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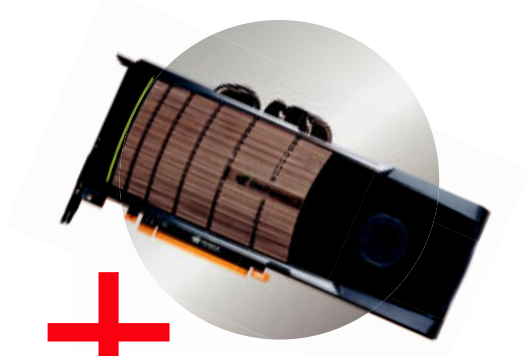

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JUNE

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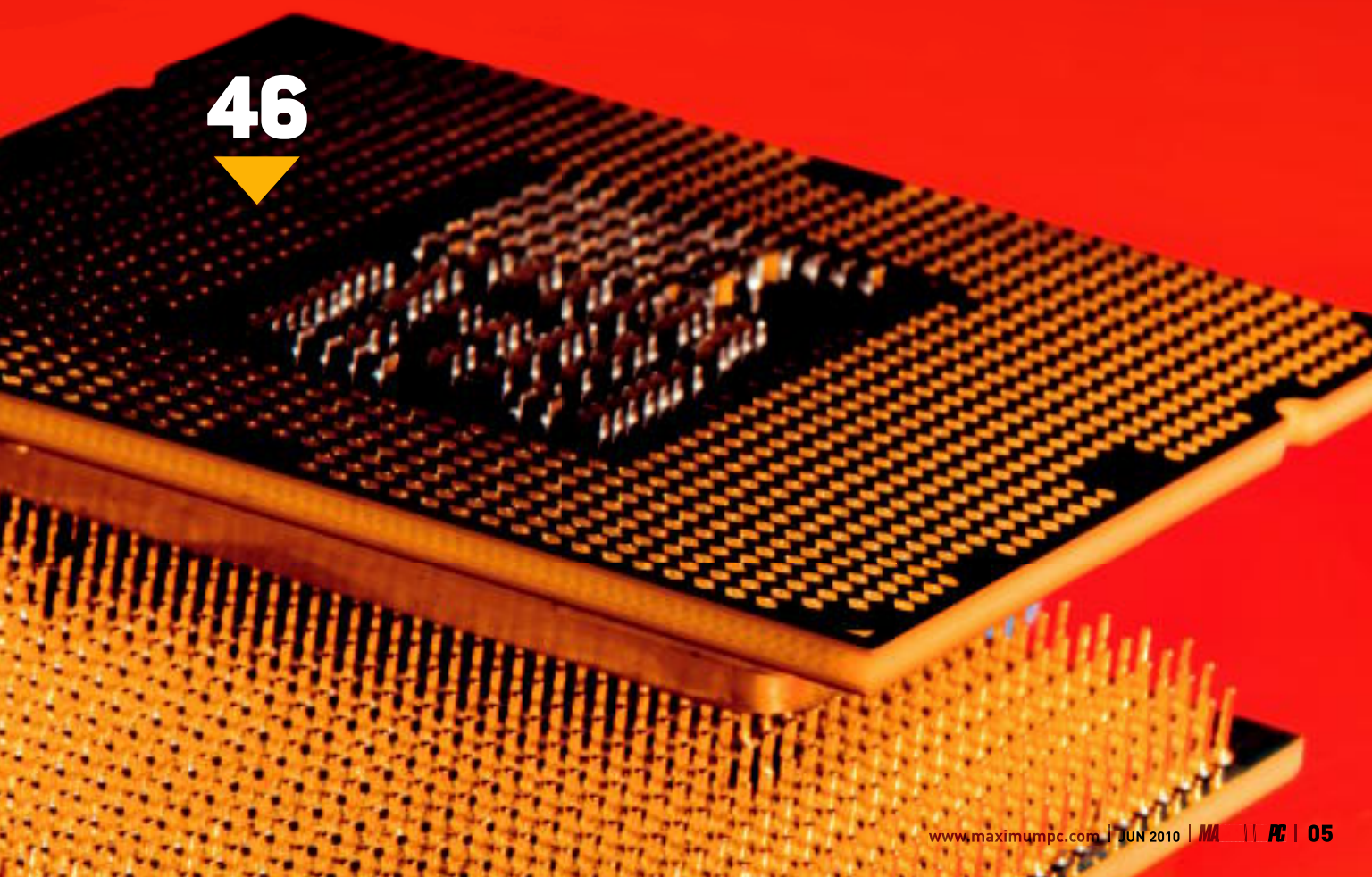

MAXIMUM PC

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Future plc is a public company quoted on the London Stock Exchange (symbol: FUTR).

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Maximum PC ISSN: 1522-4279

Keyboards? Don't Need 'Em. Can't Type Anyhow

You know who's annoying besides inveterate fanboys, political extremists, and men who wear scarves? Those touch typists who think they're so badass because they use all eight fingers and can knock out 120 words per minute. Well, I'm proud to declare that I can clock 65 words per minute, and that's with only two fingers total. It may not be what they taught those fancy lads in secretarial school, but it gets the job done. Even better, my hunt-and-peck style might be exactly the right method for entering text into the Apple iPad, the best tablet computer I've ever used.

In the May 2004 issue of this magazine, I wrote a column that simultaneously celebrated and condemned an HP tablet running Windows XP Tablet PC Edition. I loved the basic formfactor, and found the HP stylus to be a good mouse replacement for basic screen navigation. But I also found Microsoft's handwriting recognition to be laughably inadequate, and couldn't reach a happy medium between using the stylus to tap on the micro-size virtual keyboard and attaching the physical keyboard to the tablet, effectively turning the device into a very expensive netbook.

In reference to the physical keyboard, I wrote in that column, "When you're reclining on your couch, your hands aren't in any position to comfortably type." And this still holds true for today's omnipresent netbooks.

The iPad fixes everything in the data entry department. Its virtual keyboard is large, responsive, and extremely easy to use. I still hit my 65 words per minute, and I have fun doing it. I've heard complaints from touch typists that the virtual keyboard is inadequate for their highfalutin, high-maintenance ways, but for my search-and-destroy method it works just fine.

Fanboys and reasonable adults alike are dissing the iPad for some very legitimate issues, the most serious of which (in my opinion) is the OS's inability to multitask. We'll dig deeper into the iPad's strengths and weaknesses next month. For now, I just want to share that the tablet computer has in fact arrived, and its success is rooted in touch-screen technology, which decisively solves the data-entry problem. So even if you have no interest in the iPad, make sure you check out upcoming Windows-based tablets like the HP Slate. This is a hardware category I'm really excited about, and I think all tech enthusiasts should be, too.

On a different note, I'm sad/happy to announce that this is my last editor's column for *Maximum PC*. I've found a permanent editor-in-chief, so I'm returning to my big-picture, less-hands-on advisory role as editorial director. Next month, George Jones—the *Maximum PC* EIC in 2004 and 2005—is returning to lead tactical operations, completing our dream team of hardcore enthusiasts.

But that doesn't mean you can't write me. Just tap it on a touch-screen, or use a keyboard if you must.

—JON PHILLIPS @JonPhillipsSF

CAN YOU HANDLE THE TRUTH?

Nvidia's Fermi GPU page 36

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LETTERS POLICY Please send comments, questions, and Pocky to willl@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

HTML5 Heats Up

Will new and emerging web standards render proprietary media tools, like Adobe Flash and Microsoft Silverlight, obsolete? —PAUL LILLY

In 2004, a group of developers called WHATWG (Web Hypertext Application Technology Working Group) set out to evolve the online landscape by working on a new specification of HTML, the core markup language of the World Wide Web. Called HTML5, this latest revision to HTML won't be fully developed and ready for candidate recommendation until at least 2012, while the final ratification of the standard isn't expected until 2022 (that 10 years will be spent addressing developer-community comments, error handling, and rules for features). So why are we talking about it now?

