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AUGUST

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Why Is the Competition So Scared?

I'm clearly biased, but I can't stand our competition. It's not solely because they're the enemy—I embrace the battle for readers as a driving factor that should result in editorial excellence. Theoretically, at least. No, the competition (which will remain nameless) drives me crazy because they consistently cast PCs as something to be scared of and fearful around. It's not like you're going to conjure up the demon Abaddon the next time you crack open your system and upgrade your CPU.

I visited my local newsstand this past weekend—always an interesting expedition if you're into magazines—and I found myself staring at several PC tech cover stories promoting, and by extension capitalizing on, fear. Conquer the anxiety of losing your identity. Master the fear of a virus invasion. Sidestep the almost certain disaster of a Windows meltdown. Trepidation. Anxiety. Anguish.

Leveraging fear is always a craven way to drive sales. Unfortunately, based on the frequency with which I'm seeing these types of cover stories and cover lines, it appears to also be an effective strategy. Is this really the face of PC computing we want to cast forward? No wonder the mainstream expresses such hesitancy, disdain, and sheer ambivalence around PCs and PC technology. No wonder Apple has made a fortune off of what is ultimately a limited and confining product offering. And hey, what do you know? PC-oriented magazines are waging half of this battle for the Cupertino giant. Thanks, guys.

I'm hoping that you see *Maximum PC*'s philosophy as an intriguing and constructive counterpoint. Our logic is simple. First, yes there are a number of possibly bad things that can happen in our computing lives. Second, taking some simple precautions will stave off most of these disasters, or at least allow for an easy recovery. Third, can we get on with some cool PC projects, please?

We're going to spend a lot of time and energy over the next year reminding the world that PCs are capable of extraordinary tasks and diverse functionality. Our plan is to build an interesting and novel PC each issue. This month's cutting-edge home-theater cover story exemplifies our mindset. Next month, we'll be building our annual Dream Machine. And the month after that? We have some ideas, but we're open to more. Hit me up with your wildest PC-building fantasy at george@maximumpc.com. If we use it, I promise we'll give you credit.

One final note: Thanks for all your champion/nightmare upgrading stories. Just as we started closing out this issue, I began receiving the first wave of these tales. We clipped the best of these for you to read in this month's Comments section (page 94), but we'll publish a bigger list of winners (and losers) online at www.maximumpc.com/upgrade_contest.

George

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

THE NEWS

Google TV Brings the Web to Your Living Room

Get ready to change the way you watch TV —PAUL LILY

Google, the sultan of search, recently held its third annual web developer conference known as Google I/O, a two-day event aimed at informing everyone as to what Google's plans are for the upcoming year. This year's gathering was jam-packed with announcements, the biggest one being the impending launch of Google TV. That's right folks, the search giant wants to extend its presence beyond your browser and smartphone and become a permanent fixture in your living room.

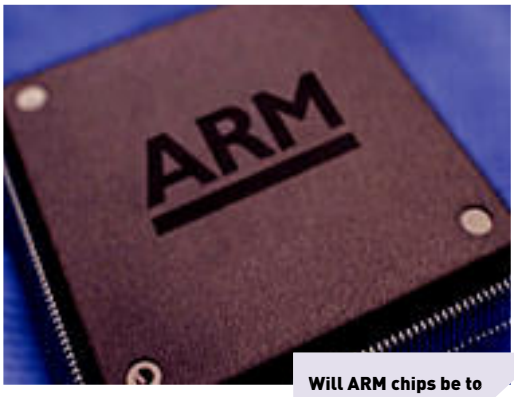
Getting down to the nitty-gritty, Google TV is an open-source software platform based on Android running Google Chrome with full Flash 10.1 support baked in. Through this new interface, the Google TV software will open up the web to users in their living rooms. Type the name of a show, for example, and Google TV will crawl through web portals like YouTube and Hulu, to name just two, as well as your cable channels. The software platform will also allow developers to create downloadable web applications, like games and social networking apps.

All this will require compatible hardware, and while Google is focusing its attention on the software side, the web titan did lay out some minimum hardware requirements, including an Atom (or better) processor, discrete GPU, IR connectivity, Wi-Fi and Ethernet, HDMI-out, and Bluetooth. Google doesn't plan on building these devices itself—at least not initially—and is instead working with Sony and Logitech to integrate Google TV into living room hardware, such as televisions, Blu-ray players, set-top boxes, and compatible remote controls. So what's at stake? Try $70 billion, which is the amount spent on television ads in the United States every year. It's a numbers game for Google, and there are 4 billion TV viewers around the globe compared to 1 billion PC users.

Google TV is only one of the initiatives that came out of Google I/O. Google also talked about taking the shackles off of web video with a royalty-free video format called WebM. The WebM codec is made up of three elements, including the open-source VP8 codec Google acquired from On2 Technologies in February, the open-source Vorbis audio codec, and a container format based on a subset of the Matroska media container. Google's vision is for WebM to become the standard codec for HTML5 video, which would eliminate H.264 patent-licensing concerns and allow compatible browsers to play back video without a plugin. Mozilla, Opera, and Chrome are all on board, and even Microsoft will support WebM in Internet Explorer 9, though you'll have to download and install the codec separately.

The other big announcement involves plans to create an app store for Google's Chrome browser and operating system. This is different from the Android Market in that Google wants software developers to build web apps instead of downloadable software, which will integrate tightly with upcoming netbooks and other devices running Chrome OS. The Chrome Web Store will launch sometime later this year and carry a variety of apps, both fee-based and free, and will even run in other browsers.

If all goes as planned, you'll start to see Google TV devices show up this fall, but it will be up to content developers to really drive the success of the platform. Without awesome apps, Google TV could end up nothing more than a glorified HTCP.



Will ARM chips be to tablets what Intel's Atom is to netbooks?

ARM Grabs at Tablets

Microprocessor maker ARM has no intention of letting Intel dominate the tablet PC sector the way it has netbooks, and according to Bob Morris, ARM's director of Mobile Computing, ARM processors will wiggle their way into 50 percent of global tablet PCs by 2011. That works out to a lot of tablets. By Morris's estimation, global tablet PC shipments will total 4 million units by the end of 2010, and then balloon to 21 million units in 2011. Morris also said that Dell, HP, Lenovo, and Sharp have already adopted ARM-based processors for their smartbooks and tablets. –PL

Return of the Hybrid Drive

Seagate Momentus XT weds capacity, speed boost

Hybrid hard drives—which meld the capacity of mechanical hard drives with the nigh-instant access of flash memory—have been MIA for years, and never really worked well to begin with. But in May, Seagate released the Momentus XT, a 2.5-inch hybrid hard drive. It combines a 500GB 7,200rpm laptop drive with a whopping 32MB of cache and 4GB of SLC NAND flash memory. An intelligent algorithm moves frequently accessed data to the flash memory, speeding up performance over time. The Momentus XT is no match for an SSD, of course, but the flash memory provides a performance boost over a standard mechanical drive. And at $150 for a 500GB hybrid drive, it's much more cost-effective than pure solid state storage. See our initial Lab results here: http://bit.ly/9ZLClP **–NE**

The Momentus XT: a hybrid laptop drive for the masses.

Anti-Facebook Gets Funded

These days, hardly a week goes by without some new revelation regarding Facebook's disregard for user privacy. Now four programming students from New York's Courant Institute of Mathematical Sciences are promising an alternative—a "privacy aware, personally controlled, do-it-all distributed open-source social network"—dubbed Diaspora. It's all still just a concept hinging on public funding, but the students' goal of receiving $10,000 by June 1 was exceeded many times over even weeks before that deadline, with pledges from 5,469 backers totaling $187,155 as of this writing.

Assuming the project moves forward as planned, Daniel Grippi, Maxwell Salzberg, Raphael Sofaer, and Ilya Zhitomirskiy will spend their summer building the distributed social network. Unlike Facebook, which requires that you put all your personal information, photos, videos, etc., in the hands of a large, faceless, corporate entity, Diaspora will be decentralized, where every user has ownership of his or her own personal server, or "seed." The seed will aggregate all of your information from the services you use. The information you share will be encrypted using Gnu Privacy Guard (GPG). To learn more and follow the progress of the project, go to http://bit.ly/dgpnNs. –KS

Apple's iPad Does Intel a Favor

Like a Hollywood starlet who spends years taking acting classes and waiting on tables before becoming an "overnight success," Apple's iPad has finally established the tablet computer as a successful product category. It's about time. Engineers at numerous companies have been working on these things since the 1970s, blowing millions of dollars on failed attempts to do what Apple has done.

Apple isn't the only beneficiary of the iPad stampede. I think Intel stands to gain, too—even though Apple snubbed Intel's x86 processors and built the iPad around a custom chip with an ARM processor. Ironically, the iPad will increase demand for Intel's newest low-power x86 chipsets.

Intel is trying to push x86 processors into cell phones, where ARM's lower-power processors reign supreme. Intel's latest attempt is an Atom-based chipset code-named Moorestown. It integrates most cell phone functions into three chips and slashes power consumption when compared with the Atom chips in netbooks. Intel hopes Moorestown will be an ARM-breaker for high-end smartphones, tablets, and other handheld devices.

Although Moorestown is definitely an improvement over first-generation Atom chipsets, it still isn't as well-integrated or as power-stingy as the best ARM-based chips. There's no compelling reason for handset designers to abandon all their ARM software and expertise. Intel's next generation, code-named Medfield, looks better. But it's more than a year away.

Nevertheless, Moorestown's shortcomings won't leave it on the bench. Because tablets are larger than phones, they have room for bigger batteries and better cooling. And because the tablet market is "new," there's more opportunity for challengers. Moorestown has a better chance of winning designs in tablets than in phones.

The highest hurdle for Moorestown is software. The iPad is compatible with the iPhone, which has zillions of apps. Most Windows desktop software doesn't work well on tablets, and Windows 7 is too big and power-hungry. Moorestown supports GNU/Linux-based operating systems like Android, Moblin, and Meego, which have relatively few apps. But Moorestown is a good start, and Medfield promises even more.

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

FCC Tries to Regain Authority

Says some regulation of Internet is necessary to ensure net neutrality

The FCC had barely unveiled its ambitious National Broadband Plan when a federal appeals court ruling in April essentially stripped the commission of the power to enact its goals. Now Commission Chairman Julius Genochowski is proposing a way to restore the FCC's authority.

FCC Chairman Julius Genochowski calls his proposed hybrid approach to Internet oversight a "third way."

Currently, broadband providers hold a Title I designation under the Communications Act, making them "information services," which are lightly regulated and free from access mandates. But according to a recent federal appeals court ruling, the FCC overstepped the bounds of that status when it sanctioned Comcast for throttling down the broadband speeds of heavy-use customers and those who used peer-to-peer services. In other words, the commission had no right to tell ISPs how to manage their networks.

In order to resolve this conflict, and thus allow the FCC to move forward with its goal of "extending broadband to all Americans, protecting consumers, ensuring fair competition, and preserving a free and open Internet," the commission is asking that ISPs be reclassified as Title II "telecommunications services," like the landline phone companies.

Consumer groups and website owners are all for the proposal, which would give the FCC regulatory authority to enforce net neutrality and prevent ISPs from blocking access to sites that use more bandwidth, charging content providers extra for delivering content faster, or favoring their own affiliated media companies. Opponents, the ISPs among them, warn of government control of the Internet and burdensome taxes that could inhibit infrastructure build-out and innovation.

Genochowski assures critics that what the FCC is proposing is a "third way"—a middle-ground between strict Title I and Title II status, whereby the commission would regulate Internet access but not content, and would implement "meaningful boundaries to guard against regulatory overreach." The FCC points out that its regulation of the ISPs would not be unlike the regulatory authority it presently has over wireless networks, which have continued to invest and innovate. **—KS**

RUN UP YOUR BATTERY

Physical motion may soon recharge your devices

Perhaps in the not too distant future, you'll be able to coax a few more minutes of talk time from your smartphone by jogging around the block. That's because researchers at the University of Georgia Institute of Technology have developed tiny nanowires constructed of zinc oxide that can generate an electric field through force or motion, converting mechanical energy into electrical energy.

"Any physical action that bends the substrate creates energy," said Zhong Lin Wang, professor and director of the university's Center for Nanostructure Characterization. Wang went on to explain that the electricity output depends on the number of nanowires and the strength of the materials.

There haven't been any field tests yet, but within two to three years, the researchers think they'll have substrates small and stable enough to integrate into low-power devices like Bluetooth transmitters. And what about those smartphones and other similar-size portable devices? We're looking at five years down the road, Wang said. **—PL**

GAME THEORY

Keeping Zynga Down on the Farm

Some facts are incontrovertible: Puppies are cute, apple pie is tasty, and Farmville is a soul-sucking experience designed for maximum irritation of the highest number of people, even when those people *are not playing the game*. If you use Facebook, you have to make an effort to avoid Farmville. It's like crabgrass: Kill it in one place and it pops up in another. Turn off the Farmville news feed and people send you invites and requests. Repeatedly refuse or ignore these overtures and people still post status updates reporting on their barn-raising or cow-tipping or sheep-shagging or whatever other unholy things they do in that sunken cesspool of dark and vitreous evil.

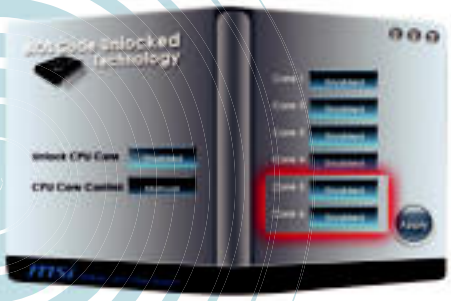
Now you're not even safe when you go to buy a Slurpee. In an absolutely terrifying turn of events, Farmville publisher Zynga is looking to *extend the brand*. First stop? 7-11, which is getting Farmville-branded ice cream and drink cups at all 7,000 of its stores throughout the busy summer months.

People, this is terrifying news. This prime branding spot is usually reserved for tent-pole Hollywood products like *Spider-Man* or *Avatar*. It tells us that Farmville is doing so well that Zynga is planning to spray its spoor all over the marketplace, with the real possibility of clothing, toys, cereal, and animated shows to follow.

Zynga is not a company you want to see with a lot of money and power. Its two biggest hits, Farmville and Mafia Wars, are rip-offs, and the company's involvement in dodgy credit-card and advertising schemes has already generated one class-action lawsuit. Its "games" are designed for advertisers, not for players. In their need for continual "servicing," these titles require users to check in throughout the day, thus creating more eyeballs for advertising and sales of premium content.

Thus far, Zynga has remained isolated and fairly harmless in the idiot-occupied world of social gaming, but it appears poised to burst into GenPop like some invidious virus, and then all the "ignore" buttons in the world won't make it go away.

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



New utility lets you avoid scary BIOS-level tweaks to unlock cores from within Windows.

MSI Unlocks Hexa-Cores?

MSI's imaginatively named Unlock CPU Core utility promises to unlock AMD CPUs with hidden cores—if such CPUs actually exist.

In a simple six-step process from within the safety of Windows, the utility can ostensibly unlock six-core chips being sold by AMD as quad-cores. Unfortunately, AMD says it has no plans to offer such chips. AMD has previously created tri-core chips by turning off one core of a quad-core, and the utility would also work for those, but dreams of a bonus six-core CPU are reportedly pure fancy. The utility is limited to MSI's new boards using the 8-series chipset. —GU

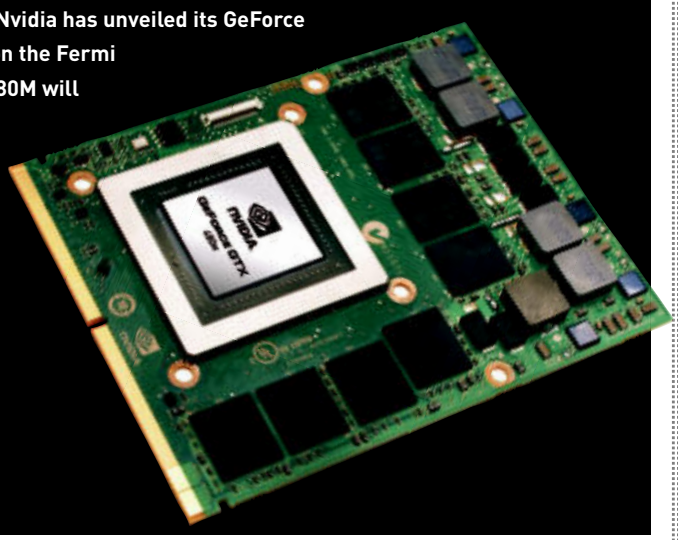
Intel Announces New ULV Procs

Intel has expanded its Core processor line into the ultra-low-voltage category. The new 32nm dual-core chips will accommodate thinner and lighter ultraportable notebooks while reportedly improving battery life and performance. At the top end is the 1.3GHz Core i7-660UM, which can reach 2.4GHz with Turbo Boost. That's followed by the Core i5-540UM and i5-430UM, both clocked at 1.20GHz, with Turbo potential of 2GHz and 1.73GHz, respectively. The 1.2GHz Core i3-330UM lacks Turbo Boost, but like all the others, features HD Graphics, HyperThreading, DDR3, and Virtualization Technology. —KS

MOBILE GRAPHICS

Nvidia Releases the GeForce GTX 480M

AMD is no longer the sole purveyor of mobile DirectX 11 graphics now that Nvidia has unveiled its GeForce GTX 480M. Based on the Fermi architecture, the 480M will compete with AMD's Mobility Radeon HD 5000–series parts for a place in gaming notebooks. —KS



BYTE RIGHTS

The Internet Unfriends Privacy

As a seasoned commenter on the intersection of technology and policy, I knew I wasn't going to be able to avoid talking about Facebook forever. Oh, I tried begging off at conferences, "accidentally" dropping tureens of soup in the laps of people that asked me about it at dinner parties, etc. I've never had a Facebook account, but that's not why. It's because this problem is bigger, older, and harder than it looks.

I don't really need Facebook to understand the Facebook problem, and not just because of my halcyon days on SixDegrees.org. Privacy problems arose online long before social networking sites, Facebook just gave them a brand. From the beginning, the Internet's architecture has been as unfriendly to privacy as it is to copyright.

Think of expression as coming in three varieties: public, private, and secret. We don't mind public data being available, and we encrypt online secrets. Being public or secret are both matters of technical implementation, but private speech has always been a function of social norms around ephemerality and intimacy. And d00ds, teh Intarwebs suxxors in these kind of subtle social situations. It's the same way the net messes up copy protection—default network behavior is to save everything and transmit on request.

Facebook is not just a victim of its own success. Its grown to embrace a politics of radical transparency, but hid it behind a bad user interface. Its users revolted, and Facebook had to take a step back and start working on making its privacy interface better, but it hasn't backed down from the ideology of extreme sharing.

This problem is going to keep coming up. We've known since the days of grooming each other on the African Savannah that sharing your private thoughts with a blabbing jerk can hurt your reputation in the community. But there's never been a blabbing jerk quite as big as the Internet before. For all the legal or technical remedies people propose, it might be easier to evolve new social norms than fix the net. And that's nearly impossible.

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

THE LIST

Top 10 Breakthroughs in Mobile Phone History

10 Motorola Razr, 2004

With its super-slim design, slick lines, and customizable color schemes, this hot lil' number eventually moved more than 110 million units as well as spawned countless variants. It was often referred to as the "iPod of mobile phones" for the way it took over the mobile landscape.

9 SHARP J-SH04, 2000

Sharp Communications partnered with mobile phone operator J-Phone to bring to market the first ever camera phone. With patents dating back to 1956, the 110,000-pixel CMOS in the J-SH04 made any moment instantly capturable.

8 Bluetooth Technology, 1994

Invented by Swedes Sven Mattisson and Jaap Haartsen while working for Ericsson, and officially introduction in 1998, Bluetooth allowed mobile users to exchange information wirelessly.

7 THE 1G NETWORK, 1979

The first commercially automated cellular network was launched in Japan by NTT. Initially covering the full metro-Tokyo area (20 millions users, 23 base stations), it expanded to cover the entire population of Japan within five years. The network used FDMA to transfer data between cells.

6 Motorola DynaTAC 8000X, 1983

The first 8000X cost $3,995 ($8,600 in 2009 dollars), featured a red LED display, and weighed nearly two pounds. Inventor Martin Cooper said of the DynaTAC, "The battery lifetime was 20 minutes, but that wasn't really a big problem because you couldn't hold the phone up for that long." The phone was used by Ameritech for the U.S. 1G launch.

5 Motorola DynaTAC 8000X Prototype, 1973

Reportedly inspired by watching Captain Kirk use his communicator on Star Trek, Martin Cooper invented the first mobile phone for non-vehicle use while working at Motorola, and then used it to call rival developer Dr. Joel S. Engel at Bell Labs. Cooper's mobile prototype went on to become the Motorola DynaTAC 8000X, the first commercially available mobile phone.

4 NTT DoCoMo i-mode, 1999

Japan's predominant mobile phone operator became the first to offer full Internet service on mobile phones in 1999. The company's i-mode service, consisting of mobile Internet (vs. wireless Internet), provided a plethora of features such as web access, email, and a packet-switched network to deliver data.

3 SHORT MESSAGE SERVICE (SMS), 1992

The first SMS message was sent in the UK to Vodafone Director Richard Jarvis (it said: Happy Christmas), marking a new way to communicate as well as a new way to utilize mobile handsets. With this new functionality, a new and annoying shorthand language emerged as users found texting an increasingly easy way to touch base.

2 APPLE IPHONE, 2007

We know, we know. But it's got to be mentioned. The iPhone's innovation and design revolutionized the mobile landscape and moved the power out of the hands of service carriers and into those of the handset manufacturers. Rumored to have cost Apple $150 million to build, this handset had folks lining up around the block (literally) to get one and quickly found its way into the hands of millions.

1 iTunes App Store, 2008

Talk about your game changers. After all, what is the iPhone without the App Store? As of April 2010 there were roughly 185,000 third-party applications officially available in the App Store, with over 4 billion total downloads. Competitors were quickly forced to follow suit—Palm's App Catalog, Google's Android Market, BlackBerry App World, and the Windows Marketplace for Mobile all scrambled to fill in the gaps for their customers. Ultimately, Apple succeeded in recasting the handset—and extending the price-point beyond the point of purchase.

For our complete list of mobile breakthroughs, go to http://bit.ly/9mCupx.

This month the Doctor tackles...

- Restoring from Image
- ATX12V
- Room-to-Room Streaming

Reinstall from Image to Defeat Malware?

I have a system with anti-virus and anti-spyware software installed. I also made a backup image with Acronis True Image some time ago. Now, somehow it got a bad malware infection that nothing can remove completely. The usual method is to reformat and reinstall Windows, but what if I use a clean image from Acronis to restore my system? Can that be done? Will it get rid of all the malware, or will some be left behind?

—Ted Bunny

Ted, provided the image you made with Acronis was taken before your computer got infected, and the image itself isn't infected, restoring your system from a drive image should be just as effective as reformatting and reinstalling Windows from scratch. We'd still suggest reformatting before you use Acronis, just to be safe.

Which Power Connector?

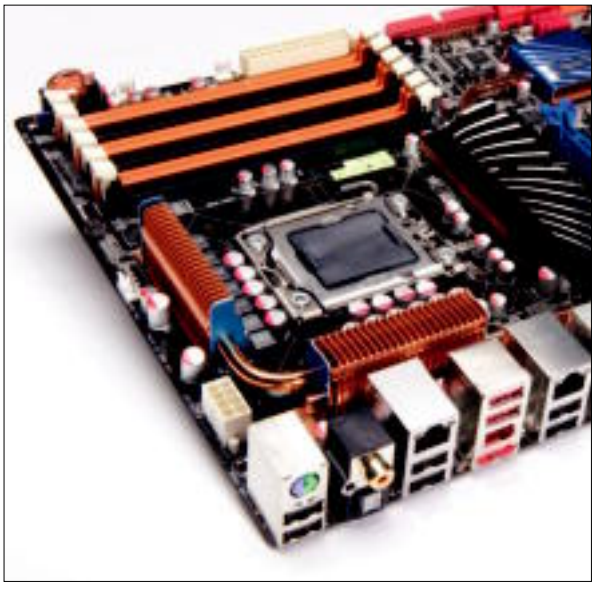
I have what I thought was a simple question, but I can't seem to find a definitive answer. I have an Asus P6T Deluxe motherboard and a Core i7-930 CPU. Should I use my PSU's 8-pin or 4-pin connector for the CPU?

—Craig

Craig, in general you should use whichever 12V power connector from your PSU that corresponds with the pinout on your motherboard. In your P6T Deluxe, for example, use the 8-pin 12V plug.

The original, 4-pin ATX12V power connector was added to the PSU spec to handle the increased power requirements of the Pentium 4 (thus, many still call these the P4 connectors). An 8-pin 12V version (known as the Processor Power Connector or the EPS12V connector) was adopted from the Server System Infrastructure spec. The added power was for high-wattage processors in use in workstations and servers. For desktop PCs, these were added to enhance overclocking.

Many enthusiast motherboards now ship with 8-pin EPS12V connectors, but with half of the slot covered up. This lets you connect a standard ATX12V connector to the board for CPU power. Which is better? Frankly, the vast majority of consumers will be fine running the 4-pin ATX12V connectors because today's CPUs are far more power-efficient than those Pentium 4s of yesterday. For power users who are overclocking or running very high-wattage CPUs, though, the EPS12V connector is preferred.



Not sure whether to use the 4-pin or 8-pin 12-volt connector from your PSU? You should probably use the one that matches your motherboard's pinout.

Streaming Internet Radio Room-to-Room

My PC is in my home office and my home theater system is in my living room about 30 feet away. I like to listen to jazz but my local jazz radio station changed format so I started listening to jazz streamed over the Internet on my PC. I would like to stream this music to my home theater system. I already have a CAT-6 cable strung from my router to the DVR in my living room for on-demand TV. I've tried to sort through all the streaming devices available but have only managed to be confused and overwhelmed by the features and specifications. I wouldn't mind streaming video too, but that is not my priority. A unit that will play Blu-ray discs is an acceptable option as all I have on my home theater system is CD/DVD, but, again, that is not a priority. Can you suggest some viable options for me? Thanks a heap!

—David Winokur

David, if you're looking to stream Internet radio to a single room, plenty of devices fit the bill. One of our new favorites is Logitech's Squeezebox Touch ($300, reviewed on page 79). This box can easily operate on your existing Wi-Fi network (music streaming doesn't consume much bandwidth), or you can make a hard-wired connection by disconnecting the CAT-6 cable from your DVR, plugging that cable into a desktop switch (e.g., D-Link's DGS-2205), and then

plugging both the Squeezebox and the DVR into the switch. The Squeezebox Touch has optical and coaxial digital outputs, if you want to take advantage of the DAC in your home-theater system, or you can use the onboard DAC and pipe analog stereo to your system.

If you're looking for a multiroom music solution, it's hard to beat the Sonos Digital Music System. The Squeezebox can do multiroom, too, but Sonos does the best job of synchronizing playback in multiple rooms to eliminate audio delays.

What Happened to AutoRun?

I am using Windows 7 Home Premium and I have found that there is no longer an AutoRun option that permits the automatic start-up of USB flash drives that contain software. I am particularly referring to flash drives that contain portable operating systems such as Portable Apps or SanDisk U3 Launchpad. The user is now presented with a prompt that permits viewing the files and double-clicking the application to be executed.

Is there a registry hack that I can use to restore the AutoRun feature for USB flash drives that contain applications?

—Bob Blum

Bob, Microsoft disabled AutoRun (as opposed to AutoPlay, which still works) on non-optical removable media for Windows 7 for security reasons. According to Microsoft's Security Research & Defense blog (http://bit.ly/uEkex), the incidence rate of Conficker and other malware that spreads via AutoRun has been increasing rapidly, so as a security precaution AutoRun is only enabled on optical removable media. We've seen various registry hacks touted as being able to re-enable AutoRun, but none seem to work very well. And we tend to agree with Microsoft on this one. We've had friends and relatives with computers brought low by autorunning malware spread via USB. In fact, some *Maximum PC* editors disable AutoPlay (and not just AutoRun) on every machine they use. This can cause trouble with some CD- and DVD-burning software, though, so do it at your own risk.

IF YOU'RE LOOKING FOR A MULTIROOM MUSIC SOLUTION, IT'S HARD TO BEAT THE SONOS DIGITAL MUSIC SYSTEM

Next-Gen Wireless Worse than Last-Gen?

I have a Netgear WNDR3300 dual-band router that broadcasts both 802.11g and 802.11n signals. Today, I noticed that in certain areas of my house, the 802.11g signal is actually stronger than my 802.11n signal, by a lot! Shouldn't this be the other way around? Currently, the router sits atop a bookcase in my basement as I don't have anywhere to put it upstairs. The signal comes from a cable modem and is attached to a Windows 7 Pro 64-bit computer. What gives?

—Brian L.

