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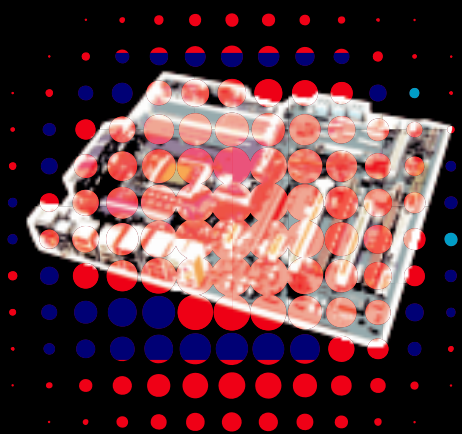
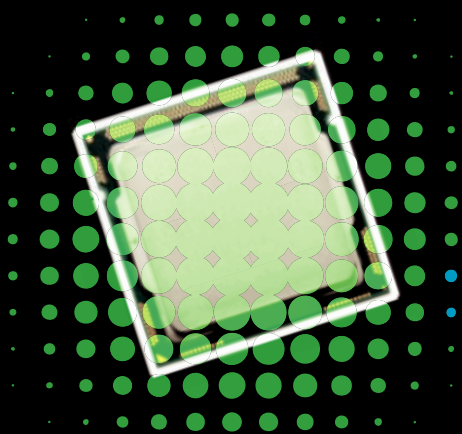
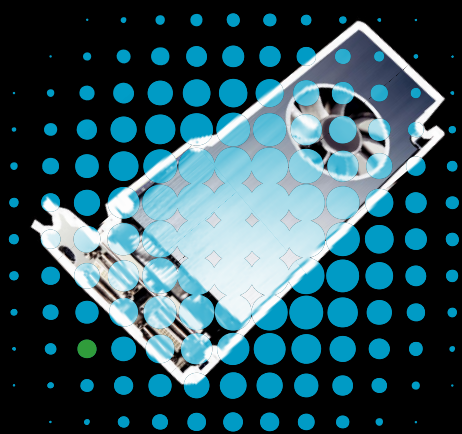


Top-Secret Chipsets!



Intel's New CPUs!



AMD's 6-Head Videocard!

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NOVEMBER

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BUSINESS
VP/PUBLISHING DIRECTOR **Stacey Levy**
650-238-2319, slevy@futureus.com
GROUP SALES DIRECTOR **Gabe Rogol**
650-238-2409, grogol@futureus.com
SENIOR REGIONAL SALES DIRECTOR **Dave Lynn**
949-360-4443, dlynn@futureus.com
REGIONAL SALES DIRECTOR **David White**
650-238-2502, dwhite@futureus.com
SALES MANAGER **Aida Rodriguez**
708-562-0686, arodriguez@futureus.com
INTEGRATED SALES DIRECTOR **Joe Pomparelli**
323-342-1888, jpomparelli@futureus.com
SENIOR MARKETING MANAGER **Andrea Recio-Ang**
650-238-2548, arecio-ang@futureus.com
MARKETING COORDINATOR **Allyson Kardel**
650-238-2312, akardel@futureus.com
ADVERTISING COORDINATOR **Jose Urrutia**
650-238-2498, jurrutia@futureus.com

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

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

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

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I Am Not, Nor Have I Ever Been, a Fanboy

It all started with a phone call from my mom. While she's not a regular *Maximum PC* reader, she read my Windows 7 review online, and called me because she was worried about the, umm, "colorful" comments. I told her not to sweat that feedback—that those folks are fanboys, people who suffer an excess of product-focused enthusiasm.

The conversation got me thinking, though. When I posted my positive review of Win7, I expected a strong response from the fanboy contingent. I expected people to accuse me of being a fanboy (that happened, check), and I expected my critics to attack my opinions (checkerino), expertise (Chekov), and moral turpitude (ditto).

I wasn't surprised by the Windows XP fanboys, who let me know that their intractable world lacks a place for any new versions of Windows. Also not shocking? That the Apple fanboys are convinced that Snow Leopard is faster, better, and cheaper than Windows 7. And I would have been disappointed if the Linux fanboys didn't tell me that I'm a dumbass for paying for an inferior, closed-source OS. What I didn't expect? Well, what I couldn't prepare myself for was the *Windows Vista fanboy*.

This revelation prompted further study into the fanboy syndrome. I stopped discriminating, and started engaging them. It turns out that the sources of motivation for the modern fanboy can be as varied as the products that they love. Nonetheless, after much study, I was able to classify fanboys into a few major archetypes:

- **The Underdog:** One of the most common fanboy types, the Underdog throws his weight behind the long-shot. As self-described hopeless romantics, Underdogs shift allegiances with nearly every product cycle.
- **The Investor:** With a strict eye toward preserving the capital expended on any particular product, the Investor frequently reads and argues about reviews of products he already owns, and rarely sees value in upgrading a product that he's invested his money (and thus, his self-worth) in.
- **The Contrarian/Non-Conformist:** Students of fanboyism commonly confuse these archetypes. They share similarities, but to the trained eye the key difference is simple: Contrarians like products because *you* dislike them, while Non-Conformists like them because *everyone else* dislikes them.
- **The Antiquarian:** The Antiquarian's motto says it all: "If it's new, it's overpriced crap." Antiquarians can frequently be found dumpster-diving behind Fry's, looking for "perfectly serviceable" parts that are "just" 10 years old.
- **The Historian:** You know that guy with the Commodore 64 ticking along in the corner? He's the Historian. Odds are, he's still running a crappy Cyrix CPU, because "Cyrix made bitchin' x86-compatible CPUs in 1993." Don't waste your breath arguing with Historians.

So, where do I fit in? I'm not a fanboy at all. I simply buy whatever is fastest and gives me the functionality I need. Where do you fit in?

Will Smith

BRINGING THE AWESOME

Windows 7 Review page 48

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

THE NEWS

Graphics News from SIGGRAPH

The yearly computer graphics conference focuses on industry professionals, but there's interesting news for PC enthusiasts –JASON CROSS

Each year, computer graphics professionals gather at the SIGGRAPH (Special Interest Group on Graphics) conference to discuss the latest research, tools, and technology in the world of computer-generated imagery. It's mostly stuff for researchers, graphics programmers, digital artists, TV and movie special effects companies, and so on. But there are always a few announcements, releases, and technical talks of interest to PC enthusiasts. For example, id Software Senior Programmer J.M.P. van Waveren spoke about virtual texturing and parallelization in id Tech 5 (the new game engine powering id's upcoming game, Rage). If you're curious, or just want to see the beautiful screenshots, go to http://bit.ly/8Ovdy.

Perhaps the biggest news for end users at this summer's SIGGRAPH was the release of OpenGL 3.2. The new revision of the graphics API standard, along with the accompanying OpenGL Shading Language 1.50, focuses on improving performance, providing options for better quality, and making porting from Direct3D easier. According to the Khronos Group, which oversees development of the standard, the highlights of the 3.2 version include:

- Increased performance for vertex arrays and fence sync objects to avoid idling while waiting for resources shared between the CPU and GPU, or multiple CPU threads
- Improved pipeline programmability, including geometry shaders in the OpenGL core
- Boosted cube-map visual quality and multisampling-rendering flexibility by enabling shaders to directly process texture samples

In addition, Khronos has defined a set of five new ARB extensions that "enable the very latest graphics functionality introduced in the newest GPUs to be accessed through OpenGL." These extensions are set to become part of the core of OpenGL in the future, after they have become widely adopted. Simultaneous with the announcement of OpenGL 3.2's availability, Nvidia announced a new beta driver for developers to support it. AMD promised a driver "soon" with support for the new API, but hadn't yet released one at the time of this writing.

Source: Nvidia

Nvidia's OptiX ray-tracing engine is capable of generating glossy surfaces, depth of field, and object motion blur.

Speaking of Nvidia, the graphics giant proudly unveiled its new OptiX ray-tracing engine at the conference. OptiX is actually part of a suite of tools released by Nvidia at SIGGRAPH, including SceniX (3D data and scene management), CompleX (multi-GPU scaling engine), and a 64-bit version of the PhsyX physics engine. OptiX allows developers to use Nvidia's Quadro FX GPUs to program real-time interactive ray-tracing applications. "Unlike a renderer with a prescribed look, or a language limited to rendering," Nvidia claims, "the OptiX engine is a flexible ray-tracing platform enabling developers to quickly build whatever they wish. Flexibility within the OptiX engine extends to procedural definitions and hybrid rendering approaches that can be leveraged to ensure the most accurate of rendering results and balance realism with speed."

Don't expect to see ray-traced games using this engine, though. "Interactive" in this context means artists won't have to walk away from their computer to render a scene, not that you can ray-trace complex game worlds at 30 or 60 frames per second. It also requires fairly high-end hardware for good performance, and runs on only Nvidia cards. Still, this is proof that the massively parallel compute power of modern graphics cards is enough to do fairly impressive ray tracing at high speed. It's not hard to imagine consumer applications like games incorporating a few ray-tracing effects in the not-too-distant future, when we have GPUs with even greater general computation capabilities along with programming standards like OpenCL and DirectX Compute Shaders.

Sony's New Kind of Lithium-Ion

Sony announced it has launched a new type of lithium-ion secondary battery using olivine-type lithium iron phosphate as the cathode material.

What does that mean? According to Sony, both high-power and long-life performance in a single package. The company claims olivine's robust crystal structure and stable performance make the material an ideal fit for use as a cathode material. In addition, Sony says its new battery technology is able to charge rapidly.

Sony has already started shipping the first battery to use the olivine material, which the company sells under its Fortelion series branding. It holds a capacity of 1.1Ah with 80 percent capacity retention after 2,000 charge-discharge cycles, and is able to recharge to 99 percent of its full capacity in 30 minutes, Sony says. –PL

Putting Idle Procs to Work

Intel and GridRepublic have joined forces to launch a Facebook application that will tap your PC's spare processing cycles to do good.

Intel calls the application Progress Thru Processors, which is built on the Facebook platform and lets users choose up to three distributed-computing projects, including Rosetta@home (finds cures for diseases), Climateprediction.net (discovers more about global climate change), and Africa@home (develops optimal strategies to combat malaria).

The application will fire up only when the PC has processing cycles to spare.

Alternately, your idle GPU or CPU can aid distributed-computing project Folding@Home in discovering the causes and cures of common diseases such as Parkinson's and Alzheimer's. Join Maximum PC Team 11108 (http://bit.ly/8TFjG). –KS

MS Word Banned in U.S.

An East Texas District Court Judge has ordered Microsoft to stop "selling or importing to the United States any Microsoft Word products that have the capability of opening .xml, .docx, or .docm files (XML files) containing custom XML." The injunction is the result of a complaint filed by Toronto-based i4i alleging Microsoft violated its 1998 patent (No. 5,787,449) on a method for reading XML.

"We are disappointed by the court's ruling," Microsoft spokesman Kevin Kutz said in a statement. "We believe the evidence clearly demonstrated that we do not infringe and that the i4i patent is invalid. We will appeal the verdict."

The judge also ordered Microsoft pay i4i $240 million in damages plus court costs and interest. All tallied, the fine is estimated to be more than $290 million. The ruling, which applies to Word 2003 and Word 2007, takes effect in 60 days. –PL

FAST FORWARD

Picoprojectors

In August, Nikon introduced the world's first digicam with a built-in video projector. The Coolpix S1000pj has a tiny projector—called a picoprojector—that can display photos and videos at 640x480-pixel resolution. In a dark room, projected images are visible up to six feet away, up to 40 inches wide.

Although picoprojector technology has been appearing in small video projectors and a few other devices, the S1000pj moves this revolutionary technology into a mainstream consumer product. Soon, "embedded" picoprojectors will be everywhere.

An embedded picoprojector is one that's built into a device other than a stand-alone video projector. Digital cameras, video camcorders, and camera-equipped cell phones are obvious candidates. Embedded picoprojectors will probably become as common as webcams in notebook computers. Hand-held videogames, media players, portable TVs, and ebook readers are additional possibilities. Picoprojectors will be used for advertising displays, vehicle entertainment systems, heads-up control panels, and other applications that can benefit from their space-saving properties.

Several companies have been working on picoprojector technology for years. Texas Instruments uses LEDs with millions of movable micromirrors to project the image by reflection. Microvision uses red, green, and blue lasers with an oscillating mirror to scan the image onto the screen. Nikon uses liquid crystal on silicon (LCoS) technology instead of micromirrors, and LEDs instead of lasers. The picoprojector in the Coolpix S1000pj has a brightness rating of 10 lumens.

By comparison, my Kodak Carousel slide projector from the 1970s is rated at 525 lumens. It easily projects a 35mm slide onto a five-foot-wide screen from 20 feet away. But the bulb dissipates a scorching 300 watts—enough to melt the little Nikon camera in minutes.

Because picoprojectors rely on the much smaller, cooler light sources of LEDs or low-power lasers, they can't yet match the brightness of old-fashioned projectors. But they have an advantage that, in time, will make up the difference—they concentrate all their light into a highly directional beam. A slide-projector bulb radiates light in all directions, wasting most of it.

Embedded picoprojectors are a game-changing technology, like LCD screens. Someday we'll wonder how we ever lived without them.

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

RealDVD, Kaleidescape Lose to DVD CCA

Courts rule in favor of copy protection over consumer convenience

Consumers' quest for greater flexibility in the digital content they purchase was recently set back by two California court rulings in favor of the DVD Copy Control Association (DVD CCA), licensor of the CSS encryption found on commercial DVDs. After almost a year of legal action involving both the MPAA and the DVD CCA, Real Networks, maker of the RealDVD software package that lets users easily copy their movie DVDs to hard disk for storage and convenience, has been ordered by a U.S. District Court to stop selling its product. Despite the fact that the DVD CCA had granted Real the CSS license, including the technologies involved in descrambling and authenticating the encryption, and that RealDVD indeed preserved CSS encryption in the ripped files, the organization later (likely at the behest of the MPAA) filed a suit claiming Real had violated "hidden and contractual terms."

The judge in the case focused on the part of the CSS license that prohibits circumventing copy protection, which technically RealDVD does—before then re-encrypting the files on the hard drive. The judge found that the anti-circumvention provision in the DMCA trumps the provision allowing users to make personal copies, saying, "fair use can never be an affirmative defense to the act of gaining unauthorized access."

In the same week, Kaleidescape, whose high-end digital entertainment server lets you rip and store all your movies and music for browsing and viewing from various TVs around your house, lost a similar court case over CSS. Interestingly, Kaleidescape had won a lawsuit filed by the DVD CCA two years ago and was granted the right to continue selling its product. The judge in the initial case found that Kaleidescape wasn't responsible for interpreting ambiguity in the CSS contract. But a California appellate court believed that in signing the CSS License Agreement, Kaleidescape accepted responsibility for following any forthcoming DVD CCA specifications. Those specifications ultimately were at odds with Kaleidescape's product.

Kaleidescape can continue selling its entertainment server until a California trial court re-examines the company's contract with the DVD CCA.

Expect both Real and Kaleidescape to take their cases to the next legal level. **–KS**

Monster GreenPower Digital PowerCenter MDP 900

So you wanna save the world? With everything going "green," Monster decided to jump on the clover-tinted bandwagon with the GreenPower Digital PowerCenter MDP 900 power strip ($130, www.monstercable.com). The "green" side of this dual power strip allows you to plug a master device, say, your computer or large screen TV, into the designated outlet. When that device powers down, it cuts off power to all the auxiliary devices on the strip (you can disable this feature, as well). Sure it works and you feel like a mad scientist throwing a switch when your computer boots and all your peripherals come to life, but you can get the same feature and feeling for about $90 less. **–RB**

GAME THEORY

Path to Pretention

One thing I learned while attending art school was that anyone who thinks he or she is an Artist-with-a-capital-A, isn't. Anyone who tries to produce Art—complete with layers of meaning and a message and prepackaged interpretations that they are just dying for some sensitive soul to uncover, is inevitably going to produce self-conscious garbage. It will probably be boring, almost certainly ugly, and without question, philosophically tendentious.

In any art, pure technique (honed by hard work and diligent practice) and pure instinct (some mystical combination of observation, perception, and interpretation, most of it subconscious) mingle to create something that speaks as "art." You can't fake it.

Thus, when I boot a pretentious art-house game like The Path, I know I'm in for instant seating at the crap buffet, complete with a tepid chaser of trite, high-school-level philosophy about MEANINGFUL THINGS. The Path is... words fail me.

It's a Little Red Riding Hood game, where you play as six girls, who I guess represent Feminine Archetypes in Our Modern World. (Or something.) I stopped caring when I realized that the designers hate me, which they made clear by firmly instructing me to stay on the path and go to grandma's house, which is how you lose the game.

You see, you're not supposed to follow rules! Stupid rules! They're all arbitrary! Make up your own rules! Grandma is a tool of the establishment! Let her save herself! You have a Voyage of Self-Discovery to embark upon! (Or something.) Wander in the dark and scary forest, complete with fuzzy visuals, sluggish controls, ghastly bits of free verse, and a creepy pedophilic vibe! Get eaten by wolves!

But maybe the wolves are a metaphor for....

And then I realized I don't like games with metaphors. And I could use about 50 percent fewer similes while we're at it.

But co-designer Michael Samyn doesn't think much of your new-fangled games: "Videogames today are simplistic, deal with stale subjects, treat the players like morons, and offer no emotional or intellectual depth, in favor of attempting to please your ego on some caveman level."

Or something.

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

Lynnfield Mobos to Support SLI

Nvidia licensing SLI to mobo vendors for Intel's new budget quad-cores

Although aimed at the "mainstream," Intel's new Lynnfield Core i5/i7 CPU platform will get a boost with official licensing for SLI.

Nvidia announced that top motherboard vendors Asus, Gigabyte, and MSI have signed on to implement SLI in their new P55-based boards. Also onboard are EVGA and even Intel, which will pay Nvidia to certify that their boards are capable of running SLI and enable driver support.

SLI won't be the only multi-GPU technology board makers support, though. AMD says many board makers will support multiple AMD graphics cards, too.

But does SLI on P55 mean Nvidia is throwing in the towel on making a Nehalem chipset? Nvidia officials wouldn't comment. They again confirmed that the company would not pursue a chipset for original Core i7, but would not confirm nor deny whether a chipset is forthcoming for Lynnfield CPUs. –GU

SLI will come to certified P55 motherboards such as this Gigabyte GA-P55-UD6.

ISPs Under FCC Scrutiny

In anticipation of the National Broadband Plan due to Congress early next year, the FCC is taking a close look at how much money U.S. ISPs are really spending on broadband infrastructure. The federal agency tapped Columbia University's Institute for Tele-Information (CITI) to conduct the review, which will not only look at the ISPs' future plans for network deployment and upgrade, but also their past record for following through on such projections.

Using this data-driven approach, new FCC chair Julius Genachowski intends to better understand why U.S. broadband speed and competition lags behind that of other countries, and to address concerns that a lack of serious competition has caused ISPs to rest on their laurels and place profits above new investment. **–KS**

Lenovo Expands Product Line

Two nettop machines enter the notebook giant's stable of computing devices

The more powerful of Lenovo's new nettops is the IdeaCentre Q110. Measuring a dainty 6x6.3x0.7 inches, it features an Atom N230 CPU, Nvidia's Ion platform, 2GB of RAM, and a 250GB hard drive. It costs $350. –KS

BYTE RIGHTS

Et Tu, Reporters?

Like the other media industries, newspapers are having a hard time finding people that still want to give them money. Unlike music and film, newspapers aren't selling to the customer so much as selling the consumer to the advertiser. But with circulations dropping and basically infinite new ad space becoming available on the Internet, advertisers aren't signing up in droves. This being the news biz, there's no lack of people to talk about why or what to do.

Some media pundits think readers who might pay are defecting to blogs. Others think Google News is being evil. Still others blame Craigslist.org for the death of classifieds.

Whatever the cause, my colleagues are running to the government for a bailout. Unlike car makers and banks, they aren't asking for huge piles of money. They want a legislative bailout.

The newspapers are asking for (among other things) changes to copyright law. Some, like *The Washington Post*, want to restrict linking to or summarizing stories for some period of time. Now, the point of news is to get your story out fast and accurately to make the biggest impact you can. Copyright-reforming newspaper folks are looking to change the law to give them a special right to stop their stories spreading.

When you're asking for a law to be rewritten to make your ultimate goal harder, something has gone terribly wrong.

Worst of all, there's scant evidence that rewriting the law would save the papers' dying business model. Many of their readers have left for good, and online advertising has lowered ad prices across the board.

Just like the RIAA isn't saving music, and the MPAA isn't saving cinema, newspapers aren't going to save journalism. Journalism turns out to be doing just fine in the age of the Internet, where people read blogs and Twitter and watch video clips and even sometimes go to newspapers' websites to get their news. Newspapers have conflated their industry with their field of endeavor, and their business model with the only way of doing it.

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

10 Examples of Secret Silicon Chip Art

10 DILBERT

Cyber-engineer Dilbert was caught on a circa 1995–97 MIPS R10000 Microprocessor.

9 THOR

The 1.1 mm^2-size Norse god of thunder adorns a Hewlett-Packard graphics support chip.

8 WHERE'S WALDO?

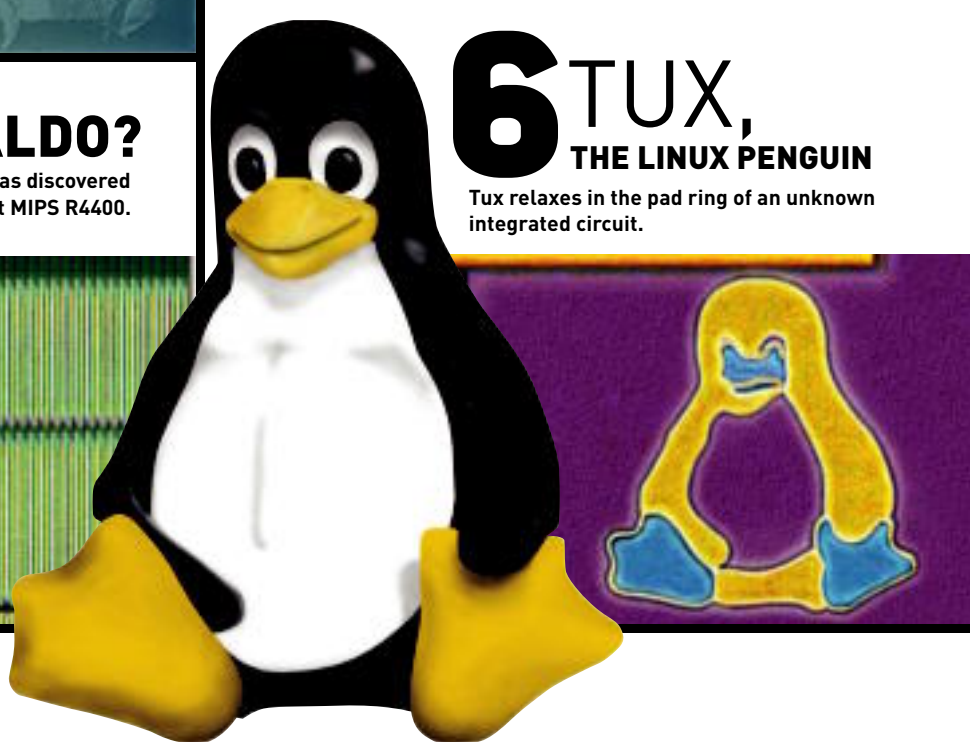
This wireframe rendition of Waldo was discovered on the surface of an early-'90s 64-bit MIPS R4400.

7 USS ENTERPRISE

This miniaturized edition of Starfleet's flagship was etched on a vintage Texas Instruments bipolar logic chip, used in many PC workstations in the early '90s.

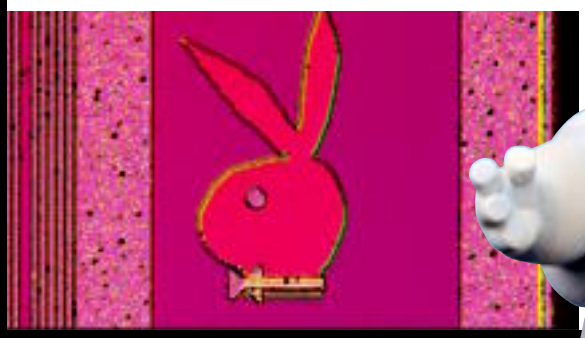
6 TUX, THE LINUX PENGUIN

Tux relaxes in the pad ring of an unknown integrated circuit.



5 PLAYBOY BUNNY

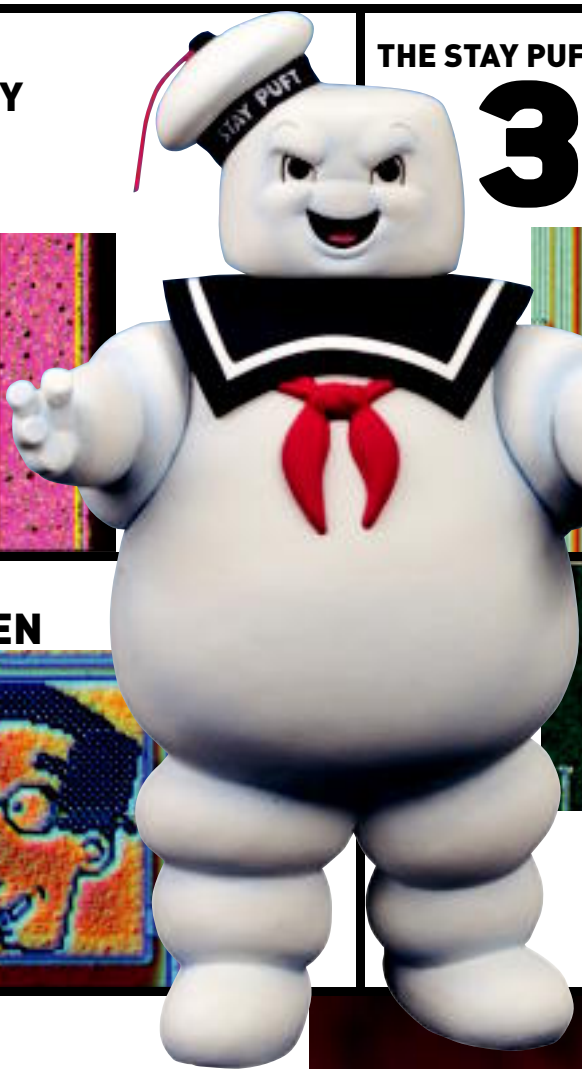
The Bunny was preserved on an integrated circuit made in Germany by Siemens.



THE STAY PUFT MARSHMALLOW MAN

3

RAY STANTZ'S MORTAL NEMESIS WAS DISCOVERED TERRORIZING A 1988 WEITEK MATH COPROCESSOR CHIP.