Because web developers can already implement several features of the new spec, and browser makers are on board, too.

The latest version of Firefox, for example, lets users drag and drop elements to and from the browser, which is just one of the many tricks up HTML5's sleeve. Every successive browser release will include more HTML5 tags for developers to play with, so even though the next-gen markup language won't be fully baked for another 12 years, you'll be able to dine on certain parts of it well before then.

One of the biggest questions looming is what will happen to rich Internet application (RIA) plugins like Adobe Flash, Microsoft Silverlight, and Sun JavaFX? HTML5's advanced capabilities could render these plugins moot. Ian Hickson, coeditor of the HTML5 specification and current Google employee, has made it clear that one of HTML5's goals is to steer the web clear of proprietary technologies and embrace open standards.

"It would be a terrible step backward if humanity's major development platform [the web] was controlled by a single vendor the way that previous platforms such as Windows have been," Hickson says.

Because of this, the term "Flash Killer" is often thrown around when talking about HTML5. But as far as Adobe is concerned, such talk is premature.

"I think the challenge for HTML5 will continue to be how do you get a consistent display of HTML5 across browsers," Adobe CEO Shantanu Narayen said during a quarterly financial call. "And when you think about the rollout plans that are currently being talked about, they feel like it might be a decade before HTML5 sees standardization across the number of browsers that are going to be out there."

Microsoft's Internet Explorer 9 Platform Preview includes several HTML5 demos to give you a glimpse of what this next-gen markup language has to offer.

But is Narayen ignoring the writing on the wall? Apple's iPad underscores that vendors don't necessarily need to support Flash in order to have a successful product launch, and HTML5 could make this scenario even more commonplace. Even Microsoft, which has a vested interest in keeping Silverlight alive, has embraced HTML5 video tags in its Internet Explorer 9 Preview, though Redmond is trying to force-feed H.264 as the video codec of choice. Video streaming sites like YouTube and Vimeo support H.264, but obtaining licenses to use the codec isn't cheap. For this reason, Mozilla and other open-source champions are pushing for Ogg Theora, an alternative video format that's free to use.

This tug-of-war over video standards has taken its toll on WHATWG, so much so, that in a public mailing list for the group, Hickson laments that, "after an inordinate amount of discussion, both in public and privately," the group removed any reference to video codecs in the HTML spec, "and [has] instead left the matter undefined."

In other words, it will be up to each individual browser maker to decide how to proceed, and getting back to Adobe, this tussle might support Narayen's notion that "the fragmentation of browsers makes Flash even more important rather than less important."

Six Cores and Turbo from AMD

The Phenom II X6 could be the first affordable hexa-core processor

Acknowledging the limits to today's multithreaded applications, AMD said its upcoming Phenom II X6 will adopt a Turbo Core technology that clocks up three of the cores when all six cores aren't needed.

Unlike Intel's more granular Turbo Boost feature, which achieves the biggest performance gain in single-core usage, then dual-core, then tri-core, etc.—each getting an incrementally smaller boost—AMD's Turbo Core will ratchet up the speed of three of the Phenom II X6's cores 500MHz during light loads. The feature is built into the X6 series and is independent of software.

AMD's upcoming hexa-core will support older AM2+ motherboards.

Both AMD and Intel have introduced their respective Turbo features in reaction to the large number of applications and games that aren't optimized for multicore CPUs.

Phenom II X6 is expected to be released this spring and AMD officials say it will debut at speeds in excess of 3GHz, with several lower SKUs, as well. Officials would not discuss pricing but numerous rumor sites have reported that the top 3GHz+ part will run in the $300 range. That's well south of the $1,000 Intel is asking for its hexa-core 3.33GHz Core i7-980X chip. AMD has also backed off plans to drop DDR2 support in the Phenom II X6. The new X6 chips will be drop-in compatible with AM3 boards and many AM2+ boards that can support performance processors. —GU

LUXURY SOUND

PC Audio Alive and Well

What? People no longer care about computer audio? Bowers & Wilkins begs to differ. The Brits have just introduced two new audiophile-class products: Its 2.0-channel MM-1 powered USB speakers feature three-inch glass-fiber woofers and one-inch tube-loaded aluminum tweeters and cost $500. B&W's luxurious new P5 portable headphones (pictured here) boast 40mm Mylar diaphragms and sheepskin ear pads and headband and cost $300. —MB

FAST FORWARD

Three Times Is the Charm for 3D

Everyone is hopping on the 3D bandwagon. Hollywood is releasing a steady stream of 3D movies. Game developers and graphics-chip vendors are showing new 3D-display technologies for PCs. Nintendo is readying a handheld videogame system that displays 3D graphics without special eyeglasses. Cable and satellite TV providers are experimenting with 3D programming, including live sports. 3D digital cameras are appearing.

It's like everyone suddenly discovered we have two eyes capable of stereoscopic vision. What next? A two-handed mouse?

Of course, 3D isn't really new. The first wave hit in the mid-1800s. The invention of photography made it possible for a dual-lens camera to simultaneously capture two different views of the same scene. When the photos were printed side-by-side on a card and viewed through a binocular-like device, an eye-popping 3D image of the scene emerged. This technology enjoyed wide popularity until the 1920s.

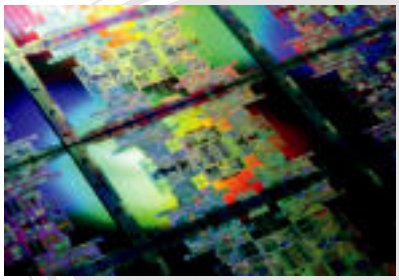
The second wave hit in the 1950s. A new generation of stereo cameras made dual images on transparency film. These stereo slides could be viewed with a handheld device or projected. Using another technology, Hollywood produced several 3D movies, like *House of Wax* and *Creature from the Black Lagoon*. But audiences spurned the uncomfortable cardboard eyeglasses.

What's different this time? The latest 3D glasses promise no eyestrain, though some people remain sensitive. Another technology is autostereoscopy, which makes glasses unnecessary. (Nintendo's DS-3D player will be autostereoscopic; so is FujiFilm's FinePix Real-3D digicam.) However, autostereoscopic screens have narrow viewing angles that are less suitable for large TVs and theaters.

I think 3D will succeed in electronic games, blockbuster movies, and special-event TV programs. Gamers have eagerly embraced novel controllers and other experience-enhancing gizmos, so 3D glasses aren't too nerdy for them. Blockbusters need three dimensions to generate excitement and hide their thin plots. Some TV programming, such as sports, can truly benefit from 3D. (Maybe we'll finally be able to follow the puck.)

However, I think 3D will be less successful in everyday photography, most TV shows, and nonaction movies. But I could be wrong. Skeptics were equally wary of talkies and color film.

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



MS Ditches Itanium

Citing the power of today's x86 server chips, Microsoft will phase out its OS support for Intel's Itanium processor to focus on Xeon and Opteron instead.

MS officials said Windows Server 2008 R2 will be the last for Itanium because x86 is up to the job. The decision is unlikely to immediately hurt Itanium as most servers based on it run UNIX variants, but analysts say it doesn't help the CPU long derisively called the "Itanic." **–GU**

Cisco Intros New Consumer Routers

First new Linksys products in nearly three years

Cisco's new Linksys E-Series line includes a model that runs on Linux and has removable antennas.

Cisco ended a nearly three-year-long dry spell by announcing an entirely new line of Linksys routers. The company also unveiled a new line of routers aimed at less tech-savvy consumers. Marketed under the Valet brand name, users can set up their entire Wi-Fi network using nothing more than the provided USB key.

