
- ✓ Maximum PC's Website
- ✓ 30-inch LCDs
- ✓ Stock Coolers

NVIDIA NVECTIVE

For eight months now, PC enthusiasts have been waiting for Nvidia to come out with stable drivers for SLI in Vista, only to get apologies and be told to please "just be patient." My question: Where are the exposes that point out the downright shame of the situation? Now we're hearing rumbings that the 8-series will probably NEVER work well with Vista. The workaround? "Revert back to old drivers [that do not support SLI] while we work on the problem."

Now BioShock is out, with a big ad for Nvidia: "Nvidia, the way it was meant to be played." So I guess BioShock with Nvidia cards was MEANT to be played with NO overclocking and NO SLI. This is pure BS. I guess I can expect the same limitations when Crysis comes out.

PC enthusiasts did not put all that money into dual cards only to be handed a bunch of BS from Nvidia. If I didn't know better (and maybe I don't), I would say Nvidia is deliberately screwing around with weak drivers just so people will get fed up and buy into its next-generation 9-series.

Please, if magazines such as yours would expose Nvidia and its failure to support its customers, maybe it would get the picture. Meanwhile, we have one card working... that is hooked up with an SLI bridge to an expensive doorstop. Thanks, Nvidia, for ripping us off.

—Jeff Nicely

SENIOR EDITOR GORDON MAH UNG RESPONDS:

While I think the driver situation in Vista is pretty piss-poor today (which is why our Dream Machine '07 sports a dual boot), I highly doubt that Nvidia is not supporting the new OS. The more likely answer for the subpar performance of games in Vista is the huge workload the company's driver writers are under. BioShock, for example, supposedly gets a healthy boost from a new beta driver that ups single-card and SLI performance by double digits, and those one-off drivers don't write themselves. I do feel your pain, though; anyone who unloads \$1,600 for a pair of Ultras should get ungodly performance. Hopefully, the situation will improve as more titles ship and Vista drivers mature.

WEBSITE WHINING

I cannot understand why your website is so difficult to use. Given the quality of your magazine content and the obvious talent of your editorial staff, it does your magazine a great disservice to be so poorly represented on the web. Case in point: Why is your Best of the Best information so difficult to unearth? Oddly enough, I don't keep a copy of your mag with me at all times, so I would find great value in being able to refer to this list online. I can't find it on your site, nor can I find the components on the list via a search, unless I have the list in front of me and can search for the exact text. It's silly. Please take some steps to address this

and bring your website up to the same standards as your find magazine.

—Scott Daunheimer

EDITOR IN CHIEF WILL SMITH RESPONDS:

We really don't like to do anything half-assed here at *Maximum PC*, which is why we stripped down the feature set to the bare minimum for the relaunch of our website. Rather than add sections like Best of the Best in an incomplete way that would be difficult

Boo on Your Budget PC

I've been reading this magazine for years and usually love it, but there's one thing that ticks me off. Regarding the \$500 PC competition we recently had [October 2007], I'm offended by the lack of a real attempt to build the best PC for that price. In particular, I was amazed by the lack of a case on one and the obvious lack of research into what makes a good low-cost PC. If you're going to try to build a budget PC then get people who will try to do it for real.

—Bill Lake

ASSOCIATE EDITOR DAVE MURPHY

RESPONDS: We based our challenge on what parts could be purchased from a retail store precisely because we didn't want the feature to turn into an arms race of Internet deals. We wanted to level the playing field from a hardware perspective, and not just compete to see who could

find the cheapest Athlon 64.

That said, we wanted to give readers options in a DIY format, while still showing our enthusiast readers what happens when you try to push a budget machine to its limits. It's unfortunate that, in this case, the limits came pretty quickly.

In regard to the lack of a case, we're all about performance here at *Maximum PC*. At the time, I thought I'd be better off spending my case budget on a faster CPU, more RAM, and a nicer videocard. Unfortunately, in practice, my plan didn't work as well as I had hoped.



to maintain and not updated as much as they should, we wanted to roll features out when they were good and ready—and even better than their print counterparts.

I'd much rather take the time to make each new enhancement for the site perfect from launch, instead of rolling out a bunch of features that aren't fully baked. Now that the site's running strong, we're going to start regularly adding new features and enhancements. I'm not sure exactly when we'll relaunch the Best of the Best section, but you can rest assured that it's coming. If you have another feature you'd like to see added to Maximumpc.com, please send me an email at will@maximumpc.com.