MILHOUSE VAN HOUTEN

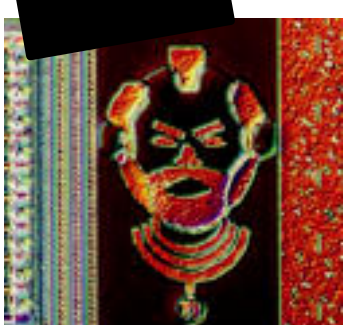
4

BART SIMPSON'S BFF, MILHOUSE, WAS FOUND IMPRINTED ON A SIL154CT64 DIGITAL TRANSMITTER, WHICH POWERED VGA DISPLAYS.

2 THE SHEPHERD

Intel engineers placed this shepherd and his two-headed ram on an Intel 8207, a dual-port RAM controller used in the early 80x86 era.

#1 MR. T



Mr. T pities the fool who can't find him hiding on a Dallas Semiconductor single-chip T1 transceiver integrated circuit, which connected folks to the blazing-fast Internet.

Thanks to The Silicon Zoo for photos! For more examples of chip art, check out The Silicon Zoo (http://micro.magnet.fsu.edu/creatures), a database curated by Michael Davidson of Florida State University.

This month the Doctor tackles...

Removing Rogue 'Security'

Flaky USB Ports

Shrinking C: Drives

Shrinking Free Space

I have a month-old computer with a 64GB Falcon SSD for my OS and my most frequently played games. After I first installed the OS and all my games I had roughly 13GB of free space. Everything I've downloaded and installed since then has gone on my secondary drive; I have not added anything new to the primary drive. Despite this, I now have just 137MB free on my primary drive and am getting warnings of low disk space. Where is my available space going? I did a disk clean-up and that hardly freed any space. I'm running 64-bit Vista SP1. Any help would be appreciated.

–Devin Binning

Graphical drive-space utilities like WinDirStat (shown) and SpaceSniffer let you see at a glance exactly which files are taking up precious hard disk space.

Without knowing more about the programs you're installing (for example, Adobe Creative Suite 3 requires substantial C: drive space even if you're installing it on a different drive), it's hard for us to give useful advice. Our gut says to check your Documents folder. By default, Vista stores saved games and other application data in your Documents folder on the C: drive; you might be filling up with game data or even temporarily stored Internet files. We suggest downloading and installing a visual data manager like WinDirStat (http://windirstat.info) or SpaceSniffer (http://bit.ly/ssniff), which will show you exactly which files are taking up all of your space. You can then move them to your secondary drive or delete them at your leisure.

Removing Rogue 'Security'

PC MightyMax 2009 was included with the purchase of my new HP a6827c with Windows Vista. After trying out MightyMax I decided I didn't want it due to its obscene costs. I obtained the instructions for removal—go to the Start menu, go to the PC MightyMax folder, and hit the uninstall button, but the software does not fully uninstall. Help!

–Shannon Swank

Doctor, I managed to get two computers infected with AntiVirus2009, simply by following a link to a video review online. Both machines run Windows XP Professional SP3. One is a Dell Vostro laptop, the other is a desktop I built about three years ago.

I've run Malwarebytes' Anti-Malware, which removed a bunch of copies, Rogue Remover, SuperAntiSpyware, ThreatFire, and ZoneAlarm Internet Security, but every so often a new browser window will suddenly open and try to access AntiVirus2009.com. I've looked at every website on the Internet (well almost) and nothing I've tried will get rid of it on either computer. The only way I've been able to keep using the computers is to manually block antivirus200*.* in ZoneAlarm.

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.

Every time I check the log, there's entry after entry where it tried to send an ICMP ping to that website or tried to open Firefox to access it. I'm at the end of my rope. I don't know what else to do and I'm sure that there are other people out there having much the same problem as I am. Is my only hope to reinstall Windows?

–Steve Rugg

Ah, our least favorite kind of malware: the kind that masquerades as useful software. Here we have two of the most insidious and widely spread flavors. PC MightyMax is a fake antivirus app that throws up false positives in an attempt to get you to pay for it. The Internet is full of people trying to remove PC MightyMax, and the general consensus is that Malwarebytes' Anti-Malware (www.malwarebytes.org) will remove the program. If not, you'll have to remove it manually. Start the Task Manager and end the following processes: pcmm.exe, ExeAfter.exe, PCMightyMaxSetup[1].exe, and any other processes with PC MightyMax in the title or location. Then run msconfig and prevent them from running at startup. Reboot and delete the folder. Run CCleaner (www.ccleaner.com) to remove registry crud.

THE INTERNET IS FULL OF PEOPLE TRYING TO REMOVE PC MIGHTYMAX

Antivirus 2009 is another faux-security malware program, but it's even more insidious. Since you've already tried Malwarebytes' Anti-Malware, which effectively removes most malware (including, for most people, Antivirus 2009), but your problems persist, you'll want to check out our full malware-removal how-to at http://bit.ly/mpcmal for detailed instructions on purging your machine of baddies. If your problems persist even after a thorough scrub-down, however, you may have to reinstall Windows. It sucks, we know, but not as much as a security-compromised PC.

USB Shutdown

At first I thought it was a fluke, but when I first installed Win7 Beta on a new HDD on my laptop, one of my USB ports stopped working and performance of the others took a nosedive, with some USB devices not getting enough power. I tried a reinstall with Win7 RC and now three of my four USB ports are having the same issues. It may not even be an issue with Windows 7 but there seems to be a correlation that the problem started and got worse with each installation.

I have Windows 7 running on two other PCs with no issues and all I can find on the Internet are people with the same problems but no solutions. I'm sure you can imagine how much it sucks having to use a four-port USB hub just so I can connect more than one USB flash drive.

–Guillermo Rodriguez

First, let's make sure this isn't a hardware issue. Grab a Linux LiveCD like Knoppix or Ubuntu and boot your machine from that. Test your USB ports one at a time. If they work, your problem is

SECOND OPINION

We Stand Corrected

In the August issue, Jeff Davidson wrote that he was having difficulty finding wireless adapters that were compatible with Vista 64-bit. You responded by telling him, as well as all readers, that wireless adapters for Windows (XP, as well as Vista, I assume) were a "notorious tricky spot for adopters of 64-bit Windows." You go on to say that "64-bit support by any vendor is spotty to put it mildly." Lastly, you say the "best bet is to just buy a long Ethernet cord."

Well, I've not only been using the D-Link DWA-552 (PCI) for a little while now, under Windows Vista Ultimate 64-bit, but I haven't encountered a single problem with it. If you had looked at D-Link's website, you'd easily notice that 64-bit drivers for the DWA-552 have been available since December 2007. Additionally, prior to installing the DWA-552, I was using a D-link DWA-140 (USB), which I switched back and forth between my desktop and laptop, and the 64-bit drivers for the DWA-140 have been available since January 2008. As with the DWA-552, I had absolutely no problems with the DWA-140.

The advice given to Mr. Davidson is not only incorrect, but may have also caused him to spend a greater amount of money on a product he didn't need: namely, the suggested wireless bridge.

–ROBB RYAN

almost certainly a driver issue. Go to your laptop manufacturer's website and download your device's specific chipset drivers. If your USB problems persist regardless of drivers or operating system, it's a hardware problem. If your machine is still under warranty, send it in to the manufacturer. Otherwise, unless you feel up to scrounging a new motherboard on the Internet and repairing it yourself, it may be time for a new PC.

8GB of RAM is Too Much?

I have a home-built PC that uses a Gigabyte GA-EG45M-UD2H motherboard. When I load it with 8GB (four 2GB sticks) of RAM, I find that I cannot install either Windows XP or Vista 64-bit. The installation process fails partway through the "expanding files" section, with a "corrupt files" error. I tried new install media to no avail. Eventually, on a hunch, I removed all of the memory except the module in slot 1, leaving 2GB on the system, and the install completed normally.

I tested all of my modules in slot 1 and all passed. I then tested a module in each slot and all four passed. So what could be the issue with this motherboard? The memory (Kingston DDR2-800) is listed in the compatible memory list and the motherboard supports up to 16GB. I could find no information about this issue on Gigabyte's website.

–Paul Jackson

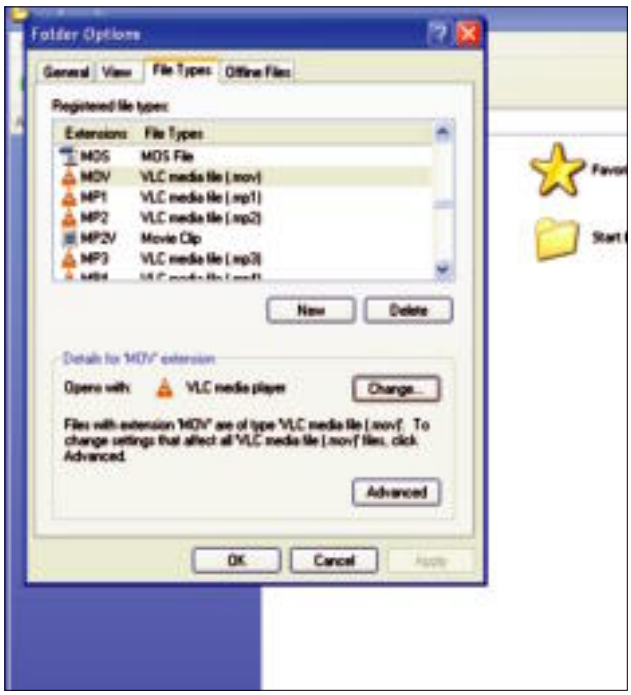
Paul, your motherboard and OS should both be able to recognize 8GB of RAM. Since your OS installed correctly with 2GB, you should now try adding the rest of the RAM to that installation, rather than trying to reinstall with all 8GB slotted in. You may need to change your RAM voltages and timings to utilize all 8GB. Look up your RAM model number on Kingston's website—you'll find specific voltage and timing information there. JEDEC standards dictate that DDR2 draws 1.8V, but some performance RAM can draw up to 2.2V. Make sure your motherboard can supply enough voltage to all of your RAM, and set the voltages and timings correctly in the BIOS.

Restoring Preview Thumbnails

I was recently reviewing different graphics programs for showing video files when I noticed that Explorer now refuses to display a miniature version of video graphics files when I go to the thumbnail view. It still shows miniatures of picture files (.jpeg and .bmp) but not video files. What would cause this? Is it possible to fix it without reinstalling the OS (XP Pro)? The video files show the miniature version when exported to another computer, so there must be something different with my OS. I've tried everything I could think of but no luck.

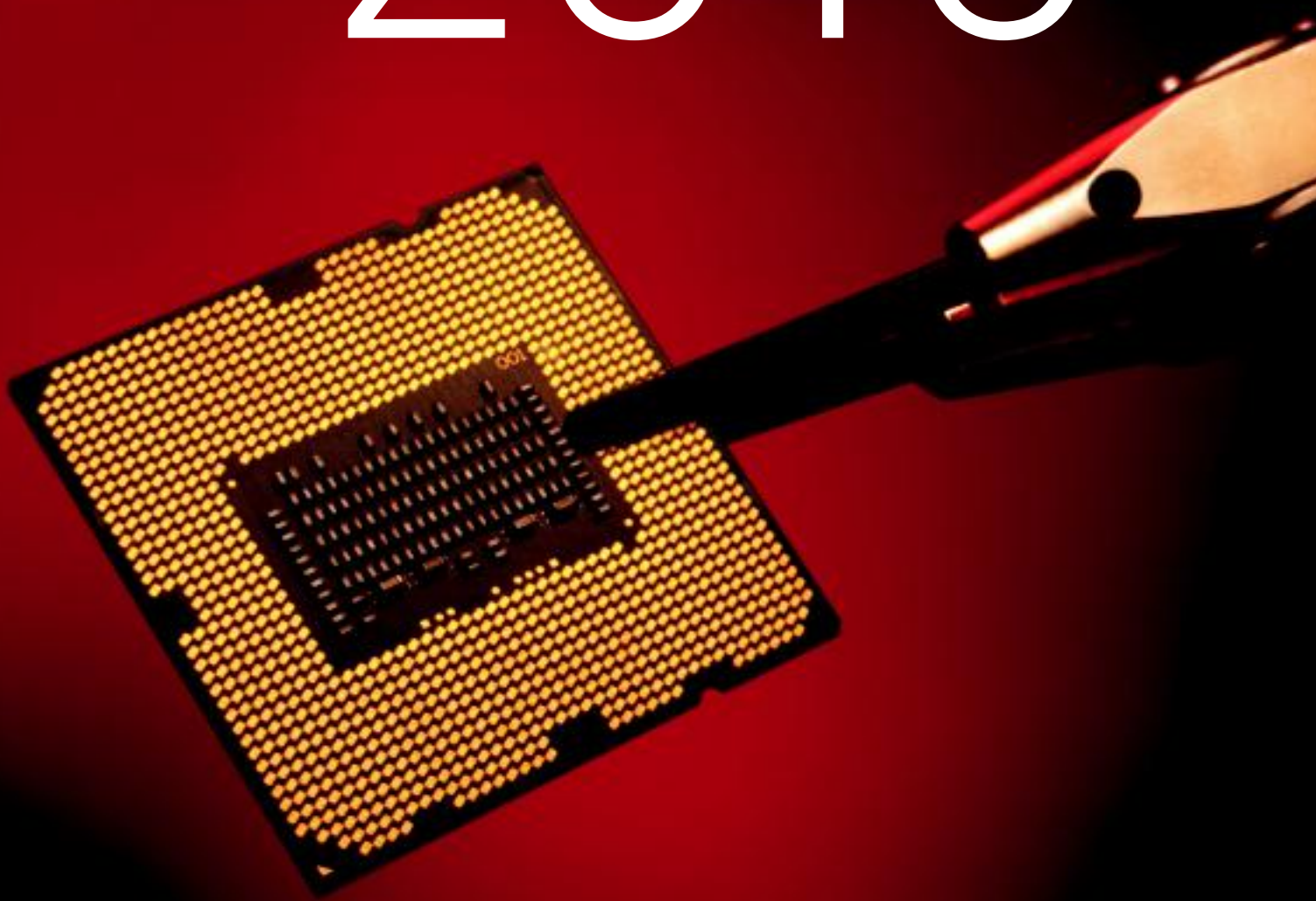
–Stephen Brown

Whether or not thumbnail previews show up for video files depends on your file associations and DirectShow filters. If you've been installing and uninstalling different video players, your file associations could be messed up. Make sure video files are associated with the player that is currently installed on your machine and that it can handle video preview thumbnails. You can do this in Windows Explorer; just click the Tools menu, go to Folder Options, and hit the File Types tab. Then make sure you have preview thumbnails enabled for all file types that support them by going to the Start Menu, opening Run, typing `regsvr32 shmedia.dll`, then hitting Enter. You could also have a problem with your codec pack. The Doctor recommends uninstalling whatever codec packs you currently use and replacing them with ffdshow tryouts (http://ffdshow-tryout.sourceforge.net).



By going to Windows Explorer's Tools menu, then Folder Options → File Types, you can change file associations and restore your graphical preview thumbnails.

THE TECHNOLOGY OF 2010



WE'VE SEEN THE FUTURE

AND IT'S FULL OF NEW AND EXCITING HARDWARE FOR POWER USERS

BY GORDON MAH UNG, NATHAN EDWARDS, LOYD CASE, AND JASON CROSS

So much in life is unknowable. Will the economy rebound? Hard to say. Will oil prices skyrocket? Maybe, maybe not. Will Brangelina add to their brood? Frankly, we don't care. But one thing's for sure: Technology is ever-changing and each year guarantees new advances for the PC user.

As we do every year around this time, we got on the horn with our industry contacts—experts in their respective fields—and pressed them for details about what new and exciting hardware power users can look forward to in 2010. Some of what we learned was expected (SATA speeds will double), some came from out of left field (six 30-inch panels on a single videocard?!), and some just plain make sense (like a Nehalem chip for the masses).

Read on to find out how your personal computing landscape stands to be altered in the year ahead.

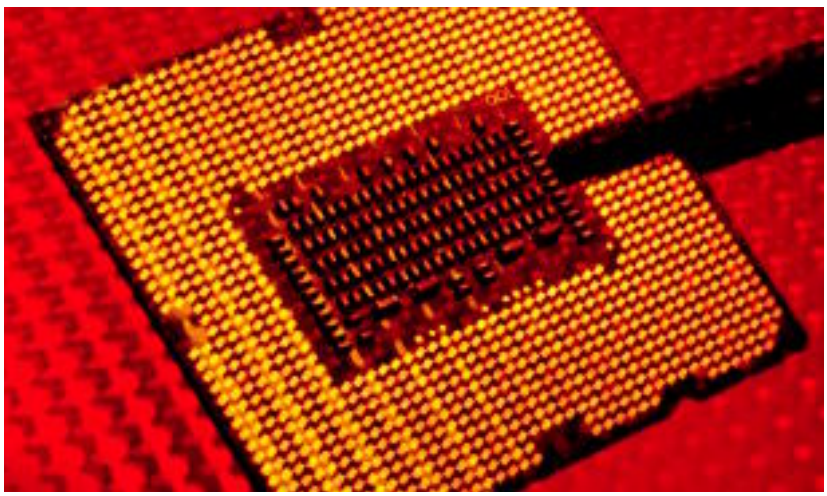
Core i7 Goes Mainstream

Intel's latest troika of new CPUs brings Nehalem goodness to the masses

Nehalem for everyone! That simple sentence best explains Intel's brand-new series of CPUs, which is sure to please budget users everywhere while confounding power users.

Why would a new CPU that gives you the best bang for the buck in town be greeted nervously? Because Intel's new CPU brings with it a new socket as well as a new infrastructure. This new infrastructure is essentially a fork in the road that forces users to make a difficult choice: Save money today but get locked out of the high-end, or splurge today knowing that the budget CPU is damn near as good as the top-end part.

For the details on Intel's new budget monster, savor our full report, consume the specs, and then digest the benchmarks to see just which path your next PC should take.



MEET LYNNFIELD

We normally don't use a CPU's code-name once its real name is known, but to help keep your head from popping off over Intel's confusing naming scheme we're going to rely on some code-names here for clarity.

Intel's newest CPU family is code-named Lynnfield. The lineup includes the 2.93GHz Core i7-870, the 2.83GHz Core i7-860, and the 2.66GHz Core i5-750. Lynnfield chips use essentially the same microarchitecture as Intel's original Core i7 CPUs, which were code-named Bloomfield, but the new CPUs are incompatible with existing Core i7 motherboards. That's right, you could walk into a store and buy a Core i7 CPU that will not work with the Core i7 motherboard you just bought. Likewise, the Core i7 heatsink cooler you bought may not work with a new Core i7, either.

SOCKET SWITCHEROO

The most notable difference in this new crop of Core i7s is the socket. For Lynnfield, Intel is introducing the LGA1156 socket. This socket is, as stated, *incompatible* with the current LGA1366 motherboards and CPUs. To irk you even more, even the heatsink cooler mounting holes are incompatible, so you probably couldn't use an LGA1366 cooler, even if you happened to have one. And even more annoying to enthusiasts, LGA775 coolers are also incompatible. Earlier this year, Intel execs told *Maximum PC* that LGA775 cooler compatibility was being considered for the new chip, but obviously the company has since ruled that out. To break it down: LGA1366 uses a 12cm gap, LGA1156 uses an 11cm gap, and LGA775 uses a 10cm gap. Yes, one centimeter difference and you have to dustbin your pricey high-rise cooler even though it's capable of handling the thermals of the new chip.

We asked Intel if it was doing this just to piss people off and the company said no, it did it for legitimate engineering reasons. Intel actually lowered the height of the new direct socket load mechanism that clamps the CPU in place, which required moving the mounting holes out. Existing heatsinks capable of the thermal load should work, Intel said, so long as consumers obtain updated mounting brackets from the cooler maker. We have to also note that very new high-end coolers are coming with mounts for LGA1156 too. Still, make sure that if the box says Core i7, support for LGA1156 is included.

Although Intel wouldn't confirm this, we've been told by high-end system builders that certain LGA1366 motherboards and coolers would flex enough to create a gap between cooler and CPU. The new design presumably fixes that problem.

MEMORY LOSS

Enthusiasts will also question the move from tri-channel DDR3 to dual-channel DDR3—why go back if wider is better? Intel's decision is based on pragmatism and cost. The tri-channel circuitry in the CPU doesn't add much cost to the processor, but it's not cheap to implement when building a motherboard. Those added traces from the socket to the RAM slots mean more layers and pricier boards. That's one of the contributing factors to excessively priced X58 boards this past year.

Should you be concerned about shifting down to dual-channel? Generally, no. For the most part, only the most memory-bandwidth-intensive apps will actually see any performance hit. The fantastic latency and overall bandwidth capacity of the

MEET THE LYNNFIELDS

	Clock	Turbo Freq	Cores/Threads	L3 Cache	TDP	Price
Core i7-870	2.93GHz	3.6GHz	4/8	8MB	95 watt	$555
Core i7-860	2.8GHz	3.46GHz	4/8	8MB	95 watt	$285
Core i5-750	2.66GHz	3.2GHz	4/4	8MB	95 watt	$199

Nehalem design is more than adequate for today's applications. This doesn't mean it's a non-issue. The vast majority of Lynnfield motherboards we've seen are opting for four-DIMM slots. That means a maximum of 8GB using affordable 2GB DIMMs (4GB DIMMs are currently cost-prohibitive). The only board we've seen with more DIMM slots is Gigabyte's GA-P55-UD6, which features six, for a total of 12GB, using 2GB DIMMs. The memory controller in Lynnfield tops out at 16GB, while Bloomfield maxes out at 24GB. Realistically, 24GB of RAM is way overkill for 99 percent of us. Our experience has shown us that most apps do not consume that much RAM; 4GB to 6GB is the sweet spot today.

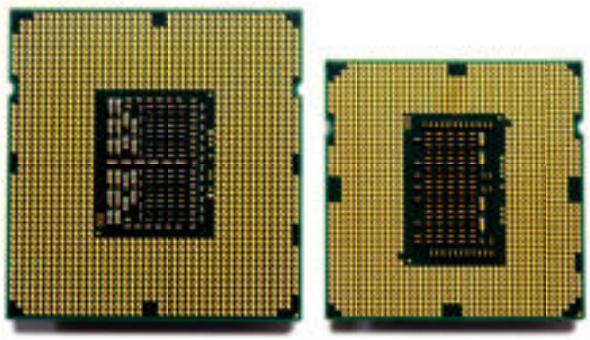
PCI-E AT THE CORE

Another significant change for Lynnfield is that PCI-E comes directly off the CPU core. In X58/Bloomfield, X48/Core 2 Quad, and 790FX/Phenom II, PCI Express is external to the CPU, residing in the north-bridge chipset. Data is pumped out to the chipset where it must then be directed to the PCI-E slots that connect to the GPUs. As you can imagine, the extra hop creates a latency issue—that's eliminated with Lynnfield. Lower latency is better, right? Yes and no. While latency is better on Lynnfield, the CPUs feature but a single x16 PCI-E 2.0 lane in the chip. That's fine for a single GPU, but multi-GPU configurations will have to split the bandwidth. That means an SLI or CrossFire X rig will run both cards in x8 mode. Remember, however, that we're talking x8 at PCI-E 2.0 speeds, which is 8GB/s for each card. From what we've seen and from what vendors have told us, only at the highest resolutions with antialiasing do you see any impact.

But, you say, what about tri-SLI? That, too, can be theoretically supported. Even though Lynnfield supports but a single x16 PCI-E 2.0 lane, additional PCI-E lanes are added through the P55 chipset—at the cost of latency. Previous designs that had PCI-E plumbed from both the north bridge and south bridge were dinged for doing just this. Some vendors are working around the lack of bandwidth by adding Nvidia's nForce 200 chip to their boards. The nForce 200 doesn't magically add bandwidth but it does manage the available bandwidth across multiple slots. Thus, a board vendor could add three or even four x16 PCI-E slots and have the nForce 200 chip manage the load for multi-GPU configurations. This would eliminate the need to have the GPUs feed off of the higher-latency connection in the chipset.

CrossFire X support is a given in the vast majority of P55 motherboards. And SLI will be as well for the board vendors who pay Nvidia to "certify" that their boards are SLI-ready. Fortunately, the big names are already onboard with that, including Asus, Gigabyte, MSI, EVGA, and even Intel.

If you're wondering why Intel doesn't just fix the lack of bandwidth by adding additional PCI-E lanes in the CPU, consider this: Intel would have to add additional traces from the CPU and the socket, and even Intel is loathe to introduce yet another new socket standard so soon. The company also doesn't think it's worth it as anyone who truly wants full dual-x16 GPU support should really be buying X58: Remember, folks, Lynnfield and P55 are for the "mainstream."

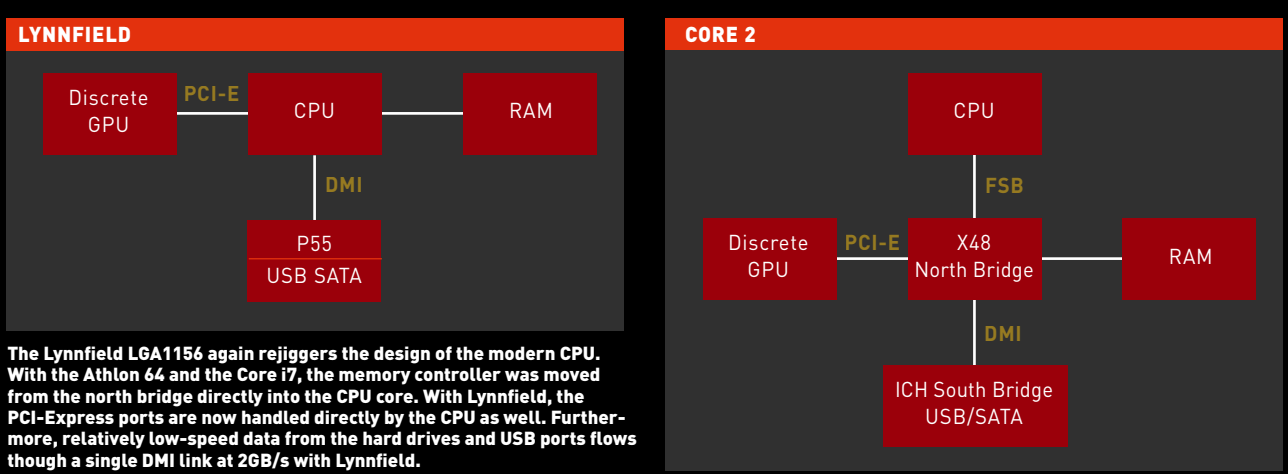


Despite its smaller size, Intel's new Lynnfield Core i7/Core i5 CPU (right) actually features an increased transistor count of 774 million and a larger die size of 296 square millimeters, compared with the 731-million-tranny Bloomfield Core i7 (left) and its 263 square-millimeter die.