Three of the new Linksys E-Series routers are housed in the familiar flying-saucer formfactor and use internal antennas. A fourth model—the Linksys E2100L—uses the Linux operating system and features removable external antennas; unfortunately, the integrated Ethernet switch on this model will be limited to Fast Ethernet (10/100Mbps). This strikes us as an odd limitation for a product that's supposedly designed for hardcore users and costs $120.

The Linksys E2000 costs the same but provides a Gigabit Ethernet switch and the option of operating your wireless network on either the 2.4GHz or 5GHz band. The top-of-the-line Linksys E3000 ($180) has a gigabit switch and the ability to operate wireless networks on both the 2.4GHz and 5GHz bands simultaneously. **–MB**

SERVERS GET MORE CORES

AMD, Intel introduce multicore workhorses

Joe Consumer may not understand why he needs a six-core CPU, but Joe IT certainly does. And AMD and Intel are out to please. AMD fired first with its 12-core Opteron 6000 series of chips. Intel then hit back a day later with the release of its Xeon 7500 series that features up to eight cores and Hyper-Threading, to boot. Intel says you could replace a cluster of 20 older single-core Xeons with a single Xeon 7500 server chip. In the process, you would save enough in energy costs to pay for the new machine in one year. AMD, meanwhile, says its Opterons are drop-in compatible with its previous platform, and shops could easily increase their compute power without having to replace the entire server. **–GU**

GAME THEORY

Battlefield Brings the Rain

Readers are welcome to use the following sentence to judge the credibility of what follows. To wit: *The Battlefield series has always been better than the Call of Duty series.*

If reviews and sales are any indication, that's certainly a minority position. While Electronic Arts napped, Activision took over the military shooter genre, thanks to the Call of Duty franchise. EA finally woke up, rummaged around under the bed, and pulled out Battlefield (one of the smartest and most entertaining military shooters ever created) and Medal of Honor (the granddaddy of WW2 shooters). It made a decision to take on Activision by returning to fields it had left fallow far too long.

EA will fail, of course: not at making great games, but at knocking CoD from the top spot. Activision played a long and consistent game with CoD: steadily building a franchise, maintaining a stream of fresh content, ratcheting up the hype, and never falling off the pace of new releases. The games are also very good. Modern Warfare 2 is a strong piece of game design, albeit one with several notable flaws.

Activision will win because CoD has become the Doom of modern military shooters: fast-paced run-'n'-gun action with snap targeting and not a lot of subtlety. It offers grand, dramatic set pieces and an increasingly visceral audio-visual experience. It simply appeals to more gamers.

Battlefield, on the other hand, has always offered something quite different: an all-aspect warfare element favoring precision and methodical pacing rather than the frenetic action that finally tipped into overkill with Modern Warfare 2.

The battlefield of Bad Company 2 is a remarkable place, filled with smart enemies, complex goals, cover that can be shattered in an instant, and a dazzling suite of weapons, vehicles, and aircraft. It offers a far broader array of roles and challenges, but extracts payment with a steeper learning curve that appeals to a smaller demographic.

No, Bad Company 2 will not make MW2 levels of money, but EA shouldn't count that as a failing: It's made a vastly superior game.

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

Acer's H5360 will be compatible with 3D Blu-ray players—when they come to market, that is.

3D on the Big Screen

There are 24-inch 3D monitors for the desktop, 55-inch 3D HDTVs for the living room, and now Acer is offering a video projector capable of casting 3D images onto a 300-inch screen for the home theater.

You'll need to connect the Acer H5360 to a PC equipped with a 3D Vision–compatible Nvidia videocard and provide your own 3D Vision kit and projection screen (unless you have a really white wall). The projector is an entry-level home-theater model based on TI's DLP technology, with native resolution of 1280x720 and a list price of $700. —MB

Droid Hits 1M Faster than iPhone

Nexus One's numbers lag far behind

Sales of the Motorola Droid during its first 74 days were better than those of the first iPhone over the same period, surpassing 1 million, according to mobile analytics group Flurry. By contrast, Google's flagship Android handset, the Nexus One, sold around 130,000 in its first 74 days. But considering that those 130K were sold directly by Google without the benefit of carrier support (and ad campaigns), those numbers aren't bad.

And Google says it's pleased with the Nexus One's sales numbers. A spokesman told us, "Our partners are shipping more than 60,000 Android handsets each day, compared with 30,000 just three months ago." By the end of 2010, Google's operating system will be running on dozens of phone models. No wonder Nexus One's first 74 days don't bother them. —NE

The Nexus One isn't the fastest-selling, but Google's taking the long view.

Cleveland's Poor Get 1Gbps

When the FCC rolled out its National Broadband Plan in March, it explicitly cited the need for research and development in the U.S.'s efforts to expand high-speed Internet access. Google's plan to test a 1Gbps fiber-to-home network is one example of this, but even more ambitious is a new study announced by Cleveland's Case Western Reserve University. The school is funding a research-driven project to outfit the community surrounding the University with 1Gbps fiber optic cable. The households in question, possibly totaling 25,000, are primarily poor—72 percent of the homes around the campus currently have no Internet whatsoever. The project seeks to discover how high-speed Internet access can transform a community. Access to a fast, robust network could, for example, greatly improve neighborhood security (with remote video monitoring), health care (via video conferencing and home health monitoring), and energy efficiency (high-tech thermostats). The school is encouraging community institutions to develop apps for the network, which will follow an open-access model. The results of the study could be instrumental in shaping the country's communications policy. The network build is already underway, and data from the study is expected by 2011. —KS

XXXX XXX

How It All Began: Anne Turns 300

There's not been much good news for copyright watchers lately. Mass lawsuits, bad laws, secret treaties, a war on remixers, and the list goes on. In short, it's a good time for heavy denial and wallowing in past glory. It's also the 300th anniversary of the very first and one of the best copyright laws. Perfect timing! I'm referring to the Statute of Anne—the British act of 1710 (named for Queen Anne) that spawned the whole of copyright law as we know it. Given what I say about copyright laws in general it might be a surprise that I'm a fan of the progenitor, but Anne was extraordinary, radically democratic for its time.

Before Anne, copyrights were granted piecemeal on different works for different terms, including some perpetual copyrights, and pretty much always as court favors. There was no concept of the public domain, and the whole of printing was constrained (and censored) by the government registration of printing presses. Authors had no explicit rights. And the public, like you? You weren't supposed to be reading, anyway. You had wattle to daub.

Then along came Anne. In the spirit of the Age of Enlightenment, the first part of the statute's full name was "An Act for the Encouragement of Learning...." It even included cost-control measures to make sure people had access to knowledge. The masses were going to get some learnin'. And for the first time, authors were to get paid just for being authors. Anne also set up copyright deposit libraries and term limits. Knowledge was not to be locked up.

But most importantly, Anne was a realistic statute for a world of printing presses. Because it was generic, it dealt with how copying really worked in the technology of the time. And it did so aggressively, throwing out the way things had been done for hundreds of years because it just didn't work anymore in the age of the cheapening press. That's the big lesson in all the bad news—that if copyright and expression are to thrive, we need a new Statute of Anne.

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

THE LIST

Can You ID Our Buried Treasure?

For the first time in five years, we cleaned out the Maximum PC Lab, unearthing a treasure trove of artifacts. If you're a true *Maximum PC* super-fan and aficionado of ancient hardware, you'll answer these nine questions with ease. Consider it practice for this year's Geek Quiz!