A TWO-FER

Which is better, a 32- to 37-inch 1080p LCD TV with its limited 1920x1080 resolution on a bigger screen or a 30-inch monitor from, say, Dell, with its 2560x1600 resolution? What are the advantages and disadvantages of each? Should I wait until DisplayPort is available, and will it be used on TVs as well? Also, would anything else need to be HDCP-compliant other than the monitor and videocard to watch HD video on my new rig?

Also, when I built my last system, I said to myself that the next system I build will probably be a laptop, but the last I really heard anything about DIY kits was when Gordon wrote an article on them last year. Has this progressed at all or is it pretty much dead in the water?

—Joel Bates

SENIOR EDITORS KATHERINE STEVENSON AND GORDON MAH UNG RESPOND:

Regarding the display, you will obviously get more desktop space with the 30-inch panel's higher resolution, although the items on your desktop will be relatively small—some people complain of eyestrain with these LCDs. Also note that the current crop of 30-inch panels offers only Dual-Link DVI inputs, whereas a TV will be more versatile, should you want to connect a cable box, DVD player, or console. Furthermore, today's 30-inch screens are restricted to single-link HDCP, so protected content can play at only 1280x800 resolution—which defeats the purpose of the high native

res, at least for commercial movie viewing. DisplayPort should change that, and we know for a fact that Samsung's next 30-inch LCD will use that interface, and we assume other vendors will follow suit. (It's unlikely TVs will feature DisplayPort, as the HDMI interface prevalent in consumer electronics products serves the same purpose.) And, yes, an HDCP-supported monitor, videocard, and optical drive will gain you access to HDCP-encumbered content.

As for the laptop, DIY models aren't dead yet, but the concept is certainly taking on water and may sink. The problem appears to be the reluctance of retailers and vendors to eat the warranty cost of a notebook that's accidentally destroyed in the building process. Inevitably, clumsy consumers will just return the whole package claiming that it's dead. That leaves either the retailer or the manufacturer eating the cost of a notebook, which is quite a bit more than the cost of single components. That doesn't mean you can't do it, however. If you hunt around, you can find stores that will sell white-box notebooks that you can add your own parts to.

TAKING STOCK

Referencing the cooler reviews by David Murphy on page 78 of the September issue, can you please let me know which stock cooler is used for comparison and whether it's of good quality. I need one.

—Larry

ASSOCIATE EDITOR DAVID MURPHY

RESPONDS: The stock cooler we use is just that—the default cooler that comes with the processor when you buy it in retail packaging. In our case, it's a boring ol' heatsink and fan for an AMD Athlon FX-60 processor. This allows us to show the relative value of an aftermarket product. If a cooler we review performs better than the stock cooler, you know it's worth considering. If it performs worse, what's the point of paying the extra money? Unless, of course, the cooler solves a problem other than temps—such as minimizing fan noise. [MPC](#)

COMING NEXT MONTH

IN MAXIMUMPC'S

FIGGY-PUDDING-FREE

HOLIDAY ISSUE



2008 PURE POWER PREVIEW!

We turn our eye toward the coming year and predict which technologies and hardware will be populating the dreams of power users.

DV CAM ROUNDUP!

Six leading high-def digital-video cameras—reviewed and rated. Learn which ones are worth owning and why.

MAXIMUM PC GIFT GUIDE

Before you compile your holiday wish list, you'll want to see all the gear, gadgets, and goodies that we've deemed geek-worthy this season.