Brian, the WNDR3300 is equipped with two radios and is capable of operating 802.11n networks on either the 2.4GHz frequency band or the 5GHz frequency band. An 802.11g network can operate only on the 2.4GHz frequency band.

You didn't say which radio is running your 802.11n network, but 5GHz radio waves have a much more difficult time penetrating obstacles such as walls and ceilings than 2.4GHz waves do. If you *are* using the 5GHz radio for 802.11n, that could explain why your 802.11g network delivers better range than your 802.11n network.

The difference between 802.11g and 802.11n devices is that the latter utilizes MIMO technology (multiple input/multiple output). MIMO turns a weakness—multi-path distortion, or the propensity of radio waves to reflect off objects in the environment—into an advantage. In theory, this *should* enable the 802.11n side of your Wi-Fi router to deliver better range than its 802.11g side.

Migrating to Home Server

I've been considering building a Windows Home Server. My problem is that I have three 1.5TB hard drives with media on them.

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

Can I move these drives to a Windows Home Server machine without formatting them? They are currently formatted in NTFS on a Win 7 machine. I have everything for the home server except the case and power supply. I also have a 40GB hard drive that I had planned to install the Home Server software on. I don't have the money to buy new drives to transfer the media from the other drives. Also, will I be able to stream .vob and Blu-ray files to Media Center on my other machines?

—Michael Engles

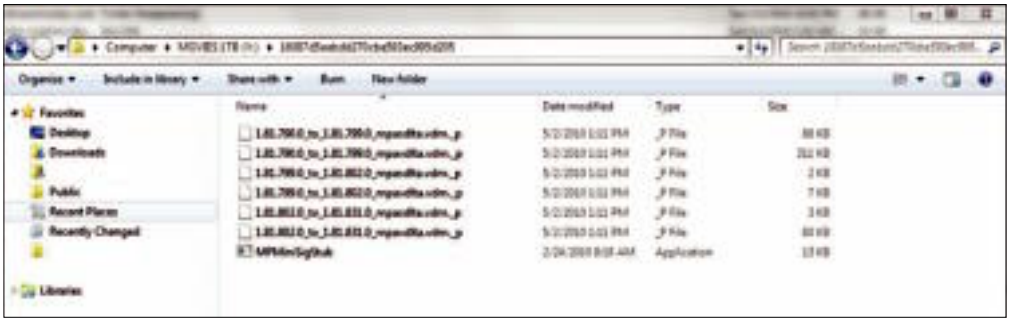
First things first, Michael: Windows Home Server reads NTFS-formatted drives just fine; it's Windows' default file system. You should be able to move them over without any problems, provided they're not in a RAID config.

Although Windows Media Center doesn't stream ripped .vob and Blu-ray files by default, you can stream them across your network, with a few caveats. First, you really need a wired connection between your server and the PC you're watching the file on, especially for high-def streaming content. One of our editors prefers to keep .iso images of his DVDs and Blu-rays on his home server, which he then mounts on his other PCs and plays with PowerDVD Ultra. This technically involves breaking the law, as bypassing the copy protection on DVDs and Blu-ray discs is against the DMCA, but we think making a backup copy of a disc you legally own and streaming it within your own home falls well within the bounds of fair use. If you prefer to rip your movies to .mkv files, Hack Media Center has a guide to streaming those to other Media Center devices, like an Xbox 360, at http://bit.ly/bIHYpc.

Mysterious Random Folders

I have four hard drives I use for storage. One of my drives is a 1TB WD Caviar Green. A folder named "35c7b77f9e7bab635e2efb4b74b9" keeps appearing, with a file "MPMiniSigStub.exe" and a bunch of files with names like "1.81.790.0_to_1.81.799.0_mpasdlta.vdm._p." When I delete the folder a new one with a similar randomly generated name appears in its place, with similar files in it. I scanned with Malwarebytes' Anti-Malware, Norton 360 4.0, and Microsoft Security Essentials; none of them detected anything bad. I have also "hidden" the folder, but it reverts back to non-hidden status.

—Kevin Young



Mysterious folder full of mysterious files? Scans turn up nothing? Try Googling the file names; it may yield answers!

Kevin, your mysterious folder is a temp folder created by Microsoft, and the files all deal with updates to Microsoft Security Essentials. MPMiniSigStub.exe contains anti-malware signatures, and the files with mpasdlta.vdm in their names are Microsoft virus definition for Security Essentials. The reason they're showing up on that drive, according to a Microsoft Answers forum post (http://bit.ly/9OETMe), is that the Windows update process (which MSE also uses) stores its temp files in whichever volume has the most free space.

Incidentally, if you're running both Norton 360 and Microsoft Security Essentials, you should remove one. Running multiple security suites actually decreases your security, as they could conflict with each other.

Disappearing RAM

I have two 1GB DIMMs of DDR/400 installed on an Intel D875PBZ mobo. The board has four slots, and I have the DIMMs arranged in dual-channel mode. I have double-checked it and I have one DIMM in channel A, slot 0 and one DIMM in channel B, slot 0. About once a week, every few restarts, the machine reboots with the error saying that the RAM amounts have changed. When I check, it shows each DIMM as 512MB instead of 1GB. On occasion, it will show the correct amount, but it will be in single-channel mode only! Keep in mind, I swapped in these 1GB DIMMs recently from a pair of 512MB DIMMs. I tried updating the BIOS but have had no success at all.

—Jeff Copeland

Jeff, the Doctor believes that the RAM is not firmly seated in those slots or may have backed out of the slot over time or when the machine was bumped. The Doc has witnessed RAM that was not firmly seated playing havoc with a Core i7 machine. In that case, the PC had 6GB of DDR3/1333 installed, which showed up correctly in Windows and would even run, but would only operate in single-channel mode. The RAM was in the correct slots, but just not seated enough for the memory controller to run all three DIMMs in triple-channel mode. You likely have the same situation—a situation you probably could not reproduce if you tried. You should remove both DIMMs and inspect both slots for debris. If there is debris, use a can of compressed air to gently blow the dust or debris out. Then reinstall both DIMMs and make sure both are firmly seated and that the arms are locked in place.

A Sharper Image?

I've been contemplating purchasing a 120Hz monitor for some time. After reading the May 2010 review of the Acer GD235HZ, this now looks like more of a possibility. I currently have a GeForce 275 GTX, and my understanding is that in order to take advantage of the 120Hz, I need to connect to the monitor with dual-link DVI. However, will this 120Hz monitor do for games what 120Hz has done for movies and TVs? Does it deliver that same crisp image that makes it feel like you are right there with the cast? Also, would a streaming service, such as Slingbox, have that same feeling if I'm steaming at HD speeds (2Mb/s+)?

—John Paul Scarpatti

John, the primary reason to connect a 120Hz display to your Nvidia videocard is to take advantage of Nvidia's wireless stereoscopic video kit, 3D Vision. Many of the games that take advantage of Nvidia's 3D solution—including Metro 2033, Batman: Arkham Asylum, and Battlefield: Bad Company 2—look great in stereoscopic mode. Nvidia's solution (with a 120Hz monitor) should also work with Blu-ray 3D movies when they arrive at retail. It won't have a significant visual impact on Slingbox streams.

Home Theater... with a Vengeance

Cutting-edge? Try bleeding-edge. Our guide to home theater reveals what components you should buy and how you should set them up

BY THE MAXIMUM PC STAFF

Hey, we get it. We understand that the way you watch movies and TV is different than the way we do, and that this probably differs significantly from the way your neighbors enjoy their living room and/or den. But we also understand that some fairly basic carnal desires rule our decision-making. Humongous HD screens. 3D movies. High-fidelity lossless sound. More HD recording options. Playback anywhere in the house.

At its core, the home-theater dream can be distilled as follows: We want our movies to feel as cinematic as possible. And we want to be able to record and watch as many shows as possible on the biggest-possible TV screen.

When we set about constructing this year's home theater, we used the phrase "cutting-edge" as our guiding light. A funny thing happened on the way to cutting-edge, however. As we started identifying the components and parts and controllers and cards—many of which are being released just as you read these words—we began to realize that we were on the bleeding-edge. We'll take that. In this story, you will find:

- What PC parts and components you should use in crafting the HTPC at the center of your home theater.
- How to capture and record four different HDTV streams at the same time using a single CableCARD device.
- What the best networking products and techniques are, as well as how they can best be used to serve TV, movies, and music within your home network.
- How to set up your system so that you can watch 3D programming and Blu-ray movies in the most cinematic style possible.
- How you can best use Windows' built-in Media Center package to access Netflix, Hulu, and your Blu-ray content.

We'll stop here, so that you can get into the heart of our 13-page guide. Enjoy the ride, and as always, we'd love to hear your thoughts, tips, and deepest home-theater desires at comments@maximumpc.com.


PIPER

Inside Maximum PC's 3D HTPC

A unique combination of parts provides an optimum entertainment experience

In building our 3D HTPC, our two primary motivations were minimal acoustic interference and full home-theater functionality. No one wants to hear the shrill whine of a fan when Michael tells Fredo, "You broke my heart." And if an HTPC machine can't play a 1080p trailer, stream HD video, and play Blu-ray 3D, it's a fail. This essentially eliminated all Atom-based configurations as well as anything using integrated graphics (at least right now). Our final 3D HTPC is slightly tall but not deep, and our InfiniTV CableCARD tuner snapped into it without any problems. Here's the full breakdown, compliments of our awesome photography department. (For a complete PC-building walkthrough, point your browser to http://bit.ly/dhTqH1.)

VIDEOCARD The GeForce GT 240 is one of only three GPUs that officially support Blu-ray 3D (the other two being the GTX 470 and GTX 480). The Zotac GT 240 has the distinction of also being fanless, which makes it perfect for our 3D HTPC. You should note that we are running the Zotac card in an x8 PCI-E 2.0 slot, as the passive heatsinks for the CPU and GPU could not coexist. We first considered Dremelling off a chunk of the Zotac but settled on running it in the second slot. Because x8 PCI-E 2.0 is the equivalent of x16 PCI-E 1.0, and because we are unlikely to ever run out of bandwidth, the second slot made more sense.

HARD DRIVE It's quiet, cool, and uses less power than higher-rpm drives, so it's no surprise we tapped a Western Digital 2TB Caviar Green drive to provide storage

POWER SUPPLY While there are external power-brick PSU options that are totally silent, they are limited to 200W, so we opted for a standard ATX PSU. Fortunately, fan noise is not an issue with Silverstone's NightJar ST40, which is fanless. This doesn't mean cooling isn't required, however. For that, we rely on the Grandia GD05's three 12cm fans to keep the PSU cool. Capable of producing 400 watts, the NightJar is pricey but it makes our 3D HTPC ultra-quiet. And believe it or not, it's rated by Silverstone to run a GeForce GTX 470, to boot.

MOTHERBOARD / RAM We considered Mini-ITX and other proprietary mini mobos but ultimately settled on MicroATX for our HTPC build. This gives us a wealth of options for add-in cards and we don't have to sacrifice any features. MSI's 890-GX offers support for 140-watt chips (including hexa-cores), USB 3.0, and SATA 6. It also features two physical x16 PCI-E 2.0 slots and a single x1 PCI-E 1.0 along with a legacy PCI slot. For RAM, we decided that 4GB of OCZ DDR3/1333 would be more than enough.

OPERATING SYSTEM We chose 64-bit Windows 7 Ultimate Edition as our OS, but you'd also be fine with Windows 7 Professional. One of the most surprising aspects of this iteration of Windows is the stability and feature-richness of Windows Media Center. (A power-user's guide to Media Center is on page 38.)

CHASSIS Silverstone's Grandia GD0 features three nearly silent 12cm fans and can accommodat an 11-inch Radeon HD 5970.

THE HTPC PARTS LIST

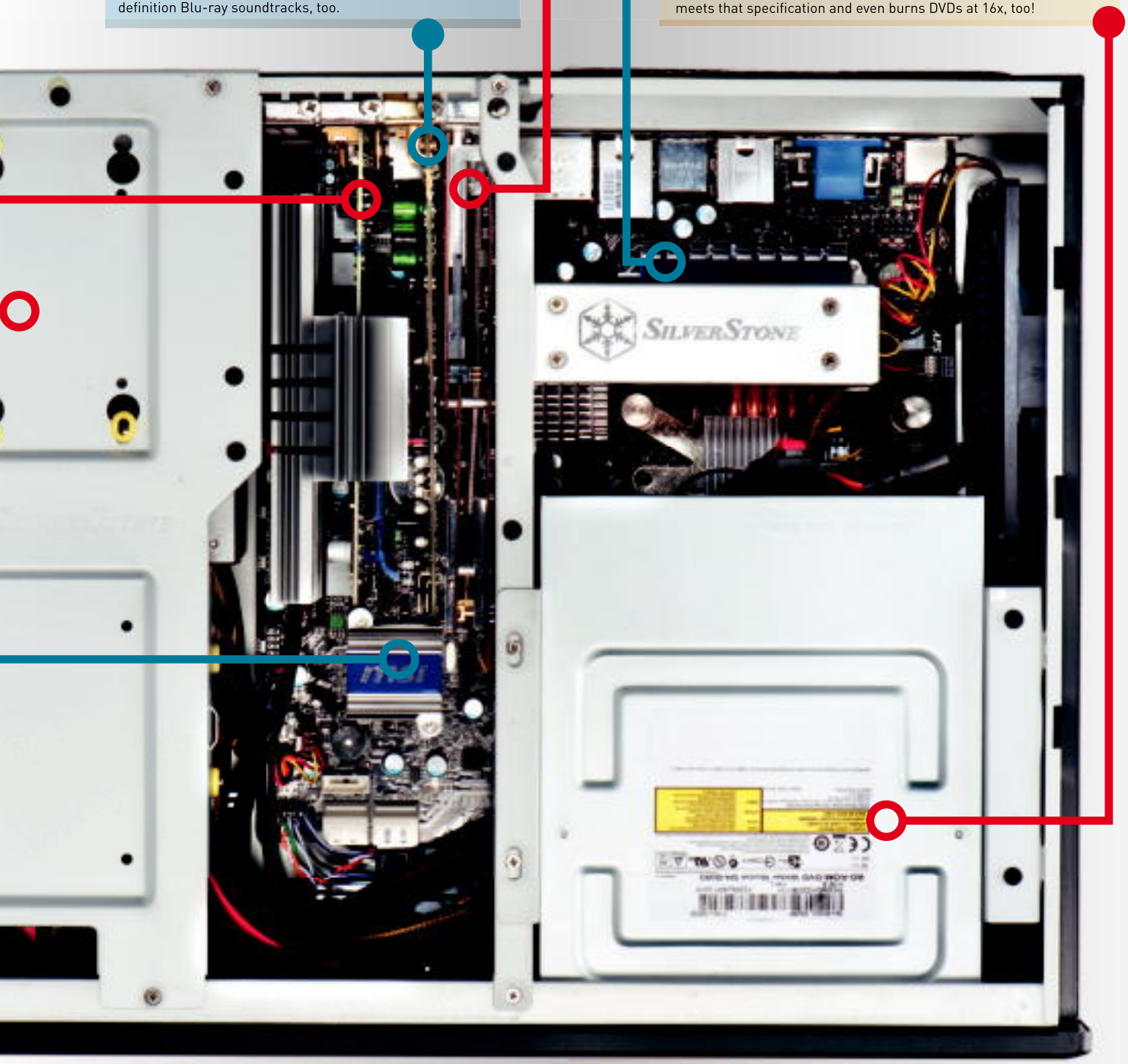
CATEGORY	NAME	PRICE	URL
CPU	Athlon II X4 640e	$143	www.amd.com
CPU Cooler	Silverstone NT01-E	$50	www.silverstonetek.com
Motherboard	MSI 890-GX	$130	www.msicomputer.com
RAM	4GB OCZ DDR3/1333	$100	www.ocz.com
Videocard	Zotac GeForce GT 240	$95	www.zotac.com
Soundcard	AuzenTech X-Fi Home Theater	$250	www.auzentech.com
Digital TV Tuner	Ceton InfinitiTV 4	$399	www.cetoncorp.com
Hard Drive	Western Digital 2TB Caviar Green	$155	www.westerndigital.com
Optical Drive	Samsung SH-B083	$100	www.samsung.com
PSU	Silverstone NightJar ST40F	$200	www.silverstonetek.com
Case	Silverstone Grandia GD05	$90	www.silverstonetek.com
OS	Windows 7 Ultimate	$175	www.microsoft.com
TOTAL		$1,887	

TV TUNER We've always been slightly skeptical of CableCARD products, and the initial "CableWHAT?" response we got from Comcast support did nothing to alleviate this. However, once we got our hands on a Comcast multi-stream CableCARD (achieved by simply walking into the Comcast store) and plugged it into Ceton's brand-new InfiniTV 4 Digital Cable Tuner, we became believers. Being able to record four different channels at the same time epitomizes the notion of a power-user's HTPC.

CPU AND COOLER We've found that sub-2GHz procs don't have the spunk to run compute-intensive chores by themselves, such as scaling video. Even though we have a discrete GPU here, we wanted to make sure we avoided the dropped frame rates a sub-par CPU can cause. With its 2.4GHz clock speed and four cores, AMD's Athlon II X4 640e seems to be made for HTPC use. Even better, this processor is rated at 45 watts, which makes it practically ice cold when running. We paired it with a Silverstone NT01-E cooler, which can run in passive mode with up to 65-watt procs. Since our Athlon II is 45 watts, we have plenty of thermal headroom.

SOUNDCARD AuzenTech's X-Fi Home Theater delivers not only best-in-class audio for our home-theater rig, but high-definition Blu-ray soundtracks, too.

OPTICAL DRIVE To play Blu-ray 3D, you need a drive with a minimum read speed of 2x. Our Samsung SH-B083 combo drive meets that specification and even burns DVDs at 16x, too!



NETWORKING YOUR HOME THEATER

There's more than one way to skin a CAT

In a perfect world, we'd all have a home run in a structured wiring cabinet with CAT6 cable running to every room in the house. Given the bandwidth demands associated with streaming Blu-ray 3D video with an HD-audio soundtrack from a media server, gigabit Ethernet is definitely the best way to go. Fortunately, it's not the only way to go; goodness knows none of us lives in a perfect world, so we'll discuss both best practices and practical alternatives.

Ideally, you'll have an 802.11n router with a gigabit switch, and a DSL or cable modem in a home run—a central location where all your cables (Ethernet, coax, and telephone) terminate. That's difficult to pull off in a home that's already built, but you really should consider at least stringing Ethernet cable from your router to your home-theater PC. We recommend CAT5e cable: It's perfectly adequate for a gigabit Ethernet network, it's a whole lot cheaper than CAT6, and your home will likely never need a 10Gb Ethernet network, anyway.

WIRED ALTERNATIVES

You might still be able to operate a wired network even if you live in an apartment or condo, can't access your attic or crawlspace, or a new cable run is otherwise out of the question.

KEY TIPS

- Wired gigabit Ethernet is the best solution
- CAT5e Ethernet cable is more than adequate
- HomePlug and MoCA are good no-new-wires solutions
- 60GHz streamers are best for wireless Blu-ray video/audio

Power-line network adapters send data over your home's existing electrical grid: Plug one adapter in an AC outlet near your source (e.g., your router), plug a second adapter into an AC outlet near your HTPC, and data travels over the electrical wires. If you go this route, make sure you buy devices that comply with the HomePlug AV standard, since it delivers theoretical data rates of up to 189Mb/s. HomePlug AV is also the basis of the still-evolving IEEE P1901 standard. Most companies building Wi-Fi routers also offer HomePlug AV products, including Belkin, D-Link, Linksys, Netgear, and Trendnet.

Power-line networking doesn't work in every situation. We've found that Z-Wave home-automation products, for instance, inject a lot of noise into the wiring, and this seriously degrades the ability of power-line networking products to achieve maximum data rates.

If power-line gear doesn't deliver a good experience, take a look at using your home's existing coaxial cable connections (the same cables you use with your roof-top antenna or your cable company's set-top box). The Multimedia over Coax Coalition (MoCA) has developed a specification for a home's coaxial cable as a networking alternative.

Since cable TV became commonplace in the late 1970s, most homes built since then include coax runs in the original construction. And unlike Ethernet cable, coax cable sheathing can withstand sun and weather and can be run outside the home (it's not pretty, but it works). MoCA adapters operate in a similar fashion to power-line adapters and offer similar data rates (up to 175Mb/s). Unfortunately, to date, far fewer manufacturers have jumped into the MoCA market. The list includes Actiontec, Linksys, and Netgear. In Lab tests, Netgear's MCAB1001 demonstrated solid performance results. (See our review at http://bit.ly/c6vJCa.)

We typically prefer to build our own rigs, but HP's MediaSmart Server EX495 is the best plug-and-play solution on the market.

WIRELESS ALTERNATIVES

Installing a wireless network is, of course, the least labor-intensive solution. A high-quality Wi-Fi 802.11n router will deliver more than enough bandwidth for HD video—provided there isn't too much distance or too many physical obstacles between the router and the client. Just don't expect to be able to stream Blu-ray 3D over a Wi-Fi network—those bit streams average about 40Mb/s. While the IEEE 802.11n standard specifies a theoretical maximum data-transfer rate of 300Mb/s, we've never seen an 802.11n router deliver more than 100Mb/s at a distance of 20 feet with a single wall between the router and the client.

If you want your Wi-Fi network to multitask by supporting web browsing and data clients as well as media-streaming clients, we suggest investing in a simultaneous dual-band 2.4/5GHz router. This will enable you to operate two discrete networks: one for data and one for media. Lastly, if you want to install a video projector across the room from your entertainment center, consider investing in a wireless HDMI system that operates on the 60GHz frequency band. The WiGig Alliance is developing a standard for this, but you can buy nonstandard devices from Best Buy and Gefen that will do the job today.

WHAT'S THE MINIMUM BANDWIDTH FOR STREAMING VIDEO?

MICHAEL BROWN
REVIEWS EDITOR

When it comes to your Internet connection, no one would dispute that faster is better. And with services such as Netflix streaming movies in 720p and YouTube offering 3D Video, speed is more important than ever. So what is the minimum-size broadband bandwidth you need?

You'll want broadband service of at least 1.5Mb/s to stream standard-definition video. Moving up to HD video streaming will entail a big jump in bandwidth consumption: For this you'll need an Internet connection between 3Mb/s and 4.5Mb/s to stream 720p video. You'll need upwards of 6Mb/s of bandwidth to stream 1080p video; even then, the client might need to buffer some of the video before initiating playback to avoid dropping frames.

Fiber-to-the-home services are the best—and most expensive—solutions. Verizon's FiOS delivers downstream speeds ranging from 15Mb/s to 50Mb/s, and upstream speeds ranging from 5Mb/s to 25Mb/s. Monthly FiOS service plans start at $50 and top out at $140. AT&T relies on fiber-to-the-node (the node being an equipment cabinet serving an entire neighborhood) for its U-Verse product. Individual homes are connected to the node via copper wire. Internet service is provided using VDSL (very-high-bit-rate digital subscriber line). AT&T offers tiered service plans ranging from 3Mb/s all the way to 24Mb/s and costing between $35 and $65 per month (the company doesn't publish upstream speeds).

Cable TV companies have taken advantage of the fat pipes they've attached to most city and suburban homes to get into the ISP business, and their offerings are compelling. Comcast's least expensive service, for instance, delivers downstream speeds as high as 15Mb/s and upstream speeds up to 3Mb/s for just $20 per month. Comcast's top-shelf service delivers downstream speeds up to 50Mb/s and upstream speeds up to 10Mb/s for $100 per month.

ROUTER AND STORAGE SOLUTIONS

How to make the most of your network

All 802.11n routers are the same, right? Guess again, Charley. We've tested a crapload of them lately—and found, well, a lot of crap. Our current favorite is Netgear's WNDR3700. This is a concurrent dual-band model, which means it can operate two discrete networks simultaneously, one on the 2.4GHz frequency band and a second on the 5GHz band. Attach a USB hard drive—we've tested it with drives as large as 500GB—and you can stream music and movies without having to deploy a NAS box or home server. Netgear discovered a firmware bug that caused periodic lockups when a USB storage device was attached, but the company told us it would have a fix available long before you read this.

For whatever reason, wireless router manufacturers haven't seen fit to move beyond offering four-port switches on their products. Better models are equipped with gigabit switches, and that's the type you want. If four ports aren't enough, you can add a stand-alone gigabit switch without losing any appreciable bandwidth, much like you can plug a power strip into a single AC outlet. By the same token, you can run a single Ethernet cable from your router or switch into your entertainment center and add a multiport switch there to service multiple clients.

Netgear's WNDR 3700 dual-band router is ideal for home theater configurations because you can use the 5GHz channel for streaming media and the 2.4GHz channel for data transmission.

MEDIA STORAGE

The typical home-theater PC enclosure doesn't allocate a lot of room for hard drives, and you'll need the bulk of whatever local storage you do have for recording TV programming. (While you could store this content remotely by mapping a folder on a NAS box drive or server to a drive letter on your HTPC, we don't recommend it.) You should store all your other types of media (movies and music ripped from disc, digital photographs, and so on) on a remote server or NAS box.

You can buy a NAS or home-server product or even roll your own using either a free or commercial operating system. If you buy a NAS box, make sure it has a gigabit Ethernet port and that it's compatible with the DLNA (Digital Living Network Alliance) standard. A DLNA server can stream media (music, movies, photos, and so on) to a DLNA-compliant player (such as a PC running Windows Media Center, an A/V receiver, PlayStation 3, Xbox, and even some network-connected TVs).

ACHIEVING DLNA COMPLIANCE

All the major NAS box manufacturers—Buffalo, QNAP, Seagate, Synology, Western Digital—offer DLNA-compliant products. Microsoft's Windows Home Server OS does not support DLNA natively, but some of the companies building Windows Home Server machines—including HP and Acer—go the extra mile and add a DLNA stack to the OS.

If you're building your own WHS machine (or if you've purchased a retail box that isn't DLNA-compliant), installing the TwonkyMedia Server ($30, www.twonkymedia.com) will accomplish the same goal. Twonky also builds versions of its server software for a raft of NAS boxes (including Linux, if you're building your own), but these are provided "as is" and there is no official technical support.

ADDING 3D TO THE MIX

How to pair your HTPC with a display that lets you watch Blu-ray 3D

Big-screen HDTVs are great, but nothing says "home theater" like a video projector and a Really Big Screen (RBS™). Finding the right displays—both a big-screen flat-panel TV and a video projector—ended up posing the biggest challenge in building our home-theater rig. We were, it turns out, just a little ahead of the curve on this one. Hopefully, our grief will be your good fortune, if what we learned makes your quest a little easier.

As many gamers can already attest, setting up a PC to play 3D games using Nvidia's 3D Vision is a snap. Plug in the IR emitter, load the drivers, put on your glasses, and you're good to go. This was not the case with Blu-ray 3D. No, sir. Getting Blu-ray 3D up and running on our HTPC was a Herculean task that required pre-release drivers and pre-release player software. Hey, this is what happens when you're bleeding-edge.

Fortunately, by the time you read this, building Blu-ray 3D into your HTPC will probably be as easy as setting up 3D Vision. The drivers should be near release, the player software should be readily available, and getting your hands on a Blu-ray 3D movie will be as simple as putting down a couple of $20s at the store.

Before we go any further, though, let's take a quick look at the various 3D technologies that enable the new wave of 3D.

HOW 3D WORKS

The 3D "feel" is created by feeding each of your eyes a different version of the same image, each from a slightly different perspective. Your brain assembles these two images and perceives depth.

The most widely known 3D technology is the old-school anaglyph variety, which uses those familiar red and cyan glasses. Each colored lens filters out one set of images, allowing each eyeball to see a slightly different perspective. The main drawback here has always been significant color shifting. In cinema, anaglyph imagery has been around since the 1920s; the first big 3D movie boom took place in the 1950s.

Most theaters today use various polarized systems. Here, two projectors are used to simultaneously spit out two versions of the same movie onto the screen. The movies are polarized differently and the glasses allow each eye to see separate images to create the sense of depth. While far superior to anaglyph, the 3D effect with this type of passive polarized system can suffer if you tilt your head during playback.

Perhaps the highest-quality 3D experience today—and the one that's being adopted by most new 3D HDTVs—uses active shutter glasses. These glasses are synced to your TV and literally blank out in an alternating pattern in time with images that are displayed in an alternating pattern for each eye. Although this can sometimes produce a slight ghosting effect, this system doesn't put two images on the screen at the same time and can deliver far more accurate color than other systems. To make the images appear smooth, a very high frame rate must be used. Thus the requirement for a true 120Hz television.

KEY TIPS

- Make sure your display accepts a 120Hz signal
- Projectors deliver more impact than TVs
- Portable projector screens are much cheaper than ceiling-mounted models
- Use High-Speed HDMI cables

Think a 65-inch plasma is impressive? Acer's H5360 DLP projector casts an image more than twice that size from a distance of 16 feet. In fact, its maximum image size is 300 inches, but you'll need a room that's 34-feet deep.