1 Name this processor:

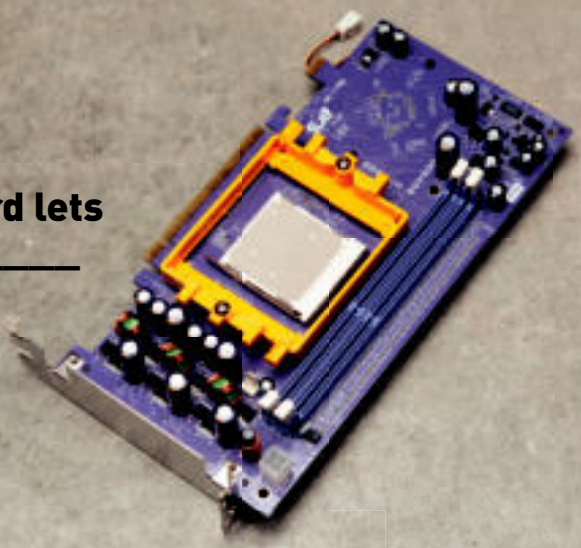
2 This Asus doohicky is a:

3 THIS IS A BOX OF:

4 This ridiculous and infamously unreliable ATI cable was used to:

5

This ECS A95 card lets you run a _____ in a _____ motherboard.



6

This is not an early webcam. It's a:

7

Which dual-processor Dream Machine was this Pentium III used in, and what was its clock speed?

8

THIS IS A COOLER FOR WHAT FORMFACTOR?

9

***Maximum PC*'s patron saint of benchmarks is:**

ANSWERS

1: Slot A Athlon
2: Socket 479 (Pentium M) to Socket 478 (Pentium 4) converter
3: 10 years' worth of bezels collected by Gordon
4: Run two ATI Radeons in CrossFire mode
5: Socket 939, Socket 775
6: Head tracker for flight sims
7: Dream Machine 2000, 1GHz
8: Intel's defunct BTX
9: Editor Emeritus Andrew "Handy Andy" Sanchez

This month the Doctor tackles...

Virtualization Without CPU Support

Secure Delete

IE8's Win7 Amnesia

Radiator Fans: Removable?

I'm debating switching to water-cooling. I was initially worried about maintenance or the unit leaking, but those issues seem to be a thing of the past. What happens, however, if the fan stops working on the radiator? Is the fan difficult to replace? Would you have to replace the entire unit? Anytime I see reviews or ads, they never specify whether the fan is replaceable or permanently attached to the radiator unit.

—Joe C.

Joe, many water-cooling radiators are sold without fans, and even the ones that include fans typically let you replace them with your own. Popular fans for water-cooling radiators include Scythe Gentle Typhoon, Sharkoon Silent Eagle, and Noctua NF-12P. We can't think of a single water-cooling radiator on which you're unable to replace the fan.

New Machine Won't Boot

Doc, I just built a new system with a 2.66GHz Core i7-920, Asus P6X58D Premium, 3GB of Corsair DDR3/1600, two GeForce 8800 GTs in SLI, two 250GB Barracudas, and an 850W Corsair PSU in an Antec 1200 case. It's all stock-clocked and the GPUs, HDDs, and PSU were from an older machine and functioned fine.

My problem is that my new rig doesn't work. I power on, but no boot. No POST, nothing on the screen, no beeps. The MEM_OK LED is on and it is red. The manual says that means the RAM is not properly installed.

So, I check to see if they are all in the correct slots, and they are. I pull them all out and put them in, one at a time, and none of them work. I took a stick from a working computer and it doesn't work. I try it on every slot, same. I take my Corsair RAM and try it in the working computer, and it all works. I power on the system with no RAM installed, and same thing; no boot, no POST, nothing on screen.

After all that, I put the Corsair RAM in and took out the videocards. I then put a 9800 GT from a working computer in and the problem is the same.

So, any thoughts? Aside from assuming that the board is defective, I don't know what else to try troubleshooting. I have heard that Asus has had some problems recently with RAM slots not working. I may have fallen victim to that. Maybe a jumper I don't know about? As far as I can see, the only jumpers on the board are related to OC'ing, and I didn't change any of them. Let me know what you think.

—K. Diaz

Whenever you build a new system and you run into a no-POST situation, you should first double-check your power connectors. Did you plug in the ATX12V connector located near the CPU? This is a very common oversight. You should also reseat your videocards, RAM, and finally (if those did not fix it), the CPU. The Doc knows you tried the RAM in many different slots, but one thing to remember with Core i7 systems is that the RAM should be paired up in the slots away from the CPU, not closest to the CPU as it has been with Core 2 and Phenom/Athlon systems. Failure to do this will cause a failure to boot. Since this is a new system, it's also possible that you may have shorted the board on a motherboard standoff. You should dismount the board. Then, with it out, count the number of standoffs in the case enclosure, remount the board and screw it in place. If the number of screws you put in the board doesn't match the number of standoffs, you have a standoff poking the motherboard in its backside, which could cause the problem. The final thing to consider is that you may have bent pins on your motherboard's CPU socket. This would be very, very bad news, as bent pins in the CPU socket mean the board is dead. When you remove your CPU to reseat it, take a close look at those tiny fingers in the socket and look for any signs of damage.

THE CHANCES OF REPLACING A BAD HARD DRIVE WITH ANOTHER BAD DRIVE ARE INFINITESIMAL—3,720 TO 1

Delete EVERYTHING!

I'd like a program that can safely and effectively clean my hard drive so that no deleted files can be recovered. Can you recommend something? I see a bunch of stuff out there but it's for permanently deleting files, not for already-deleted files. And I don't know which programs are clean—free of malware or other crap. It must be good enough that I can feel safe about giving an old PC to someone else and not worry about identity theft. Also: What would you recommend to minimize any data being stolen from a hard drive if your PC was stolen? I am presently using Splash ID to store my passwords and sensitive data but would feel better if the entire hard drive was protected.

—Norm Shaver

Among its many other features, TrueCrypt lets you encrypt an existing system drive—while you're running it!

One thing at a time, Norm: First, there are several programs that will irrevocably write over your drive—each hard drive manufacturer has its own. We like using Darik's Boot and Nuke (www.dban.org) from a boot disk—it offers Department of Defense–level overwriting security. Of course, this will completely and irrevocably delete everything on the drive, so if you're giving that old PC away, you'll need to do a clean install afterward—which you should do anyway, of course.

Eraser (http://eraser.heidi.ie) lets you securely erase individual files, if you were looking for that, and doesn't include malware or the aforementioned other crap.

The best way to protect your data in the event of your PC being stolen is to use full-disk encryption. There are several options for full-disk encryption; one of our favorites is TrueCrypt (www.truecrypt.org). TrueCrypt can even encrypt your boot drive while you're using it, so you don't need to do a clean install on an encrypted disk. All you have to do is download and install TrueCrypt, then select System > Encrypt System Partition / Drive and follow the instructions. You can find documentation at http://bit.ly/x72Ec. Once your drive is encrypted, you'll have to enter a master password before any of your data is decrypted, so if someone steals your computer, they're not getting your data.

Windows 7 Fails Where XP Succeeds?

I have Windows 7 Home Edition 64-bit. When I download pictures from the Internet, I want to save them to a specific folder—let's call it ABC. I right-click the picture and select Save Picture As. Then Windows Explorer sends me to Libraries\Picture Library. I then navigate to ABC folder and click it, then click Save. I right-click the second picture, but I'm sent back to the pictures library! The save dialog in Windows XP would open right at the last directory I saved photos to, so I didn't have to click back to the ABC folder every time. Why won't Windows 7 do the same?

—Glenn

The doctor assumes you're using Internet Explorer 8 (the default Internet browser in Windows 7). While it's not clear why IE8 on Windows 7 doesn't offer this functionality when IE8 in XP does, Microsoft has indicated that this is not a high-priority problem for them. You could try a different web browser, like Firefox or Chrome, which do remember the specific folder, or you could use a program like Belvedere. Belvedere (http://bit.ly/1SFrlo) is a little complex to set up, but basically it allows you to watch a folder and automatically move files to it based on certain criteria.