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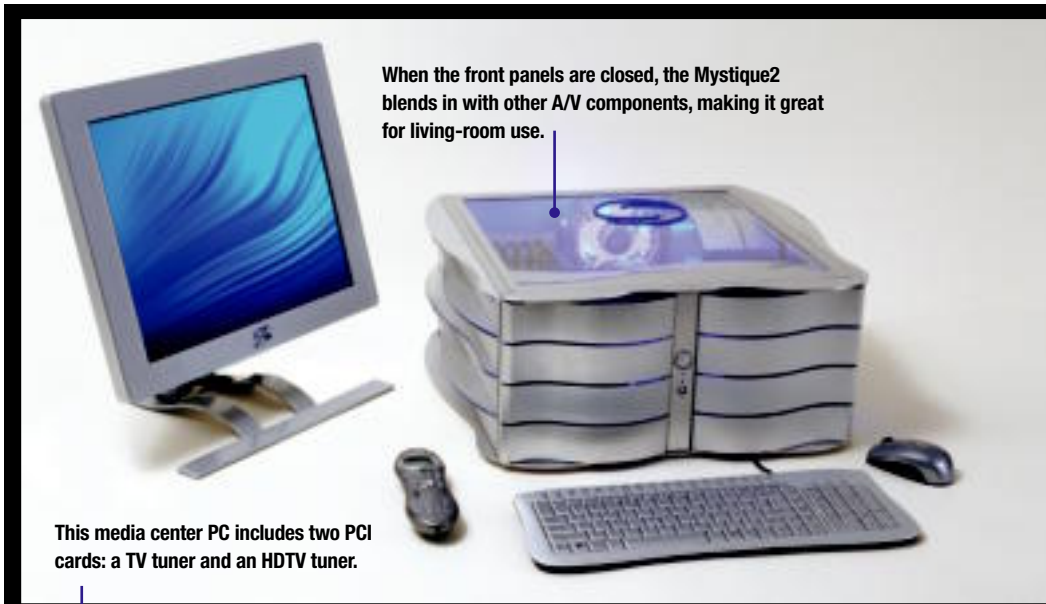
BRIAN CARTER'S
Mystique2

When Brian Carter heard that Cooler Master was sponsoring a case-mod contest, he got to thinking about just what it might take to win. Soon enough, an idea came to him: If one case is good, combining two Mystique 631s could only be better.

Brian blended the two cases and carried out the trademark CM wave motif both inside and out to create this sweet-looking media center PC. To keep everything inside looking pretty, he ran the power cables through a piece of 2¼" chrome pipe, which he routed behind the drive cage and underneath the motherboard tray.

The project took two months to complete; Brian submitted his rig on the day before the contest deadline—and won.

The Mystique2 boasts a load of media options, including an iDuo 10-in-1 card reader/iPod doc and two Pioneer slot-loading DVD drives.

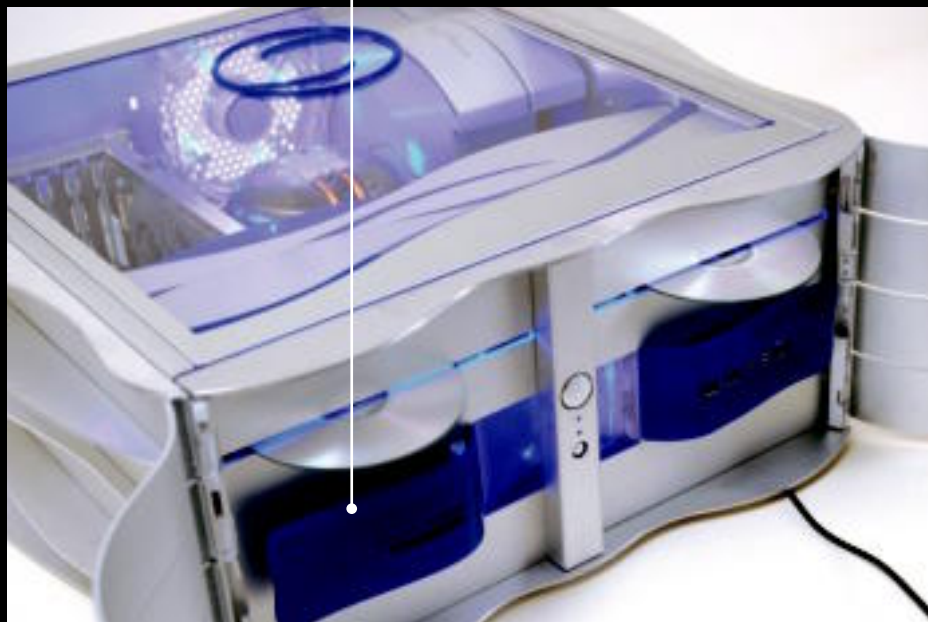


When the front panels are closed, the Mystique2 blends in with other A/V components, making it great for living-room use.

This media center PC includes two PCI cards: a TV tuner and an HDTV tuner.



A Mars CPU cooler ensures silent running; Brian hand-cut Cooler Master's logo from an existing aluminum panel and added it to the fan grill.



For his winning entry, Brian wins a \$500 gift certificate for Buy.com to fund his modding madness! See all the hardware deals at www.buy.com, and turn to page 116 for contest rules.

If you have a contender for Rig of the Month, e-mail rig@maximumpc.com with high-res digital pics and a 300-word write-up.

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