Panasonic's Viera-series plasmas are currently the best TVs available to run your 3D HTPC on.

TV OR PROJECTOR? WE SAY BOTH!

OK, let's talk products. We initially set out with the assumption that any display with a 120Hz refresh rate would work with Nvidia's GeForce 3D Vision system, as delivered by our GeForce GT 240. Wrong. As it turns out, most HDTVs marketed as "120Hz" won't accept a 120Hz input signal; instead, they take a 60Hz signal and perform an inverse telecine operation to extract the original 24 frames-per-second movie signal from the video signal. The TV then creates new intermediate frames and displays the movie at five times the original frame rate (5x24=120). This eliminates the uneven motion that results from displaying a movie shot at 24fps on a display with a 60Hz refresh rate.

Unfortunately, despite the fact that this class of TV was introduced over the last few years, they are already considered "legacy" 120Hz displays because they can't support the active shutter glasses required for Blu-ray 3D and 3D games. Ironically, just about any CRT television—remember those behemoths?—that supports a refresh rate of at least 100Hz *is* compatible with 3D Vision. (You'll find an up-to-date list of 3D Vision–compatible displays and projectors on Nvidia's website at http://bit.ly/jBBpf.)

We performed most of our testing using an Acer H5360 DLP 3D video projector paired with Epson's Accolade Duet screen. The Acer is limited to a native resolution of 1280x720p, but it's very reasonably priced at $700. Even when you tack on $120 for the screen, the total price is still incredibly affordable.

Watching a Blu-ray 3D movie with a video projector is a visceral experience that is the closest you'll get to a movie theater. A television—even a 50-inch plasma—just doesn't compare. On the other hand, Panasonic's Viera is capable of delivering 1080p resolution; we couldn't find any consumer-oriented 3D Vision–compatible video projectors capable of that at press time. That said, a TV delivers higher-quality visuals during daylight hours without forcing you to invest in room-darkening shades or heavy curtains. In our opinion, the ideal home theater will be equipped with both display devices.

So, which TV do we recommend? While there are certainly more 3D Vision–compatible TVs than there are video projectors on the market, we recommend one of Panasonic's Viera plasma models. At press time, there's only one model in the Viera VT20 line: the 50-inch TC-P50TV20. The higher-end Viera VT25 series includes 50-, 54-, 58-, and 60-inch models ranging in price from $2,600 to $4,300. In addition to larger screens, the VT25 series also includes custom-installer-favored features such as pro-level calibration and RS-232 serial ports (to support advanced remote control, among other things). Unfortunately, these TVs are in such high demand that they're sold out everywhere.

Using a preview release of Nvidia's 3DTV Play, we tested our 3D HTPC on the 54-inch Viera and were wowed. Unlike the 720p Acer projector, the Viera gave us a beautiful full resolution 1080p 3D image. There was some occasional ghosting—this happens when one eye catches a glimpse of both images at the same time—but the higher resolution will definitely elicit ooohs and aaahs from your family and friends.

WHAT YOU NEED FOR A 3D HTPC

GORDON MAH UNG
SENIOR EDITOR

OK, so now you know how 3D can figure in to your HTPC ecosystem. Here's one final checklist to make sure you've got all the necessary ingredients:

3D-ready HDMI 1.4–compliant TV Panasonic's Viera TC-P50VT25 fits the bill and offers its own set of comfortable 3D shutter glasses.

2x Blu-ray reader Blu-ray 3D is encoded using the fairly efficient H.264 MVC codec. But because the Blu-ray 3D disc is essentially sending one video stream per eye, your BD-ROM has to be capable of physically reading it off the disc at the minimum speed (the decoded stream can easily surpass 40Mb/s).

Blu-ray 3D media player There are a few to pick from, but Cyberlink's PowerDVD 10 ($95, www.cyberlink.com) is way out in front of a crowded field. We used a beta version of Power DVD 10 Ultra Mark II to test our 3D content and found it hiccup-free. A final version will be released this summer and will be free to anyone who purchased version 10.

Blu-ray 3D–ready graphics card ATI says it has plans to support Blu-ray 3D. We also understand that Intel's Core i3/i5 Clarkdale parts are capable of outputting the signal you need for Blu-ray 3D. But right now, only Nvidia has a working solution. The only retail cards to support Blu-ray 3D are the GeForce GTX 480/470 and GT 240. Older parts still support 3D games, pictures, and video, but not Blu-ray 3D playback.

Nvidia's 3DTV Play The final ingredient in playing back Blu-ray 3D is Nvidia's 3DTV Play software. This special driver pack will let your videocard talk to off-the-shelf 3D television sets. Nvidia won't release 3DTV Play until later this summer, but it will be free to anyone who bought a 3D Vision set. For folks who didn't, the company will charge $40 for the update.

DISPLAY DECISIONS

How to Buy the Right Display

1 In general, you want to buy a plasma screen for HDTV viewing in subdued ambient lighting, and an LCD for bright ambient lighting.

2 Ignore animated videos in store displays. They are artificial images and you have no reference for comparison. Under these circumstances, the brightest and most color-saturated TV will appear to be the best, but it isn't. The same lack of an absolute reference also applies to *Avatar* because the Navi are blue.

3 Some retail stores still deliver video to HDTVs using analog distribution instead of digital because it's a lot cheaper. Analog introduces a whole other layer of issues that can impact displayed picture quality. Find out if the signal distribution is analog or digital.

4 Bring a USB thumb drive loaded with evaluation photos with you to the store. Many HDTVs now have USB inputs and in many cases the store will allow you to view them. Include both challenging high-quality professional photos and also family photos—they are the best absolute reference because you know exactly what everyone and everything is supposed to look like.

5 Check the screen for reflections. Avoid glossy screens unless you will be watching in the dark. Many glossy screens also introduce ripples in the image because they are glued on poorly. The best time to check for screen reflections is when the screen is black. Look for ripples in the screen reflection as you shift your viewing position slightly. If you bring along a USB thumb drive, include a totally black picture.

6 LCDs all have trouble at the very bright and very dark ends of the intensity scale. Manufacturers (stupidly) try to squeeze extra brightness out of every HDTV in spite of the fact that they are already plenty bright. They wind up overdriving the display into what is called white saturation or clipping—this makes the picture look like an overexposed photo. Photos with very bright highlights are great for evaluating this (unless you have some special DisplayMate test patterns). If the highlights look washed out, turn down the Contrast Control. If that doesn't fix it, pass on that model. **–Dr. Raymond Soneira, creator of the DisplayMate testing suite**

RECORDING CABLE TV

We want our HBO—straight, no chaser

Sure, you can plug in a TV tuner card or USB stick and grab all kinds of free TV programming right off the airwaves—in HD, no less. Or you can log into Hulu, Netflix, or even YouTube and enjoy many of the programs that are available only on cable or satellite TV. What you can't get are the premium made-for-cable series, such as *True Blood* and *Dexter*, movies like *You Don't Know Jack*, and mini-series like *The Pacific*, at least not until several months after they've originally aired.

Install a CableCARD tuner and you can. We scored a pre-release version of Ceton's InfiniTV 4 quad-tuner PC card (www.cetoncorp.com); the product should be widely available by the time this issue reaches newsstands. We're pleased to report that the product delivered a great experience—in sharp contrast to the first time we tried using a CableCARD product. (You can read all about the ordeal online at http://bit.ly/9UfONX.)

One thing no current-generation CableCARD product can deliver, however, is two-way communication. That means you won't get on-demand or pay-per-view services. You also won't get your cable company's onscreen program guide. Thankfully, the one that ships with Windows Media Center is a perfectly fine—and in many ways superior—substitute.

Ceton's InfiniTV 4 can transform your home-theater PC into the ultimate set-top box. Unfortunately, there is no similar solution for satellite TV subscribers.

IT ACTUALLY WORKS!

The InfiniTV 4 occupies a single PCI express slot. Once you've inserted the CableCARD provided by your CATV service provider (be sure and get the M-Card version, because the S-Card version supports only one stream), your HTPC will be capable of simultaneously recording up to four channels of TV programming—including encrypted premium channels such as HBO and Showtime.

Based on our experience with Comcast, it appears that the cable companies have grown accustomed to CableCARD

activations, perhaps due to the burgeoning installed base of CableCARD-equipped TiVO set-top boxes. All we had to do was plug in the card, install the drivers, visit Comcast to pick up a CableCARD, and then activate the card. Activation was a snap—Windows Media Center handled the bulk of initializing and activating the card, and a short phone call to Comcast sealed the deal.

DISPLAYS IN OTHER ROOMS

If you have a network and the right equipment, you can watch recorded TV programs in other rooms in your house, too. Products like the InfiniTV must transcribe the cable company's "conditional access" DRM to Windows Media DRM. Programs flagged as "copy freely" can be archived to a server and played back on most any device that's capable of decoding it. Programs flagged "copy once," on the other hand, can be played back only on the device that originally recorded them.

However, you *can* play "copy once" content on any Windows Media Center extender device (the official name is Extender for Windows Media Center) connected to that PC via the network. Unfortunately, the list of Windows Media extenders still in production has shrunk to just one product: the Xbox 360. You cannot stream "copy once" content to other PCs on your network.

In our experience, we were able to stream recorded TV from Media Center to any PC on our network; we were only able to stream live TV to our Xbox 360.

HTPC ACCESSORIES

Five devices offer up unique ways of directing, accessing, and interacting with your Home Theater

LOGITECH DINOVO EDGE

They may have finally killed the floppy drive but the mouse and keyboard live on. We've all dreamed of magical 10-foot HTPC interfaces that allow us to navigate everywhere, but at some point, you will need a keyboard and mouse. Logitech's DiNovo Edge is pricey at $180, but it's still the best for HTPC applications. It has one-button access to Windows Media Center and it doesn't seem to suffer the range issues that we've run into with other devices. The only thing the Edge could use, frankly, is a backlighting option.

LOGITECH HARMONY 900

The universal remote remains an intriguing and essential accessory. After all, how are you going to turn on and off your TV and receiver? Our answer is Logitech's Harmony 900 ($400). This programmable, touch-screen remote allows you to quickly and easily specify home theater functions such as "Watch Movie" or "Watch TV." Press the button associated with a task and the remote turns on all appropriate devices and sets them to the appropriate audio and video channels. RF support means you can even hide your home theater components from view. Add-on devices allow you to control Windows Media Center, Xbox 360, or a PS3.

LOGITECH WEBCAM PRO 9000

These days, no HTPC is complete without the ability to Skype with family and friends from the comfort of your living room sofa. Logitech's Webcam Pro ($100) clips onto your flat-panel TV and allows you to instantly begin tele-broadcasting at 720p video. Carl Zeiss optics and a super-effective auto-focus feature make this perfect for video-calling home.

ZUNE HD

The thing we like most about the Zune HD is that the ZunePass allows us carte blanche access to any and all music we want on our HTPC. The Zune HD allows us to bundle all the music and TV we've recorded in Windows Media Center to go. We recommend the 64GB variant ($350) because it allows you to stack hours of TV, movies, and music. An additional nice touch is that the Zune HD AV dock add-on ($90) allows you to plug into a TV or stereo via HDMI, optical audio, or composite audio/video.

GLIDETV NAVIGATOR

A keyboard alone shouldn't be your only interface for a home theater PC, so we complimented our DiNovo Edge with a GlideTV Navigator ($150). The navigator is simultaneously a stylish-looking remote control and touchpad. In the center, the concave touchpad allows you to maneuver your mouse. The perimeter of the device contains D-pad-style click buttons that let you navigate through Media Center, Boxee, or XBMC interfaces.

SOUND SOLUTIONS

Set up your audio the right way and you'll love it forever

Klipsch's Icon W-series speakers look as beautiful as they sound.

Studies have shown that audio quality has a major impact on our perception of video quality. Pair a great display with a crappy audio system, and your brain won't be impressed with either. The audio element of your home theater, therefore, is at least as important to your enjoyment as its visual element. Don't spend a bundle on a home-theater PC, a big-screen TV, and a video projector and then cheap out on your audio gear.

KEY TIPS

- Buy an A/V receiver with two HDMI outputs
- Love vinyl? Make sure your receiver has phono inputs
- Don't scrimp on your speaker budget

The Blu-ray Disc Association certainly understands this. The consortium included high-definition standards for both video and audio in its specifications. Dolby True HD and DTS-HD Master Audio are lossless multichannel codecs used to provide studio-quality movie soundtracks in the home. Both codecs support up to eight channels of audio with up to 24-bit resolution at a sampling rate up to 192kHz.

PACIFYING HOLLYWOOD

Hollywood's copy-protection paranoia—and short-sightedness on the part of both Microsoft and Nvidia—throws a wrench into the works when it comes to getting an HD soundtrack out of a PC and to an A/V receiver. Hollywood insists that its digital property—i.e., movies on Blu-ray—be encrypted from one end of the digital chain to the other. Microsoft included a protected video path in Windows Vista and Windows 7, but it didn't provide a protected audio path. Left to its own devices, Blu-ray playback software—PowerDVD in this case—must down-sample that soundtrack to send it over an HDMI connection, compromising your audio experience. Technically, PowerDVD could use the PC's onboard audio hardware to decode the soundtrack and output it through the computer's six analog outputs without down-sampling; but even if it did, you'd need an A/V receiver with six discrete analog inputs (eight for 7.1-channel surround sound), and those are becoming increasingly rare because receiver manufacturers assume you'll use HDMI.

AMD's Radeon HD 5800–series GPUs do include a protected audio path and can therefore pipe the movie's soundtrack over HDMI without compromise. But we rejected that solution because we wanted to take advantage of Nvidia's 3D Vision technology (and none of Nvidia's current GPUs provide a protected audio path).

Enter Auzentech's X-Fi Home Theater HD ($250 street): This card takes Blu-ray audio at full resolution, decrypts it, combines it with HD video from the videocard (via an HDMI input), re-encrypts the whole thing, and sends it on to your A/V receiver via HDMI. Yeah, it's a bit of a PITA, but it works. For the record, Asus's Xonar HDAV cards accomplish the same goal, but they use a PCI slot that was blocked on the motherboard we selected.

CHOOSING AN A/V RECEIVER

We wanted the flexibility to output video over HDMI to both an HDTV and a video projector, so we needed an A/V receiver with two HDMI outs. Yamaha's RX-V3900 ($1,900) fulfills that role while delivering a host of other highly desirable features. The receiver's amp delivers 980 watts of power (140 watts times seven channels: front, surround, rear-surround, and center). Since we decided not to use rear surrounds, we took advantage of the amp's ability to bi-amplify the front speakers (driving the front tweeters and midranges distinctly from the front woofers).

Yamaha's RX-V3900 A/V receiver has all the inputs and outputs you could ask for; most importantly, it provides two HDMI outputs for our HDTV and video projector.

The RX-V3900 has an integrated 10/100Mb/s Ethernet port, so you can wire it to your network and stream music from a server or another PC on your network or listen to Internet radio or Rhapsody. It's both Windows- and DLNA-certified, so you can display digital photos and video as well as stream music. Need more playback options? There's a front-mounted USB port to support a digital media player, an integrated phono input to support a turntable, and ports for optional add-on hardware including satellite and HD radio tuners, an iPod dock, and a Bluetooth receiver.

PICKING THE SPEAKERS

An audio system is only as good as its weakest link, so we didn't compromise when it came to choosing speakers. We built a 5.1-channel system for $2,034 based on Klipsch's Icon W–series, with the WF-34 floor-standing speakers up front, WS-24 surrounds, WC-24 center channel, and the 300-watt XW-300d powered subwoofer handling LFE duties.

You can tuck a home-theater PC and A/V receiver in an entertainment center, so they don't need to look good from every angle. Your speakers, on the other hand, are going to be exposed, if not at all times, at least while they're in use. The WF-34 series' cabinets are finished in beautiful hardwood veneer to counter the spousal-objection factor.

How to Maximize Windows Media Center

The Win7 incarnation is a powerful, essential part of any HTPC

Windows Media Center has come a long way, baby. Far from the kludgy, awkward Windows add-in it once was, Media Center earns its keep with Windows 7, especially if you're opting for a CableCARD build. But while it's a fantastic program that does nearly everything you need, there's always room for improvement. Here are four ways to increase functionality.

INSTALL NETFLIX

If you aren't already rocking Netflix, you're missing out. Not only can you borrow discs from Netflix' huge DVD and Blu-ray library, but you can also snag immediate access to Watch Instantly, letting you watch movies and TV shows from the classic to the not-so-classic. Netflix even added HD content to its Watch Instantly lineup in May. If you do already use Netflix, a simple plugin enables you to access your Watch Instantly queue (and the entire Watch Instantly library), stream movies and TV shows, and even change your DVD queue all from within Windows Media Center. Just go to the Movies menu and go left to the Netflix option. Media Center will download the plugin, and then offer you a sign-in page. From there, you can access Netflix from the Movies menu or as a channel in Internet TV.

Stream cinematic masterpieces like *Waterworld* instantly with the Netflix' plugin for Windows Media Center.

INTEGRATE HULU DESKTOP

Hulu? In *my* Media Center? It's easier than you think.

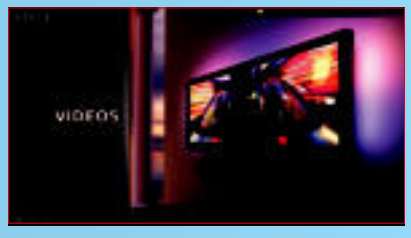
This one's a bit of a hack, and it's only really useful if you plan on keeping your HTPC in Windows Media Center for most of its uptime, as it eliminates the need to exit or tab out of Windows Media Center to view Hulu videos. Download Hulu Desktop (www.hulu.com/labs/hulu-desktop) and install it. Then download Hulu Desktop Integration from http://huluwmc.teknowebworks.com. Run the .msi to install Hulu Desktop Integration. Now open Windows Media Center, and scroll down past Extras. You'll find a brand-new Hulu menu with a Hulu icon in it! Clicking the icon launches Hulu Desktop and minimizes Media Center. When you exit Hulu Desktop, you're automatically sent back to Windows Media Center. Perfect? No. Hulu? Hell, yeah.

DO IT ON THE CHEAP WITH XBMC/BOXEE

NATHAN EDWARDS
SENIOR ASSOCIATE EDITOR

We've built a great HTPC, if we may say so ourselves. But not everyone has the moolah for a full Windows 7 box, a quad tuner, and a bitchin' sound system. Good news: You can turn an old laptop or net-top into a pretty decent HTPC using free software. You won't be pushing out lossless surround sound or recording 1080p video from four channels at once, but you can stream Internet TV and video as well as network media to your TV. Plus you can play CDs and DVDs if you're using a computer with an optical drive.

Our favorite free media center programs are XBMC (www.xbmc.org) and its variant, Boxee (www.boxee.tv). Both run on Windows, OS X, and Linux, so you don't need to spend any money on an OS to get them up and running. XBMC (which can even run from a live CD) is open source, with an emphasis on streaming and local content, while Boxee is a closed-source "social" variant that leans toward Internet television and social media, with built-in support for Netflix, Last.fm, Twitter, and more. Both are great (and free) alternatives to dropping a couple hundo on Windows 7 and Media Center.



ENABLE PLAYBACK OF MKV FILES

There are many ways to watch non-physical archives of Blu-ray and other high-def content on your HTPC. One of the *Maximum PC* editors stores disc images on a home server, mounts them on his HTPC, and watches them using PowerDVD. Others prefer their high-def content in .mkv containers, stored locally. Unfortunately, Windows Media Center doesn't recognize or play .mkv files natively. Getting Media Center to do so involves several steps. To paraphrase Scarface, first you get the codec. Then you get the splitter. And then you change some registry settings!

We found (and tried) multiple methods, but the one that wound up working best is the one we found at the aptly named (and incredibly useful) blog Hacking Windows 7 Media Center (http://bit.ly/bYaoKx). It involves the Shark007 codec pack (shark007.net) and a registry hack to get Windows to recognize .mkv files.

First, back up your registry and create a system restore point, just in case things go south. Download the Windows 7 version of the codec pack from www.shark007.net (the actual download is hosted by Majorgeeks.com) and install it, then (assuming you're running 64-bit Windows, like our HTPC is), download and install the x64 components as well.

Now go to www.hack7mc.com/downloads and download the MKV x64 Registry hack. You did back up your registry, right? As always, exercise caution when changing your registry settings. Double-click the .reg file to allow Windows to recognize .mkv files. Then you should be all set! The codec pack's default features should enable .mkv playback, but if you need to manually edit the settings, you can get there by going to the Start Menu > All Programs > Shark007 Codecs > Settings Application x64. Right-click and select Run as Administrator. There are a lot of settings here, and the UI is confusing, but remember two things: If you get stuck, you can hit Reset All to restore the defaults, and you can access the Shark007 wiki by hitting Wiki Access on the Help tab. Oh, and if you make changes while running as an administrator, after you exit the program you should re-run the program as a standard user so the changes can propagate. It's a little confusing, and depending what sort of .mkv files you use it might take a little more tweaking, but the result is native .mkv playback in Windows Media Center, so we think it's worth it.

Confused by Shark007's many options? So were we. Just remember that you can always go back to the default settings.

EXTRAS

More Media Center Tips

The four tips we cover in depth in this section only scratch the surface of what Windows Media Center is capable of. Here are a few more things you can do:

- **Create custom themes with Media Center Studio (www.adventmediacenter.com)**
- **Use your Android phone as a Windows Media Center remote (http://bit.ly/aj7zbQ)**
- **Use Remote Potato to schedule your TV recordings and stream live TV from your Media Center to any computer (http://bit.ly/cpEMmQ)**
- **Add channel logos to the TV guide (http://mychannellogos.com)**

If you get stuck, or just want more ideas, the Media Center hacking community can help! Check out community sites like Thegreenbutton.com and Hack7mc.com for tutorials, forums, hints, and hacks.

SLIM DOWN RECORDED TV

Using your HTPC as a DVR is easy, given the TV tuner/CableCARD combo we talked about in our build. But the recordings are stored in a proprietary format—and they're huge. An hour of HD TV in the .wtv format can take up nearly 5GB of space. Fortunately, there's a little freeware app called MCEBuddy (www.mcebuddy.com) that promises to help. Download the .zip file (be sure to get the 64-bit version if you're running 64-bit Windows), extract it to your desktop, then run setup.exe as an administrator. Once it's installed, run the MCEBuddy Configurator and select the output file type, whether to skip commercials, and the output destination. The app is only single-threaded, so you can run it in the background. And you can schedule when you want the conversions to run. Depending on the format you're converting to, you will sacrifice some fidelity, but it's a great way to convert your recorded TV to watch on a portable device, among other things.

Reconverting your recorded TV with MCEBuddy will save a lot of hard drive space.

DirectX 11 Deconstructed

The new graphics API comes with new buzzwords. We'll tell you what they mean and how they matter to your gaming experience

BY LOYD CASE

Just when you think you've grasped all the jargon surrounding 3D graphics, new terms and technologies flood onto the market.

AMD has been aggressively shipping DirectX 11 GPUs in almost every price category, while cards based on Nvidia's new GTX 470 and GTX 480 DX11 parts are finally becoming available. Meanwhile, Windows 7's sales ramp has been extraordinary—the fastest-selling Microsoft OS in history. Given that Windows 7 is what Vista should have been, it's also arguable that DirectX 11 is what DX10 should have been.

When DirectX 10 games hit the streets, the new API gave users marginal improvements in image quality alongside huge performance decreases. The tiny gain in visual fidelity didn't really make up for the performance hit. On the other hand, DirectX 11 brings users some very cool potential eye-candy improvements, but also promises better performance—even if you don't have a DirectX 11 GPU.

Along with new graphics, APIs come with new buzzwords: tessellation, SSAO, HDAO, and postprocessing. That last buzzword being a catchphrase for many small but cool effects made possible with today's programmable graphics chips.

We'll take a closer look at these buzzwords to dissect what they actually deliver, plus discuss the performance impact of using high-end AMD and Nvidia GPUs.

Cooler effects with shader postprocessing!


Rounder heads with DX11 tessellation!
More realistic shadows with SSAO and texture hardening!

Tessellation

Is this the final death knell of the octagonal head?

Tessellation essentially creates something from nothing—or more properly, more from less. Hardware tessellation, which is required by DirectX 11, means that the GPU can generate more triangles from existing geometry using the hardware tessellation engine that's part of the graphics chip. Now, generating more triangles for a flat surface is pointless—after all, a flat square looks like a flat square, whether it's two triangles or 2,000. What's more interesting is generating more triangles for an actual 3D model. Let's look at a simple example, the cobblestone surface from Microsoft's DirectX developer's kit (image A).

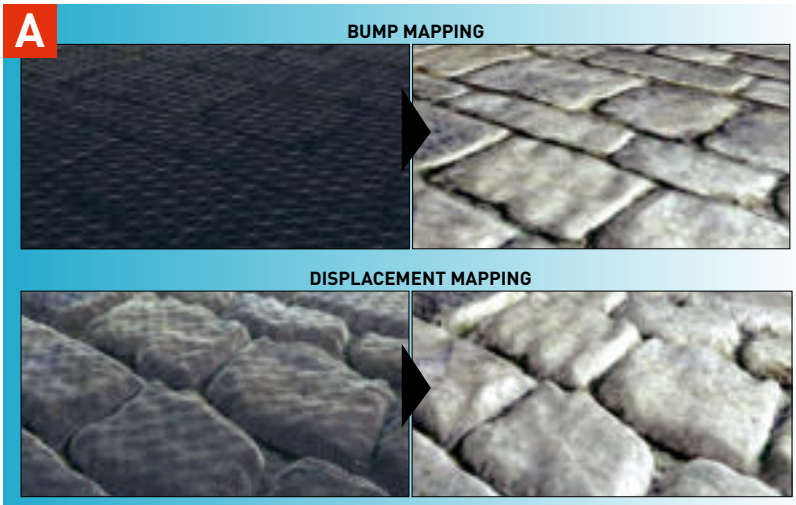
In the top-right screen, we have a flat surface that looks somewhat more realistic by the application of a bump map. Bump maps fake you into thinking a flat polygon has depth by modeling the way light falls on a bumpy object (such as cobblestones.) However, if you were to bring the camera level with the pavement surface, you'd realize it was actually a flat surface. If geometry is tessellated, the cobblestones are actually 3D, as seen in the lower-right screen.

The tessellation in the cobblestone image is handled by a technique known as displacement mapping. A displacement map is just a special grayscale texture map in which different shades of gray define how much the geometry is displaced.

Cobblestones are nice, but will we ever see differences in real games? Let's look at the recently released Metro 2033 (image B). The left image is the game with tessellation disabled; tessellation is enabled in the right image. Note how the object is more rounded in the second shot. The effect is somewhat subtle here, but the point stands: This is the beginning of the end of polygonal heads. Tessellation means that character heads will someday all be rounder.

Yet another example of tessellation, from the DirectX SDK, shows a technique known as subdivision surfaces (image C). The key idea in this technique is to start with a basic set of polygons, then divide them in ways that make sense for the object at hand. In this character model, we overlay the textures on top of the visible wireframe. You can see the additional geometry added in the right-side screen, as well as the more naturalistic, rounded features.

A



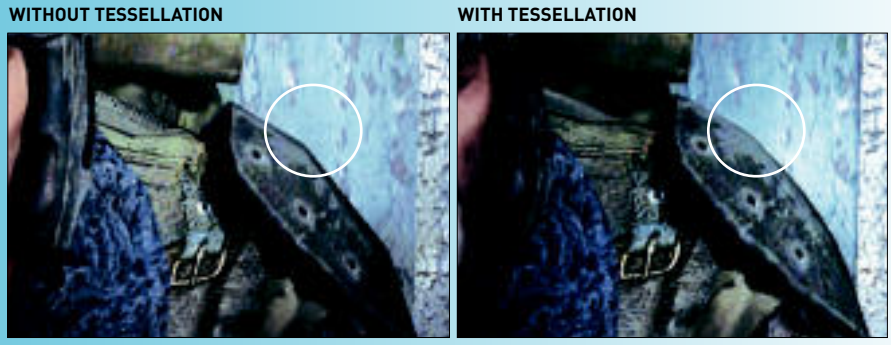
The tessellation engine in DX11 hardware is capable of generating many more triangles from existing geometry, as seen in teh screen on the lower left, to provide objects that are actually 3D.