For example, if you want every .jpg file you save to be put in the ABC folder, you can set up Belvedere in your Libraries\Picture Library and make a filter so that every .jpg you save to the default folder gets moved to the ABC folder.

New Drive Failing

So I just recently diagnosed my hard drive as having bad sectors and replaced it with a 750GB WD Caviar Black a few days ago. However, occasionally, as with my old hard drive, my system will lock up. When I reboot I get the following error: "Disk boot failure, please insert system disc and press enter." Sometimes after a restart I will receive the same error, other times the hard drive will boot but my keyboard receives no power. I haven't figured out why, but everything seems to sort itself out eventually.

One note: I have an old IDE drive that I was using once my old SATA drive became completely unusable. This hard drive never crashes or gives errors, and the keyboard never loses power.

I'm puzzled, and am running out of time to RMA this hard drive if I happened

to get a bad one. Please help!
—Jesse Dresselhaus

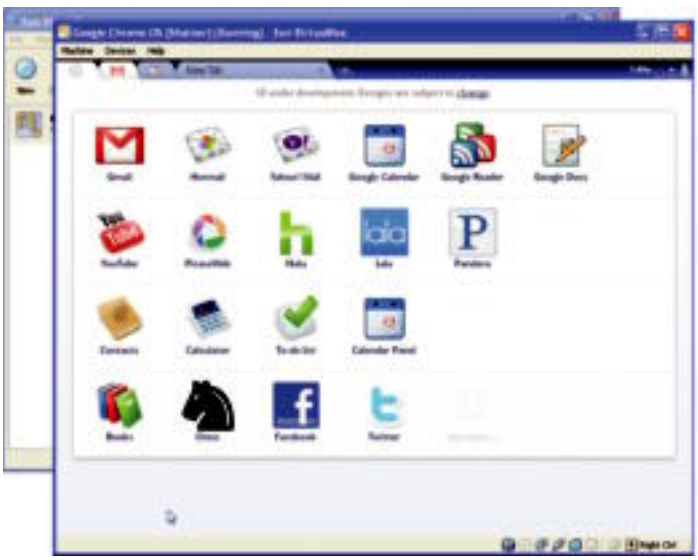
It's unlikely to be a drive problem (although if it is, note that your RMA period will likely be longer with Western Digital than the retailer). The chances of replacing a bad hard drive with another bad drive are infinitesimal—something like 3,720 to 1. Your problems are likely related to a bad SATA port on the motherboard, a bad SATA cable, or a power or data cable not firmly plugged in on the board. There's also one other issue that could be causing the booting problem. Many older motherboards, oddly, change the boot order if a USB drive is connected to a USB port. Your booting issue could be related to this sporadic problem that only happens on occasion when you have a USB thumb drive installed.

On the other hand, the keyboard power issue could be indicative of problems with the motherboard itself. Just because you're getting hard drive errors doesn't mean it's entirely a hard drive issue. A failing board or other component in the system, such as RAM, or the classic "bad cap" problem can sometimes induce similar errors.

Upgrading Frankenstein's Monster

Right now, I'm trying to upgrade to Vista Ultimate (so when I can get Windows 7, I can keep everything) from XP Pro SP3. At the end of the installation, a blue screen pops up for a second and restarts the entire machine, ruining a five-hour install. I tried installing new RAM (the old DIMMs were faulty) but it failed to work. I can't build a new rig as I don't have the cash to make a proper one, and I don't want to do a clean install as my PC has a nasty habit of being terribly unstable without certain patches (due to something CPU-related). My computer is an M3A78-EM motherboard with an AMD Phenom II X4 940 BE CPU (which amazingly, has survived a full motherboard short-out), a GeForce 8800 GTS graphics card, and two 2GB DDR2 RAM sticks. Both of the operating systems are 32-bit. Is this problem software- or hardware-related?
—Brandon Hurley

Brandon, it's pretty hard to diagnose your case. Upgrading from Windows XP to Vista to Windows 7 on a system that has had a full "motherboard short-out" and not one, but two bad RAM modules and is unstable without "certain patches" tells me that you probably have some pretty serious problems with your hardware. You should consider putting off your plans for Windows 7 until you have the ducats to properly replace the hardware. The Doctor doubts it would be a good idea to burn an activation on a board that may very well give up the ghost at any minute. Remember, OEM copies (assuming you bought one) of Microsoft operating systems are tied to the motherboard. If the board dies, Microsoft can technically deny letting you activate it on a new motherboard.



VirtualBox runs just fine, even if your CPU doesn't support virtualization.

Is Hardware Virtualization Necessary?

I am running 32-bit Windows 7 and I have a CPU that does not support hardware virtualization. I need virtualization software that does not require Intel VT, and was wondering if you had any recommendations. I have heard of VirtualBox but I'm not sure if you need VT support. Does VMWare have any products that don't require hardware virtualization?
—Josh Morgan

VirtualBox (www.virtualbox.org) works fine without hardware virtualization support, although it works even better with Intel VT. VMWare Server doesn't require hardware virtualization, either, but again, you'll get better results with it.

SECOND OPINION

Resetting BIOS with Boot Disk

I love your column and *Maximum PC*, but there is much better advice for resetting a BIOS password on a laptop (March 2010). Clearly, you've never had to do it. Basically, you boot into DOS and use DEBUG to corrupt the BIOS. On reboot, the BIOS realizes there is an error and resets everything to factory defaults, thus eliminating the password. I won't waste your time explaining the specifics here but a simple Google search for "debug bios reset" will provide all the necessary info. I've used this technique many times on out-of-date work laptops in order to get past the BIOS password. Frankly, the hardest part is making the boot disk. —ANDREW W.

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.

Nix the Friction FROM YOUR WIN7 SYSTEM!

Your OS drives your whole PC experience, so it's your job as an enthusiast to keep it in a high state of tune

BY NORMAN CHAN, MARK SOPER & JON PHILLIPS

After installing a new OS, most people just jump right in and start driving it through all their favorite applications and games. Makes sense, right? The operating system, after all, should be a background player in the computing experience—a means to an end, with the end being web surfing, content editing, and wanton destruction in the first-person shooter of one's choice.

The problem, however, is that most people, even a lot of self-described power users, never take the time to really tune the new OS, exploring its menus and setting up the interface for the fastest, most convenient operation based on personal preferences. And as operating systems offer more and more user controls, it's the curious, performance-minded enthusiast who has the most to gain from tuning an OS to his or her liking.

It's been about six months since Windows 7 hit the market, so we figure most of our readers have made their upgrades. For those who've made that jump, we present a bottle of our favorite Windows 7 tips, each designed to help you extract the very last bits of convenience and GUI-navigating performance from your own personal dream machine. And if you haven't yet upgraded to Win7, we trust you will after reading this article, as its core features—let alone its actual Lab-benchmarked performance—kicks Vista and XP ass.

We close out our tuning session with a tip designed to supercharge the process of *installing* the OS. By loading Windows 7 onto a USB key, and making that key a bootable drive, you can do an end-run around slow optical-drive technology and install your OS in (pardon the pun) a flash.

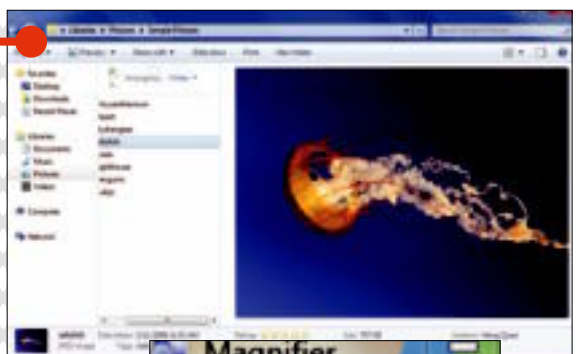
It's time to get started. Park your computer, but don't shut down. This is one PC tune-up that can only be done with your engine running.