P55: DOWNSIZING THE CHIPSET

In the old days, new core-logic chipsets were almost as exciting as a new CPU. Not so today. With X58 and Bloomfield, the chipset got fired from its job of managing the memory controller. With Lynnfield, it even loses its responsibilities for managing PCI-E, as both features are now integral to

THE DEATH OF THE CHIPSET



The Lynnfield LGA1156 again rejiggers the design of the modern CPU. With the Athlon 64 and the Core i7, the memory controller was moved from the north bridge directly into the CPU core. With Lynnfield, the PCI-Express ports are now handled directly by the CPU as well. Furthermore, relatively low-speed data from the hard drives and USB ports flows though a single DMI link at 2GB/s with Lynnfield.

the CPU itself. Today, the chipset is nothing more than a glorified south bridge, managing USB, SATA, PCI, PS/2, and other decidedly unsexy items. The P55 might have been sexier if it had USB 3.0 or SATA 6 functionality, but that won't appear until next year. And even if it had those features, it's pretty clear where the P55 stands: Its desk has been moved to the basement and its red Swingline stapler has been confiscated.

TWEAKABILITY

There was some initial confusion when Bloomfield was introduced. Early reports had it that the memory multipliers were unlocked on the high-end Extreme versions of the CPU, but locked on the lower-end versions. It turned out that was only the case for samples first sent to the press and system vendors. Retail versions of the lower-end Bloomfields were unlocked as well, making it possible for users to set the RAM at speeds higher than the rated DDR3/1066. This time around, there's no such confusion. All three new Lynnfields feature unlocked memory multipliers and the chips are actually officially rated for operation at DDR3/1333, with higher speeds obtainable through "overclocking." Of course, the chips are upwardly clock-locked, so you can't simply set your $200 Core i5 to run at 4GHz by changing the multiplier.

Though open about memory locks, Intel has been cagier about Turbo mode. With Bloomfield, Intel never revealed to consumers the top clock speeds the CPUs could hit under Turbo mode, but with Lynnfield, it's now publicizing the top speed that a single core can hit. The Core i7-870, for example, can top out at 3.6GHz by overclocking individual cores based on the thermals and power consumption of the chip. That's actually far greater than the Bloomfield modes can top out at on default. The take-away is that, with the months it has had to tinker with Lynnfield, Intel has improved Turbo mode (now officially Turbo Boost). However, the feature is locked. Only on the Extreme parts will users be able to tinker with Turbo beyond the default caps.

THE BIG DECISION

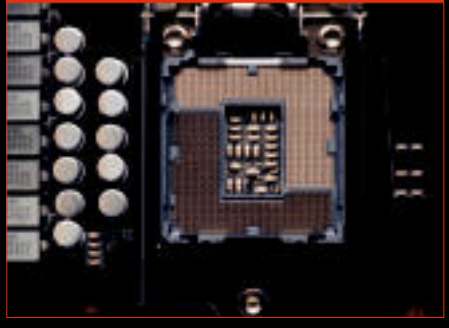
All this techno-speak is meaningless if the processor doesn't perform as expected. We don't want to give away everything here but let's just say we're not disappointed. Lynnfield is everything you'd expect of a new iteration of Nehalem and Intel's now-very-mature 45m process. As such, overclocking, is also fruitful. By simply boosting the base clock of the cheapie $200 Core i5-750, we were able to take it from 2.66GHz to a very stable 3.5GHz without any additional voltage on our very first attempt using a Gigabyte GA-P55-UD6 board. System builders have been equally impressed with these budget parts and have achieved overclocking results every bit as good as, if not better than, the most expensive Core i7-975 Extreme Edition parts.

That brings us to the main question: Why even build a Bloomfield LGA1366 at this point if building a Lynnfield system will save you at least $100 on the board and a little on the RAM, and even more money if you opt for the ultra-budget Core i5-750?

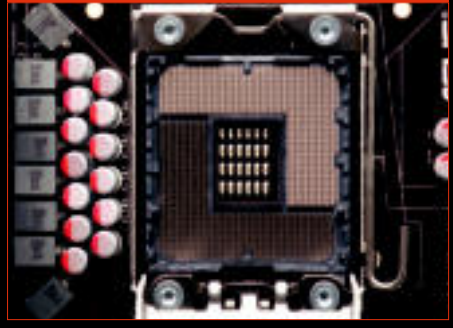
Here's that fork in the road: Lynnfield is cheaper and gets you 90 percent the performance of a Bloomfield system, but early next year Intel will introduce a CPU code-named Gulftown, aka Core i9. Core i9 adds two more physical cores to the CPU and will likely be the first consumer hexacore CPU. With Hyper-Threading, that's *12* threads available to the OS and enough to make the most jaded enthusiast perk up. Core i9, however, will only be available on the Bloomfield/LGA1366 platform. If you were to build a Lynnfield LGA1156 box there'd be no six-core for you! At least, not at this point. Intel said it has no plans for an LGA1156 hexacore. You see the dilemma. Save money now and build a really kick-ass LGA1156 or spend the extra $200 to build an LGA1366 that has an easy upgrade path to six cores with Hyper-Threading. It's not an easy choice to make under normal circumstances, but in this economic climate, it's even harder—that $200 goes a long way toward a better GPU, better PSU, more RAM, or a bigger hard drive. The choice, however, is up to you. **–GU**

SOCKETS COMPARED

LYNNFIELD



BLOOMFIELD



The new budget Core i5/Core i7 CPUs use a new LGA1156 socket design, which is incompatible with existing LGA1366 Core i7 motherboards and coolers. The design eliminates traces for the third memory controller, but builds in wires that will accommodate forthcoming CPUs with integrated graphics cores.

Lynnfield Tested and Compared

Bargain hunters can have their cake and eat it, too

As part of our performance analysis, we used three Gigabyte boards: One for AMD's brand-new 45nm 3.4GHz Phenom II X4 965 Black Edition, one for an LGA1366/Bloomfield 2.66GHz Core i7-920, and one for the two lower-end LGA1156/Lynnfield procs: the 2.83GHz Core i7-860 and the 2.66GHz Core i5-750. For the Phenom II and Lynnfields, we used 4GB of DDR3/1333 in dual-channel mode, and for the Bloomfield, we used 6GB of DDR3/1333 in triple-channel mode. All three setups used an EVGA GeForce GTX 280 card, a WD Raptor 150GB drive, and Vista Home Premium in 64-bit mode.

When we added up the numbers, the new Lynnfield/LGA1156 procs were indeed budget badasses. Our benchmark chart is abbreviated from the full suite we ran (available at http://bit.ly/1553FG), but with its roughly six percent clock bump, the Core i7-860 is roughly, well, six percent faster than the Core i7-920. The Core i7-920's triple-channel RAM indeed put it ahead in a few areas, but not enough to make it victorious—ultimately, the decision goes to the Core i7-860. Against the 3.2GHz Phenom II X4 BE, it's about as ugly as it gets. For about 15 percent more in CPU cost, you would see encoding times drop from 15 to 50 percent. And expect the extra $45 of the Core i7-860 to net you gaming spreads of 12 to 58 percent.

The real problem for Phenom II is the Core i5-750, which costs just $200. Even though we're looking at a clock difference of more than 700MHz between the two, the 750 part won the overwhelming majority of our tests.

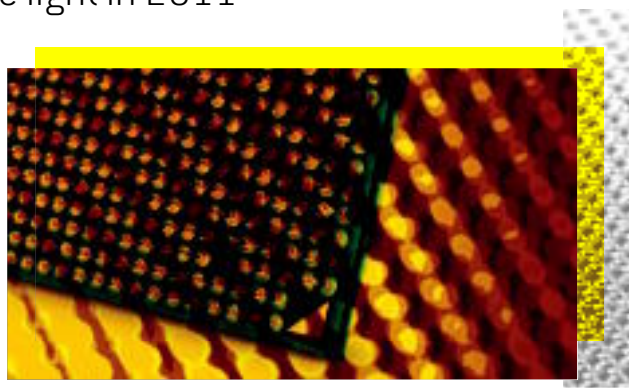
The short story should be of no surprise here: The new LGA1156 Lynnfields deliver all the performance goodness you would expect of a Nehalem. The real shocker is just how inexpensive these chips are. With motherboards expected to sell at south of $200 and the need to buy just two DIMMs of RAM, it's hard to think of anyone else right now. Unless, of course, you have your heart set on a six-core CPU next year. **—GU**

	3.2GHz Phenom II X4 965 BE	2.66GHz Core i7-920	2.83GHz Core i7-860	2.66GHz Core i5-750
MainConcept Reference 1.0 (sec)	1,388	1,235	**1,170**	1,337
MainConcept Reference 1.0 Pro AVC (sec)	840	696	**664**	769
Premiere Pro CS3 (sec)	733	671	630	**620**
Cinebench 10 64-bit	14,083	**16,140**	16,085	14,442
HandBrake iPod Classic (sec)	1,220	**994**	**993**	1,198
PCMark Vantage 64-bit Overall	6,824	6,929	**7,299**	7,208
POV Ray 3.7	3,045	3,470	**3,702**	2,773
Photoshop CS3 (sec)	123	**116**	126	128
ProShow Producer (sec)	911	636	**610**	700
Everest Ultimate MEM Read (MB/s)	8,154	**14,387**	13,641	12,867
Everest Ultimate MEM Write (MB/s)	6,794	**11,639**	10,992	9,881
Everest Ultimate MEM Copy (MB/s)	10,246	**15,790**	15,393	14,684
Everest Ultimate MEM Latency (ns)	54.3	61.0	52.3	**30.9**
SiSoft Sandra RAM Bandwidth (GB/s)	12.7	**22.4**	17.2	16.8
Fritz Chess Benchmark	17.04	21.40	**22.38**	17.38
3DMark Vantage Overall	14,544	**15,008**	14,985	14,947
3DMark Vantage GPU	11,978	**12,306**	12,247	12,249
3DMark Vantage CPU	40,679	44,002	**45,525**	44,066
Valve Particle test (fps)	95	143	**151**	124
Valve Map Compilation (sec)	125	146	133	**121**
Crysis CPU (fps)	104	146	**149.9**	147
Resident Evil 5 fixed DX9 (fps)	89.2	114	**118.1**	108.8
Resident Evil 5 fixed DX10 (fps)	89.2	117.7	**119.7**	109.4
Resident Evil 5 variable DX9 (fps)	140.3	145.8	147.2	**155.4**
Resident Evil 5 variable DX10 (fps)	140.2	150.4	157.8	**160**
World in Conflict (fps)	160	221	227	**266**
WinRar 3.20 RAW files (sec)	805	**581**	594	706

Best scores are bolded.

AMD Pins Hope on 32nm Parts

New Orochi core, based on Bulldozer, will see the light in 2011



Even before Intel released its first Core i7 last year, AMD didn't really have a part that could compete in the high end. Now the company says it will get back in the ball game—but not before 2011.

That's when its enthusiast Orochi chip is expected to begin shipping. Based on the new "Bulldozer" modular microarchitecture, Orochi will have four or more cores and 8MB of cache, and dump support for DDR2 in favor of DDR3. The company originally hoped to have Bulldozer out much sooner using its existing 45nm process, but has had to postpone the chip so it can be built on a 32nm process. AMD's fab partner, Global Foundries, won't actually have that up and running until next year.

For mainstream users, AMD plans to release a version dubbed Llano. Llano will have 4MB of cache and DDR3 support, and some versions will feature integrated graphics cores.

Until Orochi and Llano arrive, however, AMD will have to rely on its existing Deneb and Propos cores. The big question that's up in the air is whether Orochi will introduce a new socket design or not. AMD isn't saying and observers seem split on whether AMD can continue to use the AM3 socket for the redesigned chip. Reusing AM3 would make the loyalists happy, and AMD has been far more careful not to force its users to buy new motherboards, so AM3-compatibility wouldn't surprise us.

Still, with a new budget Core i5 part already faster at far lower clocks, 2011 is a long time away for the AMD faithful. —GU

PCI Express 3.0

New spec removes bottlenecks and improves throughput, but when will we see it?

PCI Express 3.0 will offer a substantial increase in both bandwidth and efficiency over the existing PCI-E 2.0. A good thing, as bandwidth requirements are being pushed ever higher by the increasing capability of graphics cards, with frame buffers now at two gigabytes on high-end cards; increasing graphics features in DirectX 11; and demands made by multiple GPUs on a single card.

PCI Express 3.0 pushes the peak bandwidth from five to eight gigatransfers per second. The new standard will also use 128- and 130-bit encoding, rather than the current 8/10-bit encoding, which should improve efficiency. Additional features include optimizations for improved signaling and better data integrity, while maintaining backward compatibility with PCI Express 1.0 and 2.0 hardware.

However, it's an open question as to when we'll actually see PCI Express 3.0–capable hardware. The PCI-SIG, the standards body responsible for PCI Express 3.0, has pushed back the final definition for the new version until mid-2010, with hardware availability pushed to mid-2011. The strong need to ensure backward compatibility as well as a high degree of reliability have been cited as the reasons for the delay.

Even the new generation of DirectX 11 graphics cards, due to hit the streets this fall, will only be PCI-E 2.0 cards. The recently announced Intel P55 motherboards are also built with PCI-E 2.0 slots. The good news is that bandwidth limits aren't likely to hit a wall with the new generation of GPUs. So, while it's disappointing to see PCI Express 3.0 pushed back, we won't suffer performance bottlenecks in the near term. —LC

Graphics

Hang onto your wallets—a new generation of videocards is about to arrive

There's been much speculation about graphics chips from both AMD and Nvidia that adhere to Microsoft's latest Direct3D 11 graphics API. In fact, AMD showed off working DirectX 11–capable hardware at June's Computex trade show in Taiwan, and more recently at Quakecon. Built on the same 40nm process as the Radeon HD 4890, the new GPU adds hardware tessellation, compute shaders, dynamic shader linkage, and more.

What's unknown about AMD's new DirectX 11 chip family, code-named Evergreen, are hardware specifics such as GPU clock speeds, memory types, the number of shader units, and so on. Estimates of transistor counts are north of one billion, with die sizes likely larger than 180mm^2 (based on photos taken of AMD showing off wafers with Evergreen GPUs.)

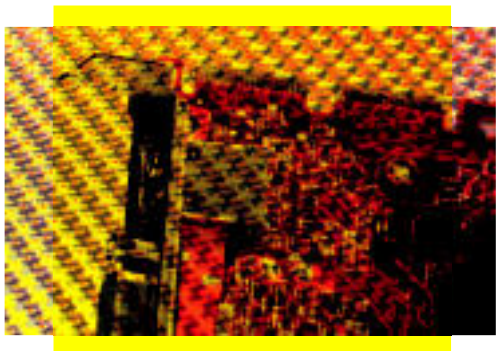
AMD has been careful not to quote performance numbers, or even suggest publicly that the flagship of the Evergreen family, the RV840, will be faster than the current HD 4890. To date, every new generation of GPUs has typically been faster than the previous generation, but that could always change. Given the demos that AMD has shown, it's looking like the RV840 will perform well and be substantially faster than any other GPU.

What about Nvidia? The company has been uncharacteristically quiet about PC graphics, instead touting design wins with its Tegra and Ion mobile platforms. Some observers have stated that the next-generation GT300 chip, Nvidia's answer to AMD's Evergreen, taped out (was sent to manufacturing) in mid-to-late July. That suggests that AMD has a substantial lead in the push to the next GPU generation. As with AMD's Evergreen, it's looking like the GT300 will use a 40nm manufacturing process, which should give Nvidia a little breathing room, as the company tends to build large chips with massive transistor counts.

Still, trailing behind AMD has got to hurt Nvidia's pride, and allows AMD to play the pricing game—charging a little more for cards early on, before the competition can ship an equivalent GPU.

Both AMD and Nvidia are racing to get their new GPUs out because the 900-pound gorilla that is Intel is readying its own GPU, code-named Larrabee. Based on a modified, multicore version of the venerable x86 architecture, with significant vector extensions, Larrabee is unlikely to ship until late Q1 or Q2 of 2010.

In some respects, these new GPUs will actually bring PC graphics hardware just a little closer to game consoles, as DirectX 11 builds on and enhances the tessellation features built into the Xbox 360 GPU. Hardware tessellation is a substantial departure from previous generations of DirectX, which used triangles and vertices as key graphics primitives. Instead, patches are passed to the tessellation pipeline, which contain control points that define areas within which triangles can be automatically generated by the hardware. This is different than previous approaches, which required the application to generate the triangles passed to the GPU.



What this means is that geometry can be automatically generated where it's needed, allowing smoother curved surfaces. Using hardware tessellation also reduces the number of steps required by game artists to create the artwork, since they only have to create one representation of an object, instead of multiple versions for different levels of detail.

DirectX 11's other major feature is compute shaders. Using graphics processors for general computing tasks has become a hot topic in the graphics world. Applications like video transcoding, certain Photoshop filters, and scientific applications lend themselves well to the massively parallel floating-point engines built onto graphics chips.

While the main target for DirectX 11 will be Redmond's newly minted Windows 7 operating system, the new API will run on Windows Vista, as well (but not on Windows XP). Full DirectX 11 support will require new hardware, but a few of the features—particularly multithreading—will run on existing DX10-, DX10.1-, and DX9-capable hardware. So, even owners of older GPUs may see some performance improvements once DirectX 11 actually ships, late in 2009. **–LC**

TESSELATION COMPARISON

TESSELATION DISABLED

ADAPTIVE TESSELATION ENABLED

DirectX 11 hardware tessellation automatically generates smoother geometry with more polygons, without the need for different art assets.

Storage

Bigger, faster, solid-state-ier drives await in 2010

To say that in 2010, hard drives will get more capacious, faster, and cheaper is to state the obvious. Shelves have been stocked with 5,900rpm 2TB 3.5-inch drives for months, and Hitachi's 7,200rpm 2TB drive comes out in September. But how will 2010 improve on that? Henry Fabian, executive director of marketing for Seagate, says, "We'll see 3TB drives, probably even higher, as everyone's vying in the areal density race." But the more data you have, the harder it is to back up.

Three terabytes is way more storage than we estimate most desktop users will need—but then again, *Maximum PC* readers aren't most users. Video editing takes up a lot of space, and those of us who back up our movies to hard drive will quickly find that 3TB holds only about 120 Blu-ray movies.

In the solid state market, expect capacity to go up quickly as prices come down—but maybe not as quickly. Troy Winslow, director of marketing at Intel's NAND Solutions Group, says he expects solid state drives to double in capacity—at least. Already, we're seeing lots of gaming PC vendors ship rigs with speedy SSDs for the OS and games, and terabyte-plus drives for storage; expect this to become even more mainstream as 2.5-inch SSDs approach 320GB—or even 500GB. But don't expect them to match magnetic-drive prices any time soon.

We'll also see widespread adoption of the TRIM command, which helps keep solid state drives performing at their fastest by informing the controller of empty blocks before a write cycle, so writing files to blocks containing deleted data goes faster. The command is implemented in Windows 7 and in the Linux kernel, and will be available in new drives as well as old drives (with a firmware update).

Is 2010 the year that solid state drives overtake standard hard drives in *any* sector?

It all depends who you ask. Troy Winslow says that in 2010 SSDs will "continue to displace high-rpm hard drives in enterprise applications, and standard HDDs in corporate and consumer laptops and enthusiast desktops." But Henry Fabian doesn't think so. "We don't see flash today overtaking hard drives, in enterprise or anywhere else, until costs come down. Early adopters will have them, but they're not ready for prime time," says Fabian. He cites other concerns besides costs, saying solid state drives won't replace magnetic enterprise drives until they can match the durability and reliability of enterprise drives. Intel and Hitachi, however, are betting that that happens in 2010, when they jointly release a line of SAS and fiber-channel SSDs.

What about magnetic hard drives with a large solid state cache? Several manufacturers released hybrid drives in 2007 and 2008, but the lines have been allowed to languish, leading many to wonder if the market segment is dead. We'd love to see terabyte-plus hard drives married to a few gigabytes of NAND for speed. Seagate's Fabian wouldn't tell us whether Seagate has any hybrid drives in the works, saying merely, "It's a capacity game, so hybrids could definitely have a role. You get your capacity, with a little boost of speed. It makes perfect sense." **–NE**

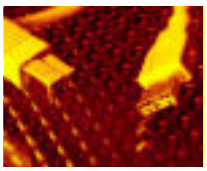
SATA 3.0

6Gb/s SATA Will Give SSDs Some Growing Room

Expect 2010 to be the year of SATA 3.0, the 6Gb/s follow-up to the current 3Gb/s SATA spec. High-speed SSDs are already starting to bump up against the 3Gb/s ceiling with their read speeds, so SATA 3.0's doubled speed gives SSDs some much-needed breathing room. SATA 3.0 also adds greater support for Native Command Queuing and better power management. Drives, motherboards, and adapters utilizing the new spec will appear before the end of 2009—expect announcements at the Intel Developer Forum in late September. We expect widespread adoption by the end of 2010.

USB 3.0

Like USB 2.0, but 10 times as fast



The maximum data transfer speed of USB 2.0 is 480Mb/s, which was fine when it was invented. Now that you have to fill dozens of gigabytes of apps, music, and movies on your cell phone or iPod, it seems kind of pokey. Enter USB 3.0, dubbed SuperSpeed USB (2.0 is officially Hi-Speed USB). The new spec boosts transfer speeds 10x to 4.8Gb/s, which means in the real world you might see transfer speeds up to around 400 megabytes per second. It also operates in full-duplex mode, meaning the USB host can send and receive data simultaneously. All previous USB specs are half-duplex.

SuperSpeed USB ports will be backward compatible with Hi-Speed USB—of course, you won't get the additional speed. You'll notice that the ports and cables used for SuperSpeed mode are a little different, though. The heads are a little longer, with the additional pins for the SuperSpeed mode data extending beyond the usual USB plug.

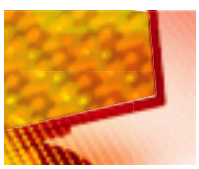
Other nice additions to the spec include new power management modes and an increase in the base power load, so charging your USB 3.0–compatible devices may be 50–80 percent faster than with USB 2.0. The best part? Motherboards with USB 3.0 ports should start rolling out by the end of this year—if we're lucky. **–JC**

DisplayPort

Smaller, simpler, faster

DisplayPort is not so much an "upcoming" technology as an "already here" one. AMD, Dell, and Apple already ship a few products with DisplayPort support, for instance. This new VESA digital display connection standard is essentially a replacement for DVI for external monitors and LVDS for internal connections to notebook displays.

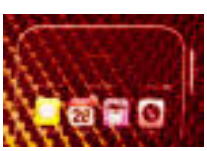
What's so special about it? Well, the connector is smaller, simpler, and doesn't have those annoying thumb screws that catch onto every cable like a grappling hook, for starters. The cables are slimmer, and a DisplayPort-only monitor could itself be slimmer—and cheaper.



Primarily, DisplayPort provides more data per wire than DVI. You know how you need a dual-link DVI cable to use a monitor with a resolution over 1920x1200? A "single-link" DisplayPort cable should provide enough bandwidth for 2560x1600, or deeper color modes. There's also an auxiliary 1Mb/s bidirectional data channel that could be used to carry touchscreen data, data for a built-in microphone, etc. The spec supports HDCP content protection, but don't expect it to replace HDMI on consumer electronics. Each will serve its own market. DisplayPort might pick up traction fastest in notebooks to replace LVDS to drive the display with fewer wires. Hinge space is already at a premium and crammed with wires, so less is more. **–JC**

Touch

It's not just for your cell phone anymore



It seems like touch-screen technology is everywhere these days. The resistive touch screens seen on old Windows Mobile devices and the Nintendo DS are quickly being replaced by more finger-friendly capacitive multitouch technology (iPhone, Zune HD). It seems like every smartphone in the world and half the portable media players these days are built around the idea that you'll operate them entirely by smearing your grubby fingers all over the screen.

Touch might be poised to enter the main computing world, too. Sure, you can get an HP TouchSmart all-in-one or a Tablet PC today, but those aren't exactly the norm. Microsoft is desperately interested in touch technology these days, and where Microsoft goes, the PC industry often follows. Witness the Surface computer and Windows 7. The latest OS out of Redmond incorporates native touch controls throughout and a multitouch API for developers. Windows 7 is clearly designed primarily for a mouse, but the seeds have been planted.

All we need now is a proliferation of touch-screen PC hardware. We need desktop monitors that are touch-enabled, and notebooks with touch screens (that aren't necessarily Tablet PCs). Building this kind of support into devices is getting cheaper all the time, but the push these days is to lower-cost PCs, not premium features. Will touch for mainstream PCs and notebooks take off? It's hard to say, but it's definitely worth keeping an eye on. **–JC**

Multiscreen Madness

If you think a 30-inch monitor insufficient, ho

Today's graphics cards can barely handle one 30-inch monitor in gaming. Pushing around 2560x1600 pixels is a challenge for current-generation GPUs. While it's true that each new generation of graphics cards can push performance, we weren't quite prepared for the preview AMD gave us of its upcoming DirectX 11–capable graphics hardware.

AMD ushered us into its Sunnyvale, CA, test lab, where it had a high-end system set up with a single graphics card. AMD would only disclose that the card had a single GPU, and was one of the company's upcoming DirectX 11–capable chips—nothing about the amount of video RAM, clock speeds, or anything else. This particular graphics card also sported six DisplayPort connectors. Attached to each DisplayPort connector was a 30-inch Dell display. The whole affair was configured as a single, 7680x4800 monitor.

Sure, you say, you can hook up six monitors and run Windows… but can it do 3D?

The short answer: yes, in spades. We witnessed the flight sim XPlane 9 running at full resolution, as well as Far Cry 2. Also shown was the flying ship scene from 3DMark 2006, running at a full 7680x4800, at between 12 and 20 frames per second. It was an amazing tour de force, and we can't wait to get our hands on one.

You can expect full reviews of AMD's new line of GPUs as they become available, in *Maximum PC* and on MaximumPC.com. **–LC**

MASTER YOUR DIGITAL DOMAIN

How to build a Windows Home Server to back up your PCs and stream all your movies, music, and photos

BY NORMAN CHAN

Your PC's hard drive is probably packed to the platter's edge with hundreds of ripped DVD videos, gigabytes of digital photos from your camera, and tens of thousands of songs. And that's not even counting the high-definition digital video from your last family vacation that you're still planning to unload. But with terabytes of media just gathering dust on your desktop PC, you risk losing years of aggregated files when your hard drive inevitably gives out (don't even think about backing it all up to the cloud). Our solution: Keep all your data backed up on a Windows Home Sever. More than just a generic NAS box, Windows Home Server maintains backups, streams media files, and works as a file share across your home network. And the best part is that you can build one yourself—we'll show you how!

Windows Home Server: An Overview

More than just a stripped-down version of Windows Server 2003, WHS has numerous features that make it ideal for small home networks

NO-HASSLE BACKUPS

WHS's primary function is providing automatic backups for computers on your home network. You can schedule daily backups for up to 10 Windows machines, and you have the option of picking specific local drives or excluding individual folders from backup. The backups aren't image-based, either: WHS looks at the file system and stores only one copy of every file on its data partition, regardless of how many PCs that file appears on. WHS also monitors the antivirus and firewall status of all client PCs, a useful tool for home admins.