OTHER USES FOR TESSELLATION

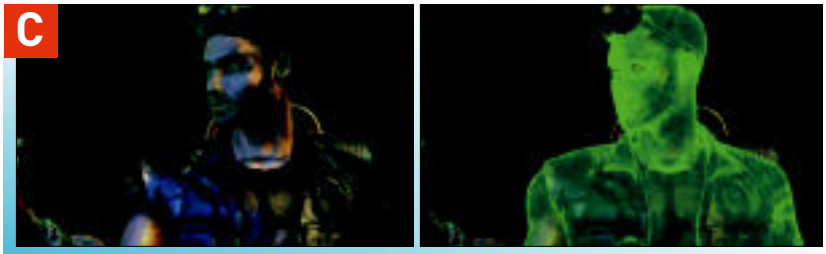
Tessellation is great for creating rounder heads and more realistic cobblestones. But it has other uses, too. Take water, for example. Instead of using pixel shaders to build better-looking water, just add more triangles… a lot more triangles,

B

In this screen from Metro 2033, you can see how tessellation makes it possible to create curved edges.



C

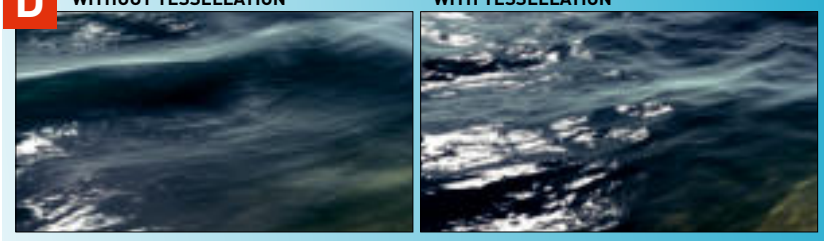


In a tessellation technique known as subdivision surfaces, a basic set of polygons is divided to add geometry and hence realism.

D

WITHOUT TESSELLATION

WITH TESSELLATION

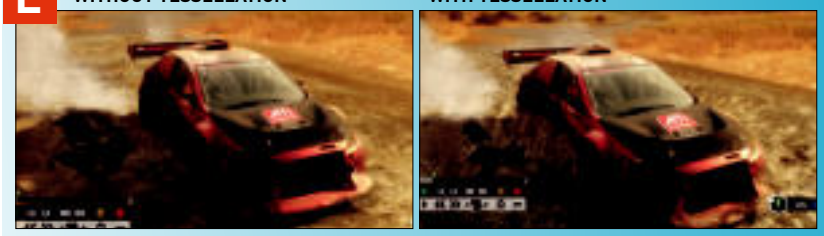


Tessellation makes water appear more real in Nvidia's Island demo.

E

WITHOUT TESSELLATION

WITH TESSELLATION



Tessellation adds waves and ripples to a scene in Dirt 2.

as in the case of the Nvidia Island demo (image D).

In the new racing game Dirt 2 (image E), cars driving through water will throw up waves in the DirectX 11 version of the game, using hardware tessellation to generate hundreds of triangles to form the effect. In DX9 mode, you see some spray, but no waves, and the water puddle itself can be as few as two triangles.

TESSELLATION GOING FORWARD

Tessellation offers the promise of better, more realistic-looking 3D objects, but it's no panacea. As with any new technique, developers will have to be smart about its implementing. It's easy to use tessellation to create objects that look wrong. On top of that, there's the performance issue While modern DirectX 11 GPUs have hardware tessellation engines, resources aren't infinite. Turn up tessellation too much, and you'll see a severe performance hit. Game developers will likely use the technology as part of sophisticated LoD (level of detail) schemes where close-up, important objects (characters) are tessellated, while distant or unimportant objects are tessellated less—or not at all.

TRANSPARENCY ANTIALIASING NOT SO SPECIAL ANYMORE

Better-quality antialiasing with transparent textures was heavily touted by both Nvidia and AMD just a couple of years ago. Nvidia called this transparency antialiasing while AMD's term was adaptive antialiasing. This is a classic case of a feature that improves image quality at the time, but isn't really considered bleeding-edge these days.

The problem lies with the way transparency is handled in many games. Transparent objects are polygons with texture maps applied where some of the texture is transparent. Examples of this are chain-link fences, bare tree limbs, and overhead wires.

Adaptive antialiasing essentially smooths out the edges bordering on the transparent areas within those textures. Think of it as AA inside the polygon.

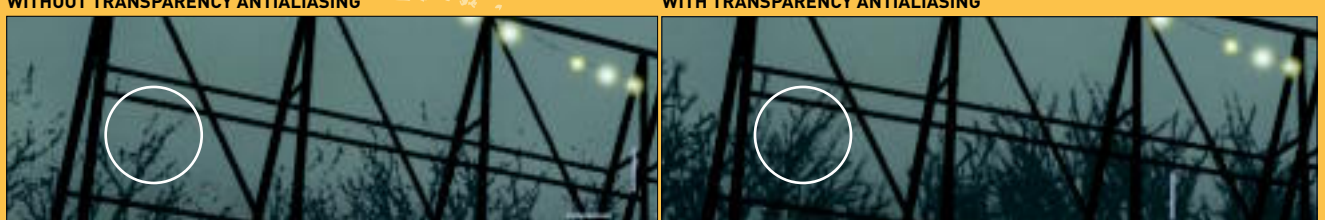
For transparent AA to work, the game must test for alpha (the transparent part), but also disable alpha blend (where the transparent texture is combined with a background color to create a new color. This is sometimes used to create translucent (partially transparent) objects.

Valve's Source game engine does this, so if you enable adaptive antialiasing (AMD) or transparent antialiasing (Nvidia) in the graphics control panel, you'll see the effect, as in the Left 4 Dead screenshot here.

However, alpha blending and other techniques are used that prevent these techniques from working. For example, enabling the feature has no effect at all in most games that use the Unreal game engine. Also, technologies like tessellation may eventually make transparency AA obsolete. If those bare tree limbs can be built with polygons representing the limbs themselves, those polygons can be antialiased with standard multisampling AA, and you don't need to mess around with adaptive AA.

WITHOUT TRANSPARENCY ANTIALIASING

WITH TRANSPARENCY ANTIALIASING



Transparency, or adaptive, antialiasing works well when a game supports it (as seen in the screen on the right), but tessellation could provide a universal substitute.

Ambient Occlusion

Achieving greater realism through light and shadows

It's all about light. Without light, you can't see. In 3D games, all lighting is created using mathematical cheats—approximations of how real-world lighting behaves. Some of the most interesting lighting effects lie in the absence of light: darkness and shadows.

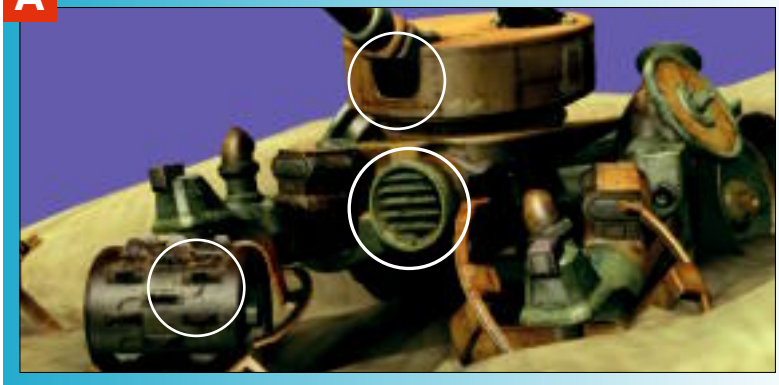
Shadows have evolved from simplistic shadow maps—where the shadows all looked the same from any angle—to the more sophisticated techniques used in today's games.

Variations on ambient occlusion are becoming increasingly more popular. Ambient occlusion takes into account how light falls on objects to create shadows, and that the properties of light and shadows change over distance. Crysis was one of the first games to attempt a form of ambient occlusion, known as screen space ambient occlusion (SSAO). SSAO techniques try to determine where a point in the scene exists relative to other points, and the effect that light falling onto that point has on other parts of the scene. Objects have reflective properties, and may in turn bounce light to other parts of the scene—even those blocked from the direct light source.

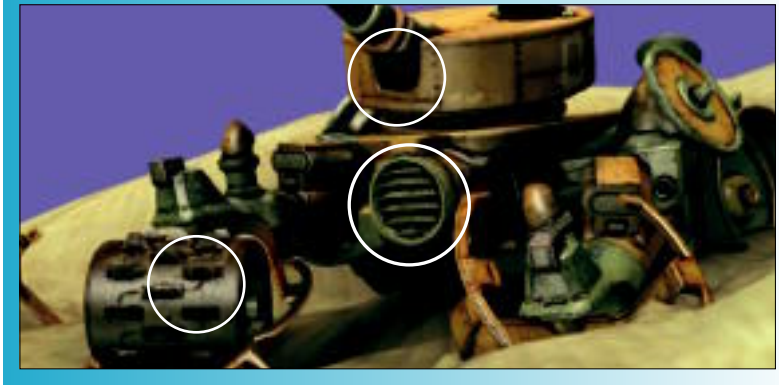
Real-world objects tend to have crevices, wrinkles, and depressions, which may not be directly lit by a light source (the sun, for example). But they aren't dark, either—they pick up light being bounced off other parts of the environment or even a nearby surface of the same object that is in direct light. Previous games often ignored this, so crevices and depressions were either completely dark or looked as brightly lit as the other parts of the object.

A

WITHOUT AMBIENT OCCLUSION

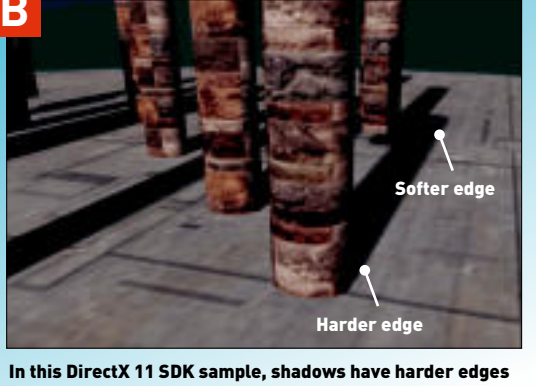


WITH AMBIENT OCCLUSION



The circled areas in this DirectX 11 SDK example show how high-definition ambient occlusion (HDAO) produces more realistic details. Notice the increased depth, sharper lines, and greater shadowing.

B



In this DirectX 11 SDK sample, shadows have harder edges near the object and softer edges farther away, as in real life.

Other types of ambient occlusion found in newer games include high-definition ambient occlusion (HDAO) and horizon-based ambient occlusion (HBAO). These are still variations on the same idea—that where a pixel exists relative to other pixels determines how light falls on it, how it bounces that light, and what type of light it is (direct or reflected.)

Above is an HDAO sample from the DirectX SDK (image A). Note the internal shadowing made possible in the lower screen by using this ambient occlusion technique. It is relatively subtle, but the overall scene seems more realistic when you're running the application in full-screen mode. In the top shot, HDAO is disabled; the bottom one has HDAO enabled.

With DirectX 11, a new technique is emerging called contact hardening. If you think about how real-world shadows behave, you'll realize that a shadow doesn't look the same along its full length. Close to the object—say, at the base of a lamp post or tree—the line between shadow and light is sharply delineated (the "hard" in contact hardening.) The farther away from the object, the shadow is more diffuse. That's because farther away, light seeps into the shadow area from the surrounding environment. Contact hardening shadows using Direct 11 graphics emulate this look. Right now, the only game using contact hardening shadows is STALKER: Call of Pripyat (image B).

Postprocessing Effects

Making graphical magic after the image is rendered

Postprocessing is where effects are applied to the 3D image after the frame is rendered. The term postprocessing comes from the film industry, where effects are added to movies after the movie is actually shot.

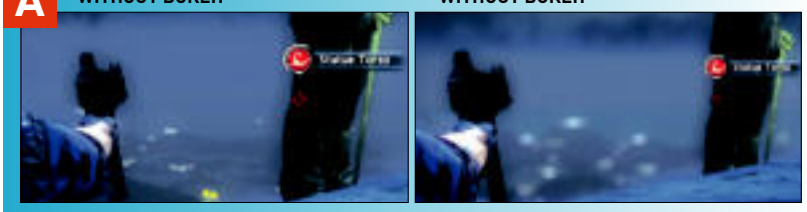
Postprocessing is really a catch-all for special effects that are generated, typically with shader programs, and aren't necessarily part of an existing graphics API. Of course, the GPU itself needs to be programmable.

Adding effects to rendered frames first began to show up with DX9 games. We've seen increasing use of postprocessing effects in DX10 and now, DX11 titles. A wide variety of postprocessing effects are possible; examples include depth of field, heat distortion, wet distortion, bokeh, dynamic blur, and film grain.

Some of these effects can be used to add realism to a scene. Heat distortion above a fire or hot desert sand is a good example of that. Other effects actually make the game less realistic, but more cinematic. Examples of these include depth of field, film grain, and bokeh effects. (Bokeh is the blurriness you see in out-of-focus areas of a photograph. The quality of the bokeh is one of the parameters used to rate the quality of a camera lens.)

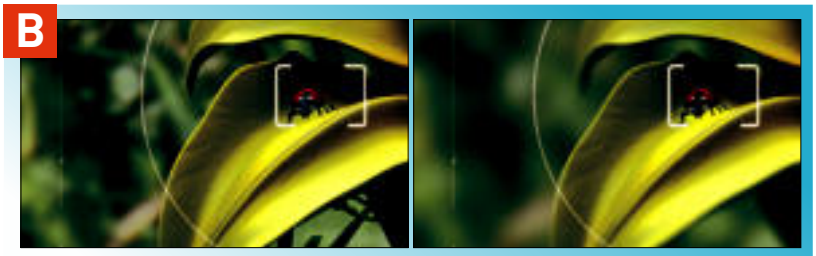
We've all seen these effects in movies and television, but rarely experience them in real life. Game developers add these effects to make their games seem more like big-screen movies. This makes sense in some games, like the over-the-top action of the recently released Just Cause 2, which emulate big-budget action movies in their overall feel.

A



In Just Cause 2, you'll see bokeh effects when you use an Nvidia graphics card.

B



In AMD's ladybug demo, you can control aperture settings to change the background's focus.

If you have an Nvidia-based graphics card running with the PC version of Just Cause 2, you'll see bokeh effects in action (image A).

The use of bokeh helps to focus the player's attention on whatever is nearby. Clever shader-program writing can give developers granular control over the effect, as we see in the AMD Ladybug depth-of-field demo (image B—downloadable from the AMD developer website: http://bit.ly/adMDtj). This demo gives the user control over aperture settings, as if they were shooting with a camera. Stopping the camera down results in a soft blurry background behind the sharply focused image. Opening up the aperture brings the background into better focus.

The game Borderlands (image C) uses depth of field to focus your attention on whatever you're aiming at with your weapon.

Programmable shaders took a big step forward with DirectX 11. Previously, if a programmer wanted to add multiple effects to a scene, the shader program became large and unwieldy. Now they can call in shader routines as needed, allowing for more efficient writing of shader programs and more efficient use of effects.

C

Borderlands uses depth of field to focus your eye on an object you're aiming at. In the screen on the left, everything is in focus, but when the player takes aim, only the target in the foreground is in focus, as seen in the screen on the right.

THE PERFORMANCE IMPACT

How does all this graphics goodness affect frame rates?

If we set the wayback machine to a couple of years ago, we'd relive the disappointment we all experienced with the first DirectX 10 games. Visual effects added only marginally to image quality, but the performance hit was huge. What's the impact of these spiffy new DirectX 11 features? Also, what's the impact of postprocessing effects? Obviously, adding more shader programs can impact performance, but how much?

We tested performance with hardware tessellation using the Unigine Heaven 2.0 synthetic benchmark (which uses a real game engine) and STALKER: Call of Pripyat. Call of Pripyat was also used to test performance with SSAO, HBAO, and HDAO.

The performance of Nvidia's GTX 480's tessellation engine looks pretty awesome relative to AMD's part in a benchmark like Heaven, but as we can see from Call of Pripyat, the impact of tessellation on real games is less clear. There just aren't enough titles yet that make heavy use of hardware tessellation to determine which GPU is superior. Subjective experiences differ; Metro 2033's performance, for example, seems to give the edge to Nvidia, though we don't have hard numbers to back this up. On the other hand, Aliens vs. Predator is a smooth experience on both AMD and Nvidia's latest cards.

Just Cause 2 supports two interesting GPU postprocessing features if you're running an Nvidia-based card: bokeh and water simulation. Thus, we tested the GTX 480's performance with and without those features using the game's Concrete Jungle built-in benchmark.

As you can see, enabling these features incurs a performance cost. But that cost is a few percentage points, rather than the 75–80 percent decrease we saw moving from DX9 to DX10.

FINAL THOUGHTS

In the past, comparisons regarding performance versus visual features revolved around antialiasing and anisotropic filtering. DirectX 10 added some new tricks to the game developer's arsenal, but came with a severe performance penalty. DirectX 11's new features can affect performance, but the new generation of graphics cards enables you to run with much better visual fidelity while maintaining reasonable performance.

It takes time for developers to take advantage of new features. The good news is that the uptake on DirectX 11–capable GPUs has been one of the most rapid in recent history. We are starting to see increasing use of capabilities that first began showing up with DirectX 9—finally. For example, it's hard to find a current-generation game that *doesn't* take advantage of the postprocessing effects made possible with programmable shaders. Developers continue to experiment with postprocessing effects, as we've seen with the bokeh setting in Just Cause 2. And features like film grain and depth of field are commonplace. Newer titles bring new effects, such as emulating color filters seen in big-budget movies and TV shows.

Good tools will be the key to seeing new features take hold. One reason postprocessing has become so common is that graphics programmers have developed tools similar in concept to Photoshop filters, which allows artists to easily implement them in the art pipeline. It will be some time before similar tools are readily available for newer, DX11-capable hardware.

Then there's the multiplatform question. Larger game publishers are leery of pushing high-end, PC-exclusive features if they're shipping big-budget titles across multiple platforms, including game consoles that may not support tessellation or other features. While the PC has made something of a comeback in the gaming arena, putting additional developer resources into PC-exclusive abilities is still something of an afterthought.

Still, we are seeing new games emerge that take full advantage of new graphics possibilities. Eastern Europe seems to be an emerging haven for bleeding-edge development of PC games, if the STALKER series, Cryostasis, and Metro 2033 are any indication. And even console-oriented titles, like Dirt 2, can be architected to take advantage of new APIs on PCs.

So if you have one of the new generation of DirectX 11 cards, turn up the eye candy and experiment. Your games can look better than ever.

GTX 480 VS. RADEON HD 5870

	NVIDIA GEFORCE GTX 480	XFX RADEON HD 5870 XXX
Heaven, no tessellation (fps)	**62.8**	56.2
Heaven, moderate tessellation (fps)	**55.0**	43.5
Heaven, normal tessellation (fps)	**50.3**	36.4
Heaven, extreme tessellation (fps)	**39.0**	21.8
Call of Pripyat, all off (fps)	78.5	**88.8**
Call of Pripyat, contact shadows on (fps)	74.7	**77.0**
Call of Pripyat, tessellation on (fps)	74.5	**86.5**
Call of Pripyat, SSAO (fps)	62.7	**75.8**
Call of Pripyat, HBAO (fps)	68.3	**77.1**
Call of Pripyat, HDAO (fps)	56.4	**65.1**
Call of Pripyat, tessellation, contact shadows, and HDAO on (fps)	52.1	**57.5**

Best scores are bolded. Our benchmark test bed is a 3.33GHz Core i7-975 Extreme Edition in an Asus P6X58D Premium motherboard with 6GB of DDR3/1333 and an 850TX Corsair PSU. The OS is 64-bit Windows 7 Ultimate. Benchmarks were run at 1920x1200. AA was disabled for these benchmarks. For Call of Pripyat, SSAO quality was set to high.

NVIDIA GEFORCE GTX 480

Just Cause 2, all off (fps)	44
Just Cause 2, bokeh on (fps)	41.7
Just Cause 2, water simulation on (fps)	38.6
Just Cause 2, both on (fps)	36.8

Tests run in Concrete Jungle benchmark. Other graphics features were dialed up to the maximum settings, and the benchmark was run at 1920x1200.

Expand YOUR BROWSER Universe

These 31 amazing bookmarklets will add convenience, functionality, and boundless joy to your Internet experience

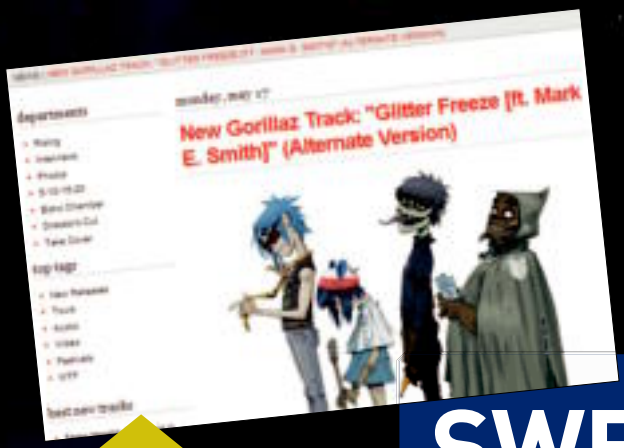
BY ALAN FACKLER, ALEX CASTLE, AND AMBIKA SUBRAMONY

Because everyone uses the Internet in a different way, there's no such thing as a one-size-fits-all browser. The feature set one person needs might be too little or too much for another person. Extensions for browsers like Firefox and Chrome go a long way toward solving this problem, but installing and managing extensions is a pain, and can be an overly complicated solution to often-simple problems.

That's where bookmarklets come in.

A bookmarklet is a snippet of JavaScript—a tiny, self-contained program that can be stored in a hypertext link and saved as a bookmark. Later, when you click the bookmarklet, the code is executed by your browser, and something happens. What exactly happens is different for each bookmarklet—some reorganize the information on the page, some integrate with popular web services, and some are just for fun. In this article, we're going to show you 32 of our favorite bookmarklets, and tell you how they work.

If you're tempted to give them a try yourself (and we bet you will be), hit up the online version of this article at www.maximumpc.com/bookmarklets. All the bookmarklets are available right there on the page, and you can join in the conversation about which bookmarklets are great, and which aren't.



GROOVESELECT

Play any song, any time With the Grooveselect bookmarklet, if you know the name of a song, you can listen to it. Harnessing the power of Grooveshark, the too-good-to-be-true, no-seriously-how-haven't-these-guys-been-sued-into-oblivion-yet music discovery service, Grooveselect will look up and play any song that you've highlighted in the browser. Better yet, it plays in the background, so it doesn't interrupt your regularly scheduled browsing.

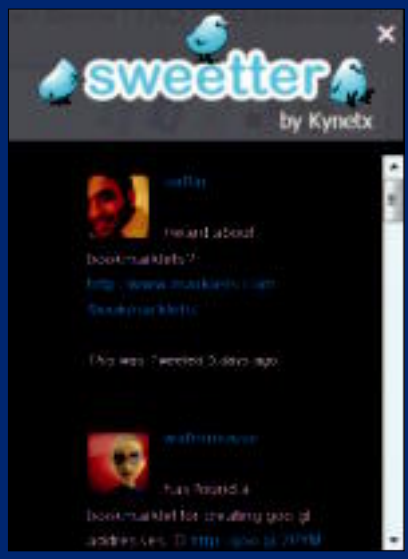
BIT.LY

Keep URLs short If you're in the habit of sharing a lot of links (Twitter users, bloggers, we're looking at you), you know that URL shorteners like Bit.ly can be a huge help in keeping your character-count down and your article uncluttered. Unfortunately, it can be a pain to manually enter each link in the Bit.ly homepage. The Bit.ly bookmarklet solves this very problem. When you click it, a sidebar appears on the site you're currently viewing, which shows you the shortened URL for that site, as well as a selection of relevant tweets.

SWEETTER

Find like-minded folk

People who don't understand Twitter think it's all about sharing what you had for lunch, or other miscellaneous trivia. The truth is, it's about having conversations about the things that interest you. Sweetter helps you find people on the web who are talking about the things you care about. If you like a certain website, or a certain blogger, just go to that content, click the Sweetter bookmarklet, and you'll see the 10 most recent tweets about the site.



READABILITY

Reformat the web One of the most well-known bookmarklets, Readability allows you to reformat any article to your own viewing standards. Do you like your articles to look like a newspaper with small margins? Readability can handle that. Do you like large, white text on a black background? Readability's got that covered, too. Your wish is Readability's command.

AMAZON WISH LIST

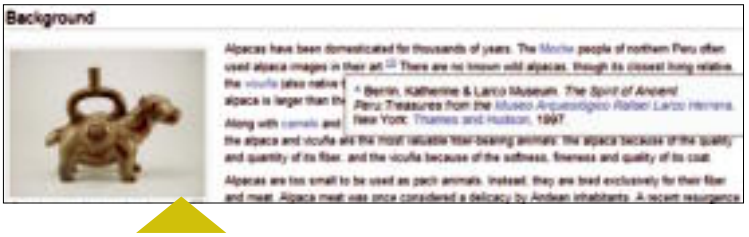
Keep track of the stuff you want

Amazon, one of the easiest ways to shop online, just got even easier. This simple bookmarklet lets you highlight any product on any site and add it to your Amazon.com wish list, without leaving the page. Use it for wedding registries, birthdays, holidays, or your own personal shopping. It works on pretty much any site, though you'll get better results with already-established e-commerce sites.

...click on this list, Scroll Down does exactly what it says—it scrolls down. Slowly. Sounds silly, but if you're the kind of person who likes to open a long article, sit back, and relax while reading, it's exactly what you need. What do you do when you get to the bottom? Well, there's another bookmarklet called Scroll Up, but that *would* be silly.

GIFEXPLODE

Animation, frame by frame When you click the GIFExplode bookmarklet, you are asked to select any animated GIF on the currently active website. You're then taken to the GIFExplode web app, which "explodes" the animation into its composite frames, which you can view individually or save.



WIKIPEDIA FOOTNOTES

Check the source Anyone who frequents Wikipedia is familiar with the little bracketed superscript numbers, which link to the all-important references that make the encyclopedia a trustworthy source. The only problem with these source links is that you can't see what the source is without scrolling all the way to the bottom of the page and interrupting your reading. With the Wikipedia Footnotes bookmarklet, you can simply hover over links, and the source is displayed in a pop-up box.

VOZME

If websites could talk... Never find yourself without a text-to-speech converter again, thanks to VozMe. Simply highlight some text on a web page, click the VozMe bookmarklet (available in male and female variants) and enjoy the sweet, robotic sounds of the VozMe web app's automatic text-to-speech service.

SLAPNOTES

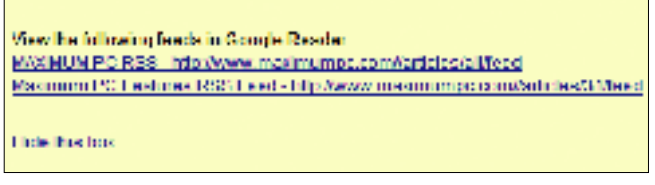
Get sticky with it Slapnotes is a web service that allows you to place virtual Post-It-style notes all over the web. You have to create a (free) account to use the service. Then use the bookmarklet to easily generate notes on any website—they'll still be there the next time you come back to the page. You can manage, browse, and search all your notes from your account page.

MARKLET

Where bookmarklets gather Hold onto your hats, because things are about to get meta. This bookmarklet keys into the massive bookmarklet database at Marklet.com, to allow you to use virtually any bookmarklet that exists, even if you haven't saved it to your bookmark bar. Just click the bookmarklet, type something into the search bar that appears, and you'll see a list of all related bookmarklets. Clicking one of the bookmarklets is the same as clicking it in your bookmarks bar, so you'll never be caught without the tool you need.

GOOGLE READER

RSS R Us There are two bookmarklets available from Google for subscribing to RSS feeds using its Reader web service. The first simply allows you to automatically view the first RSS feed on any page in Google Reader. The second bookmarklet displays a box that shows you a list of all RSS feeds on a page, for sites like our own with more than one feed. Clicking any of the feeds opens them in Google Reader, like the first bookmarklet.



RSS TO PDF NEWSPAPER

Convert and save your feeds RSS to PDF Newspaper is a handy bookmarklet by fivefilters.org that converts any RSS feed you're viewing to a newspaper-style PDF file. The bookmarklet instantly converts your feed of choice in your browser, where you can save it for later viewing. You can drag the link into your bookmarks bar, or get creative and visit fivefilters.org to customize your 'marklet. The site lets you change the header for your PDFs, add images, and change the order of your stories.

LETMEGOOGLE THATFORYOU

Put lazy people in their place How frustrated do you get when your friend IMs you to ask a question that could have just as easily been answered with a quick Google search—pretty frustrated, right? Now you can use a convenient bookmarklet to express that frustration by creating an animation that shows just how easy it is to find the answer to questions using Google. Just highlight a word, click your bookmarklet, and message your friend right back with the resulting link. It's a little snarky, but that's why we like it.

KITTENIFY

It doesn't get any cuter than this There are a lot of frivolous bookmarklets out there. We've resisted the temptation to include them in the list—up until now. The one that finally broke our resolve is Kittenify, which lets you transform all of the images on a page into cute little kittens, doing cute little kitten things. Now, who doesn't want a bookmarklet like that? We only wish it worked on ads, too, but for now all the banners on MaximumPC.com will suffice. Convert our site to kittens, stat!