Twist cap carefully. Only pour into Maximum PC–approved computer tanks.

Keyboard Shortcuts for Committed Mouse Abolitionists

Let's kick off this power-user party with keyboard shortcuts—tricks every enthusiast should memorize when mastering a new OS. We're confident the following time-saving keystrokes will save you precious neural processing cycles, and make your mouse jealous with neglect.

■ **Alt** + **P** In Windows Explorer, this shortcut activates a preview pane of your selected file, be it an image, sound, or video document. This panel is great for previewing images in your photos directory, obviating the need for fancier third-party software.



■ **Windows** + **Up** and **Windows** + **Down** If a window isn't maximized, pressing the Windows + Up arrow key will make it fill your entire screen. Windows + Down arrow will minimize that active window.

■ **Windows** + **Shift** + **Up** and **Windows** + **Shift** + **Down** Hitting these three keys will vertically stretch an active window to the maximum desktop height (the width of the window, however, will stay the same). Pressing Windows + Shift+ Down will restore the window to its previous dimensions.

■ **Windows** + **+** and **Windows** + **-** Pressing the Windows button with either the plus or minus key activates the Magnifier, letting you zoom in on the entire desktop or open a rectangular magnifying lens to zoom in on (and out of) parts of your screen. You can also customize the Magnifier to follow your mouse pointer or keyboard cursor.

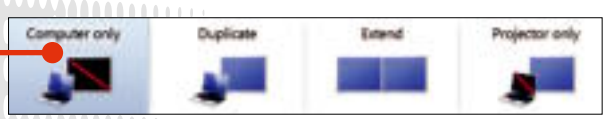
■ **Windows** + **Left** and **Windows** + **Right** These two shortcuts will make your active window fill up exactly one half of your screen—depending on which arrow key you use. And once a window is fixed to one side of the screen, you can repeat the shortcut with the same arrow key to flip it to the other side.

■ **Windows** + **Home** This shortcut minimizes every open window on your desktop except the active window. Pressing this shortcut again restores all the minimized windows.

■ **Windows** + **T** Like Alt + Tab (still our all-time-favorite Windows shortcut), Windows + T cycles through thumbnails of your open programs via the Taskbar's peek menu.

■ **Windows** + **E** Automatically opens up a new Explorer window to show your Libraries folder.

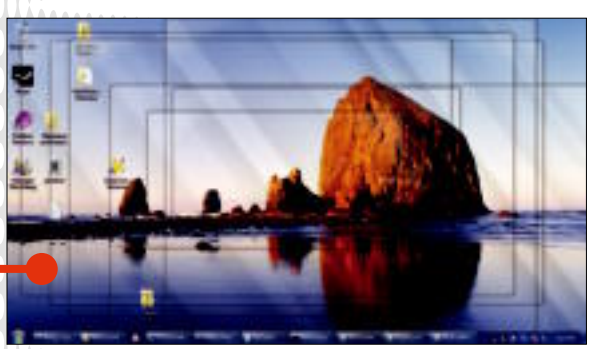
■ **Windows** + **P** Manage your multiple-monitor setup more efficiently with this handy shortcut. Windows + P opens a small overlay that lets you configure a second display or projector. You can switch from a single monitor to dual-display in either mirror or extend-desktop mode.



■ **Windows** + **Shift** + **Left** and **Windows** + **Shift** + **Right** If you're using two or more displays—and you are, aren't you?—memorize this shortcut to easily move a window from one screen to the other. The window retains its size and relative position on the new screen, which is useful when working with multiple documents.

■ **Windows** + **[Number]** Programs (and new instances) pinned to your Taskbar can be launched by hitting Windows and the appropriate number key. Windows + 1, for example, launches the first application in the taskbar, while Windows + 4 will launch the fourth.

■ **Windows** + **Space** This combo performs the same function as moving your mouse to the bottom right of the Taskbar: It makes every active window transparent (save faint outlines) so you can view the desktop underneath.



Track Your Actions with Problem Step Recorder

To aid their development of Windows 7 beta versions, the Microsoft engineers built in a diagnostic tool called Problem Steps Recorder that combines screen captures with mouse tracking to record your actions. You can launch this program from the Start Menu by typing psr.exe in the search field. Hit the Record button and the applet tracks your mouse and keyboard input while taking screenshots that correspond with each new action. When you stop recording, your session is saved to an HTML slide show recreating your steps, to which you can add comments and annotations. This tool is insanely useful if you need to create a tutorial for a computer-illiterate relative. Hi Mom, hi Dad!

Master Your New Font Manager

Font management is much improved in Windows 7. The Add Fonts dialog is history, and in its place is new functionality within the Fonts folder itself. First, the folder now shows font previews via each font file's icon (visible with Large or Extra Large icon views). Second, fonts from a single set will no longer show up as different fonts; they're now combined as a single family, which can be expanded by double-clicking the icon. Third, you can now toggle fonts on and off by right-clicking a font icon and selecting the Hide option. This prevents applications from loading the font (thus saving memory), but still keeps the file retained in the Font folder. Finally, Windows 7 includes a new fancy, free-flowing font called Gabriola that shows off the advanced antialiasing, text rendering, and "stylistic alternate" font flourishes afforded by DirectWrite (Microsoft's API for 2D text rendering) and OpenType.

Launch Games with Keystrokes

One of our biggest annoyances with Windows Vista was the Games Folder, aka the Gaming Grotto, aka the Gaming Ghetto. In Vista, Games for Windows titles and other game shortcuts automatically install to this directory, which you can only access with a Start Menu shortcut. This scheme prevents you from starting a game from the Start Menu search bar (aka the power user, keyboard-only method). Indeed, while you can launch any other application by mashing the Windows key, and typing its name in the Start Menu field, this isn't the case for games installed to Vista's Games Folder. Well, this oversight is fixed in Windows 7, and the universe is now home to slightly less evil.

BURN A SPITTIN' IMAGE

You can quit messing around with ostensibly free, malware-infected burning software, because Windows 7 comes loaded with a DVD and CD ISO burning application. Just double-click your image file and Windows will start a tiny program window to help burn your disc. It's a bare-bones app, but it works!

Become More Worldly with Hidden Wallpapers

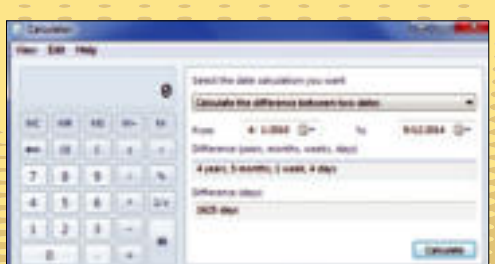
Besides its default desktop wallpaper, Win7 includes desktop backgrounds catered to your region (which is identified when you first install the OS). We Americans, for example, get six 1900x1200 images showing off National Parks and beaches. However, if your tastes run more international—don't worry, we won't hold that against you—you can grab wallpapers for other regions from a hidden folder. Type globalization in a search of your C: drive. The only result should be a folder located in the main Windows directory, and you should only be able to see ELS and Sorting folders nested here. Now search for MCT in the top-right search bar. This will display five new unindexed folders, each corresponding to a different global region. Browse these folders for some extra themes and wallpapers specific to Australia, United Kingdom, South Africa, and Canada.