INTUITIVE FILE SHARING

The WHS administrator can create user accounts that give friends and family members access to shared files on the server, as well as a password-protected account folder to store personal files. Users' PCs access the server like they would any other network-attached storage device, and they have the option of enabling data redundancy to duplicate selected folders across multiple physical drives on the home server.

ROBUST REMOTE ACCESS

Getting access to your files and managing backups on WHS remotely is easy as well. Users can use the provided Console Connector client software to change their own backup settings, navigate the file system in Windows Explorer with a network address, or even remote desktop into the server. Read more about remote access on page 42.

You can add up to 10 Windows machines to back up with WHS, as long as their drives are formatted using the NTFS file system.

VERSATILE MEDIA STREAMING

Built into the latest version of WHS is the Windows Media Connect UPnP server software, which lets any compatible digital media receiver (like the Xbox 360, PS3, or Windows Media Player 11) stream movies and music off the home network. WHS's Power Pack 2 update added support for MP4 video files and metadata, and third-party add-ins and server software enable advanced features like real-time video transcoding, so you can stream almost any file type.

EASY EXPANDABILITY

One of the coolest things about WHS is its ability to seamlessly integrate any new hard drives into its data partition. Whether you're adding new internal SATA drives or plugging in additional USB hard drives, WHS will automatically format new storage devices so all drives are treated as a single unified storage space. Replacing older hard drives is also relatively easy, though the removal process may take several hours as WHS relocates backup files to the remaining physical drives.

Build Your Own Windows Home Server

Why settle for the limitations of a store-bought server when you can build one that's even better?

Even though several PC manufacturers offer complete Windows Home Server solutions (like the ones reviewed on page 44), there are many advantages to building one yourself. Most WHS packages are limited to a maximum of four storage drives, and generally include a 1TB drive to get you started. Our build allows for up to six internal SATA drives, with a starting capacity of 4TB (two 2TB drives). Additionally, we included a dual-core Athlon processor, which is far better suited for video transcoding tasks than the typical Atom or Celeron that's included in current WHS builds. Finally, even though our build is a little more expensive than pre-assembled offerings, WHS software runs perfectly on normal PC hardware, so we recommend that you scavenge parts from old PCs to save on costs.

THE PARTS LIST

CASE Antec 200
$59, www.antec.com

MOTHERBOARD Asus M4A78 Pro
$110, www.asus.com

PROCESSOR: AMD Athlon X2 240
$61, www.amd.com

RAM: 2GB Corsair DDR2
$40, www.corsair.com

STORAGE: (2) 2TB Western Digital Caviar Green
$440, www.wdc.com

POWER SUPPLY Rosewill RP550-2
$55, www.rosewill.com

OS Windows Home Sever OEM
$95, www.microsoft.com

TOTAL $860

OPTICAL OPTIONAL

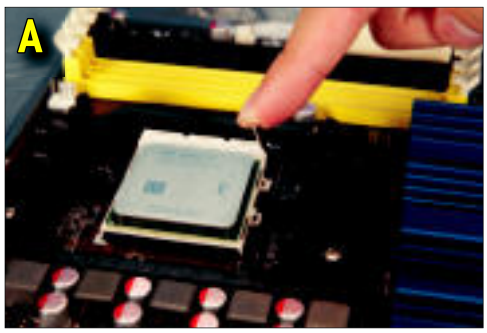
We omitted a DVD drive ($20) from our parts list because, aside from installing the OS, you're never going to need an optical drive for your server. WHS can be installed from an external USB DVD drive, but we also recommend installing from a 2GB USB key ($10).

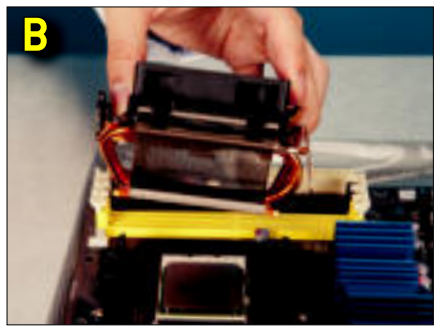
1 Prep the Case

We picked the Antec 200 because it's an inexpensive chassis with six 3.5-inch drive bays. It also one-ups other budget cases by including an external easy-swap SATA bay, which is convenient if you plan on frequently replacing your WHS's drives. The included 14cm fans also have adjustable rpm switches, so you can turn them down to keep the system whisper-quiet. To start, you'll have to snap in the motherboard's included I/O shield in the back of the case (image A), and then screw nine motherboard stands into the belly of the chassis (image B). We also took this opportunity to install the power supply (image C).

2 Insert the CPU

Next, place the motherboard on a static-free surface and install the CPU. Make sure to align the CPU properly (matching the triangle on one of its corners to the mark on the motherboard) before locking it into the socket (image A). Once the CPU is in place, plant the stock cooler on top of the proc and clamp it into the plastic bracket (image B). Then plug the cooler's three-pin fan connector into the motherboard.





3 Drop in the Motherboard and RAM

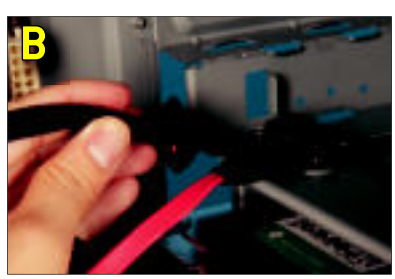
With the case flat on its side, carefully place the mother-board inside, aligning its screw holes on top of the standoffs (image A). The Asus M4A78 is a full ATX-size motherboard with six SATA ports. It also has onboard video output, which we'll use to access the BIOS and also install the WHS software. With the motherboard screwed into place, insert your two 1GB RAM modules into slots 1 and 3, which allows the DIMMs to run in dual-channel mode (image B).

4 Mount the Drives

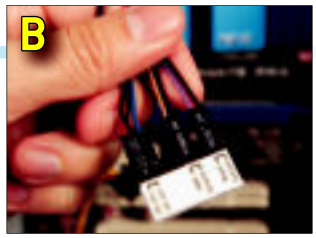
Now it's time to install your WHS's hard drives. With the case side panels removed, slide each drive into an open bay until its screw holes are visible from the side. Affix each drive using four screws. We went with two large-capacity drives to give our server ample storage space without having to worry about replacing drives anytime soon. WHS partitions 20GB for the operating system, and then corrals the rest of the disk capacity into one extended storage space using symbolic links to trick the file system into thinking you have only one really big hard drive.

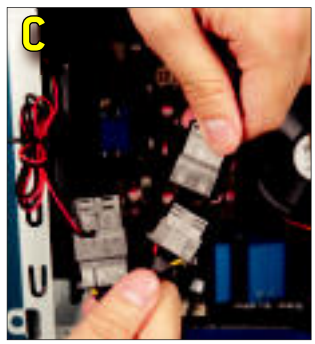
5 Attach SATA Cables

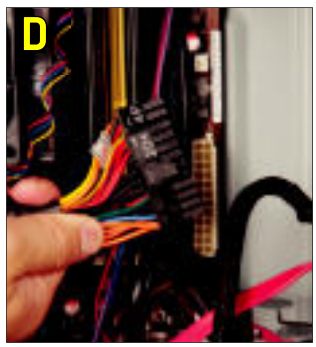
Use the included SATA data cables to connect both of the drives to the motherboard (image A). We also connected a third SATA cable to the case's easy-swap drive slot, which rests right above the internal drive bays. After the data cables are attached, connect the SATA power cables from the power supply to the drives as well (image B).



6 Wire It Up!







With all of the physical hardware in place, it's time to wire up the loose ends. We want to be able to plug USB keys and portable hard drives into the front of our WHS, so we plugged the case's two front-panel USB cables into the motherboard (image A). The other front-panel connectors, including the power switches and LEDs, are easily attached to the motherboard using Asus's motherboard adapter (image B). You'll also want to direct power to the case fans using four-pin Molex connectors from the power supply (image C). Finally, give your motherboard some juice by attaching both the main 24-pin ATX connection and four-pin CPU power connector to the motherboard (image D).

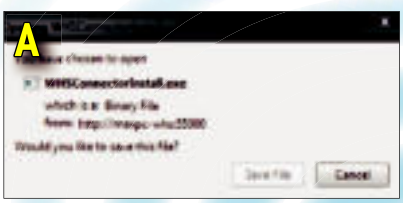
7 Install Windows Home Server

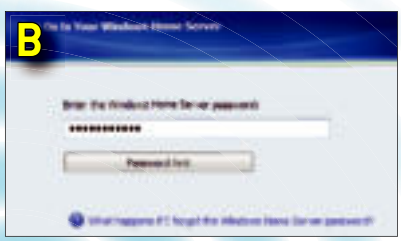
On to the software! If you opted for an optical drive (either internal or external), you can just pop in the Windows Home Sever installation disc and run the traditional install. Alternatively, you can create a bootable USB key (instructions on page 71), copy the contents of the WHS disc (about 800MB) to the key, and install from there. You'll need to enter the BIOS (by hitting the Del key at startup) to configure the appropriate boot order—make the first boot option DVD for an optical install and USB for the key. The installation process is very straightforward (even simpler than a normal Windows install)—you'll only be prompted to give the server a name and input an administrator password. Once the installation is complete, attach the server to your home network.

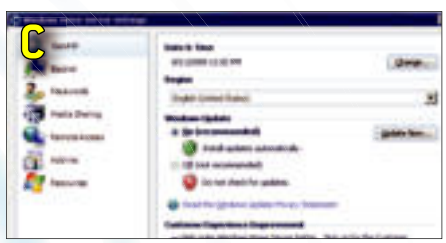
8 Add Clients to Your Server

To configure your server and administer backups, you'll need to install the WHS Connector password on client PCs. The software is included on a disc with your copy of WHS, but we found it easier to install it straight off of the network. Open a web browser on your personal PC and enter http://*severname*:55000 into the address bar, with "severname" being the network name of the server you assigned earlier (image A). You should be taken to a page called Windows Home Sever Connector Setup, which has a link to download the Connector software. Download and run the install program, which will automatically detect your sever on the network and prompt you for the server's administrator password (image B).

Once the Connector software is installed, launch it to enter the WHS Console. The first thing you should do is click the Settings button on the upper right and click the Update Now button under the General tab. This will run Windows Update to download and install the latest patches and security fixes for WHS, as well as any WHS Power Packs that might be available (image C). In the next section, we'll go over the features and functions of the Console.







The Windows Home Sever Console

The Console puts all common server chores into one convenient location

COMPUTERS AND BACKUP

Every computer that you install the Windows Home Connector software on will appear here. Up to 10 PCs can be queued for backup, and you can initiate instant backups or view backup files from this tab. To utilize backups, WHS creates a read-only virtual volume on your client PC, mounting the backup files so you can retrieve individual files. One caveat to backups is that you can configure only one backup time window for all your PCs. WHS runs through all the PCs sequentially, so if you don't allot enough time, not every client may be backed up in one session. We recommend that you create a wide enough backup window (during the day or at night) so that every computer can be backed up daily.

USER ACCOUNTS

You can use this tab to add user accounts, which are separate from the list of machines marked for backups. Users have individual logon names (ideally the same logon name they use for their Windows desktop), and as the administrator, you can toggle remote access permissions for each user. WHS also lets you enable a Guest account, but this can end up being a security hole. We recommend that you create a generic user account that you can share with friends whom you want to have access to public folders on the server.

SHARED FOLDERS

By default, WHS creates five category-specific shared folders that you can use for file sharing and media streaming. Media files found in backups won't be shown here, but some Add-ins will automatically find and sort files found in attached portable storage devices to these shared folders. Adding a shared folder is easy, and you can toggle on file duplication for individual folders if you want to store redundant copies on multiple hard drives in case one disk fails. We enabled duplication for our build, since the 2TB drives can easily handle both system backup and folder duplication duties.

Backed-up volumes don't automatically get sorted into the Shared Folder categories unless you're running HP's proprietary Media Collector software.

SERVER STORAGE

This tab shows the status of all the physical hard drives connected to the server. A pie chart provides a visual representation of how different types of files (shared folders, backups, and duplication files) are distributed on the server, and you can also use this tab to manually add or remove connected drives from the hive. While this tab is useful, we recommend installing the Disk Management Add-in for a more informative view of how data is being stored on individual drives.

SETTINGS

The Settings window, which we accessed earlier to apply updates, is the most powerful component of the Console. Here, you configure the backup session time period, passwords, and remote access settings. It's also the place where you install and manage third-party Add-ins.

GETTING THERE

Four Ways to Access Your WHS

CONSOLE SOFTWARE This is the only way to get your PC set up for backups and to configure user accounts (as explained above).

NETWORK FOLDER Users can browse Shared Folders or their own user folder by typing *servername* into Windows Explorer, with your server's network name in place of "servername."

REMOTE ACCESS WEBSITE Enabling website connectivity in Settings lets you set up your router to accept connections from users off of your home network. Your WHS license entitles you to a personalized website under the homeserver.com domain, so you and your users don't have to remember your IP address.

REMOTE DESKTOP If your PC is using Windows XP SP2 or newer, you can use Remote Desktop to access your WHS's desktop. This is useful for installing non-Add-in software like TVersity. Older PCs can download the Remote Desktop connection software manually at http://bit.ly/XzCP6.

HP MediaSmart LX195

A pint-size home server for your budding network

If you don't need terabytes of backup space for your network, the newest member of HP's MediaSmart family may be the right fit for you. With 640GB of storage, the LX195 makes sense if your home network consists of just two or three PCs. Like its higher-end siblings, the LX195 lets you perform Mac OS backups, though you'll have to partition additional drive space for Time Machine. Storage capacity is the LX195's big weakness, since there are no extra internal drive bays or eSATA ports for additional hard drives. To enable WHS's file duplication feature or add additional storage space, you'll have to attach external drives with USB.

The LX195's strengths lie in its small size and low power usage. It's no bigger than a desktop speaker, and can be hidden out of sight under your desk. Its Atom processor draws very little power (especially when idle), and we couldn't even hear the server operate during backups.

Serving high-definition WMV files to our Xbox 360 worked without hiccups on a wired network, but don't expect to transcode high-bitrate video with the meager 1.6GHz Atom CPU and 1GB of memory. However, serving content to multiple machines simultaneously is fast with the included Twonky streaming software—an HP-exclusive Add-in for now. File transfer speeds were a little faster than other entry-level home servers, but were noticeably slower than our custom-built WHS rig.

At the listed price of $400 ($300 on Newegg), the LX195 is a little pricey given its limited upgrade options. It's a suitable solution if you use both PCs and Macs and don't plan on greatly expanding your home network.

VERDICT

HP MEDIASMART LX195
$400, www.hp.com

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Acer easyStore H340

Ample thrills with minimal frills

Acer's entry-level easyStore H340 gives you everything you need to attach a robust Windows Home Server to your network, with plenty of room to expand. Its technical specs edge out HP's comparably-priced LX195—both are budget servers equipped with a 1.6GHz Atom processor, but the H340 includes 2GB of RAM and 1TB of included disk storage. The feature that really sets Acer's offering apart, however, is the availability of four hot-swappable drive bays, meaning you can add three additional 3.5-inch SATA drives with ease. And if those aren't enough, the H340 also has five powered USB ports and even an eSATA port for you to go nuts with expansions.

Sweet hardware aside, the software bundled with the H340 is pretty basic. Included server Add-ins provide compatibility for DLNA (Digital Living Network Alliance) supported hardware and iTunes library sharing, but the Lights Out power management Add-in is something you can freely download for any WHS build. You also get six months of McAfee virus protection for your server, but this is a service that you can't uninstall from the WHS console—you'll have to use Remote Desktop to manually remove it.

One other notable feature is a one-touch USB backup button. Plug any USB hard drive into the front of the server, push the button, and the H340 automatically copies all of the files into the Public Shared Folder. It'll also sort the files based on file type, distributing them into music, video, and photo folders. We found this to be a really quick and efficient way to back up the myriad USB keys found lying around at home. As a starter package, the Acer H340 is great for power users who want a home server without building their own.

VERDICT

ACER EASYSTORE H340
$400, www.acer.com

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BENCHMARKS

	HP MediaSmart LX195	Acer easyStore H340	Maximum PC's custom WHS
Small Files Upload (sec)	13.3	17.6	**10.8**
Large File Upload (sec)	5.3	6.6	**3.9**
Small Files Download (sec)	12.1	9.8	**9.0**
Large File Download (sec)	4.1	4.4	**3.8**

Best scores are bolded. To measure home server transfer speeds, we copy a 695MB folder and a 263MB video file from a desktop machine hard-wired to the server and back using the Windows browser.

5 Essential Windows Home Server Add-Ins

Third-party apps can extend the functionality of your home server

In addition to its native features, Windows Home Server allows you to install community-developed Add-ins that introduce new features and security to your server. To run an Add-in, download its .msi install file and place it in the server's \Server\Software\Add-ins folder using an administrator user account. The Add-in will show up within the Settings window, under the Available Add-ins tab. Just click the install button and you're set. Some of these Add-ins are still in beta stages, so you might encounter bugs.

ADVANCED ADMIN CONSOLE

This Add-in creates a new tab in your WHS Console window. From here, you can access your server's Control Panel, Administrative Tools, Start Menu, and even Recycle Bin, just as if you were using Windows XP. It's particularly useful when you want to tweak registry settings or remove programs installed on the server using remote desktop. The newest version incorporates support for Internet Explorer 8 and limited Windows Search integration (which works well because files stored on WHS are automatically indexed). Download at: http://bit.ly/wY9T9

DISK MANAGEMENT

The more hard drives you add to your home server build, the more you'll want to know how WHS is managing disk space across your storage pool. Disk Management provides detailed data about each drive, including real-time network activity, temperature, capacity, and file type usage. With this information, you'll know which drives to replace first when upgrading, and which drives are acting up before an impending crash. The coolest feature: a fully customizable 3D wireframe of your entire storage array. Download at: http://bit.ly/qJYjn

WEB FOLDERS 4 WHS

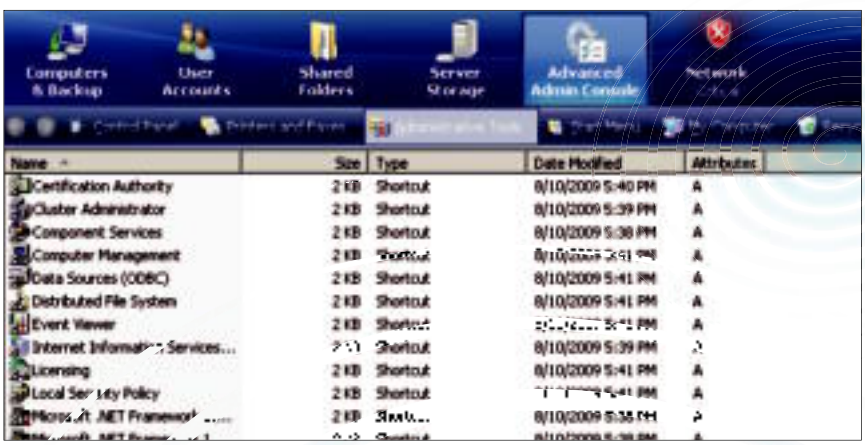
The website interface for remotely connected users is functional, but simply not powerful enough for extensive data transfers (especially since you must use Internet Explorer). With Web Folder 4 WHS, online users can access your WHS with mapped network drives created under My Computer or My Network Places (in XP). Shared WHS folders then appear as network folders, and you can drag and drop files like you would any local directory. Download at: http://bit.ly/2ovqQC

PHOTOSYNC

This Add-in monitors your server's shared Photos folder and automatically uploads found photos to a linked Flickr account. You can customize subfolders so the Add-in won't upload all of your photos, and also adjust the frequency with which the software will check for new photos. This tool is especially cool when combined with the Web Folders Add-in, so multiple users can contribute and add photos to one community Flickr album. Download at: http://bit.ly/Q55X3

MY MOVIES

If you plan on storing a lot of movies and music on your WHS, you'll want to download the My Movies Add-in, which runs through your media library and adds community-generated metadata to all recognized files. This makes browsing through movies in Windows Media Center much easier, since it facilitates browsing movies by their DVD covers. Additional conveniences such as automatic CD and DVD ripping are also available, but have to be unlocked with a $50 donation to the creators. Download at: http://bit.ly/8MVa6



WHS Power User Tweaks and Tips

To truly master your digital domain, you'll want to optimize your home server's performance

BEEF UP THE SWAP FILE

Enlarging and optimizing WHS's swap file can help when you're running multiple Add-ins and streaming lots of media. It's especially useful if you purchased a Home Server with just 512MB of RAM. To change the size of the swap file, install the Advanced Admin Console Add-in and access WHS's Control Panel. Double-click the System icon in the list to bring up the System Properties window. Under the Advanced tab, click the Settings button to bring up the Performance Options window. Under this new window's Advanced tab, click the "Change" button under the Virtual Memory section. Now select the C:[SYS] drive and change the page file's custom size to Range. The Initial Size should be set to 1.5 times the capacity of the RAM installed on the system, while the Maximum Size should be set to three times the amount of RAM. For example, in a system with 1GB of memory installed, the initial size of the page file should be 1,500MB and the Maximum Size should be 3,000MB.

QUICK TIP

Set your WHS's automatic update time to be different and far removed from the scheduled backup time.

DON'T JUST BACK UP, SYNC!

If you download a lot of media files or use BitTorrent to schedule downloads to your local drive, you can set up Windows Home Sever to automatically perform a one-way sync of files from your desktop to WHS using Microsoft's SyncToy software (http://bit.ly/2Fmihj). SyncToy pairs two folders from anywhere on your network and ensures that all the files in one folder are duplicated in the other. For example, you can set up SyncToy to watch a video downloads folder on your desktop and automatically copy any new files that show up to the Videos Share on your WHS, which then makes the file available for media streaming. SyncToy is ideal because you can configure the pairing to be in "Contribute" mode only, meaning it won't remove files from your WHS if you delete the original version.

QUICK TIP

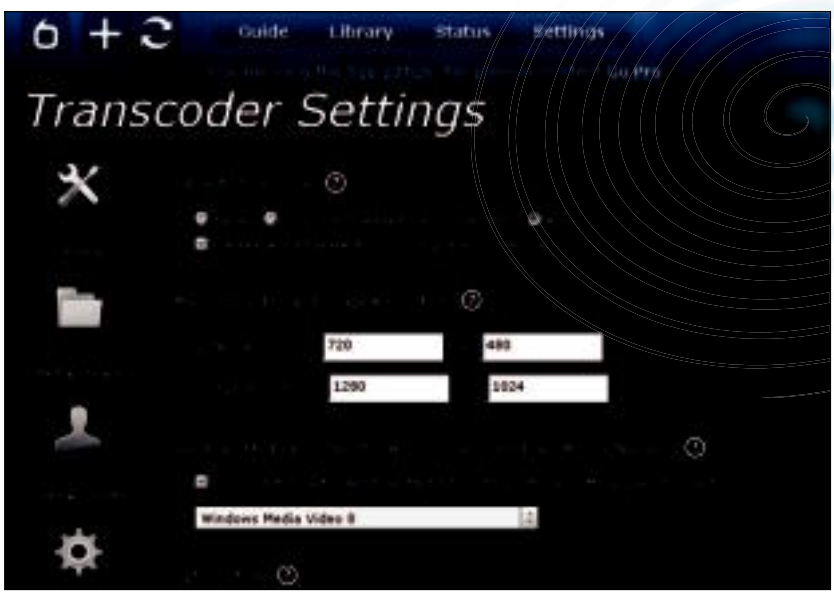
Disable WHS active notifications on client machines by right-clicking the Console icon in the taskbar (for the more computer-illiterate users on your home network).

TRANSCODE HIGH DEFINITION VIDEO

Windows Home Server includes media server software that is recognizable by other computers and game consoles like the Xbox 360 and PlayStation 3. Unfortunately, these receiving devices don't have a wide selection of video codecs to process all video file types, including the popular Xvid codec and the Matroska multimedia container (.mkv). To play these files, you'll have to install a media server that can transcode your videos into supported formats. The trick is that these programs aren't WHS Add-ins—you'll have to download and install them on your server's desktop just as you would any normal program in Windows. We've had success with TVersity (follow the instructions from our Streaming Guide here http://bit.ly/AyVZI), but another program we recommend is the PS3 Media Server (http://bit.ly/uF5l5), which also works on the Xbox 360. Just download the latest Windows build, copy the file to a folder on your server, and run the install wizard using remote desktop. The PS3 Media Server will automatically run on startup, and you can configure its transcoding settings to downsample audio or lower video bitrate to accommodate your network's bandwidth limitations (i.e., streaming video over Wi-Fi versus wired).

QUICK TIP

Split up your files into many Shared Folders (i.e., TV and Movie folders instead of just one Video folder) to facilitate more efficient file duplication.



WINDOWS 7: REDEMPTION

Finally, Microsoft makes up for the sins of Vista and releases a successor worthy of Windows XP

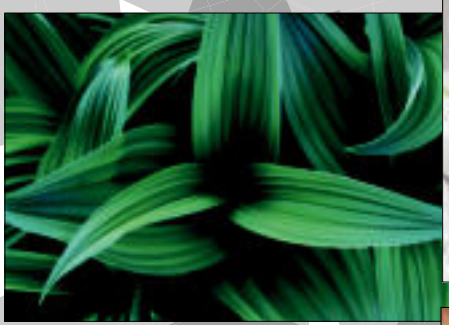
BY WILL SMITH

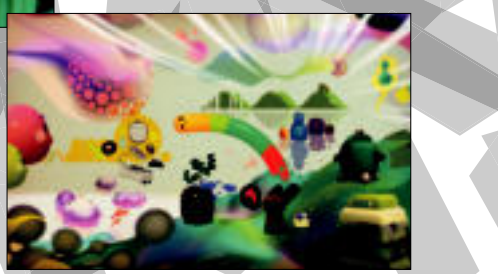
For the Windows faithful, it's been a tough eight years. With the launch of Windows XP in 2001, we believed ourselves to be on the brink of a new world of NT-based goodness. But two years and uncountable exploits later, the future of Windows looked grim. Faced with a seemingly never-ending torrent of new 'sploits, worms, and trojans, Microsoft fired back with the single greatest operating system update of all time—Service Pack 2. In a single fell swoop, SP2 turned Windows XP from Swiss cheese to secure, and once again we felt poised to enter the Promised Land with... (wait for it)... Vista.

Of course, we all know how that turned out. Haunted by poor performance in everything from games to disk access to networking, Vista is widely considered to be Microsoft's biggest failure. Nonetheless, Vista laid the groundwork for a host of new technologies, all absolutely vital to pushing Windows into the 21st century. Vista's new, modern driver architecture was designed to move core functionality from the kernel (where any instability can bring down the whole system) to user space—an absolutely necessary development. Likewise, Vista's proper enforcement of permissions for both users and applications enhanced security, even though UAC remains very annoying. And once vendors fixed their driver flaws and Microsoft squashed some underlying bugs, Vista morphed into an entirely workable operating system, even if we still wouldn't describe it as "good."