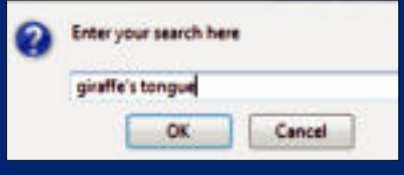
PWNYOUTUBE

Some videos need to be saved PwnYouTube is a bookmarklet that lets you save YouTube videos as either high-quality MP4 files, or as standard Flash video. Just click the bookmarklet and you'll see a yellow bar at the top of your browser screen. Right-click on either of the suggested formats, select Save As, and you'll have that hi-larious video of a surfing alpaca saved on your hard drive for all eternity!

INSTANT INFO

Five Must-Have Search Bookmarklets

So far, we've tried to keep from cluttering up this list with a lot of bookmarklets that are essentially glorified search bars. These make up a large chunk of the bookmarklets available, and all work in essentially the same way:



1) Save [service x]'s search bookmarklet

2) Highlight some text, and click the bookmarklet

3) Be whisked away to [service x]'s page, automatically searching for the highlighted text.

We haven't included these because they're all basically the same, and kind of boring, but that doesn't mean they aren't useful. Here's a list of our five most commonly used search bookmarklets:

→ **WIKIPEDIA** Keeping this bookmarklet handy makes it easier than ever to be a know-it-all online.

→ **IMDB** Unfamiliar with the actor or movie mentioned in the blog post you just read? Look it up on IMDB.

→ **GOOGLE IMAGES** Can't remember what color a giraffe's tongue is? If you had this bookmarklet you could just highlight "giraffe's tongue" and find out.

→ **ACRONYM AND ABBREVIATION FINDER** Another one that comes up often when surfing the web. Clarifies any confusing abbreviation in a flash.

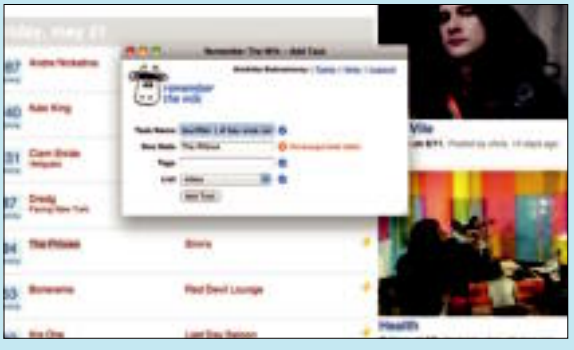
→ **URBAN DICTIONARY** Sometimes you need to learn about words that aren't in the regular dictionary. Next time you catch yourself wondering what it actually means to ghost ride a whip, you know what to use.

BOXEE BOOKMARKLET

Fill up your queue We've always been a fan of Boxee as a solid media PC app, but now we've found a way to make it even better. Boxee's own bookmarklet allows users to add videos from sites like YouTube to their queue. As long as you have Boxee installed on your system (it doesn't have to be open), you can click the bookmarklet and it will add the video in your browser to your account's queue. It's a must-have for all Boxee users!

REMEMBER THE MILK

Making the to-do list is the easy part Do you use the Remember the Milk web app to manage your tasks and reminders? Remember the Milk's own bookmarklet is a great way to add tasks to your account as soon as you're reminded of them. See a concert online that you want to eventually purchase tickets for? Just highlight it, click your bookmarklet, and add it to your list of things to do. You can edit the title, date, tags, and list all with the bookmarklet, and based on what you highlight, Remember the Milk will fill in some of the blanks for you.

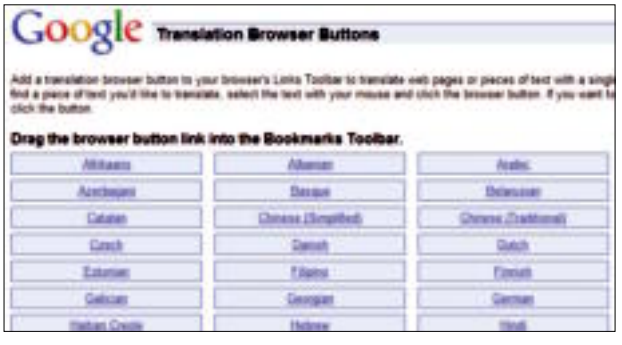


LONG URL PLEASE

Avoid unsavory surprises Thanks to Twitter's 140-character limit, URL shorteners have become all the rage. If you're tearing your hair out over all these short URLs, breathe a sigh of relief; Long URL Please is here for you. This handy bookmarklet supports 80 services, and will help keep you from accidentally stumbling upon things you'd just rather not see. Click the bookmarklet and the origins of every shortened URL on the page are revealed.

GOOGLE TRANSLATE

Now they're speaking your language It seems like nearly every one of Google's myriad online services has a bookmarklet, and Google Translate is no exception. In fact, there are more than 50 bookmarklets for the online translator—one for each language it supports. Simply save the bookmarklet for your mother tongue, then highlight some text in another language and give it a click. Google Translate will take care of the rest.



GOOGLE BOOKMARKS

Sync bookmarks from any browser You may know that you can sync your Chrome bookmarks to your Google account, but did you know you can easily do the same thing using *any* browser? This bookmarklet makes it possible. Clicking the bookmarklet displays a pop-up window that lets you edit a site's title, add tags, notes, and add it to your Google bookmarks list. If you haven't been using Google to manage your bookmarks yet, this little tool just might make it worth your while.

LINKIFY

Create links with a simple click XenoMachina's Linkify is a true time-saver for anyone who publishes content to the web. How does it work? Open up your blog editor of choice, start a post, and type. Get to something you'd like to create a link for? Select the term, click Linkify, and you'll get a pop-up that searches Google. Just pick the result you'd like to link to and you're all set. Linkify doesn't work in Google docs, but it works just about everywhere else—Flickr, Blogger, and yes, even Twitter.

FACEBOOK

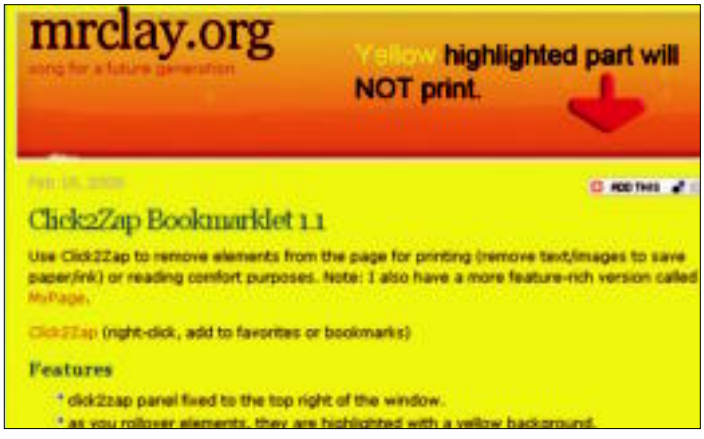
Because your friends need to know now You just dropped your favorite sandwich on the floor while taking it out of the microwave. You've got to tell the world, quick! Click your Facebook bookmarklet and post the bad news instantly to your page, then sit back and wait for a slew of sad faces from the girls and insults from guys. People don't believe you? Upload an iPhone picture of your destroyed turkey melt to Facebook, then use the Choose Thumbnail feature built into the bookmarklet interface to prove to people that you're not just a liar looking for some online pity.

VIEW PASSWORDS

Get it right the first time An unfortunate truth about passwords is, the more you get them wrong in one sitting, the more likely your browser is going to lock you out, whether you simply misspelled the password or not. Lucky for you, there's a View Passwords bookmarklet that you can use any time you enter a password, to ensure you've spelled your secret service code without error. Access any website that requires a password, punch it in, then run View Passwords to ensure that it's spelled absolutely correctly, so you can hit Login with complete confidence, no matter how much you've had to drink. (We're not judging.)

CLICK2ZAP

Print only what you want Ever try to print something from one of your favorite websites, only to find a jumbled mess of advertisements and pop-ups distracting you from the actual content (and using up substantially more ink)? Use the Click2Zap bookmarklet to selectively choose which parts of any given page you'd like to print, whether it's a single image or an entire article. Activating Click2Zap will turn your mouse into a "deselection tool," so to speak, allowing you to choose what you don't want to print by dragging a large yellow window across irrelevant information. Not happy with your (de)selection? Hit Undo at the top-right corner and give it another go. When you're done, hit Print, and save yourself some grief—and some ink!



READ IT LATER

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END NOTE

Three Ways to Better Bookmarklet Organization

There are more than 30 bookmarklets on our list, and there's hundreds more available online. That's a problem. Why? Because you can fit only about 10 or so on your bookmarks bar before it becomes a complete mess. Fortunately, there are ways to keep lots of bookmarklets organized. Here are three quick tips:

→ **ORGANIZE YOUR BOOKMARKLETS INTO FOLDERS** Bookmarklets work just as well in folders as they do on your browser's bookmarks bar, so sort them into logical groups like "Search Bars" and "Writing Resources."

→ **KEEP YOUR BOOKMARKLETS ON THE CLOUD** Bookmark-syncing applications like Xmarks usually work with bookmarklets, so you can make sure you've got your browser toolbox available to you wherever you go.

→ **RENAME YOUR BOOKMARKLETS** Changing a bookmarklet's name won't break it, and may make it shorter or easier for you to remember.

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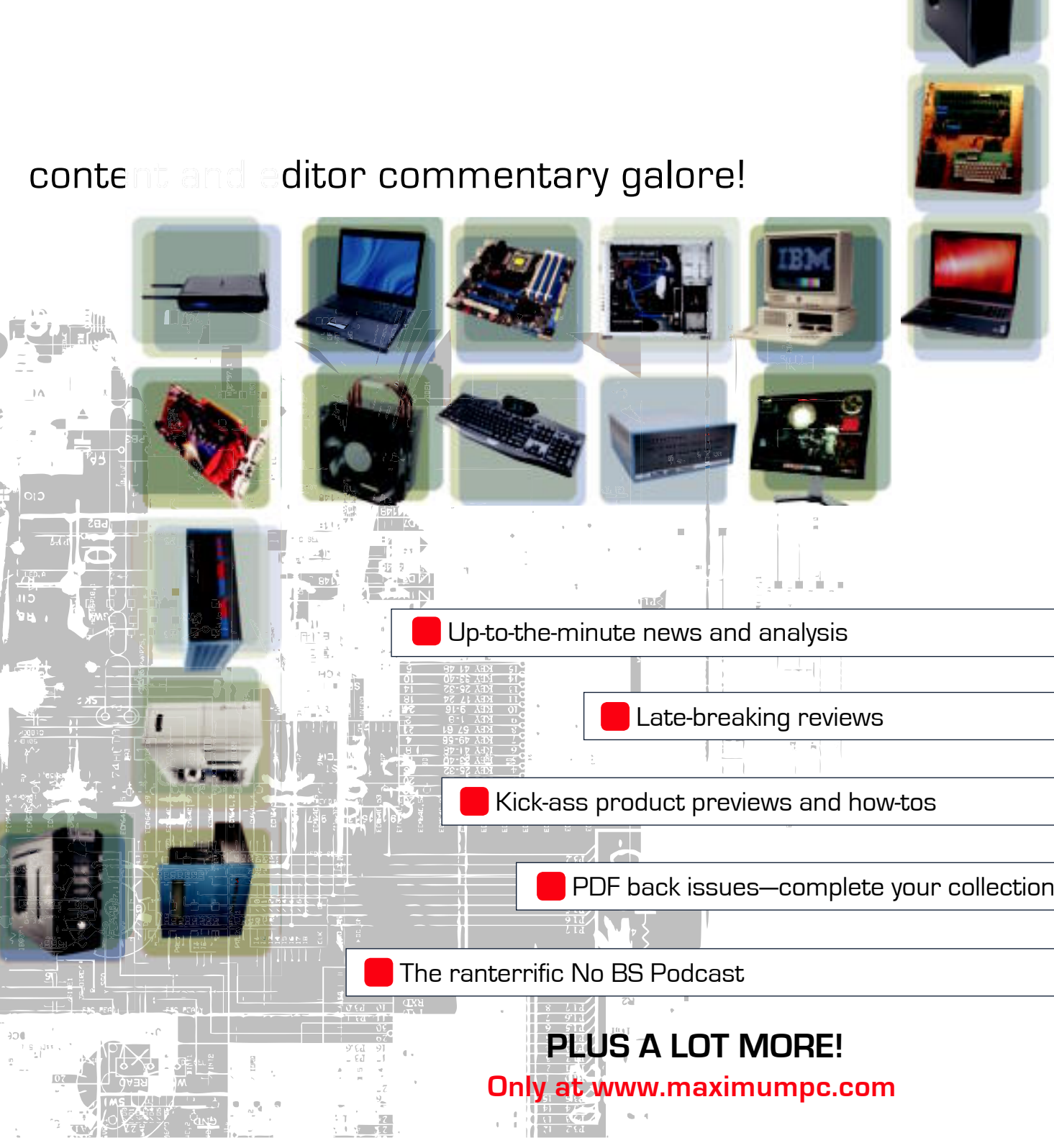

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WHITE PAPER

WiGig

One-gigabit-per-second data rates are nigh, thanks to the Wireless Gigabit Alliance's emerging 802.11ad standard. Here's how it works -GORD GOBLE

It's no secret that current wireless networking standards are imperfect. The no-cable approach is hyper-convenient, and certainly Wi-Fi in its various recent incarnations—802.11g and its theoretical 54Mb/s throughput, and 802.11n and its theoretical 300Mb/s data rates—is sufficient for moving data, streaming compressed media, and playing online games. But compare it to Ethernet (or a well-structured Power-line or MoCA network, for that matter), and Wi-Fi simply wilts—especially when you introduce such pesky barriers as walls, appliances, and human beings to the environment. And if you're thinking of streaming HD video without wires, you'd best prepare for a shuddering trickle rather than a raging torrent.

Thankfully, a new sheriff is on his way into town. He hasn't officially been appointed yet, but his gun is in its holster. And what a gun it is, promising theoretical peak throughput as high as seven *giga*bits per second (7Gb/s) and a real-world bare minimum of 1Gb/s. That's more than 10 times the throughput of current wireless solutions.

It's called WiGig, and the big reason it's so special is that it taps into the 60GHz frequency band.

GIGAHERTZ, GIGABITS, PATH LOSS

The radios in today's Wi-Fi routers operate on one of two unlicensed frequency bands: 2.4GHz or 5GHz (dual-band routers have one of each).

The 2.4GHz band has relatively few channels to work with and is extremely crowded with existing 802.11b/g/n networks—not to mention the energy emitted by some cordless phones, baby monitors, microwave ovens, and a host of other devices. The 5GHz band is both less crowded and has more channels, but it's not much wider than 2.4GHz and as utilized by the 802.11n standard remains limited to a maximum theoretical throughput of 300Mb/s.

The 60GHz frequency band is an entirely different animal. In 2001, the FCC allocated seven contiguous gigahertz of spectrum (from 57GHz to 64GHz) to unlicensed wireless communications. Prior to the FCC's move, only 0.3GHz of bandwidth was available for that purpose.

The 60GHz band is cool for a number of other reasons. First, one of its apparent drawbacks—extremely limited range—is actually a benefit. You see, 60GHz is far more susceptible than other frequencies to a phenomenon called path loss. A 60GHz electromagnetic wave suffers a significant reduction in power density as it propagates through space, preventing signals from traveling nearly as far as, say, those in the 2.4GHz or 5GHz frequency.

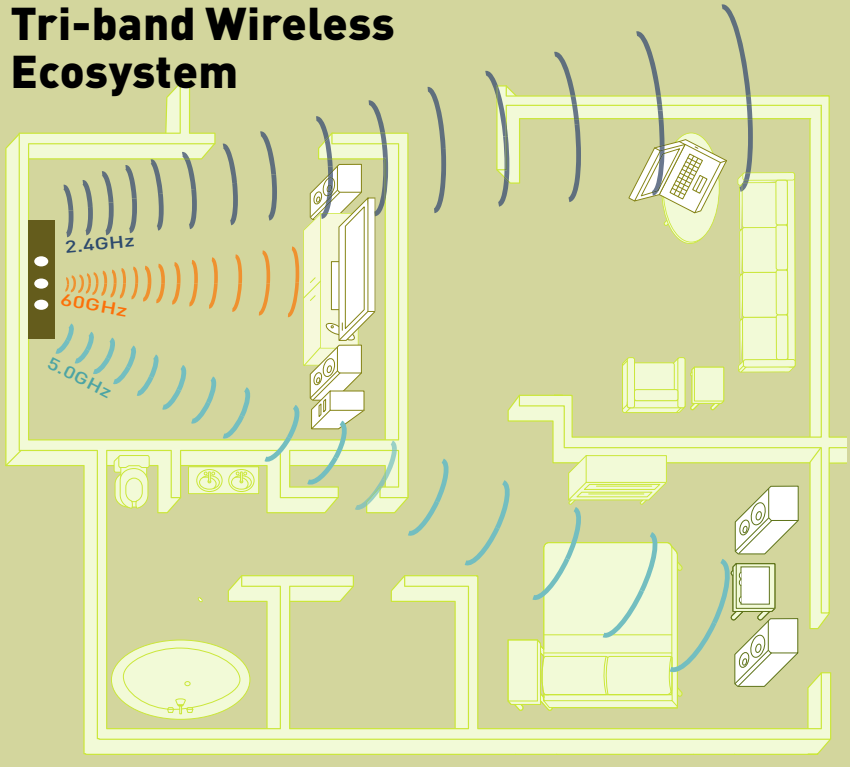
Yet susceptibility to higher path loss also makes it an ideal solution for short-range, at-home use. According to RF Globalnet, a trade publication for the radio frequency/microwave design industry, 100,000 systems operating at 60GHz can be located within 10 square kilometers without interference hassles. Indeed, the 60GHz wireless LAN range is so short that the WiGig Alliance promotes it as an in-room rather than whole-house solution.

UNDER THE HOOD

So what makes WiGig so powerful over the short haul? A low probability of interference certainly

HOW IT WORKS

Tri-band Wireless Ecosystem



Radios that operate at higher frequencies deliver more bandwidth, but radio waves on very high frequencies are more readily absorbed by walls and other physical barriers. By this time next year, we expect to see tri-band wireless routers with radios operating on the 2.4-, 5.0-, and 60GHz frequency bands. The 60GHz radios, however, will likely depend on line of sight.

helps, as does that 7GHz chunk of available bandwidth, which in turn enables much higher data rates. As WiGig Alliance board member Bruce Montag explains, "There is more unencumbered spectrum available in the 60GHz band, which enables higher spectrum utilization and multi-gigabit throughput."

Moreover, WiGig devices will pack a serious punch. According to WiGig president Dr. Ali Sadri, WiGig will compensate for path loss by utilizing high-gain antennas at both the transmitter and receiver stages to increase the "link margin"—the difference between the receiver's sensitivity and the actual received power—and the total EIRP (effective isotropic radiated power), which is the measurement of antenna signal strength. But raw power isn't everything. In order for both transmitter and receiver to maximize the amount of gain, they need to "learn" training algorithms that help determine the most favorable direction for waveform arrival and departure. This is accomplished though something called "adaptive beamforming," a process that increases link margin by dynamically directing signals to the best route.

Given the shorter range of WiGig, Sadri and his organization maintain that it isn't a competitor for existing Wi-Fi. Instead, it's envisioned as an enhancement to existing Wi-Fi architecture. Sadri envisions a scenario where dual- and tri-band devices utilize the 60GHz frequencies for high-bandwidth line-of-sight networking and seamlessly fall back to legacy (2.4GHz or 5GHz) Wi-Fi for longer-range transmission. Sadri also envisions homes outfitted with signal reflectors mounted on the walls that will bounce WiGig signals from room to room. Even the Power-line and MoCA camps are greeting WiGig with open arms, noting that their technologies may be bridges between WiGig-equipped zones.

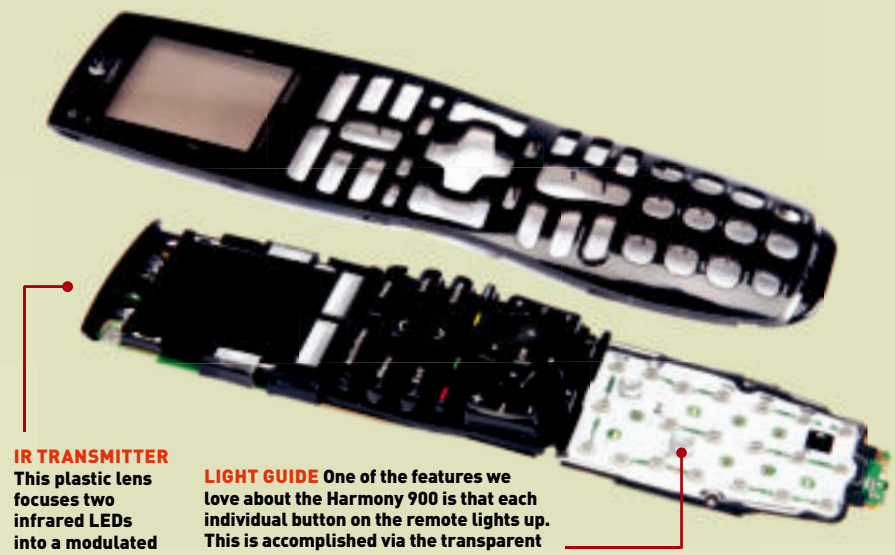
WHAT'S NEXT?

Of course, industry reactions may be a bow to the potential inevitability of WiGig. It's backed by a veritable who's who of the tech world, including industry giants such as Microsoft, Nokia, Intel, and Broadcom. The WiGig Alliance plans to submit its first-draft standard to the IEEE committee responsible for developing the latest wireless networking standard, known as IEEE 802.11ad, but that doesn't mean it's willing to wait. The WiGig Alliance has formed a strategic partnership with the Wi-Fi Alliance (the organization that certifies all 802.11a/b/g/n products for interoperability) and will likely produce a similar logo program if the IEEE doesn't act quickly enough.

When will you be able to buy a WiGig device? Our sources tell us sometime between Q4 2010 and Q1 2011, although some proprietary point-to-point 60GHz products are available today.

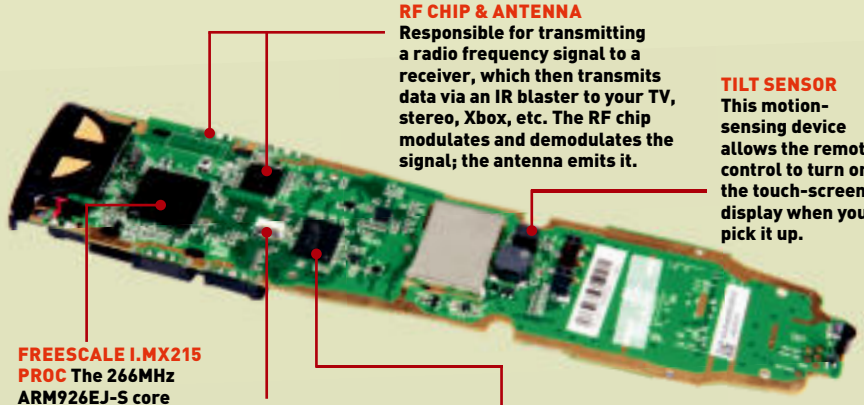
Logitech Harmony 900 Universal Remote

A universal remote allows a user to control a host of home theater products with a single device. Logitech's remote is an interesting piece of consumer electronics because it has a touch-screen display and because it is fully programmable. You plug it into your PC, input the devices you want to control, and the remote sets everything up. We dissembled it to find out what makes it tick.



IR TRANSMITTER This plastic lens focuses two infrared LEDs into a modulated narrow beam.

LIGHT GUIDE One of the features we love about the Harmony 900 is that each individual button on the remote lights up. This is accomplished via the transparent light guide, which directs beams of light from tiny LEDs to each button.



RF CHIP & ANTENNA Responsible for transmitting a radio frequency signal to a receiver, which then transmits data via an IR blaster to your TV, stereo, Xbox, etc. The RF chip modulates and demodulates the signal; the antenna emits it.

TILT SENSOR This motion-sensing device allows the remote control to turn on the touch-screen display when you pick it up.

FREESCALE I.MX215 PROC The 266MHz ARM926EJ-S core provides on-chip support for an LCD controller, USB On-The-Go, and a variety of serial interfaces for other controllers.

TOUCH-SCREEN DRIVER This tiny controller drives the Harmony 900's capacitive touch-screen display. Information from the touch sensor is translated into information that the CPU can understand.

FLASH MEMORY The Harmony Remote uses 64MB of standard NAND memory.

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

HOW TO Step-by-Step Guides to Improving Your PC

THIS MONTH

RESTART EXPLORER.EXE WITHOUT A REBOOT

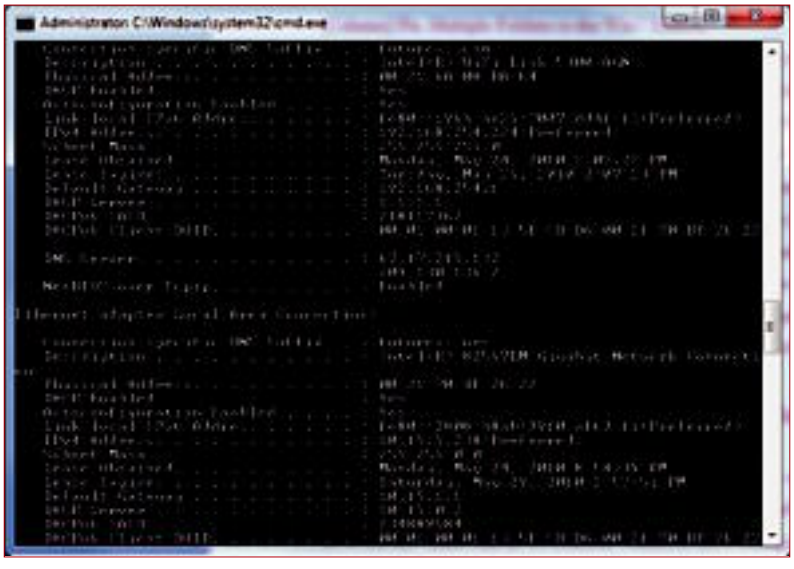
ALEX CASTLE
MANAGING ONLINE EDITOR

In the great list of Things That Can Go Wrong With Your PC, one of the most catastrophic-seeming is an explorer.exe crash. Explorer.exe is the Windows process that controls the shell, and when it is somehow corrupted or crashes, features as fundamental as the Start Menu, Taskbar, and Desktop cease to function. What can you do? Suck it up and restart the machine? Not necessarily.

Even though explorer.exe is a vital process, your computer can actually run just fine without it, meaning that you can shut it down and restart it if it begins to act up. To shut it down, simply open the Task Manager (Ctrl+Shift+Esc) and terminate the process "explorer.exe" like you would any other misbehaving thread. To start it back up, click File > New Task (Run...), and enter explorer.exe.

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

WINDOWS TIP OF THE MONTH



See Your IP Address with ipconfig/all

When you're setting up a home network, playing LAN games, or troubleshooting a faulty Internet connection, you often need to know information like your local IP address, local gateway, and DNS servers. These can all be found in Windows' networking properties, but the power-user way to scope out your network stats is to open a command prompt and enter the following command: `ipconfig/all`.

Save Your Old Boot Drive with Windows Virtual PC

When you finally make the decision to start fresh with a new OS on a new hard drive, it can be nerve-wracking. If you've been following proper hard disk etiquette, most of your programs and data should be stored on different drives or partitions than your operating system, but somehow important data has a way of making its way onto your C: drive. And although you can do your best to make sure you back up all the data you want to keep (your My Documents folder, for instance), it's hard not to feel like you're forgetting something.

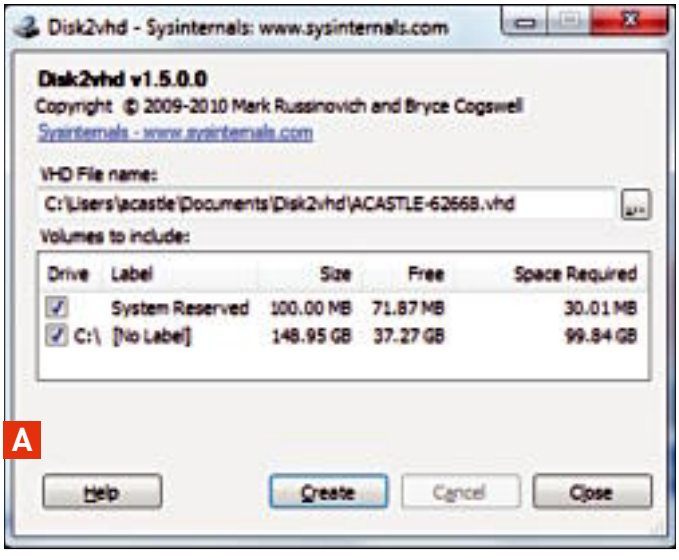
You don't have to worry. Thanks to new tools from Microsoft in Windows 7, you can preserve your entire hard disk on another drive as a Virtual Hard Disk (VHD). So don't worry that you'll forget important data on your old drive—just freeze it solid, like Han Solo in a block of carbonite, and rest easy knowing that if you suddenly recall that you left something important on your drive, you can simply run it as a virtual PC, or mount it to your new system.