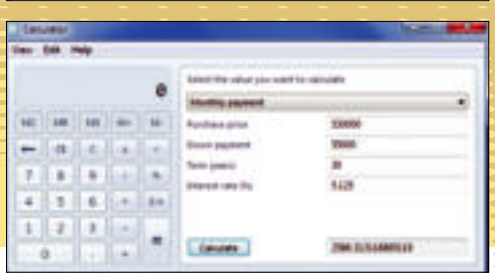
Take Control of UAC

Despite good intentions, User Account Control pop-ups were one of the most annoying aspects of Vista, and thus UAC became a feature that most of us immediately disabled after a clean install. UAC in Windows 7 displays fewer warnings, but you can also fine-tune its notification habits by launching the UAC Settings dialog from the Start Menu. Just type UAC in the Start Menu search field and click the result. We find that setting the bar to just one tick above "Never notify" provides a comfortable balance between mindful security and incessant, Alice Kramden–caliber nagging

CALCULATE YOUR MORTGAGE AND OTHER MATH TRICKS

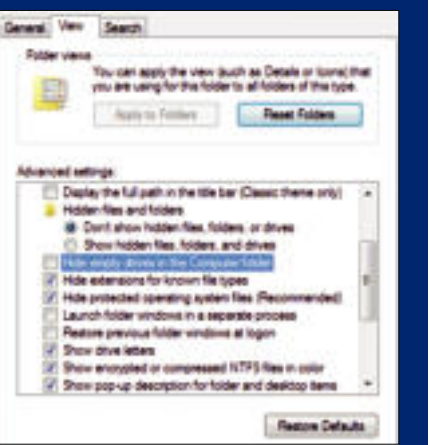
The reliable Calculator applet has been beefed up to do more than just basic arithmetic. You can now toggle between Standard, Scientific, Programmer, and even Statistics modes. In addition, the Options menu lets you pull out many new automated conversation tools, such as Unit Conversion (e.g., Angles, Temperature, Velocity, and Volume) and Date Calculation (e.g., calculate the difference between two dates). More templates give you the ability to crunch gas mileage, lease tipping points, and even mortgage estimates (yeah, right!) based on any variables you input.





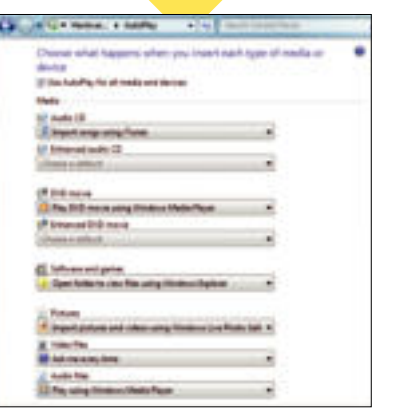
REVEAL ALL OF YOUR DRIVES

If you use built-in memory-card readers in a 3.5-inch drive bay or on your desktop display, empty memory card slots will not show up as drives in My Computer. But that doesn't mean they're not still there. To reveal hidden memory card slots, open My Computer. Press Alt to show the toolbar at the top of the screen, and go to Folder Options under Tools. Hit the View tab and uncheck the "Hide empty drives in the Computer folder" option.



Control AutoPlay Settings Like a Megalomaniacal Tyrant

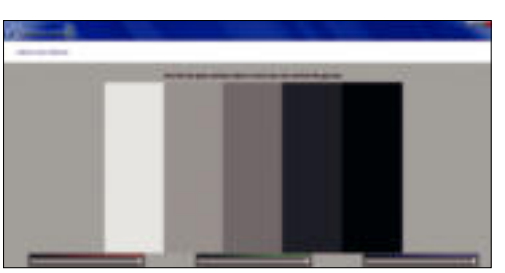
Windows 7's version of AutoPlay, like its predecessors', lets you specify what to do with media types when you connect an external drive or insert a disc. Sure, you may have hated AutoPlay in Windows XP, but Win7 provides you with reasons to take a fresh look. As in Vista, Win7 lets you configure AutoPlay settings by media type, but you should poke around for more tweaking options. Open Control Panel, select Hardware and Sound, and then select AutoPlay. By default, Win7 uses AutoPlay for all media and devices; this can be unchecked, and from there you can personalize AutoPlay actions like a madman. Note that each type of media—music CDs, DVDs, software and games, media files, blank media, and video discs—offers you choices based on Windows utilities as well as third-party programs. Choose your favorite app as an AutoPlay default, or to keep the traditional pop-up AutoPlay menu, select Ask Me Every Time.



Use Devices and Printers to Quickly Dig into Hardware

Tired of switching between Device Manager, Properties menus for your devices, and the Start Menu to manage and use printers, digital cameras, mice, and other peripherals? Windows 7 comes to your rescue with its Devices and Printers dialog. Open Control Panel and select View Devices and Printers from the Hardware and Sound category. Right-click a device icon in Devices and Printers to configure the hardware, create shortcuts, troubleshoot, view properties, and run programs. Devices and Printers can save you a lot of effort. For example, when you use it to manage your computer, you have one-touch access to 12 different Control Panel and Explorer interfaces. And when you use a Windows 7–specific driver that supports Device Stage, Devices and Printers uses thumbnail art of the *actual device*, as shown.

Calibrate Your Notebook's Text and Color

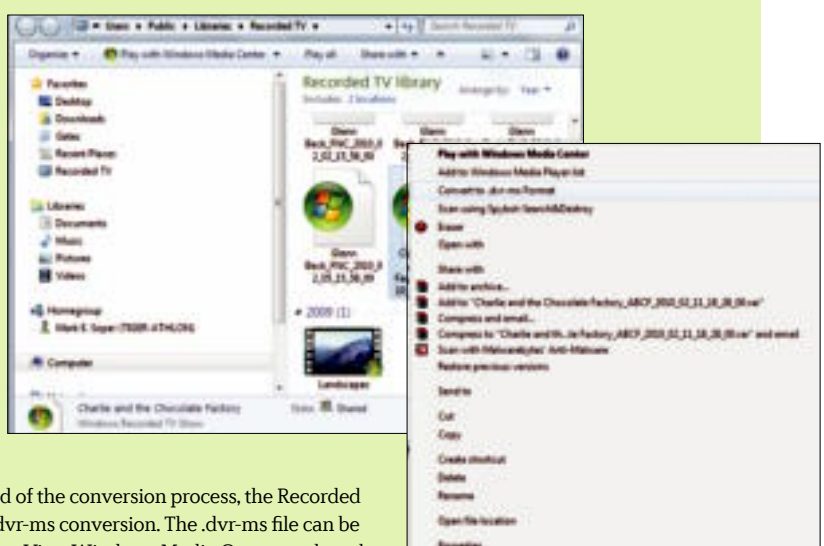


After doing a clean install of Windows 7 on a notebook, the first thing you should do is tune and calibrate ClearType text and Display Color. Windows 7 includes two built-in wizards that run you through the entire process, pain-free. Launch ClearType Text Tuning by typing cttune in the Start Menu search field and opening the search result. You'll go through a brief series of steps that ask you to identify the best-looking text-rendering method. For Display Color Calibration—useful if you're using Windows 7 with a projector or large-screen LCD—search and launch dccw from the Start Menu. It'll run you through a series of pages where you can adjust the gamma, brightness, contrast, and color of the screen to make images look their best.

Solve External Hard Drive Hassles with Convert.exe

Windows 7 prefers hard disk drives that use the NTFS file system: Its integrated backup program cannot back up files from or to drives that use the older FAT32 file system. So, if you select a drive that uses FAT32 as the backup location, Windows 7 displays an error message. FAT32, a leftover from the days of Windows 98, works with both MacOS and Windows (which is why most external hard disks use this file system by default), but it lacks the features needed to fully support Windows 7 backup. Use Convert.exe to solve this problem. Open a command-prompt session and use the following command to change your external hard disk's file system: `convert x: /fs:ntfs` (replace x with the actual drive letter of your external hard disk). Convert.exe will check your external hard disk for errors, verify there's enough space for conversion, and then convert with abandon. While this theoretically will not destroy your data, we recommend you back up your files first.