So, as 2009 draws to a close, we find ourselves testing another new Microsoft OS: Windows 7. Building on the now-mature technologies introduced with Vista, but with a renewed focus on performance and ease of use, Windows 7 seems poised to succeed where Vista couldn't. We've finally received a final build of Win7, and have run it through the wringer in both the Lab and the real world. Here's what we found.

New and Exciting Features





While support for new hardware and improved security are perfectly valid reasons to upgrade your OS, the sexiest benefits of an operating system upgrade are all the new features. Indeed, from a completely revamped user interface to brand-new tools designed to make organizing and sharing your files easier, Windows 7 delivers much more than some new wallpapers and a different color Taskbar.

USER INTERFACE ENHANCEMENTS

The most obvious changes from previous versions of Windows to Windows 7 are found in the redesigned user interface. Sure, much of the interface remains familiar, but Microsoft has completely overhauled key elements, starting with the Taskbar.

THE NEW TASKBAR

After 14 years of nothing more than cosmetic changes, Microsoft's redesign of the Taskbar combines the pure window-organizing power of the classic Taskbar with the application-launching, multipurpose convenience of Mac OS X's Dock. In addition to showing the applications you currently have open, the Windows 7 Taskbar also hosts shortcuts to your most commonly used applications. Click a shortcut when the app is running, and it brings the most recently used window to the foreground. Click the same shortcut when the app is closed, and it will launch the app.

But that's not all. Drag a file onto a shortcut in the Taskbar, and Windows will open the file using that app. Hover your mouse over a running application's icon, and it expands to show live thumbnail previews of all of that app's windows, floating just above the Taskbar. Mouse over a thumbnail, and Windows will bring that particular window to the foreground. You can even close individual windows from the thumbnail previews.

For anyone who regularly finds himself with more than 10 windows open, the new Taskbar is a dream come true.

JUMP LISTS

Another core enhancement to the OS comes in the form of Jump Lists. In short, Jump Lists put frequently used files in a convenient menu that's a simple click away from the shortcut icon on the Taskbar or on the Start Menu. Apps that support Jump Lists will display the list when you right-click the shortcut, or when you left-click and drag the mouse up away from the Taskbar. Additionally, some apps will automatically populate their Jump List with files you recently opened.

EXPLORER ENHANCEMENTS

Windows Explorer also receives some much-needed love. The changes since Vista are relatively minor, but they serve to make the left-column of Explorer the quickest way to navigate to any folder on your hard drive, network, or even in the cloud. Furthermore, you can arrange the different categories in any way you want, quickly add special folders to the Favorites section, and even hide sections you don't use.

LIBRARIES

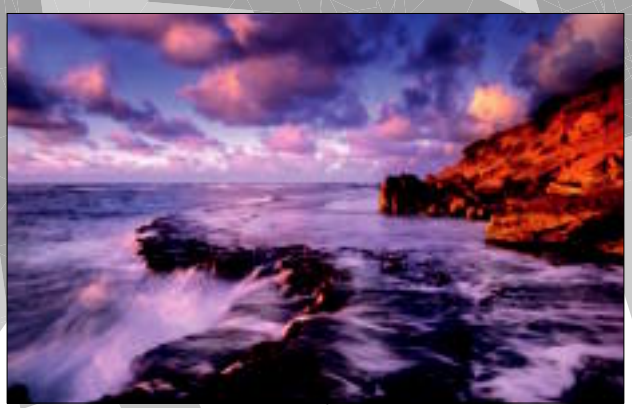
The other major new Explorer feature is Libraries. Libraries are simply data buckets (for lack of a better term) that can store content that's similar in nature but located in different places on the same computer, across a network, or in the cloud. Libraries are handy for organizing and collecting files in one place, because they appear to be normal folders to most applications.

For example, suppose your music is stored in the Music folder in your profile, but your wife's music is stored in the Music folder in her profile. If you want to stream both collections of music using some sort of streaming software, you can either point it to both folders, or you could create a Library that includes both folders and then point your streaming application to that Library.

THE HOMEGROUP

Since home networks first became commonplace, Microsoft has been promising to make the home networking experience better, easier, faster, and safer. These are admirable goals, but connecting to a network share has been essentially un-

Windows 7's Taskbar is the biggest change to the Windows UI since Windows 95. With live previews of each window, it's both functional and attractive.



Windows 7 includes more awesome desktop wallpapers than any version of Windows we've ever tested, as well as a utility that automatically swaps your wallpaper at fixed intervals. Still missing, however, is a way to run different backgrounds on each display of multiple-monitor rigs.

changed since the days of Windows NT 4. Enter Windows 7. Now, instead of haplessly navigating a maze of permissions, share settings, and firewall boondoggles when you want to share your files or printer with other networked PCs, you simply join a HomeGroup. And it's as easy as typing a password. Once you've created your HomeGroup, just right-click on a folder or file, click Share With, and select the option you want. You can exclude individual files or folders the same way.

Our only complaint with HomeGroups concerns compatibility: Neither earlier versions of Windows nor Windows Home Server machines can join HomeGroups today.

Improvements over Windows Vista and XP

In addition to shiny new features, many legacy features from Vista and XP have been tweaked, touched up, or otherwise improved upon.

SEARCHING IS FUNDAMENTAL

Vista was the first Windows version to have deep search features built right in. Does anyone use them? Not enough people do, so the best advice we can give the new Windows 7 user is to embrace search. As in Vista, you can use search to launch apps without removing your hands from the keyboard, to find specific settings in the control panel, and to parse your email, document folders, and even shared folders on your network. Getting started with search is easy—just mash the Windows key on your keyboard and type your query. The Windows 7 search is speedier than Vista's was at launch, and finally allows searching of network shares, assuming they're part of either your HomeGroup or indexed on the server side.

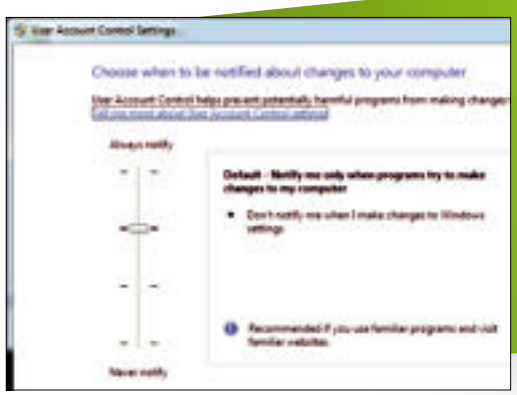
BETTER UAC

User Account Control was one of the most maligned new features to appear in Vista, and for good reason. We have all been *extremely* annoyed by UAC's incessant prompts for permission to do *anything* that requires administrator access. Worse yet, sometimes Vista will prompt multiple times *for the same action.* All that said, UAC has produced Microsoft's desired effect: In situations where malware has infected Vista PCs, UAC helps contain those infections to a limited portion of the hard drive, typically a single user profile.

In Windows 7, Microsoft exposes multiple levels of UAC notification control, and has greatly reduced the number of notifications you'll typically see. Whether you want granular control over the actions of each and every application you install, or you simply want to be left alone, you can choose the setting that's right for you.

UI SPEED

Many of the behind-the-scenes tweaks to



Many of our complaints about User Access Control are addressed in Windows 7. It's less spammy and more useful now.

Windows 7 were designed to do one thing: improve the responsiveness of the user interface. Whether it's the result of core kernel improvements that boost the performance of multithreaded apps on multicore CPUs, or improvements in the way frequently used applications are cached in memory, the new OS feels snappier in almost every way.

Versions, Activation, and 64-bit

Like Windows Vista, there are many versions of Windows 7 available. However, unless you're an IT guy at a big company, you really only need to be concerned with four different editions: Starter, Home Premium, Professional, and Ultimate. Yes, Microsoft has simplified the different versions of Windows that are available, but choosing the best OS for your needs still isn't effortless.

The easiest way to look at the Windows 7 product family is to recognize that each version is a superset of the versions beneath it. For example, Home Premium includes all the features of Starter, but adds the Aero interface and Media Center. Professional, meanwhile, includes all the features of Home Premium (and thus Starter), but adds a few features oriented toward business users. (Starter version not available retail.)

With that said, there are only a few core features that would demand you buy one version over another. The main difference between Windows 7 Home Premium and Windows 7 Professional is that Pro supports the virtualized XP-compatibility mode, the ability to back up your computer to a network drive, a Remote Desktop Connection server, and the ability to connect to corporate networks. Ultimate, meanwhile, includes all the features of Home Premium and Professional, but adds support for BitLocker drive encryption and the ability to switch the OS between different languages.

So which version should you buy? We recommend that most home users buy Home Premium, unless you either run a domain controller inside your home or want to be able to use Remote Desktop to log into your computer from another PC.

Software activation continues to be a hassle for people who purchase Windows 7. We didn't complain when Microsoft launched Windows XP, but we have grown increasingly irked by the unnecessary hassles it creates. For example, upgrading a hard drive or videocard frequently requires a call to Microsoft's phone activation line. While we recognize that Microsoft must protect its OS against piracy, we're not fans of any anti-piracy technology that inconveniences paying customers more than the pirates it's designed to thwart.

Our final thought on Windows 7 SKUs concerns the eternal debate between 32-bit and 64-bit support. The debate is essentially moot, as all retail versions of Windows 7 include both 32-bit and 64-bit discs. What's more, your activation key for Windows 7 is good for either a 32-bit install or a 64-bit install, so you can try out whichever version you'd like, without worrying that you're locking yourself into a version of Windows you may not want. That said, we'll be running 64-bit Windows 7 on our machines, and expect most enthusiasts to do the same.

WINDOWS 7 CHEAT SHEET



	Windows 7 Home Premum	Windows 7 Professional	Windows 7 Ultimate
KEY FEATURES	•32-bit/64-bit versions in box •Media Center •HomeGroup •Aero	•Everything in Home Premium •Windows XP Mode (downloadable) •Connects to domains; includes Remote Desktop server	•Everything in Professional •BitLocker drive encryption •Switch between 35 supported languages
PRICE (FULL VERSION/UPGRADE)	$200/$120	$300/$200	$320/$220

The Performance Story

Windows 7 Professional x64 compares favorably to its predecessors in the benchmarks

APPLICATIONS AND NETWORK BENCHMARKS

	Windows XP x86	Windows Vista x64	Windows 7 x64	XP▸Win7	Vista▸Win7
ProShow Producer (sec)	**826**	1,166	848	-2.66%	27.27%
MainConcept Reference (sec)	**1,649**	1,657	1,653	-0.24%	0.24%
Premiere (sec)	831	**739**	840	-1.08%	-13.67%
Photoshop (sec)	141	**127**	140	0.71%	-10.24%
PC Mark 2005					
CPU	**9,116**	9,076	8,568	-6.01%	-5.60%
Memory	6,459	6,371	**6,463**	0.06%	1.44%
HDD	**8,029**	6,782	7,537	-6.13%	11.13%
PCMark Vantage					
HDD	WNR	4,657	**4,728**	n/a	1.52%
File Transfer – small files (sec)					
Download	46.9	56.3	**21.8**	53.52%	61.28%
Upload	20.5	**16.5**	16.9	17.56%	-2.42%
File Transfer – large file (sec)					
Download	46.2	4.3	**4.1**	91.13%	4.65%
Upload	4.9	4.6	**3.9**	20.41%	15.22%

As you can see, the performance of different applications in Windows 7 x64, Windows XP x86 with SP3, and Windows Vista x64 with SP2 varies wildly. It seems the hard drive performance problems that plagued early editions of Vista are solved in Windows 7—in HDD tests, the latter was a few percentage points slower than XP SP3 but faster than Vista SP2. It's also worth noting that in several of our tests Vista was actually the big winner, thanks to performance enhancements that hit in Vista Service Pack 2.

One of the main problems with Windows Vista prior to Service Pack 1 was poor network performance, but the days of waiting for files to copy across a network are over. Win7 is stupid-fast at transferring files across a network.

To test gaming performance, we ran a mix of DirectX 9 and DirectX 10 benchmarks on both ATI and Nvidia hardware. Rather than comparing ATI to Nvidia, you should compare their respective scores on the different OS platforms to see which has the best Win7 drivers.

In DX10 benchmarks, ATI and Nvidia chalked up almost identical scores in Vista and Windows 7. That's to be expected, since both companies are using a universal driver in Vista and Windows 7. Everything changes with DirectX 9 benchmarks. Depending on the benchmark, Windows 7 ranged from about 10 percent faster to about 10 percent slower than Windows Vista. What you gain in one benchmark, you lose in another. And, over the entire range of our DirectX 9 tests, everything ended up even.

For gamers, especially those currently using Windows XP, there's a strong reason to upgrade to Windows 7. You may sacrifice a little performance in some games, but you'll gain in others, and you'll have the ability to run DX10 and DX11 apps, which will never be possible in Windows XP.

GAMING BENCHMARK: ATI

	Windows XP x86	Windows Vista x64	Windows 7 x64	XP▸Win7	Vista▸Win7
DX10 Benchmarks					
Far Cry 2 HQ (fps)	WNR	52.9	**53.1**	n/a	0.38%
Far Cry 2 LQ (fps)	WNR	57.8	**58.4**	n/a	1.04%
Crysis - very high - no AA (fps)	WNR	31.4	31.4	n/a	0.00%
Crysis - very high - 4x AA (fps)	WNR	27.5	**27.6**	n/a	0.36%
DX9 Benchmarks					
Far Cry 2 HQ (fps)	42	41.6	**45.5**	8.33%	9.38%
Far Cry 2 LQ (fps)	**46.5**	46	41.2	-11.40%	-10.43%
Crysis – high – no AA (fps)	**47.7**	44.4	41.6	-12.79%	-6.31%
Crysis – high – 4x AA (fps)	**40**	36.1	36	-10.00%	-0.28%
Call of Duty (fps)	92.9	95.2	**97.8**	5.27%	2.73%

GAMING BENCHMARKS: NVIDIA

	Windows XP x86	Windows Vista x64	Windows 7 x64	XP▸Win7	Vista▸Win7
DX10 Benchmarks					
Far Cry 2 HQ (fps)	WNR	62.7	**62.8**	n/a	0.16%
Far Cry 2 LQ (fps)	WNR	**69.5**	68.6	n/a	-1.29%
Crysis – very high – no AA (fps)	WNR	30.1	30.1	n/a	0.00%
Crysis – very high – 4x AA (fps)	WNR	25.6	**25.7**	n/a	0.39
DX9 Benchmarks					
Far Cry 2 HQ (fps)	47.5	**50.5**	46	-3.16%	-8.91%
Far Cry 2 LQ (fps)	**52**	46	51.4	-1.15%	11.74%
Crysis – high – no AA (fps)	**50.7**	49.5	49.5	-2.37%	0.00%
Crysis – high – 4x AA (fps)	39.7	39.7	**40**	0.76%	0.76%
Call of Duty (fps)	**121.4**	114.9	116.9	-3.71%	1.74%

Best scores are bolded. Our test rig consists of an Intel Core 2 Quad Q9770 Extreme processor, 4GB of DDR2 memory, a 1TB Barracuda 7200.12 drive, and an ATI Radeon 4890 videocard. To test gaming performance with both the ATI and Nvidia drivers, we used a manufacturer-overclocked GeForce GTX 285.

The Final Judgement

No matter how you slice it, Windows 7 is a win

Whether you're coming from XP or Vista, Windows 7 offers a massive leap forward in usability, security, and support for new hardware and technology, especially for enthusiasts and power users. For anyone who regularly keeps many windows open at one time, the new Taskbar alone is worth the price of admission. For XP users, the security improvements are equally worthy of praise, while Vista users will be thrilled with the much improved, much less annoying UAC. Add to that support for new hardware technologies, more new features, and kernel improvements that should allow you to get more from your multicore CPU, and Windows 7 becomes a tidy, compelling package for all Windows users.

Best of all, the new OS simply *feels* faster than Vista, or even XP. As one editor said after a session testing the OS, it's the best of both worlds—the user interface speed of XP and the features and security of Vista and more. That is something to be lauded.

We're happy with the changes Microsoft has made to Windows 7 as a product line. With the more expensive SKUs as supersets of the less capable versions, choosing the right version of Windows 7 is as simple as it was picking a version of XP (and exponentially easier than navigating the almost incomprehensible SKU structure for Vista). However, we still don't see any benefit to Microsoft fielding more than two SKUs of Windows—without Aero, Starter edition is unnecessarily crippled, as with Vista. Who should buy Ultimate? In our eyes, no one should, unless you desperately need multiple-language support in the UI. As with Vista, the extras in Ultimate don't justify the added cost. For most of our readers, we'll simply recommend Windows 7 Professional if you need to connect to a domain, and Home Premium if you don't.

Windows 7 includes many UI enhancements that make managing tons of windows easier. For example, you can move your cursor over a thumbnail on your Taskbar and all the other windows fade to outlines, putting the information you need front and center on your screen.

Your personalization settings in Windows 7 are cleverly organized in Themes. It's not a new feature, but the new presentation is great.

As with Vista, and XP before it, we remain unhappy with the activation process. As enthusiasts who frequently upgrade hardware and reinstall our operating systems, we're tired of being punished with increasingly obnoxious reactivation processes. Paying customers shouldn't have to get on the phone every time they need to reinstall Windows, whether that behavior triggers piracy flags or not. The music industry has already figured out that the best way to drive paying customers to thievery is to treat them like thieves. Hopefully, Microsoft will get the memo between now and the launch of Windows 8.

Moral objections to product activation aside, Windows 7 is unquestionably the best version of Windows that Microsoft has ever released, and is the true successor to Windows XP. If you're an enthusiast or power user, Windows 7 is well worth your money, whether for an upgrade today or on your next new machine.

We expect that this new OS will mark the beginning of the end for Windows XP, which is the highest praise we can give the latest version of Windows. Well done, Microsoft.

MAXIMUM PC KICK ASS!

VERDICT 9

WINDOWS 7

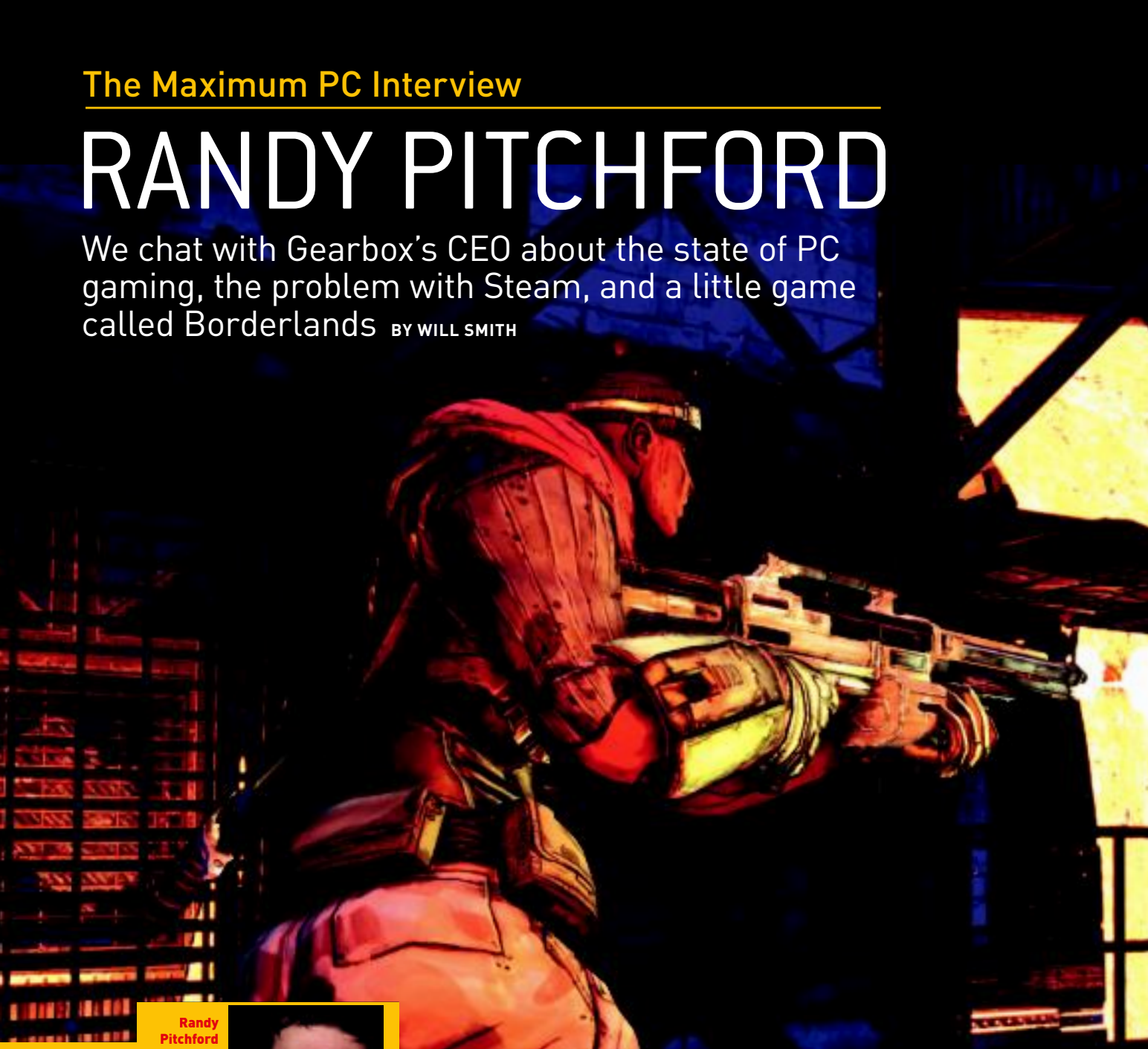
+ DOUBLE-HUNG	− BAY
Unquestionably the best version of Windows to date; snappier UI and kick-ass new features.	Activation process continues to suck; multiple product SKUs create unnecessary confusion.

See chart pg. 52, www.microsoft.com

RANDY PITCHFORD

We chat with Gearbox's CEO about the state of PC gaming, the problem with Steam, and a little game called Borderlands

BY WILL SMITH



Randy Pitchford

From the first time we saw Borderlands, we were intrigued. By mixing a fast-paced first-person shooter with the procedurally generated weapon system of a loot-hoarding RPG like Diablo, and letting you play the game cooperatively with three of your pals, Gearbox has made a game we simply can't wait to play. We went down to Plano, Texas to play the first three hours of the game and chat with Gearbox CEO Randy Pitchford about the future of PC gaming, why Steam is not an ideal method of distribution, and why Randy loves Wal-Mart.

BORDERLANDS

MAXIMUM PC We see a lot of games developed simultaneously on multiple platforms, where the PC is very clearly a second-class citizen compared to the Xbox and PS3 SKUs. What have you guys done differently with Borderlands?

RANDY PITCHFORD The first thing is that we author our content on the PC. With Borderlands, we're not porting the game to the PC, we're starting there. The PC is our development platform.

The best-looking version of the game that you're going to get is on PC. We target a high-end PC, but it's scalable so you'll still have a great experience on a 2-year-old PC. A 2-year-old PC will be comparable to the Xbox experience.

MPC Borderlands is a multiplayer-focused game, but there aren't any lobbies?

RP All the modes you can play are actually inside the game. In most games, you have the campaign, which is one thing, then you have competitive multiplayer, which is another. In Borderlands, if you want to play with a friend, you can just invite him to join you, but from that point on, there's no lobby.

In addition, if you're playing with friends in the cooperative mode, you can also compete with them. There are a couple of ways to do this: One is the duel, where you

can smack someone in the head, then if that person smacks you back, you can just throw down right there. It's just a quick way to go, "Alright bitch, I've had enough of you, let's see who's got it." There are also arenas, which are like the Thunderdome from the *Mad Max* franchise. You go into the arena and you can set up a more organized competitive match. Instead of a free-for-all deathmatch, you can play a kind of rocket arena or team DM.

MPC Obvious influences: Diablo and World of Warcraft, hardcore first-person shooters, and something with cars?
RP Yes. Actually, I was having a hard time explaining that. We use vehicles kind of the same way Halo uses vehicles. There are some missions that are vehicle-centric, and there are interludes with big *Road Warrior*–style combat, but it's not a racing game. Vehicles are kind of like gravy.

MPC What happens when you beat Borderlands?
RP If you go through the story missions, and you've beaten them all, and ended the story, you have a couple of choices. You can go back and complete the optional missions, and level up your character and become more powerful and get better gear. Alternately, if you've completed the story, you can replay the game, but everything's harder, and all the bosses are tougher.

The other thing is that you can reach the level cap, and there are some end-game content places where it's fun to grind for gear. We're not announcing anything yet, but I can hint that there will be DLC for Borderlands, as well.

MPC For PC too?
RP Yeah, for all platforms.

MPC How are you going to do downloadable content for PC? You're not using Steam or Games for Windows?
RP I did say we're not doing Games for Windows. We haven't said anything about Steam yet.

Settlements, like this one, serve as quest hubs in Borderlands. Places where you'll come to get new missions, upgrade your gear, and recharge your health.

As you add more players to your co-op game, Borderlands ramps up the difficulty. With four players, expect to fight lots of baddies, and a ton of Badass bosses, the game's uber-difficult elite characters.

THE STATE OF PC GAMING

MPC What's your feeling about the health of the PC as a platform for games?
RP It's tricky, right? It's a very powerful platform and it's very flexible. It becomes a real challenge to push things because it's difficult to know whether your customer has a high-end gaming machine or a 4-year-old computer with Intel integrated graphics. Ultimately, though, that versatility of the platform means the PC won't be the dominant platform, but it also means it will never go away.

MPC Unless people stop making PC games.
RP Which is very unlikely. Games will change, but we're always going to amuse ourselves with whatever tools we have.

MPC What about the widening hardware gap between the Xbox 360 and a modern PC?
RP The longer the generation goes with the consoles, the more the PC will have an advantage, from a technology perspective. However, the biggest games in the world are very costly to produce. It's become very difficult to rationalize that investment on the PC alone.

MPC How worried are you about piracy?
RP I think I look at piracy a little differently than most people. It sucks as a content creator who has invested a lot of, not just our money, but our souls, our creativity, and our time, to know that someone's stolen something. That feels bad.

On the other hand though, the PC gaming retail experience can be inconvenient and risky. Half the time you don't even know if that game is going to run on your PC. DRM has been handled terribly for so many years. For example, false negatives are a disaster for everyone. I'd much rather have a false positive, and allow thieves to play, than prevent a paying customer from playing my game. The industry has destroyed a lot of good will with DRM problems.

STEAM, GAMES FOR WINDOWS, AND WAL-MART

MPC The download services, like Steam, are helping make it easier to buy games though, right?
RP I'll tell you what. Steam helps. As a guy in this industry though, I don't trust Valve.

MPC Because it's a competitor?
RP Right.

MPC You guys have worked with Valve a lot!
RP I know. And I, personally, trust Valve. But I'm just saying, honestly, I think a lot of the industry doesn't.