There are several programs that will allow us to accomplish our goal, but only a few that are both free and simple to use. For this how-to, we'll use Windows Virtual PC and Disk2vhd. Both programs are free, but there is a major limitation: Windows Virtual PC only works with disk images of no more than 127GB in size. Fortunately, this is enough for many Windows XP–era boot disks, but not all. If your drive is bigger than 127GB, you can still create the VHD using Disk2vhd, and you will be able to mount the VHD as an additional hard drive, but you won't be able to "boot it up" using Virtual PC.

–ALEX CASTLE

1 CREATE A VHD

The first thing you must do is create a virtual copy of your C: disk while it's still your boot drive. This is made very simple with the aforementioned Disk2vhd, which exists for just that purpose. Even better, Disk2vhd works while the disk is online, meaning you can install and run it while still using the drive you intend to clone. Simply download the program at http://bit.ly/VL8gT and unzip. When you run the executable, you'll be asked to specify one or more drives to clone, and an output destination for the .vhd file (image A). Make sure you've got another disk with enough space to save the virtual disk, which will be the same size as the original.



A

That's all the direction Disk2vhd needs. After that, it'll take its time making a perfect copy of every disk that you selected in the first step.

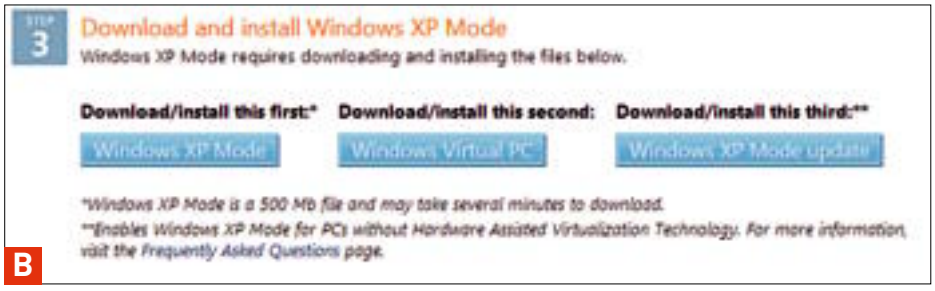
2 RECOVER DATA FROM THE DISK

So, now you've created your virtual hard disk, installed your new OS, and a month or so has passed. Suddenly, you remember a very important file that you forgot to get off of your old disk. How do you retrieve it from the VHD file? There are two options:

1) RECREATE YOUR OLD MACHINE USING VIRTUAL PC

This is the most straightforward case, but it only works as long as your VHD is 127GB or smaller. If it is, you can load it into a virtual machine created by Virtual PC. To use Virtual PC, you'll first have to download it from Microsoft, at http://bit.ly/lvAjC. At the bottom of the page there are three download options, with the instructions to download them all (image B). You can actually skip the first and third downloads, which simply create a premade virtual machine that will allow you to use XP Mode in Windows 7. (If you don't have Windows 7 Professional or higher, you'll have to use Virtual PC 2007, available at http://bit.ly/bLSEmx.)

To create your virtual machine, simply press the Start button and type vpcwizard into the Run bar. This will walk you through the simple steps involved in creating a new virtual machine for your saved hard drive. The most important step is the one labeled "Add a virtual hard disk" (image C). Here,



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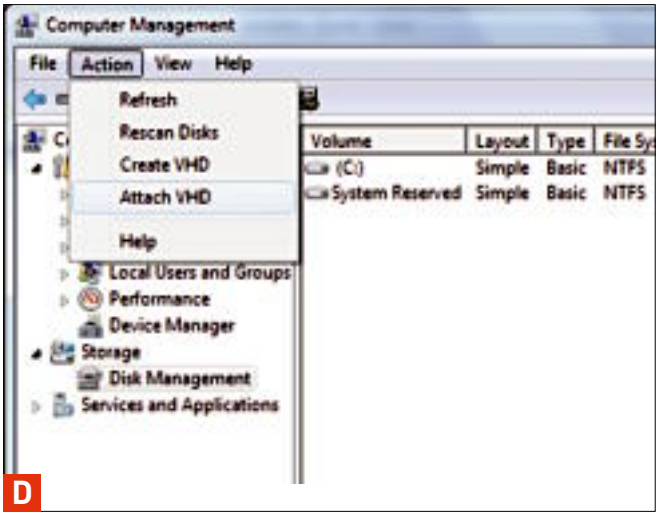


click the second radial button, labeled "Use an existing virtual hard disk" and browse for the disk you created earlier. When you're done with the wizard, you'll have a virtual version of your old machine, which you can use to locate any old files or applications you may have forgotten.

2) MOUNT THE VIRTUAL DRIVE If your VHD is too large for Virtual PC, you can still mount it to your new computer as a regular hard drive. To do this, first open the Computer Management window by clicking the Start button, then right-clicking Computer and selecting Manage. In the Computer Management window, click Disk Management, then click Action and select Attach VHD (image D).

You won't be able to boot from the virtual disk, but you should see it in the Windows explorer as though it were a real hard drive. You can now browse through its contents and find any files you need.

Run All Your Old Games Using DOSBox

Most PC gamers have, at one point or another, known what it feels like to have a computer that's too slow to play the latest games on the market. It sucks, but it comes with the territory—you just save up some cash and upgrade. Unfortunately, there's another, more insidious problem that can keep you from playing the games you want to: a PC that's too fast.

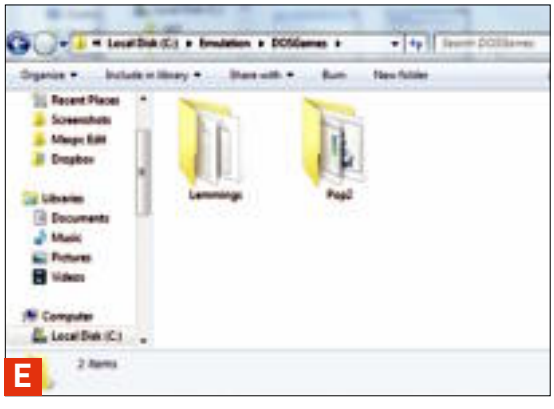
If you've ever tried to run an old DOS game on a modern computer, you probably know what we're talking about. If the game loads at all, it's glitchy, or too fast, or the sound doesn't work. It's a symptom of software written at a time when gigahertz-scale processors and gigabytes of RAM were simply unthinkable. If you wanted to, you could try to fix the problem by building a PC out of vintage hardware and running DOS natively, but there's a much easier solution, called DOSBox.

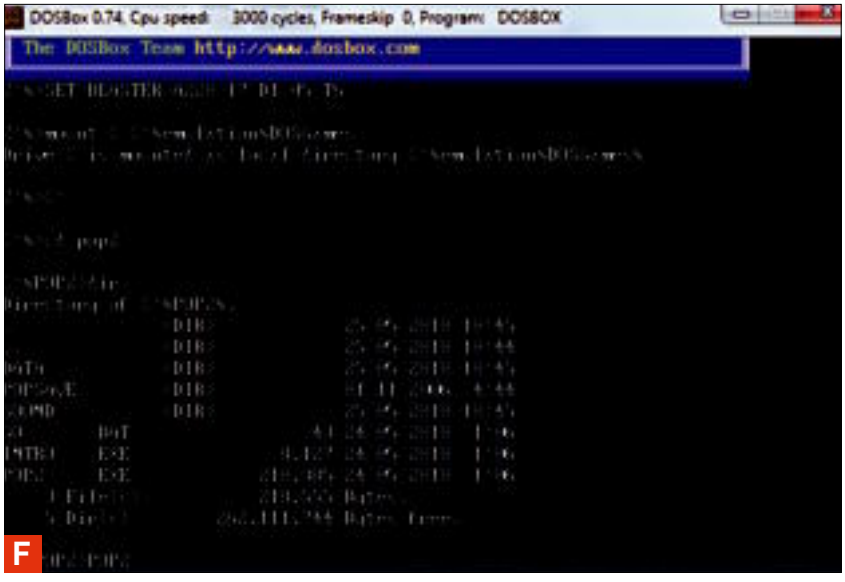
DOSBox is an emulator, similar to those that allow you to play classic console games on your PC, which simulates a DOS environment running on old hardware. In this article, we'll show you how to get set up with DOSBox, so you can play all of the classics on even the most breakneck-fast modern rigs. —ALEX CASTLE

1 DOWNLOAD AND INSTALL DOSBOX

The installation procedure for DOSBox is straightforward. Just download the latest version at the DOSBox homepage (www.dosbox.com) and run the installer. You'll be asked to choose a location to install DOSBox to—put it wherever you like.

Before you run DOSBox for the first time, you'll need to create a folder to house your old games (image E). When you start DOSBox, you'll mount this folder as a virtual C: drive, so make sure that it contains all the games you'll want to play. Once you've done this, launch DOSBox by running DOSBox.exe.





F

2 LAUNCH A GAME

When you run DOSBox.exe, two Windows will open, both resembling a command prompt. The window that opens in the background, labeled DOSBox Status Window, is only for troubleshooting and can be safely ignored (for now). The other window is where we'll launch our game. To do so, start by mounting the folder you created earlier. The command to do this is `MOUNT [drive letter for mounted drive] [game folder path]`. So, if your games are saved in C:/Emulation/DOSGames, and you want to mount that folder as the C drive, you would enter `MOUNT C C:/Emulation/DOSGames`.

Now that your games folder is mounted, navigate to the folder containing the specific game you want to play. If your DOS skills are a little rusty, you can do this by first entering `C:` to move to the (virtual) C drive, then typing `CD` followed by the name of the game directory and hitting enter. Now, run the game's executable. If you forget what the name of the executable is, enter `DIR` to see a list of a directory's contents (image F).

G

3 TWEAK THE GAME

If everything goes according to plan, your game will now launch in a small window (image G). To switch to (or from) full screen at any time, just hit Alt+Enter. Once you get into the game, it's very likely that it will run too fast or too slow. If you experience this, you can either speed up or slow down the simulated-computer's processor by pressing Ctrl+F12 or Ctrl+F11, respectively.

If the game won't launch at all, you may need to adjust the emulation options by running DOSBox Options.bat and editing the hardware settings in the configuration file.

4 CREATE A DESKTOP SHORTCUT

If you find yourself playing a particular game frequently and don't want to have to run it from the DOSBox command line every time, you can create a shortcut that will run the game directly. To do this, first create a new shortcut to DOSBox.exe, then edit it. In the Target field after the DOSBox.exe path, add, in quotes, the filepath for the game you wish to run (image H). If your game needs any special

H

configuration options, you can save a separate config file (make any changes you need to the default DOSBox config file, and then save it as a copy with a different filename) and specify that the shortcut should use that configuration by adding the -conf tag, followed by the filepath of the new config file, in quotes, before the filepath for the game you wish to run.

Once you've got the Target field all filled out, simply rename the shortcut, and (if you want) change the icon, and you can run your old game whenever you want, right from your desktop.

5 MULTIPLAYER

Way back in the DOS era, before the Internet boom, multiplayer games frequently used modems (image I), or old communications protocols like IPX. Of course, modern computers are rarely equipped to use those old methods, so DOSBox includes a solution.

For IPX games, DOSBox emulates an IPX network, though it is actually using the modern UDP protocol to connect to other computers. To use DOSBox's IPX feature, each player first has to enable IPX networking by opening the DOSBox config file (which you can do by clicking the DOSBox Options.bat file) and changing the line that says `ipx=false` to (you guessed it) `ipx=true`.

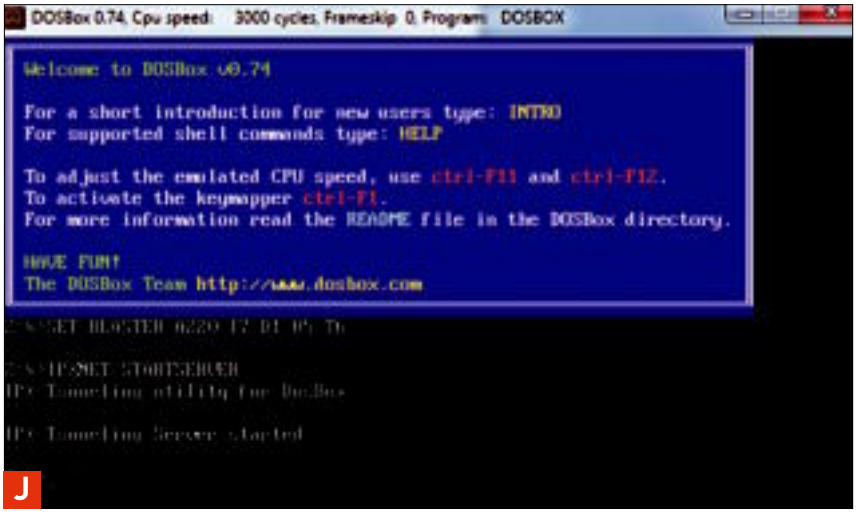
Next, you need to establish the emulated IPX network using DOSBox's internal IPXNET program. One person will have to act as the IPXNET server. That person simply opens DOSBox and enters `IPXNET STARTSERVER` (image J). IPXNET uses UDP port 213, so if you're behind a NAT firewall you may have to set your router to forward that port. More information on this can be found at http://portforward.com.

Everyone else who wishes to connect to the IPX game needs to open DOSBox and type `IPXNET CONNECT [IP address of server]`. If you're playing on a LAN, the server can find his local IP using ipconfig. If you're playing over the Internet, he can find his external IP by visiting http://whatsmyip.org.

Once everyone is connected to IPXNET, simply start the game you want to play, and start a multiplayer game as though you were really connected on an IPX network. You can see your simulated IPX address in the DOSBox Status Window.

DOSBox can also emulate a serial nullmodem connection using TCP. To use this feature, the server and the client must each make a change to the DOSBox config file. The server has to change the line that says `serial1=dummy to say serial1=nullmodem`. The client must change the same line to read `serial1=nullmodem server:[IP of server]` (image K). Use the same methods as above to determine the IP address of the server, and don't include the brackets.

I



J

```
serial1=nullmodem server:63.150.42.5
serial2=dummy
serial3=disabled
serial4=disabled
```
K

Run a Ventrilo Server with a Static Hostname from DynDNS.com

We're on a bit of an IP kick this month in the R&D section. In the Windows Tip we showed you how to locate your local IP, and in the DOSBox article we showed you how to play old games online, as long as you know your IP. We've got one more IP-related trick up our sleeves: How to set up a Ventrilo chat server for your gaming friends, using a static IP from DynDNS.com.

Having a static IP is tremendously useful. In addition to allowing you to host a Ventrilo server, it also lets you play older games online, and run services like fileservers, media streamers, or ebook repositories (as seen in the July issue) on your desktop PC or home server, and then access them from anywhere. Unfortunately, most ISPs won't give you a static IP for free. That's OK though, because it's easy and free to get a static hostname from DynDNS.com, which can be used in most situations where you would need a WAN IP.

–ALEX CASTLE

1 CREATE A STATIC HOSTNAME AT DYNDNS.COM

To get started, just head to DynDNS.com, click Sign Up Now, and then select DynDNS Free. Next, you'll be asked to specify a hostname, choosing from one of 80-some domains (image A).

Next, you'll have to specify the current external IP for the computer you want to use as a host. Assuming that's the computer you're using to sign up for DynDNS, you can just click the link below the IP Address field that says "Your current location's IP address is [IP address]." At the bottom of the form, select the services you'll want to host using your static hostname (for Ventrilo, select Chat Server).

A

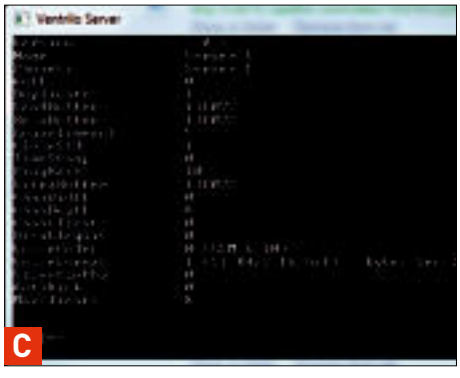
When you finish, click Add to Cart. You'll be asked to create an account (for free), so fill out the form to continue. All that's left to do is check your email inbox, click the activation link, and then press the Activate Services button. DynDNS will now track your computer's dynamic IP, and redirect the hostname you've selected to it.

2 RUN THE VENTRILO SERVER

Now, download and install the Ventrilo server software (not the Ventrilo client) from Ventrilo.com. To change the settings for your server, edit ventrilo_srv.ini (image B). You can leave most settings as they are, but you should change the server name, password (if you want one), and the admin password fields. Run ventrilo_srv.exe to launch the server (image C). If you're behind a router, you'll very likely need to forward the Ventrilo port. As usual, visit Portforward.com for step-by-step instructions about how to do this.

Now, you and up to seven of your friends can run the Ventrilo client software, and connect to the hostname you got from DynDNS.

B



C

REVIEWS

Tested. Reviewed. Verdictized.

INSIDE

ONLINE

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

Origin PC Genesis

A new gunslinger shakes up the status quo

If we asked you to name three boutique PC vendors, we're pretty sure that Origin PC wouldn't make your list. Hell, you've probably never even heard the name Origin PC.

But that's to be expected. The company has only been selling PCs since November. That's not a lot of time to jump into a game dominated by the likes of Falcon Northwest, Digital Storm, and Maingear.

Origin PC isn't just a typical startup, though. The three founders of the company are expatriots of one of the oldest names in gaming PCs: Alienware. That's the old Alienware, too, before it was sucked into the Dell mothership and relocated to Austin, Texas.

Despite those credentials, we were skeptical the company could ship us a functioning high-end gaming rig that could compete with the big boys. After all, we've had many new companies talk the talk but fail to walk the walk.

Sometimes, they can't even ship us the system intact. And shipping is literally half the battle. You can't just take a 90-pound rig, pack it in the cardboard box the case came in, and expect it not to end up in a dozen pieces. Origin PC got that part of the test right. Shipped in a wooden crate (Digital Storm uses a similar shipping system), the Genesis arrived next-day-air almost unharmed. During shipping a water reservoir shifted a quarter of an inch. We shifted it back.

On the hardware front, there are few surprises. You can read the spec chart for the full deets, but the highlights are tri-SLI GTX 480, an Asus Rampage III Extreme board, and an Intel 3.33GHz Core i7-980X overclocked to 4.5GHz. The overclock puts the machine just slightly ahead of the Maingear Shift (reviewed in June) at 4.2GHz 980X and Digital Storm's HailStorm (reviewed in May),which ran its 980X at 4.4GHz.

In hardware, these three have very similar configurations. The biggest variation was in cooling. The Shift was the most pedestrian with an off-the-shelf Acetek unit and air-cooled GTX 480 cards. That made it the loudest of the three. Surprisingly, despite its custom Koolance water-cooled GTX 480 cards, the Genesis wasn't especially quiet. That honor goes to the HailStorm.

But what about performance? Obviously, the Genesis smokes our now pathetic Core i7-920 zero-point system. But what about the HailStorm and Shift? Not surprisingly, with its higher-clocked CPU, the Genesis came out on top. We saw the Genesis run roughly 2 to 8 percent faster than the HailStorm in applications and from 2 to 10 percent faster than the Shift. Gaming also saw the Genesis out front except in STALKER: CoP, where the HailStorm's Radeon HD cards kept it in the lead. To sum up, the Genesis now holds five benchmark records. Not by a huge margin, but a win is a win is a win. We've also been running informal DX11 tests using Heaven 2.0 at max settings and 2560x1600 res. The Shift's tri-SLI gave us 45fps and the Genesis gave us 50fps. Hell, the Genesis even survived a CPU burn-in test and a GPU burn-in test, to boot.

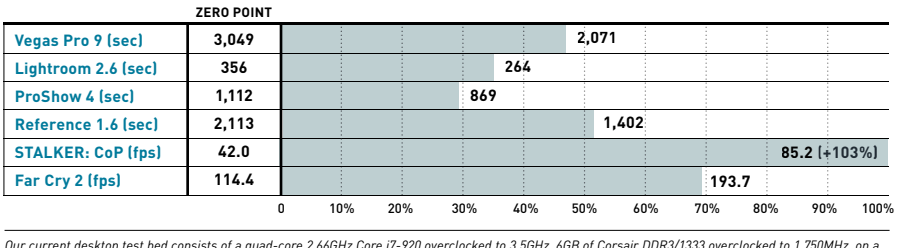
So, color us impressed. This one victory doesn't automatically elevate Origin PC to the same status the established boutique vendors hold (there are still questions of long-term viability as well as long-term support and service that can only be answered over time), but it's clear that this upstart can build a machine as fast or even faster than the best guys in business. —GORDON MAH UNG

Origin PC's Genesis packs no hardware surprises, but it's impressive nonetheless.

SPECIFICATIONS

Processor	Intel 3.33GHz Core i7-980X (overclocked to 4.5GHz)
Mobo	Asus Rampage III
RAM	6GB Corsair DDR3/1600 in tri-channel mode
Videocard	Three GeForce GTX 480 in tri-SLI
Soundcard	Creative Sound Blaster X-Fi Titanium Fatal1ty
Storage	Two 160GB Intel X25-M in RAID 0, 1.5TB Seagate Barracuda 7200.11HDD (7,200rpm)
Optical	Pioneer BDR-205 12x Blu-ray burner
Case/PSU	Corsair 700 D/Silverstone 1,500W PSU

BENCHMARKS



Our current desktop test bed consists of a quad-core 2.66GHz Core i7-920 overclocked to 3.5GHz, 6GB of Corsair DDR3/1333 overclocked to 1,750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and 64-bit Windows 7 Ultimate.

MAXIMUM PC KICK ASS!

VERDICT 9

ORIGIN PC GENESIS

+ PROJECT GENESIS	− GENESIS THE BAND
Record-setting benchmark performance; highest stable overclock we've seen to date.	Not as quiet as you would expect; unpacking is a two-person job.

$7,500, www.originpc.com

EVGA GTX 470 SC

Excellent performance at a price that won't punish your wallet

GPUs that cost $500 are all well and good, but the sweet spot for high-end graphics cards is in the $350–$400 range. That's still a good chunk of change, but it can get you a card with close to 90 percent of the performance of high-end cards.

That's certainly true of EVGA's GTX 470 SC. Built on a cut-down version of Nvidia's high-end, DirectX 11 GPU, this card posted eyebrow-raising benchmarks, pretty much putting it into a class of its own.

EVGA's super-clocked GTX 470 GPU ships with 448 shader processors, running at 625MHz, with a shader clock of 1,280MHz. That's a 3 percent faster core clock and 2.5 percent faster memory frequencies than the stock GTX 470. (The GTX 480 uses 480 shader processors at 700MHz). The 320-bit-wide memory interface pumps data to 1,280MB of GDDR5 running at 850MHz (3,400MHz effective.) Of course, the card supports the usual set of Nvidia features, including hardware SLI, PhysX acceleration, and 3D Vision Surround video.

The card is shorter than the GeForce GTX 480 at just 9.5 inches long. Unlike its big brother, this card needs only a pair of 6-pin PCI Express graphics power connectors, rather than an 8-pin and a 6-pin. Monitor interfaces include two dual-link DVI ports and a mini-HDMI port. EVGA includes a mini-HDMI-to-HDMI cable adapter in the box.

We were happily surprised by the performance. The GTX 470 SC crushed the Asus Radeon HD 5850 and even outpaced the slightly pricier Radeon HD 5870 in a few benchmarks. So while EVGA's card costs more than GTX 470 cards running at stock speeds, the pricing is in line with the overall performance.

Overall, we feel that the GTX 470 SC and the Radeon HD 5870 are tied but the GTX 470 has the edge in more forward-looking titles. Most Radeon HD 5870 cards also come in at or above $400 while the majority of GTX 470 cards are around $350.

It's worth noting that at 1920x1200, quite a few games seem to be CPU-bound on the GTX 470 without AA enabled. So we really recommend pumping up the eye candy. If you've got a 30-inch display, you might have to dial down AA a bit to keep frame rates high.

What about noise and heat? The fan does spin up to high volumes when the card is under load, but it's only a little noisier than the Radeon HD 5850. EVGA's card burns a lot more power at full throttle, though; our system posted 353 watts under load, while the HD 5850 system posted a scant 261W. Now, a 100W power difference while actually gaming won't set your electricity bill on fire, but you'll pay a little more over the long term.

EVGA offers a limited lifetime warranty on the 470 GTX SC card, if you register the card upon purchase. So in addition to overclocking the card for you, the company is backing it up with a warranty.

So, it's official: We're crowning a new king of the high midrange. Performance is exceptional, and while the price is on the high side of affordability, you do get a lot of bang for your buck. **—LOYD CASE**

MAXIMUM PC KICK ASS!

VERDICT **9**

EVGA GTX 470 SC

+ PENDRAGON	− MORDRED
Superb performance for the price; card will fit in most cases; EVGA warranty.	Costs more than the competition; power-hogging; noisy.

$380, www.evga.com

BENCHMARKS

	EVGA GeForce GTX 470	Asus Radeon	Diamond Radeon
Unigine Heaven 2.0 (fps)	**24**	14	17
Battle Forge (fps)	**50**	40	47
Dirt 2 (fps)	**71**	62	**72**
Far Cry 2 / Long (fps)	**83**	65	75
Far Cry 2 / Action (fps)	**68**	54	63
Tom Clancy's HAWX (fps)	86	76	**89**
Crysis (fps)	24	27	**32**
STALKER: Call of Pripyat (fps)	30	32	**37**

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

Meet the new king: EVGA's GTX 470 SC rules the price-to-performance kingdom with an iron fist.

SSD Mini-Roundup

Two new SandForce-powered drives face off against a newcomer

It seems like just yesterday that we said farewell to our June 2010 issue and with it our second-ever solid state drive roundup. But no sooner had we shipped that issue to the printers than a new pile of tasty solid state drives landed on our doorstep. This month, the OCZ Vertex 2 (the sequel to that "limited edition" drive from June) bumps heads with another SandForce drive—Corsair's Force F100—as well as the Patriot Zephyr, which uses JMicron's new JMF612 controller. The SandForce SF-1200 controller seems to be replacing Barefoot's Indilinx as the go-to performance chipset, but what about JMicron? Its JM602 controller was largely responsible for the poor write performance of first-gen SSDs, so can the JMF612 wash that bitter taste out of our mouths? You can bet your second-favorite platypus that we'll find out. Don't bet your favorite platypus; that's just irresponsible.

—NATHAN EDWARDS

OCZ VERTEX 2 100GB

In June, we tested OCZ's Vertex Limited Edition, one of two drives we had that used the SandForce SF-1200 controller. At the time, we wondered why OCZ would artificially limit supplies of an SSD with such great performance. And now we know: It was a trial run to help SandForce, a recent startup, gain capital to scale up production. It's since done that, and in gratitude to OCZ has granted the company exclusive random-write-IOPS-boosting firmware for its Vertex 2 drives. The new firmware will be available to other SF-1200 drives (probably by the time this issue hits stands)—but as of press time, it's an OCZ Vertex 2 exclusive deal. Ethics of "exclusive firmware" aside, is the Vertex 2 any better than its Limited Edition stable mate?

Sweet particulate platypus, yes. We lauded the sequential write speeds of the two SandForce drives we tested previously, but noted that their sequential reads were still lower than those of Barefoot drives like the Corsair Nova and Patriot Torqx. The Vertex 2 has no such limitations; its HDTune 4.01 average sequential write is identical to the LE's, but its average sequential read is a whopping 228MB/s on our test bed, faster than any SSD we've tested to date. 4KB random read IOPS were in the 11,000 range, with write IOPS in the 10,000 range. This is a far cry from the 50,000 IOPS OCZ claims that the firmware allows, but still the highest we've ever seen with our current test suite, which uses a different program to measure IOPS than OCZ does. Interestingly, random IOPS in the Corsair Force F100 (reviewed on the next page) are nearly on par with the Vertex 2, which was supposed to have a firmware-driven lead, but the Vertex 2 does outstrip the F100 in sustained reads. This, again, could be a benchmark-related issue.

The Vertex 2 also clocks one of the highest single-drive PCMark Vantage HDD subscores we've ever seen, at nearly 35,000. In fact, it is as good as or better than every SSD we've ever tested in nearly every category (although Intel's drives still reign supreme in random-write speeds).

It's been a long time since we could unequivocally give a Kick Ass award to a solid state drive—the Patriot Torqx has held our Best of the Best spot for a long time—but the OCZ Vertex 2 takes the crown. Prices range from $200 for 50GB to over $1,800 for 480GB; the 100GB version is $400.