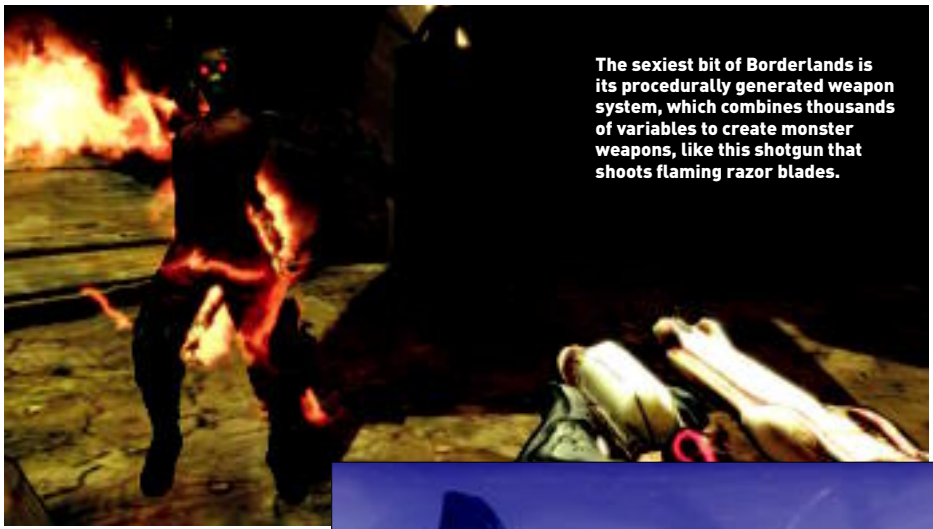
MPC So you think Valve should spin off Steam?
RP It should! It would be much better if Steam was its own business. There's so much conflict of interest there that it's horrid. It's actually really, really dangerous for the rest of the industry to allow Valve to win.

I love Valve games, and I do business with the company. But, I'm just saying, Steam isn't the answer. Steam helps us as customers, but it's also a money grab, and Valve is exploiting a lot of people in a way that's not totally fair. Valve is taking a larger share than it should for the service it's providing. It's exploiting a lot of small guys. For us big guys, we're going to sell the units and we will be fine.

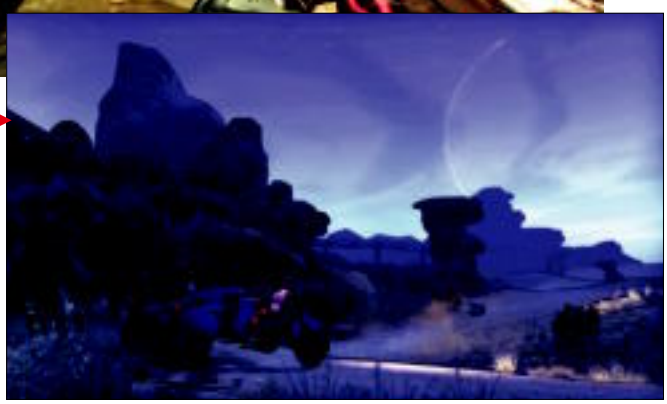
MPC What about Microsoft?
RP Microsoft has every single one of us running Windows, and it could solve [the distribution] problem in a second if done right. It's not hard, but either the company doesn't know how to do it, or it's not willing to invest, or it's got other priorities. Gamers can see the prioritization. Microsoft is focused on the console platform. For the time being, that's nice, because some of us aren't sure we want Microsoft to control [distribution]. Frankly, at this point, I'd rather trust Best Buy and Wal-Mart.

MPC But you can't think brick and mortar retail is the future?
RP The thing I love about a digital method is that I'm buying a credential. When I buy a credential, I can log in from any terminal and my content can follow me, but I don't care whom I buy it from. I'd rather buy it from someone whose only interest is serving me. I'm cool with it being a digital retailer, but I want that to be their only business. And then I'll really trust them.

Of course, I'm kind of joking when I say that I want Wal-Mart to control it. What I'm really saying is that brick and mortar stores work because they give the customer the retail experience he wants. At the end of the day, their only business is retail, and if they fail to serve their customer, they die.



The sexiest bit of Borderlands is its procedurally generated weapon system, which combines thousands of variables to create monster weapons, like this shotgun that shoots flaming razor blades.



Rocket launcher–equipped vehicles in Borderlands not only let you travel quickly across the game world, they also open a whole world of vehicular combat, giving entirely new meaning to the phrase road rage.

As you progress in the game, you'll be able to customize your character, specializing in one or two of the six main weapon archetypes. The upshot? As you progress in the game, you'll be able to do even more damage with that machine gun that fires grenades instead of bullets.

WHITE PAPER

Building a Modern CPU

From concept to design to manufacturing and everything in between, the processor inside your rig was years in the making -LOYD CASE

Designing and manufacturing a modern CPU is a huge project. It requires both backward compatibility and an understanding of where PC workloads are going in the future—a delicate balancing act made more difficult by the huge engineering staffs and massive dollar outlays involved. Let's take a look at the steps needed to build a Core i7 or AMD Phenom II processor.

DESIGN IS AN ITERATIVE PROCESS, CONTINUING TO THE POINT WHEN THE FIRST CHIPS COME OFF THE LINE

Before the manufacturing plant starts churning out chips, there are a few critical preliminary steps. Prior to the first circuit being laid out or the first simulation run, the designers need to know exactly what it is they're designing. This phase takes input from many sources. Marketing gets involved, with predictions of what users will need when the CPU actually ships, usually two to four years in the future. Engineering and performance teams feed in billions of traces of actual applications being run on current-gen CPUs, so the designers can see how existing CPUs perform under real-world conditions.

THE DESIGN PROCESS

After the specification phase, the design phase begins in earnest. Design involves creating a design document, validating the design with simulations, and laying out the design.

The architecture team begins by defining how the CPU is supposed to work. How many registers will it have? What's the power budget? How many cores? How much cache? These and thousands of smaller details are all ironed out in the design document, which becomes the bible from which the final product is created.

Once the design is in place, it needs to be tested. How do you test a CPU that doesn't exist yet? You run simulations. There are specific programming languages that chip designers use to build simulations of a CPU. Actual code is compiled and run on the simulated CPU, albeit much more slowly than on the final product. Those applications-code traces collected during the specification process are re-run on the simulation to make sure everything works as expected.

In the layout phase, the real process of building the CPU begins. Engineers use special software to route circuits into patterns that can then be processed in the lithography step. With high-performance PC processors, some elements of the logic layout are hand-tuned, while other aspects, such as cache line layout, may be automated. Chip companies often have prebuilt blocks in libraries that can just be dropped into the overall CPU layout.

Today's processors also utilize multiple layers of semiconductors. Each layer needs to be laid out so that it can be connected to the others. The primary goal of the layout step is to create circuit patterns that are efficient yet simple enough that they can be manufactured. The first draft of the design undergoes verification, which runs more virtual tests on the layout to make sure connections are correctly made and circuits completed. The final layout is known as tape out, where the layout is compiled into an industry standard format and sent to manufacturing.

Note that these design-phase steps aren't linear. Simulations, for example, will be run constantly, up until the first working silicon returns from the fab. Design is an iterative process, continuing to the point when the first chips come off the assembly line.

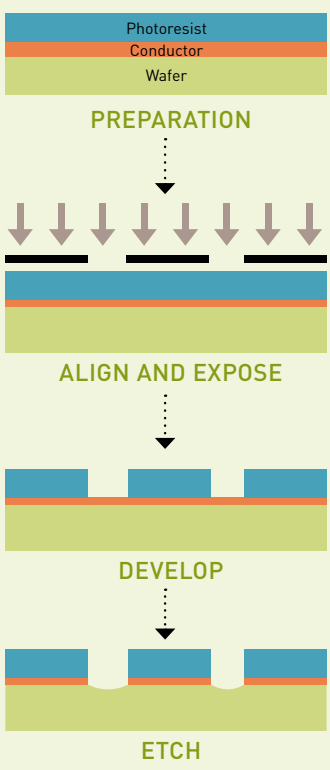
THE MANUFACTURING PROCESS

Here's where we get into the physical processes of building our CPU. First, ultra-pure wafers of silicon are coated with the conductive material that will make up the final circuitry. Then the chip is baked at temperatures above 200 degrees C to remove any water or volatile contaminants.

Building a chip is essentially a photographic process. Photoresist—material that is light sensitive—is applied uniformly to the

HOW IT WORKS

Etching a CPU Die



Creating circuits on a CPU uses light to expose a photoreactive material, which is then removed, so that the conductor can be etched away.

wafer, usually by spraying it onto the wafer while it's spinning at high speed. The layer must be thin and very uniform. Once applied, the chip is again baked to dry the photoresist and make it more uniform.

The lithography step marks the chip's design on the wafer by exposing the photoresist to light of specific frequencies. These intense beams of light, which shine through masks, define the layout of the circuits on the chip. Note that these beams are very narrow, so either the beam scans across the wafer, or the wafer is moved slightly (stepped) under the light beam. Today's modern process technologies often use a hybrid of the scanning and stepping techniques. Another bake cycle removes imperfections left over from the lithography process.

The develop step removes the exposed photoresist, leaving behind patterns of circuits. Now the wafer has a layer of material with narrow "channels" laid out in the pattern of the CPU circuitry. But these patterns are not yet circuits. Next, chemicals are applied to the wafer that permanently remove the now exposed conductive material, which was initially coated on the chip in the wafer prep phase. The photoresist still on the chip resists the etching process, so only the circuit patterns are implanted into the wafer substrate.

The final step in the actual chip making process is stripping the remaining photoresist from the wafer surface. What's left are many dies on the wafer, cleaned and ready to be processed.

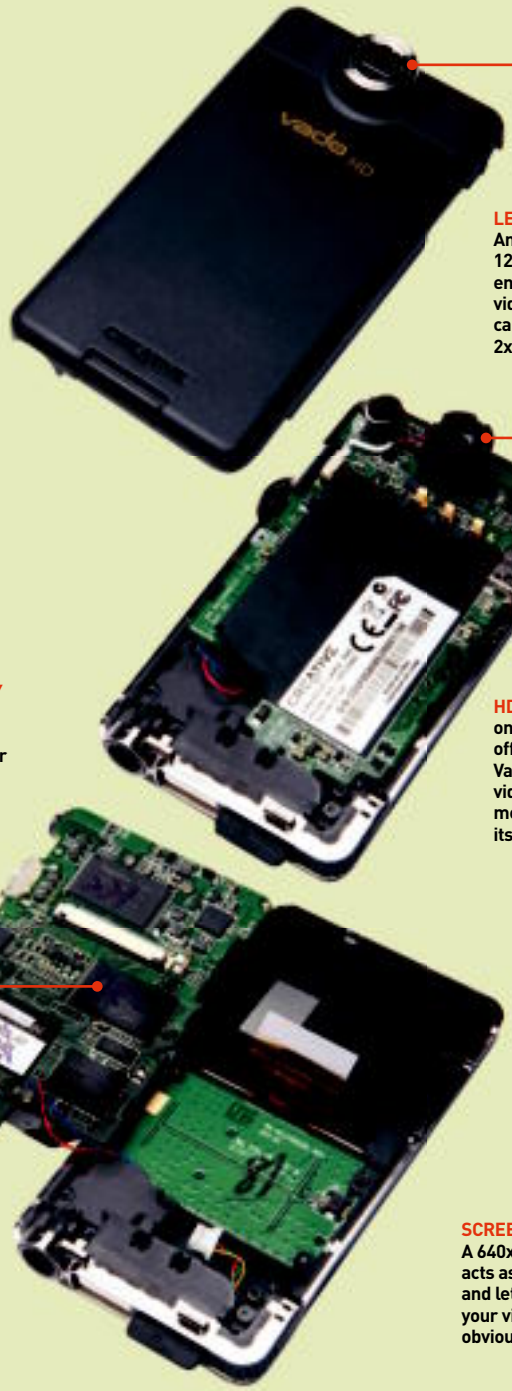
FINAL STEPS

Next, the entire wafer is tested to ensure it meets quality standards. The dies are then cut and sent to the packaging line, where the different layers are assembled into the chip packages we're all familiar with. During the packaging process, function and validation tests are performed, which allow the manufacturer to sort according to clock speed and functional bins. This is where a Core 2 Quad Q9650 may be differentiated from a lower-clocked Q9550, for example.

Of course, this is a simplified overview of the process for building a modern CPU. You can find more details at websites including entries on Wikipedia for photolithography, photoresist, wafer creation, and more. One fairly technical, but still understandable overview of the lithography process can be found at Lithoguru (www.lithoguru.com/scientist/lithobasics.html).

Creative Vado HD Camcorder

Cheap HD mini-camcorders give everyone the ability to create high-def video clips and chuck 'em on the Internet. So what's inside this marvelous device responsible for so many cute cat videos?



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

TAKING MORE SHORTCUTS

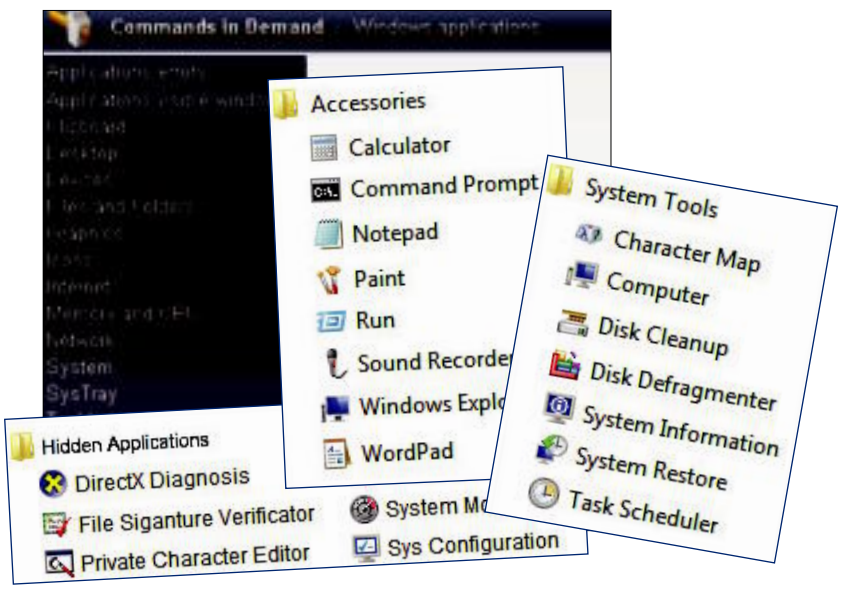
NORMAN CHAN
ONLINE EDITOR

In previous editions of this How To section, we've given you lists of our favorite Windows keyboard shortcuts. But while you may have essential combos like Ctrl+C and Ctrl+V permanently programmed into your fingers, memorizing commands becomes far trickier when it comes to application-specific shortcuts.

The program that arguably has the most complex series of shortcuts of any popular application has got to be Adobe Photoshop. Boasting hundreds of shortcuts for tasks ranging from basic image resizing to advanced layer management, not even experienced design professionals have them all memorized. Adobe recently released a small program to help people remember their Creative Suite shortcuts. The Adobe Shortcut App (which runs using Adobe AIR), gives you a searchable cheat sheet for every shortcut in all of Adobe's programs. You can download it at http://bit.ly/10DZMB. This shortcut reminder app is a great idea—hopefully someone will create a similar app that includes shortcuts for other popular productivity programs, as well.

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



Windows Commands on Demand

If you're still running Windows XP, some of Windows' more obscure system tools can be lost in the archaic version of the Start Menu. Commands in Demand (free, http://bit.ly/DH7hN) gives you quick access to those tools, and lets you manage your Desktop, System Tray, and other administrative services from one simple window.

Clean Your PC

Every computer collects dust over time. When the computer is running, it creates a field of static electricity, which in turn attracts clumps of dust and hair. These cluttering particles can easily collect around your processor, power supply, and case fans, and can block airflow and lead to overheating. This is why an important part of taking care of a computer is making sure that it's clean.

To that end, we've put together a comprehensive guide on how to clean your computer hardware and peripherals to make your rig look as good as new. We took a 4-year-old computer and thoroughly cleaned it using a few household supplies. All it took was a little bit of patience and a few hours and we managed to get some impressive results. Follow along below to achieve the same cleanliness Zen with your own machine. —FLORENCE ION

What you need:

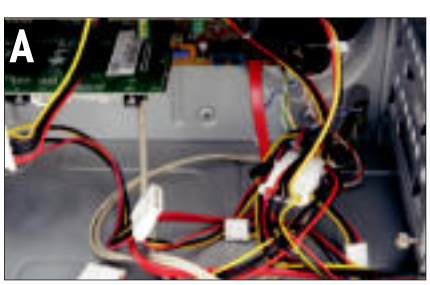
- Compressed air
- Isopropyl rubbing alcohol
- Lint-free or microfiber cloths
- Paper towels
- Q-tips
- Scissors
- Swiffer Dry Refill sheet
- Masking tape
- Vacuum with a removable handle and crevice tool

1 START WITH CORD MANAGEMENT

First, let's start with the external cables. Begin by untangling any that have become entwined. Now, grab a soft, microfiber cloth and dampen it with a bit of isopropyl rubbing alcohol, then run it along the length of all of your cords to remove any dust that may have built up (image A). Then, grab a few zip ties and begin organizing your cables in terms of their location in your machine: For example, the wires connecting peripherals reside toward the top; the DVI connector and power supply cord are toward the bottom, and so on. This will prevent your cables from getting tangled over time. Don't group any power cables with speaker wire. Make sure to put on the zip ties toward the middle of the cords to give yourself some flexibility when you disconnect or connect devices (image B). Now, unplug your cable bundles so they're out of the way while we clean the inside of your machine.

2 CLEANING YOUR CASE

Now, make sure the power supply is turned off, lay your case on its side, and remove the side door. First, you want to inspect the internal data and power cables to make sure they're all connected and well-fastened (image A). If there are any damaged cables, consider replacing them entirely—do not attempt to fix them with electrical tape. Generally, electrical tape is only used for insulation purposes, not to patch-up wires, and this rule is especially crucial when dealing with the inside of a computer.



Next, you want to get rid of the dust bunnies around your motherboard. Grab a can of compressed air and make sure that the straw is securely inserted. Stand the case upright—when you shoot at it, make sure the can of compressed air stays upright as well (image B). Do not tilt the can on its side or shoot at the computer sideways

Squeeze the trigger to blast air in the direction of the key components in your case: the crevices in between your fans, the drive bays, connection ports, and any other areas that are plagued by dust and tiny hairs. If you find that you have excess grime or stray dust balls rolling around, you can actually use your vacuum cleaner to deal with them, provided that it's equipped with a removable handle and a crevice tool. Vacuum away from the motherboard and use it only to eliminate giant dust bunnies that fall to the bottom of the case. Additionally, if you have an air filter in your case, remove it and run it under warm water to remove the dust. Be certain it's completely dry before re-inserting.

3 WIPE DOWN FANS

With a different piece of lint-free cloth, wipe down your fan blades, then sprinkle the cloth with a few droplets of 90 or 99 percent rubbing alcohol solution and run it along the inside of your case (image A). Use a Q-tip to clean tight spots like your CPU

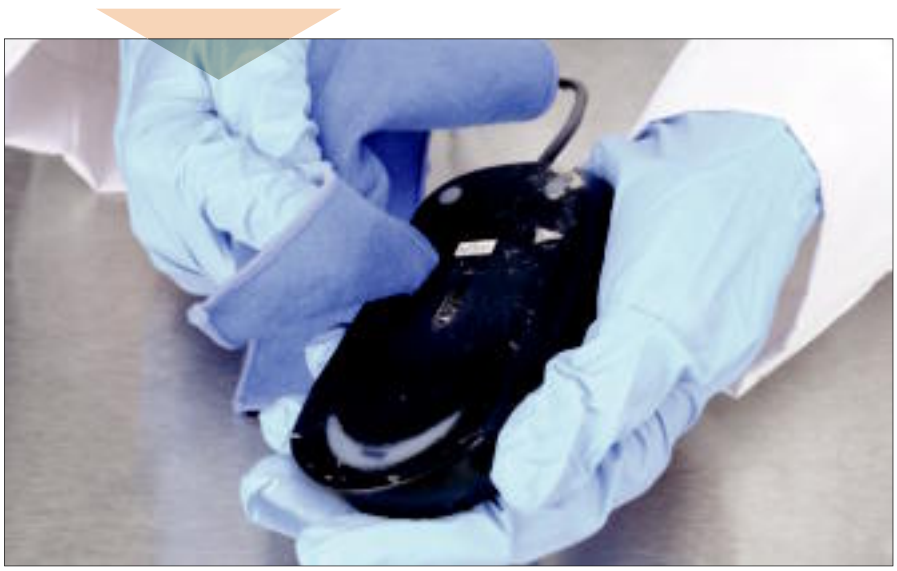
cooler's fan blades (image B). When you're finished and everything has dried, feel free to close up the case.

4 MAKE YOUR OWN FILTER

A great way to keep dust from infiltrating your PC is to create your own air filter using a Swiffer Dry Refill sheet. All you need to do is cut the sheet to fit the grill on the outside frame of your case and affix it with a few pieces of masking tape. In this instance, we pasted it between the outside of the case chassis and the front-frame. Be sure to place this filter only where air is being sucked in and remember to replace it every few months (or as it visibly accumulates dust).

5 CLEAN YOUR MOUSE

Assuming your cords are still unplugged, dampen a lint-free cloth with rubbing alcohol and clean the outside shell of the mouse, paying attention to any residue on the buttons. It's important that you exercise caution while cleaning peripherals like an optical mouse—cleaning solutions should never come in contact with the optical sensor at the bottom of the mouse—it could ruin it. Also, avoid using paper towels; stick to lint-free materials so that you don't risk leaving behind any fluff that could stick to the sensor.



6 CLEAN YOUR KEYBOARD

One easy way to clean gunk out of your keyboard is to turn it upside down over a sink and smack the bottom to knock out the colony of crumbs that have undoubtedly settled in. Run through the keyboard's spaces with a can of compressed air to get loose crumbs and hairs out of the way, and then use rubbing alcohol and Q-tips to clean grease off the surfaces and in between each key.

For a more thorough wipe-down, you could even stick your keyboard in the dishwasher, though we warn you that this is NOT a solution for expensive keyboards with LCD displays and USB slots—there is also a very real chance that it will destroy your keyboard. Before placing it inside the machine, bundle the cord and put a plastic bag over it, making sure it covers the USB/PS2 plug and that it is securely sealed with a rubber band.

Situate the keyboard on the top rack of the dishwasher so that it is facing down—we want the jets to hit up against the keys and wash off the residue. If your dishwasher has a speed dry cycle, turn it off—if you let the inside get too warm it could warp the plastic or crack the circuit board from thermal expansion. For the first run, we suggest omitting soap altogether, but to remove tougher stains, a pea-size amount of soap is also OK, but use at your own risk. After running it through a light cycle, let the keyboard dry for several days or until all the water has dried before reconnecting it.

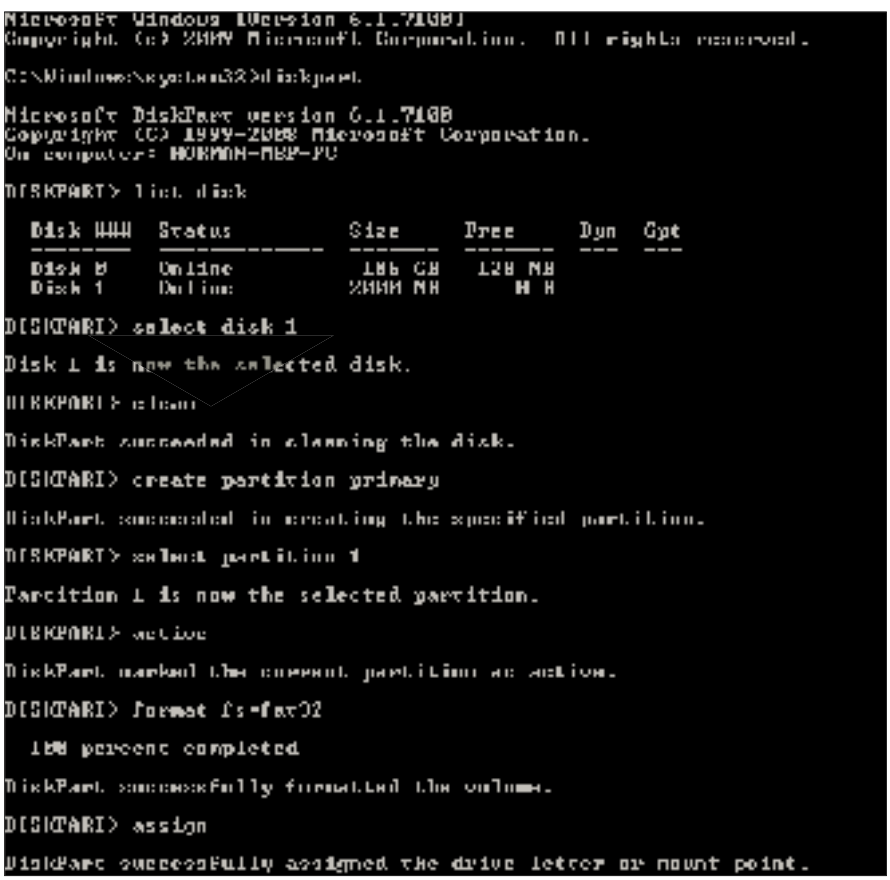
7 CLEAN YOUR MONITOR

Grab a microfiber cloth and gently wipe your screen to free it of dust, fingerprints, and any other smudges. You can make your own screen cleaning solution using a half-and-half mix of 70 percent isopropyl alcohol and distilled water, or you can pick up a premixed solution from any computer store or office supply retailer. Under no circumstances should you use Windex or paper towels to clean an LCD screens, especially those with anti-glare surfaces. If you're using a CRT, use a few dabs of rubbing alcohol to gently wipe away greasy spots from the screen.

Make a Bootable USB Key

A bootable USB key is a convenient way to install an operating system on a machine without an optical drive—say, a netbook—or for carrying around a Live OS with you at all times. Here's a definitive guide to making a bootable USB key with either Vista or Windows 7. —NORMAN CHAN

- Find and right-click the Windows Command Prompt in your Start Menu and choose to run it as an Administrator.
- At the prompt, type `diskpart` and press enter to launch Microsoft's disk management utility. The command line should now read DISKPART>.
- Type `list disk` and press Enter to show a list of all disk drives. If your USB key is plugged into your PC, it should be listed here, along with other physical drives. Note the USB key's disk number—you can pick it out by looking at the disk capacity.
- Type `select disk #`, with the USB key's disk number in place of #. Press Enter.
- Type `clean` and press Enter for the utility to clean the disk, which DiskPart will confirm.
- Create a new bootable partition by typing `create partition primary`. Press Enter.
- Choose this partition by typing `select partition 1`, then Enter, and mark it as active by typing `active`, then pressing Enter.
- Format the key by inputting `format fs=fat32`. This should take a few minutes; DiskPart will display a progress percentage.
- Lastly, type `assign` to give this USB key a drive letter. Close the DiskPart program by typing `exit`. You can now copy your OS's installation files from the original DVD onto the key. We also recommend copying your hardware drivers onto the same key so the OS installation wizard can find them.



REVIEWS

Tested. Reviewed. Verdictized

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CyberPower Gamer Xtreme 3200

Get a Nehalem and have cash left over

The CyberPower Gamer Xtreme 3200 gives you damn-near the performance of machines that cost two or three times the price.

Even we have to admit that in this economy, you have to be thankful if you're not still driving a Pentium 4 rig. Still, for budget buyers today, the choice usually doesn't get much better than a dual-core machine that takes overnight to encode video and a GPU that can't push pixels downhill.

Fortunately, it's no Pentium Dual-Core or Celeron that CyberPower opts to stick you with. Instead, CyberPower reached into its parts bin for Intel's brand-new, budget badass: the $200 2.66GHz Core i5-750. This chip is like Chuck Norris in a bar fight: It not only wipes the floor with Phenom II X4, it commits a little fratricide against its Core 2 Quad and Core 2 Duo siblings, too.

To this Two-Buck Chuck, CyberPower adds what is definitely not a budget part: Nvidia's fastest videocard in the form of EVGA's GeForce GTX 295. At the foundation is Gigabyte's new GA-P55-UD5 and 4GB of Kingston DDR3/1600. Storage is left to a 1.5TB Seagate Barracuda and a Samsung 22x DVD burner. A Cooler Master V8 cooler and Scout case complete the package.

How does it do? Not bad. Against our 2.66GHz Core 2 Quad/SLI GeForce 8800 GTX machine it's a slaughter, of course. But even compared to its Core i7 contemporaries, the CyberPower holds its own. It's a bit slower, but for the money, it's a solid performer.

Compared to other budget machines that we've reviewed in the last few months, the CyberPower gives you nearly the same performance for about half the price. You can thank the fact that CyberPower pushed the 2.66GHz Core i5 up to 3.35GHz. Clock speeds alone don't always pay off, though. The reliance on a single 1.5TB Barracuda, as fast as it is, can't compare to SSD or RAID 0 configurations on anything that hits the drives a lot. And what about our Budget Surplus machine that the editors themselves configured and built in our September issue? How does this $1,600 CyberPower do against our $1,400 Dream Machine? First, a mea culpa: We didn't include the price of the OS for our Budget Surplus rig because Windows 7 wasn't available yet, so the two are really on cost parity once an OS is included.

While performance comparisons are expected, our Budget Surplus rig's use of Windows 7 RC makes head-to-head numbers unfair. So we'll base our criticism squarely on the configuration and declare… a tie. Our Budget Surplus featured a single Radeon HD 4870 X2. This elderly dual-GPU card definitely takes a back seat to the GeForce 295 GTX, but it's also quite a bit cheaper, too. Both systems featured the same 1.5TB Barracuda drive and similar-speed burners, so storage isn't the difference.

What it comes down to is where you want to go. The CyberPower is likely a slightly better gaming rig thanks to the faster graphics card, but our Budget Surplus gives you the option of upgrading to a six-core Gulftown next year. Then again, if you're looking at $1,500 rigs, are you really going to buy a $1,000 CPU early next year? No.

When all is said and done, the CyberPower is definitely one of the best budget rigs we've seen. **–GORDON MAH UNG**

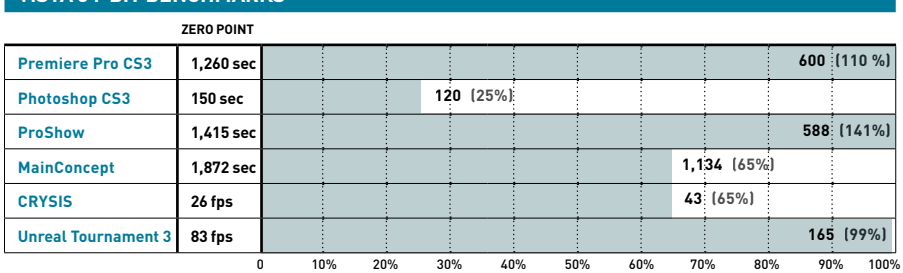
VERDICT 8

CYBERPOWER XTREME 3200

+ PRICE IS RIGHT	− FAMILY FEUD
Fast and cheap—CyberPower doesn't disappoint.	A low-cost SSD would give this machine the touch it needs.

$1,645, www.cyberpower.com

VISTA 64-BIT BENCHMARKS



Our current desktop test bed consists of a quad-core 2.66GHz Intel Core 2 Quad Q6700, 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard. We are running two EVGA GeForce 8800 GTX cards in SLI mode, a Western Digital 150GB Raptor and a 500GB Caviar hard drive, an LG GGC-H20L, Sound Blaster X-Fi, and PC Power and Cooling Silencer 750 Quad. OS is Windows Vista Home Premium 64-bit.

SPECIFICATIONS

Processor	Intel 2.66GHz Core i5-750@3.35GHz
Mobo	Gigabyte GA-P55-UD5
RAM	4GB Kingston DDR3/1600
Videocard	EVGA GeForce GTX 295
Soundcard	N/A
Storage	Seagate 1.5TB Barracuda 7200.11
Optical	Samsung 22x DVD+R
Case/PSU	Cooler Master Scout / Corsair 750TX

Intel X-25M 160GB MLC SSD

Intel's killer solid state drive gets a capacity increase, but is it still the best?

Last fall, Intel slapped the solid state drive market on the back of the head with the release of the 80GB X25-M MLC drive. That drive absolutely trounced the competition with its 200MB/s read speeds, incredibly low random-access times, and best of all, no random-write stuttering or cache overflows. The first X25-M garnered a Kick Ass Award and defeated all comers in our last SSD roundup (November 2008), but the market has come a long way since then. With powerful competition from drives sporting Indilinx and Samsung controllers, can the 160GB X25-M maintain Intel's crown?

The 160GB X25-M ships in a silvery chassis, unlike its predecessor's black, and is 7mm tall—an included spacer accommodates 9.5mm drive bays. Intel's kicked the flash manufacturing process down from 50nm to 34nm, and retained native SATA and Native Command Queuing from its previous iteration.

First, the good news. The 160GB X25-M is even faster than the 80GB, offering 209MB/s sustained reads and 79.5MB/s sustained writes in our h2benchw benchmark, compared to the 80GB version's 206MB/s and 64MB/s, respectively. Random-access reads and writes are within .01ms of the 80GB version, and Premiere Pro times are five percent faster. Oddly, though, its PCMark Vantage score is only 23,288—faster than nearly every drive but its predecessor, which amassed a cool 30K.

Unfortunately, the X25-M just isn't the coolest kid on the block anymore. Not since we've seen other drives come along and smash the 100MB/s sustained-write barrier, or which feature either a Samsung or Indilinx drive controller with cache that eliminates the random-write stuttering that plagued early JM602-based drives. Both Samsung's 256GB drive (reviewed August 2009, retailing as the Corsair P256) and Patriot's Torqx (September 2009) nearly match X25-M's read speeds and obliterate its sequential writes, with the Torqx and its fellow Indilinx Barefoot MLC drives (OCZ Vertex, G.Skill Falcon) offering write speeds close to 175MB/s.

The X25-M still reigns supreme in random-write times, though, with a latency of just .08ms compared to the Torqx's .31ms. And it does so without the Indilinx controller's 64MB of DRAM cache.

The X25-M remains a rock-solid choice for SSDs, and its read speeds and random-write response times are second to none. But in sustained-write speeds, it's no match for the Patriot Torqx and its peers. But hey, the 160GB X25-M is $.10/GB cheaper than the Torqx, and 160GB is enough room for your OS and a dozen of your favorite games. —NATHAN EDWARDS

BENCHMARKS

	Intel X25-M	Patriot Torqx 128GB	Intel X25-M
Capacity	160GB	128GB	80GB
Average Sustained Transfer Rate Read (MB/s)	**209.1**	205.4	206.6
Average Sustained Transfer Rate Write (MB/s)	79.5	**175.1**	64.3
Random-Access Read (ms)	0.13	**0.11**	0.12
Random-Access Write	**0.08**	0.31	0.09
Premiere Pro (sec)	969	**674**	732
PCMark Vantage Hard Drive	23,288	21,247	**30,322**

Best scores are bolded. All drives were tested on our standard test bed using a 2.66GHz Intel Core 2 Quad Q6700, EVGA 680i SLI board. HDTach 3.0.1.0, h2benchw, and Premiere Pro CS3 scores were obtained in Windows XP; PCMark Vantage 2005 scores were obtained in Windows Vista Home Premium 32-bit.

The new X25-M ships with a spacer so it can fit in 9.5mm as well as 7mm 2.5-inch drive bays.

VERDICT 8

INTEL X-25M 160GB MLC SSD

HAM	SPAM
Blazing-fast reads and random writes; decent capacity. Cost per GB keeps falling.	Can't keep up in sustained writes.

$440, www.intel.com

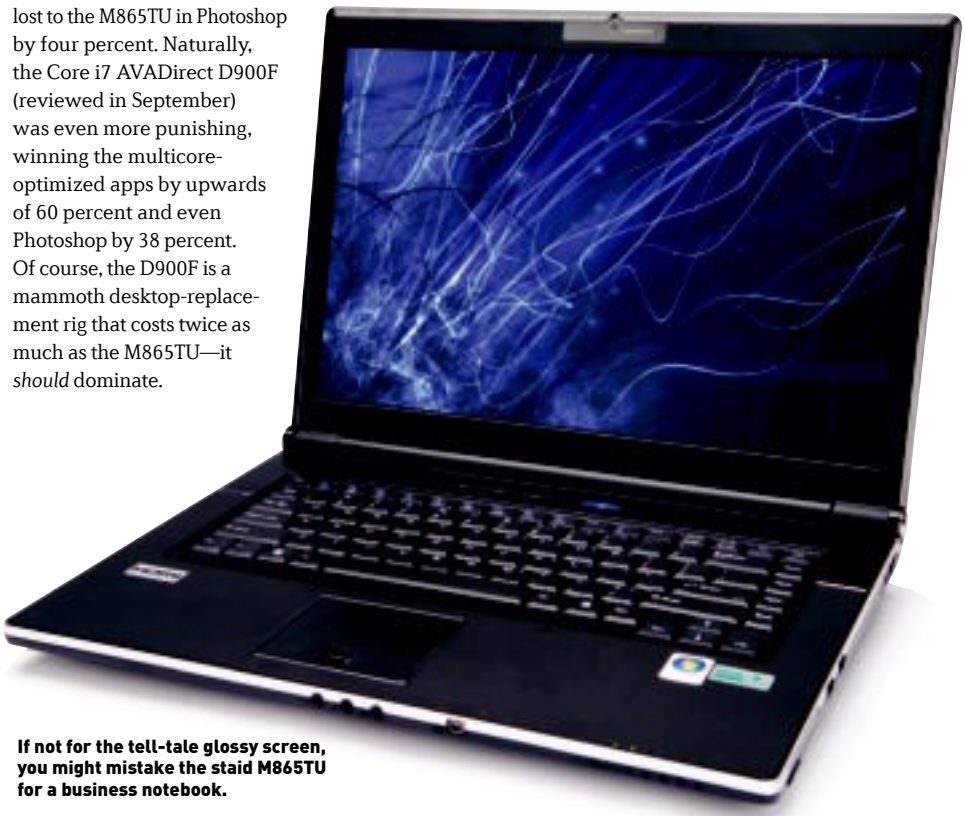
iBuypower M865TU

A 15-inch gaming notebook that holds its own in bigger company

From the looks of it, you probably wouldn't figure iBuypower's M865TU for a gaming notebook. Its aesthetic is much more subdued than typical representatives of that class. The chassis is covered in a subtly textured black plastic, with tasteful silver trim around the edges and the touch pad. Unlike other gaming notebooks, backlighting is limited to the power button and an unobtrusive iBuypower logo on the notebook's lid. Furthermore, the 15-inch M865TU is smaller than many gaming rigs and has a more streamlined formfactor.

But despite its smaller stature and no-nonsense appearance, the M865TU's got game. That's courtesy of the Nvidia GTX 260M GPU under its hood. Based on a reworked G92 chip, which uses a smaller, faster process (55nm vs. 65nm) and features slightly higher clocks, the GTX 260M proves more capable than previous-generation G92 mobile parts. For example, the M865TU performed almost 30 percent better in Far Cry 2 and Call of Duty 4 than the 9800M GTX-equipped Qosmio X305 we reviewed in June, with scores of 31.3fps and 58.3fps, respectively, at the notebook's 1680x1050 native res and the highest quality settings. (This month, we jettisoned the games we have previously used for notebooks reviews in favor of FC2 and CoD4, which are far more indicative of a GPU's prowess—expect to see these titles integrated into our benchmark chart going forward.)

In the applications department, the M865TU is also competent. The rig's 3.06GHz Core 2 Duo Mobile helped it handily whoop our zero-point notebook in the benchmarks by 30-60 percent. Granted, the story changes when you compare the M865TU to quad-core machines. The Core 2 Quad Mobile part in the Qosmio X305, while clocked at just 2GHz, beat the M865TU by 13-18 percent in the benchmarks that scale with cores (Premiere, Photoshop, MainConcept), although lost to the M865TU in Photoshop by four percent. Naturally, the Core i7 AVADirect D900F (reviewed in September) was even more punishing, winning the multicore-optimized apps by upwards of 60 percent and even Photoshop by 38 percent. Of course, the D900F is a mammoth desktop-replacement rig that costs twice as much as the M865TU—it *should* dominate.



If not for the tell-tale glossy screen, you might mistake the staid M865TU for a business notebook.

What we like about the M865TU is that it provides decent application performance, a marked improvement in single-card notebook gaming, and a more portable size and weight—it's lighter by two or more pounds than other gaming notebooks we've tested recently. Sadly, its battery life isn't much better than the pack's, lasting just one hour and 40 minutes when playing a movie in power-saving mode. Oh, and the speakers suck. —KATHERINE STEVENSON

SPECIFICATIONS

CPU	3.06GHz Core 2 Duo Mobile T9900
RAM	4GB DDR3/1,066MHz
Chipset	Intel PM45
Hard Drive	500GB Seagate ST9500420AS (7,200rpm)
Optical	Toshiba TS-L633A CD/DVDW
GPU	Nvidia GeForce GTX 260M
Ports	DVI, HDMI, Ethernet, modem, three USB, eSATA/USB, FireWire, three analog in/out, 7-in-1 media reader, Express Card
Lap/Carry	12 lbs, 0.4oz / 14 lbs, 15.6 oz

BENCHMARK

	ZERO POINT	
Premiere Pro CS3	1,860 sec	1,320 (40.9%)
Photoshop CS3	237 sec	147 (61.2%)
ProShow Producer	2,416 sec	1,504 (60.6%)
MainConcept	3,498 sec	2,702 (29.5%)

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

Our zero point notebook uses a 2.6GHz Core 2 Duo E6700, 2GB of DDR2/667 RAM, an 80GB hard drive, a GeForce Go 8600M, and Windows Vista Home Premium.

VERDICT 8

IBUYPOWER M865TU

+ STUART SMALLEY

Sophisticated looks; truly portable form-factor; improved G92 performance.

– STUART LITTLE

Inferior to quad-cores in apps; 17-inch price; poor battery life.

$2,000, www.ibuypower.com

Thermaltake ISGC-300

Kind to the ears, deadly to heat

Everyone and their CPU-cooler-manufacturing mother are jumping aboard the skyscraper-formfactor bandwagon, hoping to match the performance of Thermalright's Ultra-120 eXtreme and Noctua's NH-U12P air coolers. Last month we tested Zalman's attempt, and this month we have Thermaltake's answer, the ISGC-300, one of a series of four ISGC-branded air coolers recently released into the wild. Thermaltake's creative relationship with the English language is responsible for the ISGC moniker, which stands for "Inspiration of Silent Gaming Cooling."

The ISGC-300 consists of a copper heat exchanger with four heat pipes running into a tower of 33 saw-toothed fins. At 6.24 inches high by five inches wide by 2.8 inches deep, it's slightly shorter and narrower than Thermalright's Ultra-120, but about a quarter-inch deeper. A 12cm white Thermaltake hydrodynamic-bearing fan is held onto the front using metal clips in a manner reminiscent of the Noctua NH-U12P. The nine-bladed fan is quiet and includes a variable-speed switch in lieu of a four-pin PVM connector. At its quietest, it's nearly silent; at its loudest, it's still damned quiet.

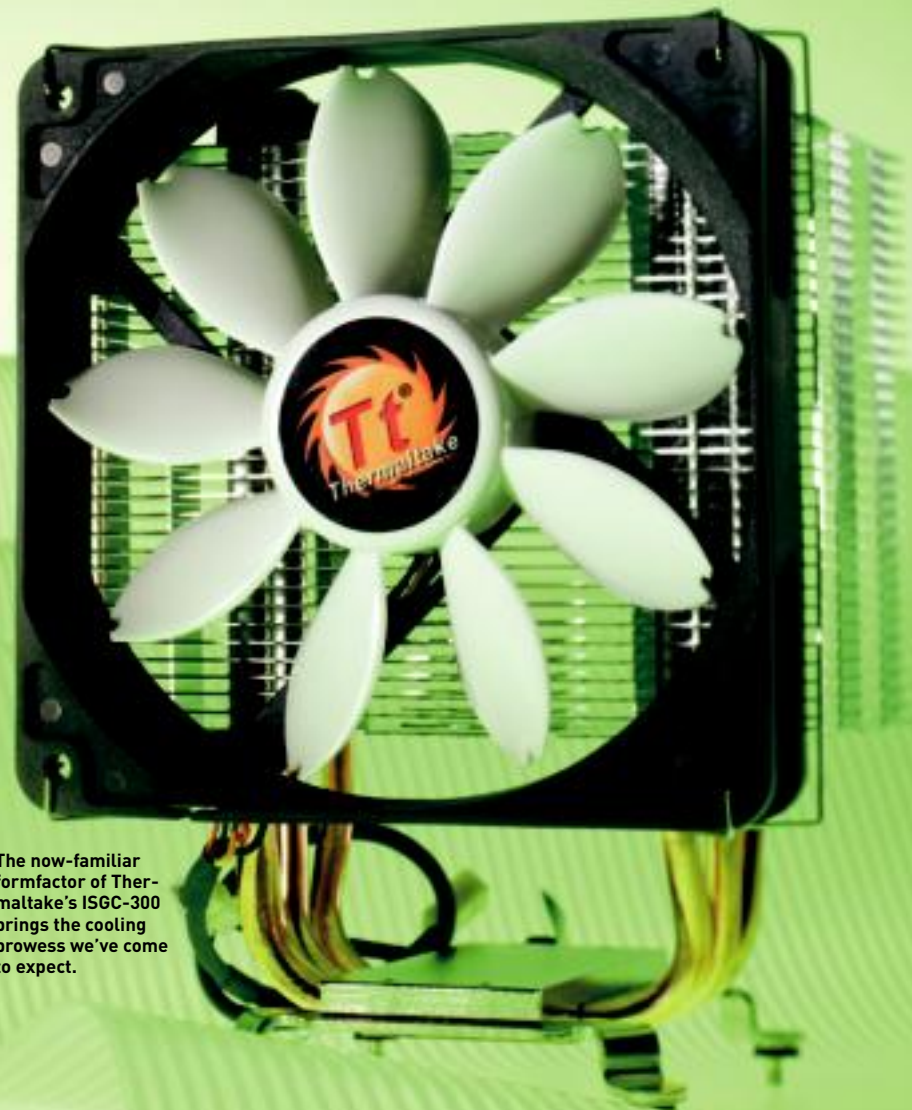
Unlike most of the coolers we've reviewed recently, with their backplates, finicky spring screws, and wobbly mounting brackets, the ISGC is pretty painless to install. You screw the mounting brackets onto the bottom of the cooler, then secure them to the motherboard with nuts and washers—no backplate or long-handled screwdriver required, although if your motherboard tray doesn't have a cutout for the CPU, you'll have to remove your motherboard for the install. The lack of a backplate, which provides stability, could be an issue if you plan to ship the box a long distance. But frankly, we've had no problems with far larger heatsinks that lack backplates. Like most coolers of this style and size, you may have to mount the heatsink so it's parallel with your RAM, as mounting the other way may bump into RAM cooling fins.

At its highest fan speed, the ISGC cool to within a few degrees of our champion air cooler, Thermalright's U120-eXtreme. The ISGC-300 cooled an idling CPU to within a half-degree Celsius of the Thermalright, and at full burn the ISGC's temps were less than two degrees Celsius higher than the Thermalright's. Thermaltake has taken a step in the right direction with the ISGC-300, with its relatively easy install, competitive price, near-silent operation, and performance that comes close to the category leader. —NATHAN EDWARDS

BENCHMARKS

	Thermaltake ISGC-300	Thermalright U120-eXtreme	Stock Cooler
Idle (C)	27.75	**27.25**	38.75
100% Burn (C)	45	**43.25**	70.5

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



The now-familiar formfactor of Thermaltake's ISGC-300 brings the cooling prowess we've come to expect.

VERDICT 8

THERMALTAKE ISGC-300

+ GIVE	− TAKE
Easy to install; quiet, variable-speed fan; good performance; competitively priced.	Bulky; can interfere with RAM cooling if installed facing upward.

$60, www.thermaltakeusa.com

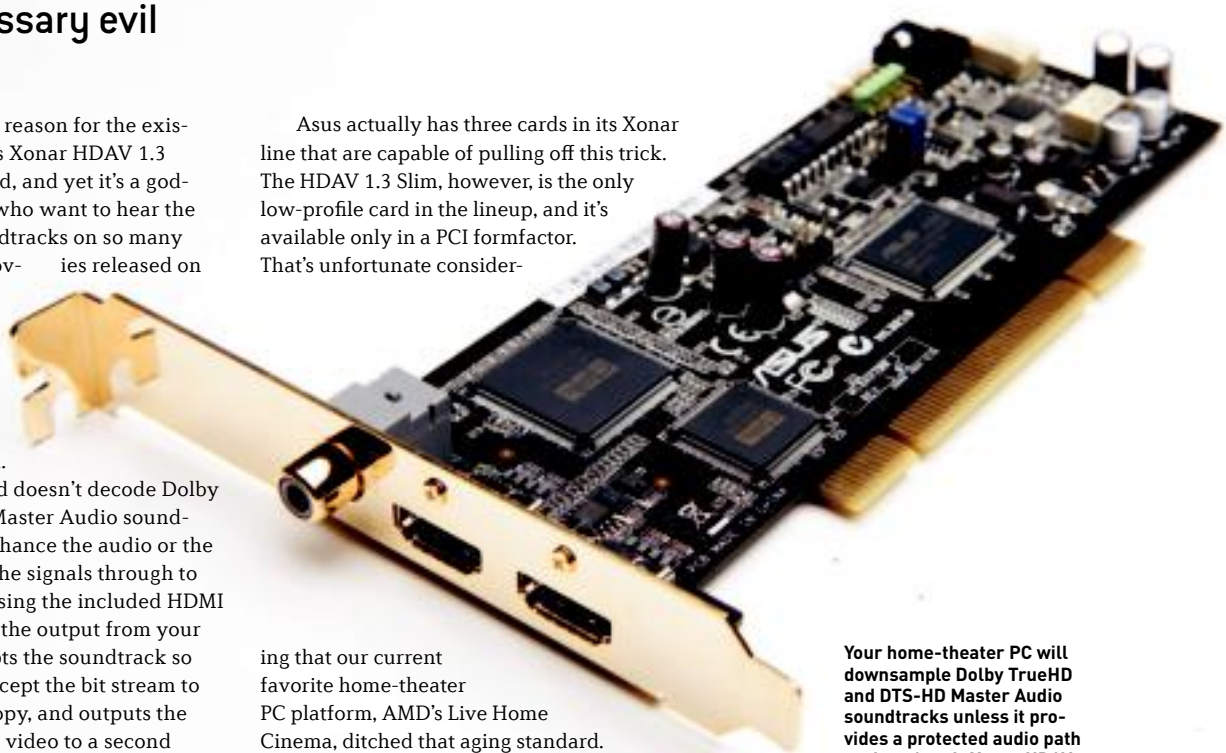
Asus Xonar HDAV 1.3 Slim

A very necessary evil

There's no *good* reason for the existence of Asus's Xonar HDAV 1.3 Slim soundcard, and yet it's a godsend for those of us who want to hear the high-definition soundtracks on so many of the Hollywood movies released on Blu-ray disc. Blame Microsoft for the contradiction: No one would need a product like this if Vista provided a protected audio path.

After all, this card doesn't decode Dolby TrueHD or DTS-HD Master Audio soundtracks, nor does it enhance the audio or the video; it just passes the signals through to your A/V receiver. Using the included HDMI cable, the card takes the output from your videocard, re-encrypts the soundtrack so that no one can intercept the bit stream to make a bit-perfect copy, and outputs the encrypted audio and video to a second HDMI port. For those without HDMI, Asus also includes a DVI-to-HDMI cable.

The protected audio path requires a software component, too, so Asus bundles a copy of ArcSoft's TotalMedia Theatre with the Xonar. Not your favorite media player? Too bad, it's the only one that's compatible. For what it's worth, we don't have any complaints about the program. There's nothing objectionable about its user interface; it can handle all the major codecs; and it supports BD-Live, so you can access whatever online content is linked to the movie you're watching.



Your home-theater PC will downsample Dolby TrueHD and DTS-HD Master Audio soundtracks unless it provides a protected audio path such as Asus's Xonar HDAV 1.3 cards do.

Asus actually has three cards in its Xonar line that are capable of pulling off this trick. The HDAV 1.3 Slim, however, is the only low-profile card in the lineup, and it's available only in a PCI formfactor. That's unfortunate considering that our current favorite home-theater PC platform, AMD's Live Home Cinema, ditched that aging standard.

So we dragged our desktop rig, which is currently outfitted with an HIS Radeon HD 4770, into our home theater for this evaluation. We connected it to a Yamaha RX-V665 A/V receiver, which is in turn connected to a 42-inch ViewSonic N4285P LCD television. We used Klipsch Reference Series RF-35 loudspeakers. In terms of image quality, the PC clobbered the Samsung BD-P1600 standalone Blu-ray player we used for comparison. But the Xonar card doesn't perform any video processing, so we can't give it credit for that; more importantly, the PC didn't sound any better than the Blu-ray player. Then again, the PC would be forced to downsample the soundtrack without the Xonar card in the loop.

The HDAV 1.3 Slim has a front-panel output header that you can connect to your enclosure's headphone jack, and a four-pin auxiliary input header you can connect to your TV tuner's analog audio output. The mounting bracket has an S/PDIF output that can accommodate both coaxial and optical connectors (with an adapter), along with the aforementioned HDMI input and output. The card is compatible with the HDMI 1.3a specification and supports all three of its optional features: Deep Color (up to 48 bits per pixel, compared to HDMI 1.0's 24-bit color), the xvYCC color space (which means the card uses the full range of values in an 8-bit space), and both lossless audio codecs.