Say hello to our new Best of the Best 3Gb/s SSD, the OCZ Vertex 2 100GB.

VERDICT

OCZ VERTEX 2 100GB
$400, www.ocztechnology.com

9 KICK ASS!

PATRIOT ZEPHYR 128GB

The JMicron JM602 controller, paired with insufficient cache, hobbled the first generation of consumer SSDs—once the cache filled, write speeds slowed to a crawl. Random-write latencies could get as bad as a fifth of a second (compared to .1ms for most modern SSDs), pulling average sustained writes down as low as 20MB/s in some cases. Manufacturers responded by adding more cache or by building future generations of drives on different controllers, such as the Barefoot Indilinx part. Since then, JMicron has been pretty quiet, but now Patriot's Zephyr line has arrived, powered by JMicron's new JMF612 SATA controller. Is this new effort enough to the put JMicron into our good graces?

For space reasons, we're dropping the suspense. While average sustained reads over 200MB/s are impressive, a minimum sustained write speed of 0.6MB/s and an average write speed of just 62.9MB/s in HDTune show the telltale signs: the drive stutters. Not in every benchmark—HDTach averaged 164MB/s writes with no sign of jitters—but it does happen. The massive 64MB of DRAM cache should mitigate the jitters in most real-world circumstances, but not all—the Zephyr's Premiere Pro write times are slower than any SSD we've tested recently, bar two: the Marvell-based Plextor drive and WD's SiliconEdge Blue, both tested in our June roundup. Read and

JMicron's new controller in the Patriot Zephyr SSD is better than the infamous JM602, but not good enough.

write IOPS are likewise less than impressive, especially the latter, which averaged a decidedly non-leet 1,337 IOPS.

Ultimately, the JMF612 controller can't match the performance of either the Barefoot or SandForce controllers. And while the price is nice, most people who can afford a performance SSD at all can afford to spend a few more dollars for one based on a more stable controller.

At $365 for 128GB, the Patriot Zephyr offers more capacity for the price than current-gen SandForce drives, which trend toward $400 for 100GB. But we don't think the price break is worth the performance cut. If you're looking for a cheaper and more capacious alternative to a 100GB SandForce drive, look to Barefoot drives such as the Corsair Nova V128 or Patriot's own Torqx.

VERDICT

PATRIOT ZEPHYR 128GB
$360, www.patriotmemory.com

6

CORSAIR FORCE F100

Man, we are all about SandForce these days. The controller company burst out of stealth mode early this year, and proceeded to rock our socks with every drive that uses its SF-1200 firmware. The Corsair Force F100, like all drives of its ilk, relies on commodity NAND and the rock-solid SandForce SF-1200 controller, which eschews DRAM cache entirely in favor of not sucking. And though it doesn't reach the unprecedented reads and writes offered by the OCZ Vertex 2 and its custom firmware, the Force F100 performs on par with the next best drives out there, which all happen to be SandForce-powered.

Like the OWC Mercury Extreme and the OCZ Vertex LE, the Corsair F100 displays average sustained read speeds of around 195MB/s, with average sustained writes topping out at more than 220MB/s. It far surpasses either of those competitors in 4KB random read/write IOPS, though; at 11,102 read IOPS and 9,778 write IOPS in HDTune, the F100 is just barely outperformed by the Vertex 2. Corsair says it will soon have access to the same firmware OCZ currently uses for the Vertex 2, which should further reduce the IOPS gap. However, the Vertex 2 does still outstrip the F100 in sequential reads as of press time.

The Force is with Corsair's first SandForce-powered SSD.

For some reason, the F100 did not perform at its peak straight from the box. Only after we zeroed the drive with diskpart did its performance match that of other SandForce drives. This may only have been an issue with our review unit, but it's not a bad idea to zero a drive before you use it, anyway.

With performance on par with the best SandForce drives (save in sequential reads, where it's bested by the Vertex 2), the F100 is a force to be reckoned with. Provided you zero the drive first, we have no qualms recommending it above all SandForce drives on the market today save the Vertex 2.

VERDICT

CORSAIR FORCE F100
$400, www.corsair.com

9

BENCHMARKS

	OCZ Vertex 2	Patriot Zephyr	Corsair Force F100	Patriot Torqx
Capacity	100GB	128GB	100GB	128GB
Controller	SandForce SF-1200	JMicron JMF612	SandForce SF-1200	Indilinx
HDTune 4.01				
Avg Read (MB/s)	**228.1**	203.6	196.5	220
Random Access Read (ms)	**0.1**	**0.1**	0.2	**0.1**
Burst Read (MB/s)	**227.7**	135.0	200.6	220
Avg Write (MB/s)	**223.5**	62.9	221.9	162.3
Random Access Write (ms)	**0.1**	0.2	0.2	0.2
Burst Write (MB/s)	206.3	142.0	206.3	**221.7**
4KB Read (IOPS)	**11,145**	5,245	11,102	7,084
4KB Write (IOPS)	**10,025**	1,337	9,778	3,435
Premiere Pro (sec)	**363**	431	373	364
PCMark Vantage HDD	**34,050**	23,922	33,393	23,674

Best scores bolded. All drives tested on our hard drive test bench: a stock-clocked Intel i7-920 CPU on a Gigabyte GA-EX58-UD3R with 6GB DDR3, running 64-bitWindows 7 Professional. All tests performed using Intel south-bridge SATA chipset with Windows 7 default AHCI drivers unless specified.

Eurocom D900F

The most processing power you can get in a notebook, bar none

The D900F sports a fairly unadorned dark-gray finish, but its Core i7-980X gives it unparalleled inner beauty.

Our notebook benchmarks had barely recovered from the wailing they took at the hands of AVADirect's Core i7/SLI-wielding X8100 (reviewed June) when Eurocom's D900F arrived to inflict further punishment. At least this time around they suffered a different set of injuries.

Eurocom's 17-inch desktop replacement flexes its muscle in the form of a 3.33GHz Core i7-980X, making it the first hexa-core notebook we've tested. The humble 3.06GHz Core 2 Duo T9900 in our zero-point notebook didn't stand a chance. We watched in awe as the D900F tore through the applications benchmarks with brute force. From its 450 percent lead in Premiere Pro to its 222 percent lead in ProShow Producer to even its 56 percent lead in the mostly single-threaded Photoshop test, the D900F was merciless. It even walloped the 1.73GHz Core i7-820 quad-core in AVADirect's X8100, with leads ranging from 29 percent (Photoshop) to 225 percent (Premiere Pro).

Our benchmarks got a bit of a breather in the gaming runs, where the D900F achieved relatively small gains over our zero-point's scores. That wasn't the case in June when AVADirect's two GeForce GTX 285M cards in SLI broke gaming benchmark records. We're not saying that the D900F isn't up to playing games—it's single GTX 280M can certainly handle graphics-intensive workloads. But you might not choose to play every game at the notebook's native 1920x1200 resolution—for example, we saw a just-barely acceptable 29fps in Far Cry 2 at the D900F's native res.

In all respects, the D900F is a classic Clevo workhorse—stout, sturdy, and fully featured. In addition to the aforementioned components, the 15.5x11.5x2.5-inch notebook accommodates three 7,200rpm 500GB hard drives—two of which are in RAID 0—4GB of DDR3, a Blu-ray combo drive, a full keyboard and numeric keypad, a glossy 17-inch screen, decent speakers, and plenty o' ports. Indeed, it has all the makings of a primary computer. Which is a good thing, because a notebook that's just shy of 15 pounds (giant power brick included) is mostly for staying put. And if this big boy's heft doesn't convince you of that, consider its battery life: The D900F lasted just 75 minutes in our video rundown test.

No, this isn't the notebook you take to the café in order to work over a cappuccino. Instead, it's a solid, serious machine with six cores of processing might that can perform all the functions of a full tower—albeit, for a full-tower price. **—KATHERINE STEVENSON**

SPECIFICATIONS

CPU	3.33GHz Intel Core i7-980X
RAM	4GB DDR3/1333MHz
Chipset	Intel X58
Drives	Three Seagate Momentus 500GB (7,200rpm), two in RAID 0
Optical	LG Blu-ray combo drive (HL-DT-ST BDDVDRW)
GPU	Nvidia GeForce GTX 280M
Ports	HDMI, DVI, Ethernet, four USB, eSATA, FireWire, headphone, mic, line-in, media reader, Express Card slot
Lap/Carry	11 lb, 15.2 oz / 14 lb, 15.6 oz

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	1,320	240 (+450.0%)
Photoshop CS3 (sec)	153	98
Proshow Producer (sec)	1,524	473 (+222.2%)
MainConcept (sec)	2,695	906 (+197.5%)
Far Cry (fps)	32.7	34.8
Call of Duty 4 (fps)	58.2	73.2
Battery Life	100.0	75 (-25%)

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

Our zero point notebook is an iBuypower M865TU with a 3.06GHz Core 2 Duo T9900, 4GB DDR3/1066 RAM, a 500GB Seagate hard drive, a GeForce GTX 260M, and Windows Vista Home Premium 64-bit. Far Cry 2 tested at 1680x1050 with 4x AA; Call of Duty 4 tested at 1680x1050 with 4x AA and anisotropic filtering.

MAXIMUM PC KICK ASS!

EUROCOM D900F

VERDICT 9

+ SIX CORES	− SIX SIGMA
Core i7-980X; capable graphics; big, bright screen; fully featured.	Limited portability; pricey as hell.

$4,250, www.eurocom.com

Squeezebox Touch

Logitech gets all touchy-feely

More often than not, a monolithic public corporation acquiring a small independent company ends up stifling innovation, sacrificing quality for quantity, and inexorably suffocating the golden goose. Happily, that scenario never played out when Logitech bought Slim Devices. While we don't have any insight as to what's gone on behind the scenes, we can tell you that the Touch—the fourth addition to the Squeezebox family of digital audio receivers under Logitech's reign—is utterly fabulous.

The Squeezebox Touch's slab-like industrial design harkens back to the Squeezebox 3, which Slim Devices shipped in late 2005. But where that player was equipped with a 320x32 vacuum fluorescent display, suitable only for displaying text and crude, monochrome graphics, the Squeezebox Touch is outfitted with a 4.3-inch, 24-bit color, capacitive-touch LCD. The onscreen icons are just the right size for our relatively fat fingertips, and we had no trouble navigating the menus.

The Touch comes with a basic infrared remote control, too; but having grown accustomed to the Sonos Digital Music System's RF remote, we quickly tired of the Logitech's line-of-sight leash. There are a few alternatives, although we haven't tested them: Logitech's C-RL65 controller (the remote that ships with the Squeezebox Duet) will control the Touch via your Wi-Fi network and it has an LCD of its own. iPhone users can use the iPeng app, and Palm WebOS users can use the Squeeze Control app.

The Squeezebox Touch has a great onboard DAC and analog outputs (stereo RCA and headphone), or you can use any outboard DAC with an optical or coaxial digital input.

The Touch is the first Squeezebox capable of hosting a USB storage device; it's also outfitted with an SD memory card slot. The Touch is equipped with an AKM Semiconductor AK4420 stereo DAC that supports bit streams up to 24-bit resolution with sampling rates as high as 192kHz (the Touch itself is limited 24-bit/96kHz) while delivering an impressive signal-to-noise ratio of 105dB. This is the first time we've encountered this DAC (Logitech has used Burr-Brown and Wolfson DACs in the past), but we dig it. It not only sounds great, but it also enables the Touch to play the 24-bit, 48kHz FLAC files we've been buying from B&W's Society of Sound music service. That's a feat the otherwise mighty Sonos system can't match.

—MICHAEL BROWN

MAXIMUMPC KICK ASS!

SQUEEZEBOX TOUCH

VERDICT 9

+ SQUEEZE	− THROTTLE
Gorgeous touch screen; USB host and SD card slot; supports 24-bit, 48kHz FLAC; supports Internet radio,	Infrared remote; inferior to Sonos in multi-room configurations.

$300, www.logitech.com

The touch screen on the Squeezebox Touch is a joy to use, provided you're in close proximity to the player and don't have to bend over to tap it.

MSI R5870 Lightning

MSI revamps the reference design inside and out

A custom PCB and dual-fan cooler combined with MSI's Afterburner overclocking tool make the R5870 a unique part.

Factory overclocked graphics cards seem too good to be true. You get increased performance plus the manufacturer's warranty. XFX's Radeon HD 5870 XXX was the first factory-OC'd version of that GPU we reviewed (May 2010); that card pushed core clocks to 875MHz and memory to 1,300MHz (5,200MHz effective.) Now MSI is jumping into the game, and unlike XFX, builds a custom cooler onto its 1GB R5870 Lightning.

If you have any doubts about the amount of customization MSI put into the R5870, one look at it tells you it's not your typical reference card. The custom cooler uses two fans instead of one, and the heatsink is a massive chunk of metal that runs the length of the card and features numerous heat pipes. The PCB is also anything but stock, and extends about 3/4 of an inch taller than other Radeon HD 5870 cards. Stock Radeon HD 5870 cards run off an 8-pin and 6-pin power connector. The R5870 features support for two 8-pin connectors for "extreme overclocking."

Out of the box, the card is clocked higher than XFX's card. But interestingly, while MSI pushes the core clock to 900MHz, it leaves the memory clock at the stock 1,200MHz (4,800MHz effective). The company also ships its Afterburner overclocking tool with the card, which offers a little more control over clock speeds and core voltage than the default Overdrive tool that AMD supplies in its Catalyst Control Panel.

In practice, however, we weren't able to juice core clock speeds much beyond 900MHz— and memory clocks proved even more finicky. Perhaps we just got a card with a GPU and memory that couldn't handle much higher settings. And yes, we did run two 8-pin connectors to the card for "extreme overclocking." Or maybe the card just needed a little more burn-in.

Still, despite our failure to overclock the card further, the 900MHz core clock that the card ships with is a boon in itself, right? Maybe not. We compared the MSI R5870 with the XFX Radeon HD 5870 XXX and an Asus GeForce ENGTX480. If you're going to cry foul because the Asus card is priced above $500, we disagree. While most stock Radeon HD 5870 cards are priced about $400, MSI is asking you to plunk down $480. That's already $60 more than the XFX Radeon HD 5870 XXX and roughly $30 shy of Asus's Nvidia-based card. For $30 more, the Asus ENGTX480 crushes both cards in almost all benchmarks (Crysis and STALKER are dead heats). The XFX card costs $100 less than the Nvidia card, but what defense does the MSI R5870 have?

And what of MSI's custom dual-fan cooling solution? The dual fans were completely enclosed in our test chassis. At idle, the noise levels seemed slightly lower than the reference cooling design on the XFX card. At full throttle, though, both cards seemed equally noisy. And, not surprisingly, the power-hungry Asus ENGTX480 was louder than both.

The bottom line is that MSI's R5870 Lightning is a flawed, if interesting, effort to ship a Radeon HD 5870 card designed to be overclocked. We just wish we'd had more success at actually overclocking it. Given the price, it's hard to justify this card over the XFX card—or even over paying a little more for the GTX 480. —LOYD CASE

BENCHMARKS

	MSI R5870 Lightning	XFX Radeon HD 5870 XXX	Asus ENGTX480
Unigine Heaven 2.0 (fps)	13	13	**26**
Battle Forge (fps)	49	49	**61**
Dirt 2 (fps)	73	71	**80**
Far Cry 2 / Long (fps)	79	78	**103**
Far Cry 2 / Action (fps)	65	65	**76**
Tom Clancy's HAWX (fps)	91	92	**104**
Crysis (fps)	**33**	**33**	31
STALKER: Call of Pripyat (fps)	38	38	**39**

Best scores are bolded. Our test bed is a 3.33GHz Core i7-975 Extreme Edition in an Asus P6X58D Premium motherboard with 6GB of DDR3/1333 and an 850TX Corsair PSU. The OS is 64-bit Windows 7 Ultimate. All games are run at 1920x1200 with 4x AA.

VERDICT **6**

MSI R5870 LIGHTNING

+ ENTERPRISE	− GALILEO
Factory overclocked with warranty support; custom cooling solution.	Pricier than the competition; limited success in actually overclocking.

$480, www.msicomputer.com

3M MPro150 Pocket Projector

Your all-in-one presentation pal

Pocket Projector is an apt label for 3M's MPro150 video projector. It's not only incredibly small, but it's completely self-contained, too. All the software you need to display digital photos and videos, PDFs, Word docs, Excel spreadsheets, and even PowerPoint presentations is built right in. You can even store those files in the 1GB of onboard flash memory or on the 2GB MicroSD card that's included. And it'll run on either AC or battery power.

The MPro150 is just a little bigger than the wee Optoma Pico PK101 projector we reviewed in April 2009 (you can read our review online at http://bit.ly/qlzYm), but 3M's device has a far superior feature set. In addition to what we've already described, the MPro150's LCOS (liquid crystal on silicon) micro-display boasts a native resolution of 640x480. The Optoma uses a DLP (Digital Light Processing) chip and has a native resolution of just 480x320.

And where the PK101 is capable of accepting only a composite video signal, the MPro150 can accept VGA plus audio or composite plus audio using the special cables that are provided. Although the projector's video input looks exactly like a mini HDMI port, the projector cannot accept digital video signals. 3M also sells a $24 cable for connecting the projector to component-video devices, and a $50 cable for connecting it to an iPod or iPhone.

It should come as no surprise, however, that the MPro150 isn't much brighter than the PK101; after all, there's only so much an LED light source with maximum radiant power of just 0.59 milliwatts can do. We had to darken the Lab almost entirely to get satisfactory performance over a large surface area. But we were very impressed that the MPro150 proved capable of producing an acceptably bright 5.5-foot image on our Epson Accolade Duet screen from a distance of just six feet. Moving the projector closer to the screen produced a much smaller image, but it also enabled the device to operate with more ambient light.

The MPro150 is equipped with a mini USB port, but it cannot host a USB storage device; the port is provided so that you can exchange files between the projector's onboard storage and MicroSD card and a host PC. The presence of the MicroSD slot, though, renders that shortcoming a moot point. A wireless remote control is the one accessory we sorely missed; as it stands, the only way to control the projector is to mash its surface-mount buttons, and that invariably shifts the image being displayed. —MICHAEL BROWN

VERDICT 8

3M MPRO150 POCKET PROJECTOR

+ PICO	− PICADOR
Very small (5.12 x2.4x0.98); full suite of integrated software; 3GB storage; MicroSD slot; VGA input.	Needs a very dark room to deliver best performance; no remote control.

$350, www.3m.com/mpro

The tiny MPro150 video projector has an integrated kickstand, or you can mount it to a tripod (3M puts this mini tripod in the box).

Belkin Play Max Wi-Fi Router

Don't you just hate idiot lights?

Could any component in a router's BOM (bill of materials) cost less than an LED? Don't think so. So why the heck did Belkin design its Play Max wireless router to use a single LED to inform you of its operating status?

Granted, the Play Max's street price is $20 to $30 cheaper than many other concurrent dual-band wireless routers, and there might even be a lot of folks who don't pay much attention to details like the status of their router's ports or whether or not both of the router's radios are operating. We do though, and a single LED that glows green when the router has an Internet connection and amber if something is amiss doesn't cut it.

As much as we appreciate having a DLNA-compatible media server, we'd prefer one that runs on the router versus one that ties up one of the router's clients.

BENCHMARKS

	Belkin Play Max (2.4GHz Band)	Netgear WNDR3700 (2.4GHz Band)	Belkin Play Max (5.0GHz Band)	Netgear WNDR3700 (5.0GHz Band)
Kitchen, 20 feet (Mb/s)	60.7	**84.7**	69.5	**78.0**
Enclosed Patio, 38 feet (Mb/s)	41.4	**43.9**	30.2	**46.8**
Media Room, 35 feet (Mb/s)	31.2	**33.4**	19.9	**20.7**
Bedroom, 60 feet (Mb/s)	32.2	**41.1**	30.9	**40.9**
Outdoors, 85 feet (Mb/s)	**10.5**	5.2	**12.2**	N/C

Best scores are bolded. TCP throughput measured using IPerf. N/C indicates no connection at that location. Read more about our testing methodology at http://bit.ly/16w270.

BENCHMARKS

	Belkin Play Max	Netgear WNDR3700
PC to NAS, small files (min:sec)	12:47	**5:15**
PC to NAS, large file (min:sec)	37:39	**11:55**
NAS to PC, small files (min:sec)	11:15	**1:04**
NAS to PC, large file (min:sec)	14:05	**3:52**

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

OK, enough kvetching. The Play Max is equipped with two wireless radios capable of operating on the 2.4GHz and 5.0GHz frequency bands simultaneously. It supports a virtual guest network on the 2.4GHz band, and it has an integrated four-port Gigabit Ethernet switch. That description fits a number of routers from the likes of Linksys, Netgear, D-Link, and Trendnet these days.

Two and a half things do set Belkin's offering apart from the competition: First, the Play Max is outfitted with two USB ports and so is capable of functioning as both a USB printer server and a USB NAS controller. Most routers have a single USB port and force you to choose one application or the other. Second, Belkin includes a suite of software applications that run on the client PC. The half is a BitTorrent client named Torrent Genie that enables the router to finish downloading a Torrent to a USB storage device attached to the router after the client PC is turned off.

That, along with Memory Safe, a client PC backup program; Music Mover, a DLNA media server; Music Labeler, an IP3 tagger; and Daily DJ, an app that analyzes your music library and automatically generates playlists according to your mood are moderately useful. None of them rate high on the wow scale, though, and superior cheap and free alternatives abound; but their EULAs do allow installation on multiple machines.

The Play Max's wireless routing performance is a mixed bag: The router's 2.4GHz radio trailed our Best of the Best pick, Netgear's WNDR3700, by a wide margin in every location except outdoors. In that test, the Belkin surprised us by delivering twice the TCP throughput of the Netgear product. We had a similar experience with the 5.0GHz band: The Play Max was significantly slower nearly everywhere except outdoors. In this case, our client couldn't connect to the WNDR3700 at all, while the Belkin's 5.0GHz radio delivered even faster TCP throughput than that of its 2.4GHz radio.

A USB hard drive attached to a router is a poor substitute for a genuine NAS box; attaching one to the Play Max is probably a mistake unless you're using it exclusively for media streaming. The router required a staggering 37 minutes, 39 seconds to write a single large file (2.79GB) to an attached 500GB Verbatim CLON drive. The Netgear WNDR3700, by comparison, accomplished the same task in just 11 minutes, 55 seconds. And where the Netgear was able to write our 647MB collection of small files to the attached drive in 5 minutes, 15 seconds, the Play Max required 12 minutes, 47 seconds.

Backing up a client PC to a USB drive attached to the Play Max could devolve into a major time sink, but we do appreciate being able to attach both storage and a printer. And the Play Max's TCP throughput at range is very impressive. —MICHAEL BROWN

VERDICT 8

BELKIN PLAY MAX WI-FI ROUTER

+ MAX'S WOLF SUIT	− MAX'S ATTITUDE
Impressive TCP throughput at long range; USB ports for both printer and storage; BitTorrent client.	Glacially slow USB port; bundled software runs on client PCs, not the router.

$130, www.belkin.com

Antec Sonata Proto

Sonata hasn't changed much in the past few years—too bad components have

Like all the cases in Antec's Sonata line, the Proto is a consumer case with an emphasis on quiet performance. In fact, it's virtually identical to its predecessor, the Sonata III 500, except for a few small details. It's not a gaming chassis—it lacks such essentials as cable management, toolless bays, multiple fans, or a removable right-side panel—but it doesn't claim to be. It *does* claim to be silent, efficient, and affordable. So is it?

The Sonata Proto is on the small side for a mid-tower chassis, at eight inches wide, 16.5 inches high, and 18.5 inches deep. Its frame and side panels are steel, with a plastic front bezel and door. The side and top panels are painted a mid-quality matte black, with a glossy front panel and door. The door hides the front drive bays as well as the power and reset switches, and both it and the side panel have barrel locks on them. The rest of the case is unpainted metal. It supports microATX, Mini-ITX, and standard ATX motherboards, although a full ATX mobo will leave your rig feeling cramped. The motherboard tray is not removable and does not contain cutouts for CPU cooling backplates or cable management. In fact, the left side and top panel are one solid piece of rolled steel riveted to the frame, thus making the job of installing a system much harder than it needs to be.

The PSU mounts above the motherboard, and due to lack of space must be installed first. Because there's no backplate cutout (or even access), your CPU cooler must be mounted before the mobo is installed. If you have a large CPU cooler, good luck wedging a screwdriver between the PSU and cooling fins to secure the upper-left mount point, or even squeezing the board into the case with the heatsink attached.

The Sonata Proto's spartan interior makes other no-frills cases look positively baroque.

The Antec Sonata Proto looks exactly like the Sonata III 500, minus the latter's front-panel eSATA port.

The case features three 5.25-inch optical drive bays, four 3.5-inch hard drive trays with silicon anti-vibration grommets, two external 3.5-inch bays (you know, for all those floppy drives), and the Proto's sole new feature: mounting points on the bottom of the case for a 2.5-inch SSD.

At $80, the Proto is aimed squarely at the elusive junction of budget and quiet. Other low-noise cases use big low-rpm fans and acoustic damping foam to minimize noise, but the Proto's designers opted to eliminate the noise-producing parts rather than trying to muffle the noise itself. Unfortunately, those parts are called fans, and it turns out they're pretty important. The Proto has just one fan—a two-speed 12cm exhaust fan that isn't very quiet on either setting. The case's only intake area, the bottom of the front panel, has no fan but at least has a removable dust filter.

It's a given that you won't be building a gaming rig into the Sonata Proto. It barely fits a 10.5-inch card like the Nvidia GeForce 8800 GTX. Its sole fan doesn't provide much airflow to heat-producing parts, and cable-management options are nil. But that's OK, because it's supposed to be a quiet case. Unfortunately, it just isn't very quiet. The two-speed fan is fairly loud on even the low speed, and the case has no acoustic damping inside to muffle the noise from the PSU, GPU, and CPU fans. The silicon vibration-damping grommets on the hard drives are nice, but hard drives aren't the noisiest parts in a case these days, anyway.

For another $20, you can have your pick of enthusiast mid-towers with the amenities you've come to expect. They might be a little louder, but chassis like the NZXT Hades come with scads more fans, vents, and even vibration-damping grommets.

On the other hand, the Sonata Proto is solid, and no worse than its predecessors. If you just need a small no-frills chassis for a workstation or momputer, you could do worse. But we'd be hard-pressed to recommend this case for much else. —NATHAN EDWARDS

VERDICT **6**

ANTEC SONATA PROTO

+ PROBOT	− PROTOTYPE
Cheapish; quietish; vibration-damping grommets on hard drive trays; SSD support.	Not for enthusiasts; only one fan; non-removable side and top panel; not very quiet.

$80, www.antec.com

Cisco Flip SlideHD

Flip's first touch-screen video camera

Flip's SlideHD reminds us of Rocky Balboa. Unfortunately, not the Rocky Balboa of the original *Rocky* or even *Rocky II*. Instead, we're thinking of *Rocky III*, where The Champ comes in out of shape and loses to, of all people, Mr. T.

What else would you think after picking up Cisco's Flip SlideHD? Unlike the Flip MinoHD 8GB, which is truly svelte, the SlideHD feels chunky.

You can thank the camera's "slide" feature for much of the chunk. Unlike previous Flips that have a tiny two-inch screen integrated in the back, the back of the Flip SlideHD sports a much larger three-inch touch screen that flips open and sits at a 45-degree angle to the rest of the unit for video playback.

In an odd interface choice, you use a thin touch strip on the camera's base to scroll or "slide" through the videos on the unit. Touching the slide strip will play or stop the video. We say the slide strip is odd because, given the unit's good-size touch-sensitive screen, wouldn't it make more sense to just do your sliding there? Also irritating is the inability to change the volume levels when the unit is in slide mode. To change the volume, you have to flip the screen shut and stab a set of virtual buttons. It's clunky, to say the least.

That brings us to another complaint: In shooting mode, instead of incorporating a new UI for the touch screen, Flip decided to emulate the controls of its physical units. On one level it makes sense that buyers of the SlideHD are likely to own other Flip cameras, so the same UI makes for less confusion. Unfortunately, the virtual UI looks antiquated.

Shooting with the SlideHD is really no different than with all previous HD video iterations. The lens is a fairly fast f/2.4 but slightly tighter than the MinoHD's, which might make it tough to video a group of people up close. The 720p video at 30fps is slightly more efficient than the MinoHD's. With 16GB of memory onboard, that gives you about four hours of footage. The battery runtime is rated at two hours. Files are stored as MPEG-4 files and encoded with 3ivx's codec, which makes it a bit difficult to share the files directly. Since the codec is not free, users will have to install the Flip software just to view videos on their friends' machines.