Nonetheless, there's really only one reason to buy an HDAV 1.3 Slim: So you can enjoy the splendor of Dolby TrueHD and DTS-HD Master Audio soundtracks while taking full advantage of your home-theater PC's video capabilities. —MICHAEL BROWN

To get lossless Blu-ray audio out of your PC, you'll need to also play the movie using the included ArcSoft TotalMedia Theatre player.

VERDICT 8

ASUS XONAR HDAV 1.3 SLIM

+ UPSCALING	− DOWNSAMPLING
Delivers HD audio from a home-theater PC without downsampling; low-profile design.	There's no PCI Express version; compatible only with ArcSoft's TotalMedia Theatre.

$150, www.asus.com

Lenovo IdeaPad S12

How big can a netbook get before it stops being a netbook?

The guts of the Lenovo IdeaPad S12 are virtually identical to the IdeaPad S10 that we reviewed back in 2008 (http://bit.ly/RuOyQ)—1.6GHz Intel Atom N270 CPU, 1GB DDR2 RAM, 160GB HDD, and integrated Intel GMA950 graphics. The difference is the body. At 11.4 inches wide, this is one of the largest "netbooks" we've ever tested. The S12 has a 12.1-inch WXGA screen with a 1280x800 native resolution—far superior to the netbook-standard 1024x600, and much more usable. The glossy screen is impressively bright even at low LED-backlight levels.

The S12's keyboard features large, comfortable keys and is a joy to type on, although as usual, Lenovo has mixed up where the Ctrl and Fn keys should be. The glossy black patterned lid and matte-black ABS frame make the S12 one of the best-looking and best-constructed netbooks we've ever tested, although the battery is a little wobbly and the lid is a fingerprint magnet. Both RAM and hard drive are easily accessible and upgradeable.

While some S12s ship with VIA's Nano platform and an Ion-based version is in the works, ours came with a standard N270, and its performance reflected that. The S12 took 708 seconds to complete our Photoshop benchmark—about the same as the Lenovo S10 and Samsung NC10, two other N270-based netbooks. In Quake III, the S12 grabbed a respectable 60.9fps, slower than the 63.8fps the record-holding MSI Wind U123 managed with the same settings. The six-cell battery lasted a respectable four hours, 15 minutes in our rundown test.

The Lenovo IdeaPad S12 is not the fastest netbook we've ever tested, nor the smallest—but that isn't the point. It's a competent netbook in a much more usable formfactor. The higher screen resolution makes everything better—from browsing the web to editing photos and watching movies. And at a three pound, 6.5 ounce lap weight, it's only a few ounces heavier than the Asus Eee 1000HE or MSI Wind U123—still light enough to throw in a bag and bring to the coffee shop.

Some might argue that a netbook with a 12-inch screen isn't even a netbook anymore. We think they're wrong. It's still cheap (on the low end of $500) and portable, has great battery life, and the combination of a great screen and excellent keyboard means that folks who dismiss netbooks as too small to be usable have another thing coming.

—NATHAN EDWARDS

VERDICT 9

LENOVO IDEAPAD S12

+ MONKEY ISLAND	− MONKEY BUSINESS
Nice 1280x800 screen; excellent keyboard; good battery life; mostly solid construction.	Battery connector is a bit wobbly; midrange netbook performance; fingerprint-magnet lid.

$500, www.lenovo.com

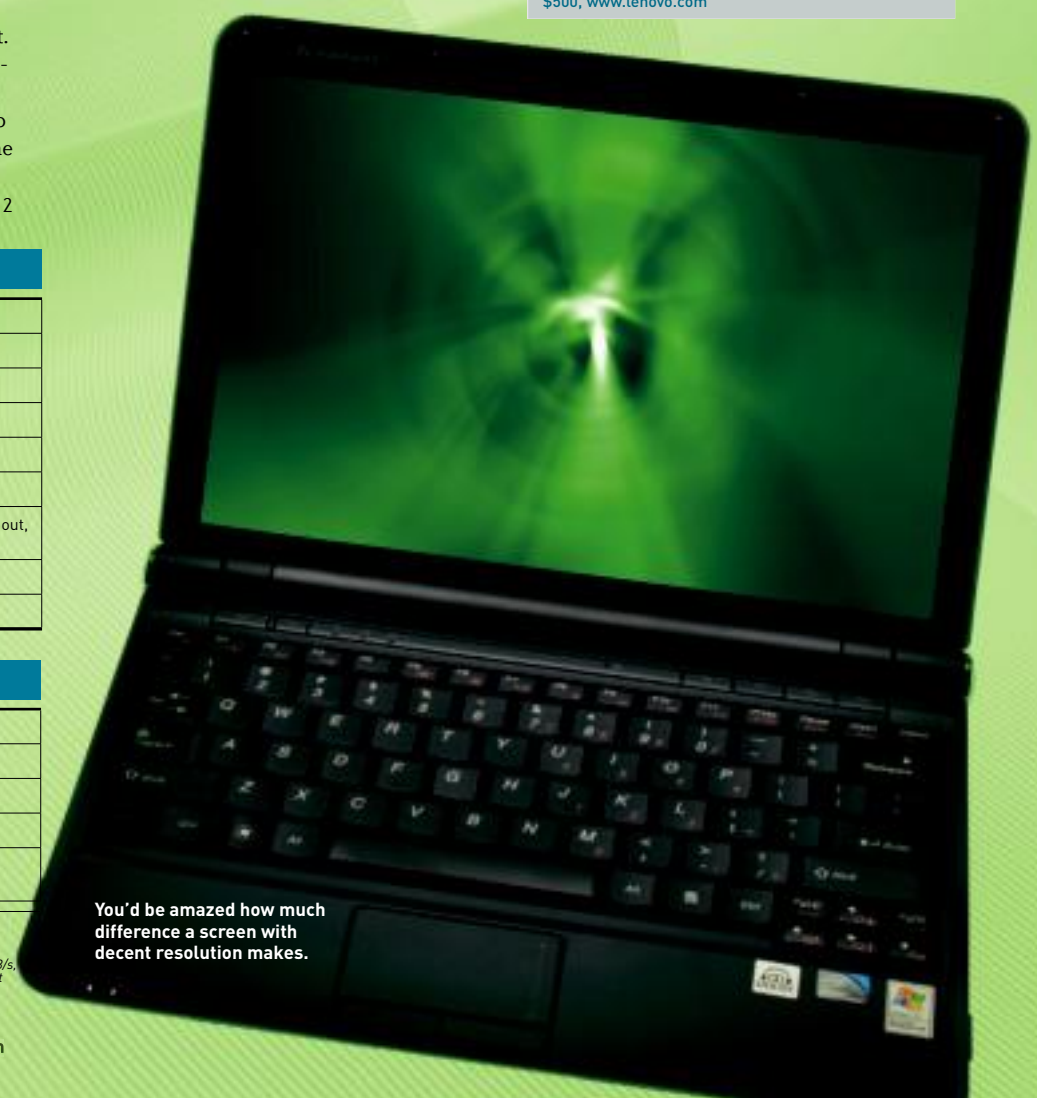
SPECIFICATIONS

Display	12.1-inch LED-backlit TFT@1280x800
Processor	1.6GHz Intel Atom N270
Chipset	Intel 945GSE
Graphics	Intel GMA950
RAM	1GB DDR2/667
Storage	160GB HDD (5,400rpm)
Ports	Three USB, audio in/out, SD card, VGA out, ExpressCard/34, 10/100 Ethernet
Wireless	802.11b/g
Lap/Carry	3 lbs 6.5 oz / 4 lbs 2.5 oz

BENCHMARK

Photoshop (sec)	708
Battery (hrs:min)	4:15
H.264	Yes
Quake III (fps)	60.9
MainConcept Reference (hrs:min)	4:11

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



You'd be amazed how much difference a screen with decent resolution makes.

Logitech Speaker System Z520

Damn-good cheap speakers

We haven't auditioned many cheap speaker systems lately. Why? Well, let's just say we don't enjoy subjecting our ears to the sonic equivalent of waterboarding. But Logitech has a knack for packing big sound into inexpensive boxes, so we agreed to review its new two-channel Z520 system.

You'll have to decide for yourself if the Z520 system's $130 price tag really puts it in the "cheap" category, and we imagine the folks at Logitech will cringe to hear us describe them as such; but you can cut only so many corners before we begin to ask, "Why bother?" Judging by these speakers' performance, Logitech's engineers know just how low they can go.

When we see small speakers, we usually pigeon-hole them as near-field monitors: short-throw speakers that produce a small stereo soundstage that collapses as soon as you move more than three feet away from the cabinets. There's nothing inherently wrong with near-fields, especially in a PC environment, but they have their limitations. So we were surprised to hear Logitech boast that the Z520 could provide a "great listening experience throughout the room." We decided to put that claim to the test as soon as we took the speakers out of the box.

We connected the set to Asus's kick-ass two-channel soundcard, the Xonar Essence STX, which meant we had to find an adapter to convert the speakers' six-foot hardwired cable. The cable ends in a 1/8-inch stereo plug, but the soundcard's jacks are stereo RCA. The six-foot cable connecting the left speaker cabinet to the right, which houses the amp, is hardwired to the left cabinet. We realize that renders setup fairly idiot-proof, but it also limits where you can put the speakers.

We played a number of tracks that we'd ripped from CD and encoded in FLAC, starting with an old favorite: Joe Jackson's "Rant and Rave" from his *Blaze of Glory* release. We expected the speakers to be bright, since there's no subwoofer (and no way to add one), but we were pleasantly surprised with their range and definition. Listen to a song like this on most inexpensive speaker systems and the acoustic piano, horns, and vocals will peel your ear drums. The Z520 produced the congas, acoustic piano, trumpet, and vocal as thoroughly distinct elements. The system even delivered respectable bass response from its three-inch woofers, without having to resort to devices such as reflex ports and passive radiators. The cabinets are fabricated from thick plastic and flare out with a wide bottom that renders them very stable. There's not enough bass here to satisfy hardcore gamers or movie buffs; but for the price, we think most music listeners will be satisfied.

The Z520's integrated amp produces just 26 watts per channel, so don't expect it to fill a large room with sound, especially if you're throwing a party. With the volume control knob turned about three-quarters full, however, it did manage to fill our 14x8-foot home office. But the speaker's ability to present a stereo image almost anywhere in the room is what really impressed us; in fact, the soundstage didn't begin to decay until we were standing at a nearly 90-degree angle to the speakers. Remarkable. **–MICHAEL BROWN**

An auxiliary input on the side of the right cabinet can accommodate an MP3 player; there's a headphone output there, too.

VERDICT **8**

LOGITECH SPEAKER SYSTEM Z520

+ SOLAR POWER	– FOSSIL FUEL
Great sound for the money; very wide soundstage; attractive industrial design.	Not enough bass punch for games or movies; hard-wired cables.

$130, www.logitech.com

Eye-Fi Pro

Latest version caters with advanced features

We've long loved Eye-Fi's series of Wi-Fi-enabled SD cards that allow you to instantly upload pics from your camera to a website, but it has lacked two key features: the ability to select which photos you want to upload and the ability to perform peer-to-peer transfers from the camera to a computer or laptop. This new card addresses those needs.

The card continues to support all the good stuff we've seen before in Eye-Fi cards: the ability to connect to open access points to upload your photos to a photo service, Wi-Fi-based geo-tagging, and video sharing. But we're more excited by the improvements in the Eye-Fi Pro. Now, instead of uploading every image on the card, you select which photos you want to upload by checking the write-protect on the files and the card dutifully uploads them. JPEG, video, and even RAW files are now supported, too. And in case you're wondering whether RAW is too large to transfer via Wi-Fi, we moved an 18MB RAW file from a Canon EOS Rebel T1i to a laptop in about two minutes using the Eye-Fi Pro's Ad-hoc mode. Not bad.

While the new Ad-hoc mode is one of the improvements we appreciate about the Pro card, it's also one of our complaints—the long-sought-after ability to upload without the need for an access point is great to have but not exactly easy to set up. You have to dig through the site's FAQ for a PDF on how to do it, and even then, you still have to fuss with it. Our other complaint is the size. With 16GB SD cards in the $30 range, a 4GB card, especially one aimed at "pros," with RAW support is just too small. Still, that doesn't take away from how cool and useful the Eye-Fi Pro is. —GORDON MAH UNG

EYE-FI PRO

VERDICT 9

+ RAW FISH	− RAW MEAT
Doesn't need an AP to send files; does RAW lickity-split.	Capacity is under-whelming in this age of cheap SDHC cards.

$150, www.eye.fi

An Ad-hoc mode in the latest Eye-Fi lets you upload directly to your laptop.

Wolfenstein

The secret uber-weapons of WWII

Nazi skeleton-men hate lightning. But they love cinnamon.

Id Software didn't develop the latest Wolfenstein, but the sequel to its genre-founding 1991 classic Wolfenstein 3D absolutely captures the meaning of the studio's name: an impulsive, stimulating shooter full of gory, colorful, mindless gunplay.

Wolfenstein embraces over-the-top action like a summer blockbuster movie. As U.S. super-operative B.J. Blazkowicz, you're tasked with foiling the Nazis' latest evil archaeology: They've dug up ancient medallions and energy crystals to build some scary sci-fi weaponry. The medallions let their holders access a shadow dimension called the Veil, and when B.J. gets his hands on one, it grants him a set of powers that augment his gunfightin'—slow-mo, a personal shield, enhanced damage, and turquoise-colored "Veil sight" that lets him see in the dark.

Though these Veil abilities operate similarly to BioShock's plasmids, they aren't the focus of Wolfenstein. Nor is B.J. himself. Instead, it's the arsenal: Nazi-melters like the particle cannon, a Ghostbusters-like hose that sprays gallons of disintegrating blue-green energy. Or the Tesla gun, a spinning iron coil that feels like an exposed power transformer and sends deadly jolts through anyone you point it at. Basic firearms like the MP40 and KAR 98 are also available, ready to pop the limbs off endless identical Nazi privates.

It's a credit to Raven's effects artists that operating these overpowered guns is enough to make the game worth buying, especially since the game tours B.J. through very familiar WWII set pieces: industrial labs, box-filled warehouses, and stone-cobbled streets dotted with exploding gas drums and squads of Hitler's henchmen on patrol. That's by-the-numbers stuff for anyone that's played a shooter set in the '40s, but developer Raven Software manages to make each encounter completely entertaining—partly due to its expressive enemies that leap, tumble, and scream "Mein lieben!" at the drop of a shell casing, and partly thanks to the cast of crazy mini bosses the game puts in your path: Nazi dominatrices with laser whips, radioactive skeletons, and teleporting Axis sorcerers.

Where you fight these fascist foes is also Wolfenstein's biggest surprise: This is not a linear game. The fictional German city of Isenstadt serves as a hub for everything you do; within it, B.J. can take on missions from a resistance faction, buy weapon upgrades at a black market, comb the city for secret passages and gold, or just ambush Nazi patrols and checkpoints (that respawn when you return to Isenstadt after a mission) on a whim.

It's by no means an open-world game like Grand Theft Auto, but this tinge of freedom creates a pace that isn't reliant on checkpoints to bookend the action. And that perfectly suits the nature of the gunplay: spontaneous, unfrustrating, and bloody. While Wolf's boss battles don't attempt the same surprising design that Isenstadt does, campy, conventional showdowns against the worst that Nazi science has to offer still suits the game's arcade feel.

A warning to anyone looking for a meaningful multiplayer mode from Wolfenstein: The online content feels shoehorned compared to the quality of the campaign, bringing in up to 12 players for team-based modes that ape the feel of Call of Duty, but excluding the exotic power weapons that make the single-player so delightful, and noticeably ratcheting down visual effects to support multiplayer's larger maps. —EVAN LAHTI

Expect random run-ins with the worst of Hitler's experiments in Isenstadt as you progress in the game.

VERDICT **8**

WOLFENSTEIN

+ HUNGRY LIKE THE	− BOY WHO CRIED
Elegant and destructive weaponry; well-animated enemies; bold use of color and visual effects.	Token multiplayer; popcorn plot; familiar level design and shooter set pieces.

$50, www.wolfenstein.com, ESRB: M

LAB NOTES

What Would Gordon Do?

With Windows 7 nearly upon us, it's time to start thinking upgrade

GORDON MAH UNG
SENIOR EDITOR

As one of the last editors here who hasn't pulled the trigger on building a Core i7 machine, I'm at that fork in the road we've talked about so much. I want to build a new box for Windows 7, but do I take the path of the budget-badass Core i5/i7 LGA1156 or plan for the future with a more expensive Core i7 LGA1366 box? That's the same dilemma many of you will face. No matter how I add it up, though, I can't see how I can rationalize building an LGA1366 rig today. Do I plan on running tri-SLI? With my 24-inch flat panel? No way. Do I plan on upgrading to the hexacore Core i9 early next year? I'd like to, but realistically, I probably won't upgrade until 2011 when it's far more affordable.

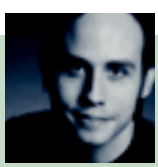
So as much as I hate the thought of ripping out a motherboard to upgrade to six cores, it's hard to say no to LGA1156. At $285, the 2.8GHz Core i7-860 is cheap, it's fast, and pretty tough to beat.

FLORENCE ION
EDITORIAL ASSISTANT

PCs have a habit of accumulating dust, but I've found that households with pets produce the dirtiest rigs. I might be a bit of a neat freak, but I never thought there would come a day when I'd need a face mask to thoroughly clean a system's innards. For this month's How-To, I needed the blue gloves!

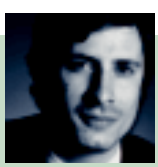
WILL SMITH
EDITOR-IN-CHIEF

As you might imagine, I spent a ludicrous amount of time with Windows 7 this month. Using it, trying out every possible workload I could think of, running endless benchmarks on XP, Vista, and 7, and then finally just taking a step back to see as much of the Windows vista (sic) as I could. Phew.



ALEX CASTLE
ASSOCIATE ONLINE EDITOR

This month, I've been building a MAME cabinet—a single machine that's able to play just about any old arcade game. It's a pretty involved project, but it's also been a lot of fun and the machine looks great. If you want to see how I did it, and learn how to build one yourself, check out the article online at http://bit.ly/16Cwm1.



NATHAN EDWARDS
ASSOCIATE EDITOR

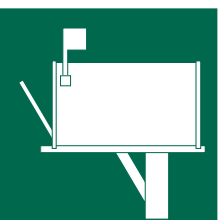
During one of San Francisco's few warm summer weeks, my non-air-conditioned apartment got pretty stuffy—to the point where my graphics card would overheat every few hours. After swapping to a case with much better airflow, the problems went away. Now to invest in a ceiling fan.

NORMAN CHAN
ONLINE EDITOR

Even though I now have my entire music collection backed up on a Windows Home Sever, I still find myself hesitant to delete the original files from my PC. Color me paranoid, but I don't think you can ever have enough backup copies of your favorite trance and country tracks!

We tackle tough reader questions on...

Cooling Benchmarks
Copy Protection
Dream Machine Sound



Cooling Changes?

In the September issue, the Thermalright U120-E cooled the chip to 29.25 C at idle and 44.5 C at 100 percent, according to the benchmark chart; in October, the same cooler *improved* to 26.65 C and 42.5 C, respectively. How do you explain that?

–Daniel S.

Associate Editor Nathan Edwards responds: Because ambient air temperatures in our Lab do not stay constant on a day-to-day basis, we re-test the stock and champion air coolers on the same day we test each review unit. This way, you know how well each cooler performs under the same conditions.

Ripped Off

I can't think of a more appropriate word to describe the ID Vault by Identity Guard besides "rip-off." I bought two of the company's USB devices when it was first introduced and there was no mention of a subscription fee. I have no intention of paying again and again, what with free software available that provides the same function, but I'm wondering if it's going to become useless if I don't.

– Bill Hepp

Senior Editor Gordon Mah Ung Responds: Yes, you do need to pay an annual subscription to get the full features of the ID Vault USB token/key. ID Vault says that subscription pays for the updates and access to the ID Vault Trusted Network. In other words, you're going to have to pony up cash for the thing to work, which does suck. This is one of the reasons we didn't recommend the ID Vault when we reviewed it.

Damn You Digital Hippies

I was struck by Michael Brown's editoral in the Fall 2009 Digital Media Special Issue, which decried and criticized movie content providers for their stand on DRM and copyright protection (that it is a crime to copy music CDs, DVDs and Blu-ray discs). I have always been astounded by the arrogance, selfishness, and effrontery of people who believe that copying content should not be a crime and that copy protection methods should not be employed. I suppose that in the fantasy-land inhabited by these people, the rest of the world is there to provide things for them at no cost. Do you expect people to continue to produce content when they aren't getting paid? Human nature being what it is, customers will always seek the lowest possible price to pay for any item they obtain.

The only practical means I can see to curtail this kind of abuse is for the legal system to penalize for these sorts of activities.

–Wayne Torrey

Editor-in-Chief Will Smith Responds: You missed the most important thing that Mike said in his column. "If you purchase music or a movie, you should have the right to make a copy of it for your own personal use." At *Maximum PC*, we do not approve of piracy or file

IF YOU PURCHASE CONTENT YOU SHOULD HAVE THE RIGHT TO COPY IT FOR YOUR OWN PERSONAL USE

NOW ONLINE

The Evolution of Web Browsers

Whether you surf the web with Firefox, Chrome, or Internet Explorer, the web browsing features you take for granted today are the result of nearly two decades of browser design. We examine the unique innovations and advancements made with every notable PC web browser, starting with the first text-based interfaces that debuted in 1991: http://bit.ly/Qpv1p.

sharing, but we do believe that when you purchase content, you should have the right to convert it to play on your devices.

6, 9, or 12?

In your Dream Machine article (September), I can't find any mention of how much RAM you put into the Stimulus Package. I see you spent $166 on Corsair Dominator 1600 C8, but I don't see a blurb explaining amounts, why you chose Corsair, or anything. Three slots must mean at least 6GB, but it could be 9 or 12. The blurb on the mobo says it handles up to 24 gigs but I don't think you got 24 gigs for $166!

–Brian Mahoney

Senior Editor Gordon Mah Ung Responds: We used 6GB of Corsair Dominator 1600 C8 RAM. A lot of soul-searching went into deciding how much RAM to use in the system. Using 24GB would have been out of the question, but we did flirt with the idea of 12GB. In the end, we decided that the performance-to-cost ratio you get out of 6GB was the way to go since we were still trying to get it in under budget.

Dream Machines, I Can't Hear You

I have been a reader since the *boot* days and you guys are as good as anyone out there, if not the best. I freely admit that the *Maximum PC* staff knows more about PCs then I do, so pardon my ignorance, but I noticed you didn't use a soundcard in any of the three Dream Machines (September). My question is, are the onboard sound chips on par with the add-in boards from Creative or others? Sound and music are a big part of the PC experience, at least as much as the visual side. So if you're going to blow big bucks on multiple high-end videocards for a real dream machine, I would think you would want to get the best soundcard as well. And since I'm picking on you, maybe liquid-cooling would have been good, too.

–Jerry Bittner

Senior Editor Gordon Mah Ung Responds: It was a very difficult decision, but with our tight budget, we decided that the soundcard had to be jettisoned. Would I have liked to have spent another $200 for a soundcard? Yes. I would also have liked to have full water-cooling like we have done for previous Dream Machines—but not at the cost of another $400. As you know, compromises are all part of working on a budget. Is onboard up to the standards of discrete? Frankly, no. Discrete audio will get you the cleanest audio on a PC. However, few people can actually tell the difference unless the motherboard implementation is *very* bad.

CUTCOPYPASTE

In our review of the Seagate Barracuda LP 2TB drive (October), we published the wrong benchmark chart. The correct benchmarks are below.

BENCHMARKS

	Seagate Barracuda LP 2TB	WD Caviar Green 2TB
h2benchw Average Sustained Transfer Rate Read (MB/s)	**91.9**	76.3
h2benchw Average Sustained Transfer Rate Write (MB/s)	**90.8**	76.5
h2benchw Random Access Read (ms)	13.2	**12.9**
h2benchw Random Access Write (ms)	10.06	**6.7**
HDTach Burst Read (MB/s)	196.6	**218**
PCMark Vantage Overall Score	**4,712**	4,529

Best scores are bolded.

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

COMING IN

MAXIMUM PC's DEC ISSUE

We'll Jingle Your Bells

Windows Tips and Tweaks

Want to know the right way to install Windows 7? Want to make your PC snappier and get rid of the useless cruft lurking in the corners of your OS? Come back next month and we'll give you the full low-down!

LCD Monitor Roundup

Still rocking a 20-inch CRT? It's finally time to upgrade that ancient thing! Next month, we test and review eight high-end LCD monitors.

Super-Secret Hardware—Revealed!

We can't say what it is, who makes it, what it does, or even what color it is. But rest assured, gentle reader, we'll take the wraps off some truly revolutionary hardware—next month!

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BUDGET CPU

Intel 2.66GHz Core i5-750

Budget computing doesn't get any better than a $200 Nehalem. True, you don't get Hyper-Threading, but for the vast majority of apps, that won't hurt too much. Turbo Boost will automatically overclock the processor for non-optimized apps up to 3.2GHz, too. And remember, this cheapie Nehalem actually has a list price lower than AMD's Phenom II X4 processors. The Core i5 even runs cooler and overclocks better, to boot. The Core i5's budget approach isn't just about the CPU, either. While LGA1366 Core i7 motherboards typically push $300, nicely outfitted Core i5 boards will sell for less than $200. www.intel.com

THE REST OF THE BEST

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

High-End Processor
Intel 3.33GHz Core i7-975
www.intel.com

LGA1366 Motherboard
MSI Eclipse SLI
www.msi.com

Socket AM2 Motherboard
MSI K9A2 Platinum
www.msi.com.tw

$500 Videocard
Nvidia GeForce GTX 295
www.nvidia.com

$250 Videocard
Nvidia GeForce GTX 275
www.nvidia.com

$150 Videocard
ATI Radeon 4870
www.ati.com

Performance Storage
Patriot Torqx 128GB
www.patriotmemory.com

Mainstream Storage
Seagate Barracuda 7200.11 1.5TB
www.seagate.com

Capacity Hard Drive
Seagate Barracuda LP 2TB
www.seagate.com

DVD Burner
Samsung SH-S223
www.samsung.com

Blu-ray Drive
Pioneer BDR-2203
www.pioneerelectronics.com

Full-Tower Case
Cooler Master ATCS 840
www.coolermaster.com

Mid-Tower Case
Silverstone Fortress
www.silverstonetek.com

Gaming Mouse
Logitech G9x Laser Mouse
www.logitech.com

Gaming Keyboard
Logitech G19 Keyboard
www.logitech.com

Games We're Playing

Wolfenstein
www.wolfenstein.com

Batman: Arkham Asylum
www.batmanarkhamasylum.com

ARMA 2
www.arma2.com

Demigod
www.demigodthegame.com

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

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