We thought this whole review was going to result in a TKO for the SlideHD, but just like Rocky, the big Palooka came back swinging in our video test. Shooting simultaneously with the SlideHD, MinoHD, and Kodak Zi8, we actually found the SlideHD's video to be the winner. It looked slightly crisper than those produced on the MinoHD, and has better white-balance and fewer compression artifacts than the Zi8's output. Low-light performance was also better than with the others, but not great. (Hey, it's time you guys put LEDs into these puppies for low light, or add a night mode.) Don't get your hopes too high, however—the video still can't touch output from those obsolete HDV camcorders. But those don't fit in your pocket, either.

So where does this leave us? By a split decision, we'd say the SlideHD needs work on its UI and could shed some weight, but ultimately, its superior video gives it a slight edge over its lighter and more feature-rich competitors. —GORDON MAH UNG

VERDICT 7

CISCO FLIP SLIDEHD

+ ROCKY	− ROCKY V
Audio-out at last! Large screen is viewable in direct sunlight.	Thick around the waist; expensive; no charger or HDMI cable; clunky interface.

$280, www.theflip.com

By pocket cam, you mean cargo pants pockets, right?

The Slide HD's three-inch touch screen oddly doesn't let you use the touch screen to scroll through video.

Silverstone HDDBoost

A roll-your-own hybrid drive option for people who don't want to reinstall Windows

The Silverstone HDDBoost does not include the Intel SSD shown here.

Hybrid drives that combine NAND flash and mechanical hard drives are making a comeback. But what if you could make your own hybrid drive, with as much capacity as you want? That's the concept behind the Silverstone HDDBoost. The idea is to slot an SSD between your OS drive and the motherboard, allowing your PC to read system files from the SSD instead of the HDD. This effectively adds an SSD to your machine without any of the actual work.

The HDDBoost is easy to install—just screw any SSD into the HDDBoost, slot both into a spare 3.5-inch bay, and connect SATA power and data cables. One SATA cable runs from the old OS drive to the HDDBoost, and another from the HDDBoost to the motherboard. Boot into the BIOS and set the HDDBoost as your boot drive, and away you go. The HDDBoost copies the first gigabytes of your boot drive (which contain your system files) to the SSD. The system treats the HDDBoost as part of one contiguous volume with the capacity of the larger drive—any data present on both drives will be read from the SSD first, speeding up your system's performance without any further action on your part. If you write to the section of the hard drive that's synced to the SSD, it will be synced at your next boot. Thus, you can take advantage of some of the speed of an SSD without reinstalling your OS.

We tested the HDDBoost in the 3D HTPC we built for this month's cover story. The PC's sole drive is a 2TB WD Caviar Green. The SSD we chose is our current go-to budget SSD, Intel's 40GB X25-V. To test the performance boost, we looked at average read speeds and random access times, boot times, and the PCMark Vantage x64 HDD subscore.

Because the HDDBoost treats both drives as one, HDTune and HDTach performance registered as expected: the first 40GB of the volume showed read speeds of more than 150MB/s and low random-access times, while the rest of the drive acted exactly the same as the pre-Boost Caviar Green, with read speeds near 100MB/s at the beginning of the drive, trailing down to around 50MB/s toward the end sectors. The huge boost in the first 40GB was enough to lift HDTune average read speeds across the whole drive up from 63.7MB/s to 78.7MB/s. The HDDBoost also lowered boot times from 56 seconds to 50, a decent improvement. But the most impressive improvement came in PCMark Vantage's HDD subscore, which more than doubled from 2,620 PCMarks to 5,860.

Adding the HDDBoost to your system won't hurt your OS drive—if the SSD is disconnected or fails for some reason, you can just boot from the mechanical drive as normal. This is good, since the target audience seems to be people who can afford an SSD plus $50, but don't want to do a clean install or reconfigure their system with multiple drives. It's also a good way to utilize an older-generation SSD—since HDDBoost only writes to the SSD during manual sync or reboots, it doesn't need TRIM or garbage-collection utilities.

You won't see the same performance boost from an HDDBoost and mechanical drive that you would from just installing Windows on the SSD, but the HDDBoost works as intended and won't break your system, so if you'd like a bit more performance without the hassle, the HDDBoost could do the trick. —NATHAN EDWARDS

BENCHMARKS

	Before HDDBoost	With HDDBoost
OS Drive	2TB Caviar Green	2TB w/40GB X25-V HDDBoost
HDTune Avg Read (MB/s)	63.7	**78.7**
HDTune Random Access (ms)	21.7	**20.6**
Boot time (sec)	56	**50**
PCMark Vantage HDD Subscore	2,620	**5,860**

Best scores are bolded.

VERDICT 7

SILVERSTONE HDD BOOST

+ BOOSTER GOLD	− FOOL'S GOLD
Relatively inexpensive; no need for TRIM; no need to reinstall OS; no data loss in event of SSD failure.	Limited utility for most users; better performance could be had from the OS on an SSD.

$50, www.silverstonetek.com

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Psyko 5.1 Gaming Headset

Drivers sit on top of your head, not near your ear

The Psyko 5.1 takes the idea of 5.1 surround sound in a gaming headset to its logical extreme. Not content with using two drivers to simulate 5.1 surround sound, the Psyko 5.1 actually packs seven drivers into the headset; five for directional sound, and two for bass. The Psyko isn't the first headset with that many drivers, but the way it uses them to achieve its surround-sound effect is truly unique.

It's a bit complicated to explain, but we'll try: When gaming on a traditional surround-sound system, when a sound is played on the front-right speaker, the sound from that speaker hits your right ear a millisecond before your left ear, from the front. With the Psyko 5.1 headset, the same bullet sound would also be played primarily on the front-right speaker, except that now it's located on the right half of the headband. The sound then travels through an acoustic channel, and is piped into the front of both ear chambers. Because the sound originates on the right side of the band, it hits your right ear first, producing the same effect as a physical speaker. Sound from the rear speakers works the same way, but is piped into the back of the ear chambers.

Very unusual. But does Psyko's unique tech pay off? In terms of directional audio, it emphatically does. Simply put, the Psyko 5.1 headset delivered the best directional audio we've heard in a gaming headset. Sounds in games are clear and easier than ever to locate. There are, however, a few drawbacks to Psyko's approach. First, the headset is big—it has to be, to fit all those drivers—and that makes it heavy (a whopping one pound, three ounces). Even though Psyko has gone to great lengths to make its headset comfortable, with extra padding, an adjustable band, and ear cups that open for ventilation, the sheer weight of the set proves somewhat uncomfortable during longer play sessions.

Sound quality for non-gaming applications is passable, but not great, and because the drivers need to be extra loud for the sound to reach your ears, the set requires an inconvenient external amplifier, and suffers from a lot of noise leakage.

Though we're intrigued by the technology behind the Psyko 5.1, and love the directional audio, we'd have to wait for a version 2 at a lower price or with expanded general-purpose audio features before we would give it an unqualified recommendation. **—ALEX CASTLE**

VERDICT 7

PSYKO 5.1 GAMING HEADSET

+ PSYCHO	− MARNIE
Excellent directional sound; unique technology; cans with ventilation windows.	Bulky; requires an amplifier; noise leakage; so-so music performance.

$300, www.psykoaudio.com

The best positional sound we've experience from a headset—and perhaps the heaviest, too.

Adobe Photoshop CS5 Extended

Finally, enough features to justify the upgrade

After 9.5 versions of Photoshop (Windows wasn't supported until PS 2.5) it's easy to become jaded about Adobe's stalwart photo editor. Fortunately, Photoshop CS5 gives us something to get worked up about all over again.

Packing more than 250 new features, Photoshop CS5 is an amazing upgrade capable of performing a wide range of tasks we've never seen before, while simultaneously simplifying the trademark tasks we've come to know and love.

Case in point: the Content Aware Fill tool, a hybrid between the Clone Stamp tool and the Patch tool, that allows users to selectively remove any part of an image and replace it with a suitable, blendable background. Using a newly developed algorithm that can stitch together multiple parts of a surrounding background image, Adobe has developed a groundbreaking tool that can make objects in an image seemingly disappear into thin air. When it works, it's truly a sight to behold.

Unfortunately, it doesn't work all the time. Complex or layered backgrounds tend to generate some iffy results, but these minor miscalculations can usually be tended to with a little touch-up work with the Clone Stamp tool.

Additional new features include an updated brush system offering more customizable options, including brush shape alterations and brush tip options—a major plus for graphic designers. Puppet Warp, a new addition to Adobe's transformation toolbox, consolidates a ton of transformation tools into a workable, grid-based interface that allows you to place points (or strings, if you will) of articulation anywhere on an image and drag and pull along those predefined points. You can even add points of articulation to an image of a person or animal and move its limbs realistically, as long as you've isolated the subject onto its own layer.

Content Aware Fill, a new addition to the Spot Healing Brush, can quickly and easily remove parts of a photo and replace those parts with a blendable background.

The new Refine Edge tool allows you to make insanely detailed selections, including individual strands of flowing hair.

Responding to complaints about CS4's subpar high dynamic range (HDR) capabilities, Adobe has revamped its HDR features with a new system known simply as HDR Pro. HDR Pro can hastily compile and create impressive HDR renders using multiple images, in conjunction with a refined set of Vibrance, Exposure, and Detail settings for added depth and color. On the simpler side, CS5 offers a new feature known as HDR Toning, which allows the user to create a realistic-looking HDR composite out of a single image by tinkering with some new color-treatment settings.

When used in conjunction with tools like the Quick Select tool, Adobe's new Refine Edge tool allowed us to make some of the most detailed selections we've ever experienced, picking up on even the most minor details, like strands of hair or leaves on a tree, with some quick and easy brush strokes. The new Mini Bridge app makes organizing and consolidating photos a snap, without the hassle of actually having to minimize Photoshop. Other minor upgrades include a grid-based cropping system (adhering to the rule of thirds), a refined zoom tool, automatic lens corrections, and the very handy option to define your own layer defaults, just to name a few.

Photoshop CS5 is a polished and complete program, with more than enough new features to justify the $200 upgrade from CS2 or higher. People who are brand-new to the program will have to pony up $1,000. At that price, it's definitely a tool for professionals, or at the very least, advanced amateurs. But whether you're a professional photographer, graphic designer, or just a hobbyist, there are more than enough tools bundled into this software to keep you busy for years to come. —ALAN FACKLER

VERDICT **9**

ADOBE PHOTOSHOP CS5 EXTENDED

+ ANSEL ADAMS	− BRYAN ADAMS
Huge assortment of new tools including Content Aware Fill and Puppet Warp.	Content Aware Fill can't handle crowded backgrounds; non-upgrade version is very expensive.

$1,000 ($200 upgrade), www.adobe.com

AVG Anti-Virus Free Edition 9.0

Proof you don't need to pay for protection

When AVG's Anti-Virus Free Edition 9.0 didn't make the cut of our AV roundup in May, a football stadium full of readers let us know of the injustice. We're not really surprised by this, considering that AVG was once the hands-down favorite among free virus scanners. At one time heralded for both its excellent detection rate and small footprint, AVG has since fallen out of favor somewhat, partly because of its perceived bloat, but also because competitors' AV products have stepped up their game. So where does that leave AVG today?

Straight and to the point: AVG ranks somewhere between Avira AntiVir and Microsoft Security Essentials (MSE), two other popular free AV scanners, both of which were included in our May antivirus roundup. Compared to MSE, AVG stood as its equal in terms of beating back malware like a prize fighter walloping on two-bit thugs. AVG wasn't rattled by our synthetic spyware (www.spycar.org) and virus (www.eicar.org) testing, and during our real-world evaluation, AVG proved equally adept at warding off malware. AVG also swept through our files much faster than MSE. Whereas MSE doesn't cache files that it deems safe to skip, AVG does, resulting in significantly faster sweeps, though still not as fast as Avira.

On the performance front, AVG turned in the highest PCMark score of any antivirus software we've yet tested this year, but it also added 29 seconds to our boot time, which is 20 seconds more than MSE and 23 seconds more than Avira. Had that not been the case, AVG might have regained its position as our all-around favorite, but it will have to settle for simply being in the discussion.

The interface remains virtually unchanged from last year's version, and for the most part that's not a bad thing. It's easy to load any of the various modules from the main menu, but if you really want to tinker with AVG's inner workings, you'll need to poke your head in the Advanced settings accessible through the Tools menu. It's here you'll discover far more to play with than in MSE, though not as much as any of the fully fledged Internet security suites that carry a price tag.

AVG's interface hasn't changed much from last year's version, but the redesigned scan engine now runs more efficiently and effectively than before.

AVG's update manager is also fairly gimped compared to paid security software. In the free version (AVG also sells a fleshed-out security package), the only thing you're able to change is what time each day the software will ping AVG's server for updates. To check for updated definitions more often, you'll have to do it manually, and even then you won't be protected in the same manner that Symantec, McAfee, and a few others offer through so-called pulse updates, which are small updates pushed out to your system throughout the day rather than one big one every 24 hours.

Overall, we're much more impressed with this version of AVG than we were with last year's version. Boot time notwithstanding, resource management has been improved, and you can tweak the scan engine accordingly by configuring it to run slow, normal, or fast. Combined with robust malware detection, AVG has earned the right to once again stand among the top free AV solutions. —PAUL LILLY

DARE TO COMPARE: PERFORMANCE

	AVG	Avira	MSE	Norton	ESET
Scan 1 (min:sec)	12:48	**6:37**	16:56	16:18	7:45
Scan 2 (min:sec)	5:21	**3:12**	16:56	4:47	7:43
PCMark	**6,170**	6,093	5,622	5,760	6,067
Boot (seconds added)	+29	**+6**	+9	+18	+12

Best scores are bolded. Our test bed is a Core 2 Quad Q9400, 8GB DDR2/800, a Seagate Barracuda 320GB 7200.10 (~60GB filled across two partitions), a Radeon HD 3650, and Windows 7 Professional 64-bit. The reviewed app is compared to the top-performing apps from our AV showdown in the May 2010 issue (see http://bit.ly/cB6sqN).

VERDICT 8

AVG ANTI-VIRUS FREE EDITION 9.0

+ 2-1B	− H1N1
Fast scans; low system impact; free!	Slows boot more than other free scanners.

Free, http://free.avg.com

Tom Clancy's Splinter Cell: Conviction

Say goodbye to all the sneaking around

Somewhat ironically for a game titled Conviction, rendering a verdict on superspy Sam Fisher's latest skulking, sneaking, neck-snapping adventure is actually pretty difficult. Here's the problem: There are two ways to judge Tom Clancy's Splinter Cell: Conviction—as a longtime series fan, or as someone who thinks a Splinter Cell is something that needs to be examined by a doctor before it becomes infected. The good/bad news, depending on which camp you fall into: Conviction is fast-paced, action-packed, and prone to bouts of random, violent explosion. Sorry, longtime fans.

That's not to say that longtime fans can't enjoy the game, mind you. They'll just have to adjust their expectations a bit. If you enjoyed previous Splinter Cell games for their tense, strategic "blow it and start the mission over" games of cat-and-mouse, prepare for a rude awakening. On the flipside, if that's the exact reason you chose to steer clear of the series, you'll be happy to hear that Conviction won't ask you to memorize any guard patrols or hide any corpses.

This time around, Sam's modus operandi fits his motive: He's pissed. Turns out, his daughter's alive after all, and he wants answers. Now. This, however, works as a bit of a double-edged sword. On one hand, Sam's reckless abandon makes for a faster pace and a number of well-balanced "stealth here, shootout there" levels. On the other hand, too many missions—especially later in the game—devolve into cover-centric versions of peek-a-boo with guns. At that point, lethal force is the only option, and any pretenses of stealth are thrown out the window.

Sam politely asks a new acquaintance if he'd be so kind as to tell him where the frak his daughter is.

Also changed for the better/worse is the game's emphasis on gadgets. In Conviction, Sam's no longer on Third Echelon's leash, so even his precious night-vision goggles don't step into the spotlight until a ways into the game. However, he makes up for it by adding a couple of new techniques to his already lethal bag of tricks.

First up, there's Mark and Execute, which is earned by successfully performing a melee kill instead of making a suppressed weapon kill. More useful is Last Known Position. Basically, any time Sam is spotted, he leaves behind a ghost image of himself. When enemies investigate the ghost image, you step out and snap their necks. This means that it's not very difficult to feel like a total badass while playing. Purists may argue, however, that Splinter Cell's former appeal was in earning that neck snap. And while Conviction is no cakewalk, it's nowhere near as tough as Splinter Cell: Chaos Theory, either.

The game gives you objectives and relays information by projecting it onto walls. It takes some getting used to, but it's actually pretty useful.

Where Conviction's single-player slips up, its multiplayer breaks its fall. Foremost, there's an entire completely separate co-op campaign that's just as enjoyable as anything the single-player campaign throws at you. Fans of previous Splinter Cells' contemplative, planning-oriented style will want to check out Deniable Ops, a set of modes that places more emphasis on cunning and forethought. Also wickedly fun is Face-Off, wherein you and an opponent have to outwit and outfight each other while contending with hordes of enemies.

On the whole, Splinter Cell: Conviction is an impressive reinvention of a classic series. Mixing stealth and guns-a-blazing action is a tricky balancing act, and much of the time, Conviction pulls it off. The question, then, is whether or not you actually wanted Splinter Cell to change in the first place. —NATHAN GRAYSON

VERDICT **8**

SPLINTER CELL: CONVICTION

+ INNOCENT	− GUILTY
Engaging, well-designed levels; new techniques that reinvent combat.	Perhaps a bit action-heavy; later portions of the game are glorified shoot-outs.

$57, www.splintercell.com, ESRB: M

LAB NOTES

3D HTPC After-Action Report

It's a hell of a home-theater PC, but there's always room for improvement

GORDON MAH UNG
SENIOR EDITOR

Once you finish a project, you always wonder if you should have done it differently. With the 3D HTPC, I'm pretty satisfied. It's truly dead-silent (EIC George Jones said it was quieter than his laptop) and you know how capable it is. I wouldn't change much, but there's always a little something that can be tweaked. One option I considered late in the build was an SSD. I opted for the 2TB WD Green drive since we had a quad-tuner card that would suck up the space. Normally, an SSD is considered a luxury item for gamers who need performance, but if the budget allowed for it, I think a redo would include one for OS and applications and the 2TB Green drive for video storage. That would give the 3D HTPC even better responsiveness, albeit at the added cost of $400 for a top-quality SSD.

KATHERINE STEVENSON
DEPUTY EDITOR

This month I finally made the switch from Firefox to Chrome. I had to see what all the fuss was about. After the initial adjustment period—mostly getting used to the new Bookmarks location and remembering to put my search terms in the address bar—I feel totally comfortable with the browser. And, yes, it feels zippy, although I haven't run any tests to prove that it's actually faster.

ALEX CASTLE
ONLINE MANAGING EDITOR

This month I wrote the first of our new online editor columns. They'll be going online twice a week, and every one of us will have his or her own, with its own focus. Mine is about DIY projects and "maker" culture. If you want to read more about a bunch of very cool projects and technology, check it out at bit.ly/bNIWAQ.

ALAN FACKLER
ONLINE ASSISTANT EDITOR

I've always been a fan of finding ways to maximize my "lazibility," but bookmarklets never really appeared to be all that helpful. Boy, was I wrong. Digging around the net for these useful little snippets of code quickly became a fun and addicting endeavor—there's a bookmarklet for virtually anything you can imagine, and finding them not only made for a fun story, but made my PC-life a whole lot simpler.

GEORGE JONES
EDITOR-IN-CHIEF

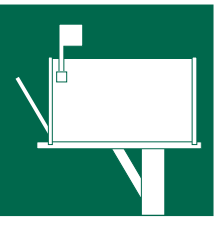
Ceton Corp's InfiniTV single-handedly changed my mind about CableCARD devices and Windows Media Center. I picked up an M-series CableCARD from Comcast, plugged it into the InfiniTV, and bang, I was HD channel-surfing and recording four channels at a time. This, combined with the increased storage capacity of an HTPC and the streaming capacity of Windows, means I'll probably be shifting my TV sourcing in the near future.

NATHAN EDWARDS
SENIOR ASSOCIATE EDITOR

When I'm not testing hardware, I do actually use my rig to play games. I'm really excited about Red Dead Redemption, but the PC version hasn't even been announced yet. Desperate for some Wild West action, I did what any respectable gamer with an Xbox 360 would do—I went outside and shot a horse. Send bail money.

We tackle tough reader questions on...

AM2/AM3 Mobo Recommendations
DirectX 11
OS X Hatred



Whither AM3?

In your Best of the Best list, you still have the K9A2 Platinum motherboard by MSI listed as the best AM2 motherboard. However, it hasn't been available on Newegg for more than six months and I haven't been able to find it on TigerDirect in numerous months, either. An update should be made to this list immediately, not to mention adding AM3 motherboards to the list.

—Joseph Zimmerman

Senior Editor Gordon Mah Ung Responds: Yes, unfortunately, we are way behind on our AM3 coverage. We had one review previously scheduled but pushed it back to make room for other hardware. Although we have not formally reviewed it, we've been using MSI's 890FXA-GD70 mobo for the bulk of our Phenom II X6 coverage. It hasn't caused us any problems and it offers some cool features such as touch-sensitive switches on the board. We are planning a big roundup of AM3 boards in the near future though, so stay tuned.

Moving up to DirectX 11

There's a one-liner in the June issue story about Nvidia GTX 480 that says, "installing DX11 will improve performance, since the libraries themselves are now multithreaded." Can you elaborate on this and let your readers know how significant a boost to expect? If I have Windows Update on, will I get DX11 automatically in Vista or Windows 7?

—Andrew Linder

Contributing Editor Loyd Case Responds: We should have said that DX11 will "theoretically improve performance" since we haven't actually tested it. As for getting DirectX 11, you'll obtain it automatically when you install a game that supports it. Titles include Dirt2, Aliens vs. Predator, STALKER: Call of Pripyat, Metro 2033, BattleForge, and many others. If you want to go ahead and grab the DX11 libraries for yourself, you can get the latest Microsoft DirectX redistributable library at http://bit.ly/9agfV6.

One More Windows Tip

In the "The Ultimate Tune-Up" article in the June 2010 issue, you mentioned that Windows 7 eliminated "the option to use the classic grey Windows 2000–style Taskbar." I am happy to report that you are wrong! Right-click the desktop, and select Personalize. Now, scroll down to the "Basic and High Contrast Themes" section in the Visual Themes selection box. Right there is our old favorite, the Windows Classic theme. Just make sure to set the taskbar to use small icons and "Combine when taskbar is full." Now you've got a theme that's pretty faithful to the original.

—Chris Loder

CUTCOPYPASTE

▶ In the June issue we mistakenly referred to the AVADirect notebook as the X1800; the model is actually the X8100.

▶ We goofed in our "8 Signs a Geek Has Too Much Money" list in the July issue and confused the $1,500,000 R&D costs for Xten's Pininfarina Office chair (www.xtenchair.com) with the actual retail price, which is $1,500.

NOW ONLINE

In Depth: This Month's Features

Go online to get a more in-depth look at two of the features from this month's *Maximum PC*.

First, check out our expanded mobile breakthroughs list, with 20 full-length entries and pictures: http://bit.ly/9mCupx.

Then, hit up the online version of our Bookmarklets feature, with more screenshots and ready-to-save links to every bookmarklet: http://bit.ly/a5E4KV.

Why the OS X Hate?

I was disappointed when I read what Nathan Edwards wrote on page 53 of your June 2010 issue regarding the OWC Mercury Extreme Enterprise 100GB SSD. It reads, "And given that OS X doesn't support TRIM, well, we don't even think that platform deserves performance this good." I work with both platforms on a daily basis as a systems administrator. I enjoy reading all the material focusing on both platforms. I understand that OS X does not support the TRIM command. However, that is not an excuse to say that OS X does not deserve the additional performance that an SSD delivers.

I personally have swapped out my early 2007 MacBook Pro's internal 7,200rpm hard drive with an Intel SSD. I have noticed a huge performance improvement even when both disks have identical contents. I am not here to start a flame war, but comments like your editor's may add fuel to the flames.

—Steve Du

Senior Associate Editor Nathan Edwards Responds: You're right, Steve, everyone deserves good performance. But in order to keep SSDs performing at their fastest, proper garbage management, like TRIM, is essential. It's hard to unequivocally recommend an SSD on a platform without TRIM support—and yes, that includes XP and Vista as well as OS X. Of course, Macs and PCs both have their strong points. But as a dyed-in-the-wool PC user, I admit to getting in my digs at Apple when I can.

Your Best (and Worst) Upgrading Moments Revealed

In the July issue, we asked you to regale us with tales of the best and worst PC upgrades in your life. Right before press time, we were flooded with stories. Here's the best of the best. Congrats—each of you will receive a set of limited-edition Maximum PC coins. (For more details, point your browser to www.maximumpc.com/upgrade_contest.)

New Year's Negatory

It was New Year's Eve and my girlfriend and I were going to relax together and enjoy our countdown to 2010. But lo and behold, the USPS guy showed up late with my new PC parts. I spent four hours setting up the new system. When I finished installing the parts, it was two minutes until the New Year. I had my girlfriend and family crowd around the case, waiting for my new i5 build to start up. I pressed the power switch at the stroke of midnight and it started up, a few pops were heard, and then it shut down. My family thought I had put fireworks in the case or something, so they cheered, but I knew the truth—a capacitor on my motherboard had exploded. I spent the first hours of 2010 frantically trying to get the PC to start up, but it was too late.

—Matt Carney

Blame the Mouse

Since I was on a tight budget, I ordered all the best parts online that I could afford: the new, overclockable 1.6GHz Pentium 4, an Asus motherboard, 512MB of Samsung RDRAM, an aluminum case that looked just like the Antec SOHO 1030—the works. The day the final piece arrived, I was as excited as a kid in a toy store. I rushed down to the basement and put the whole thing together. The moment I had been waiting for had arrived. I pushed the power button to bring my awesome creation to life and… nothing. I checked and double-checked everything. I took the whole thing apart and put it all back together again. Still nothing. What had gone wrong? Then, on a whim, I unplugged the USB mouse and hit the power button again. The computer roared to life. To this day it will not boot if that mouse is plugged into a USB port.

—Terry Irwin

Unnecessary Emergency Surgery

About 10 months ago, I realized that my 9600 GT videocards running in SLI weren't giving me what I needed, so I shopped around and found the BFG Tech GTX 260. I slowly slid the card in and saw the back end go into the slot. Imagine my horror, though, as I could not for the life of me get the end nearest the rear of the computer to snap in. After spending $190 dollars, I wasn't about to turn back. I grasped the blue plastic of the PCI slot with some needle-nose pliers and pulled it off. After an hour, I began to admit defeat. As I sat looking at the card I slowly started to realize my mistake. In my haste to remove and re-arrange my previous setup I had forgotten that this card takes up TWO slots in the case. I removed the screw, slid the card in easily, booted it up and was ready to go in 10 minutes. The card works great and I even got a modded motherboard (albeit Frankenstein-looking) out of the deal.

—Bill Martin

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

NEXT MONTH

COMING IN

MAXIMUM PC's ALONG WITH GREAT POWER COMES GREAT POWER

SEPT ISSUE

The Dream Machine 2010

You won't believe the system we're cooking up for our annual foray into peak-performance computing. Here's a hint: The theme is "raw power."

All-in-One Death Duel

What kind of performance do you get for your dollars when it comes to all-in-on PCs? We're testing the latest batch of them as you read these words.

Geek Quiz

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MIDRANGE VIDEOCARD

GeForce GTX 470 SSC

We know, calling the $360 GeForce GTX 470 SSC a midrange card is a bit of a stretch, but we think it's worth the stretch over our previous best midrange card: the $320 Radeon HD 5850. Why? The GeForce GTX 470 SSC cleans the clock of the Radeon HD 5850 and can even outshoot the pricier Radeon HD 5870 on some benchmarks. The EVGA GeForce GTX 470 SSC really shines in DirectX 11 games, which means it has legs. Heck, the EVGA GeForce GTX 470 SSC pretty much offers 85 to 90 percent of the performance of the $500 GeForce GTX 480, which is the single-fastest GPU on the market today. See our full review on page 74. www.evga.com

THE REST OF THE BEST

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

Midrange Processor
Intel 2.8GHz Core i7-860
www.intel.com

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

LGA1366 Motherboard
MSI Eclipse SLI
www.msi.com

LGA1156 Motherboard
Asus Maximus III Formula
www.asus.com

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

Budget Videocard
ATI Radeon HD 5770
www.ati.com

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

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

DVD Burner
Samsung SH-S223
www.samsung.com

Blu-ray Drive
Plextor B940SA
www.plextor.com

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

30-Inch Display
NEC LCD3090
www.nec.com

Gaming Mouse
Logitech G9x Laser Mouse
www.logitech.com

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

Games we are playing

Just Cause 2
www.justcause.com

Blur
http://blurgame.com

Tom Clancy's Splinter Cell: Conviction
http://splintercell.us.ubi.com

Team Fortress 2
www.teamfortress.com

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

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