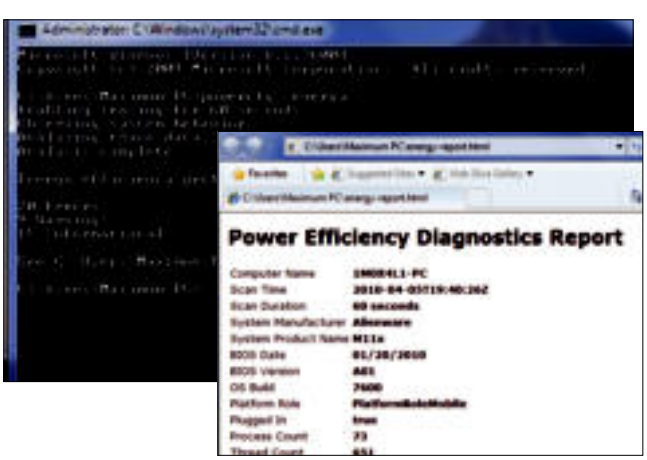
CONVERT WMC RECORDINGS FOR USE WITH VISTA AND XP



Windows Media Center (WMC) improved in the jump from Vista to Windows 7—you'll find better integration of cable, broadcast, and Internet TV in the program guide, better support for widescreen displays, and a refined user interface, among other changes. But if you want to share your recordings with Windows XP or Vista users, or use the dozens of recording and file-conversion utilities made for those versions of WMC, you're sort of screwed, as Windows 7 no longer uses the DVR-MS file format for recording. Instead, it uses WTV (Windows TV), and WTV files can't be used by older versions of WMC or Windows Media Player.

You can, however, convert a TV recording from WTV to DVR-MS by using the conversion utility provided in Win7.

TV recordings are stored by default in the Public Recorded TV library. Open the library, right-click the recording, and select Convert to DVR-MS Format. At the end of the conversion process, the Recorded TV library contains both your original .wtv file as well the .dvr-ms conversion. The .dvr-ms file can be used with programs designed for Windows XP and Windows Vista Windows Media Center, and can be played on Windows Media Center and Windows Media Player in Windows XP and Windows Vista.

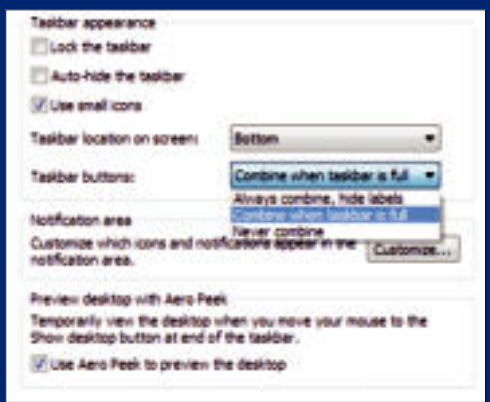


COMMAND WINDOWS 7 TO GENERATE AN ENERGY REPORT

As a power user, you may be concerned with power consumption, making the command-line utility powercfg.exe a must-see. To create a report on your PC's energy appetite, press the Windows key and type cmd in the search box. Right-click cmd and select Run as Administrator. Now, select the box and type `powercfg -energy` at the command-line prompt, and hit Enter. Powercfg will run for about 60 seconds, then generate a report called energy-report.html in C:\Windows\system32. This report will notify you of anything in your computer that is keeping the CPU cycling, thus burning power and sucking notebook batteries dry. After you run the report, you'll likely find that USB devices never entered Suspend state. While you might think the power consumption of a USB key is pretty insignificant, if it prevents the CPU from cycling off, that device can really hit where it hurts—in your battery's nards.

CLING (DESPERATELY) TO VISTA'S TASKBAR

Let's start with the bad news: Windows 7 eliminates the option to use the classic grey Windows 2000–style Taskbar. You're also committed to the modern version of the Start Menu. But the good news is that you can still tweak the Taskbar to make it run like it did in Windows Vista, replacing the program icons with the names of each open app. Right-click the Taskbar and hit Properties. Check the "Use small icons" box and select "Combine when Taskbar is full" from the drop-down menu under Taskbar buttons. You still get the peek-view thumbnail feature of the Taskbar, and inactive programs remain as single icons, but open programs will display their full names.



EXILE PROGRAMS TO THE SYSTEM TRAY

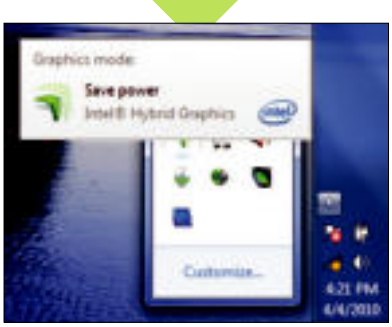
All active programs show up as icons on the Taskbar, whether you want them to or not. While this is useful for web browsing or word processing, your taskbar can get cluttered with icons you would normally expect to be hidden away, like those for Steam or a chat client. You can, however, keep active instances of these programs hidden away in the System Tray/Notification Area by right-clicking their shortcuts, navigating to the Compatibility tab, and selecting Windows Vista under the Compatibility Mode drop-down menu. Just be aware that this only works for programs that would previously hide away from the Taskbar in Vista.

Manage Your Jump Lists

The Jump List, a list of shortcuts to files or tasks for a particular Start Menu or Taskbar item, is one of the most significant improvements in Windows 7. Each time you open a file or website, or run a task with a program that supports Jump Lists, Windows 7 stores the shortcut to the file, website, or task for reuse. Unlike Windows XP, however, Windows 7 doesn't group these shortcuts into a single location. Instead, it stores shortcuts for each program's files, websites, or tasks in a separate shortcut list—aka the Jump List. To see the Jump List for a program in the Start Menu, simply click the right-arrow icon. To see the Jump List for a program icon on the Taskbar, right-click the icon. Windows eventually removes items from the Jump List when it runs out of space, but you can override this. To make any Jump List item a permanent entry, highlight it and click the pushpin icon (reverse this process to unpin it). And if the idea of leaving an icon trail of all your recent history disturbs you, you can disable Jump Lists entirely: Right-click the Start Menu, choose Properties, and uncheck the two boxes under Privacy.

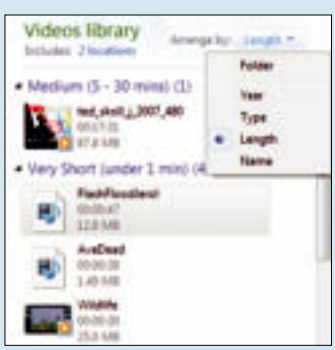
Organize Your Taskbar and System Tray

The programs that you pin to your Taskbar can be moved around to any order you want, whether they're just shortcut icons or currently active applications. The Taskbar, if unlocked, can also be dragged to latch to the left, right, or even top of your desktop. As shown below, Windows 7 improves side-docked Taskbar support with better gradient rendering and shortcut support. It really works well if you're using a widescreen monitor. Just as the Taskbar icons can be rearranged at will, the icons in the System Tray (actually called the Notification Area) can be dragged and set to any order, as well. Hidden Icons can be dragged back into view, and you can hide icons by dragging them over the white triangle, and dropping them into the Hidden Icon well—much easier than working through the Notification Area Customization menu.



Accelerate Your Start Menu

The Start Menu hasn't changed much from Vista, but there are some notable improvements. The behavior of the power button has been changed to Shut Down, as opposed to Hibernate, which was the asinine default in Vista. But you can also change the button default to do other actions. Right-click the Start Menu, and choose Properties. From the Power Button Action drop-down, you can choose a new default button behavior. If you hit the Customize button, you'll enter a world of opportunities that help you control what the Start Menu displays. Most options are turned off, but you may want some on, like the option to display recorded TV files, a feature that's new in Windows 7. Also be aware that Start Menu items should be set to "Display as a link" if you want them to open up Jump Lists.

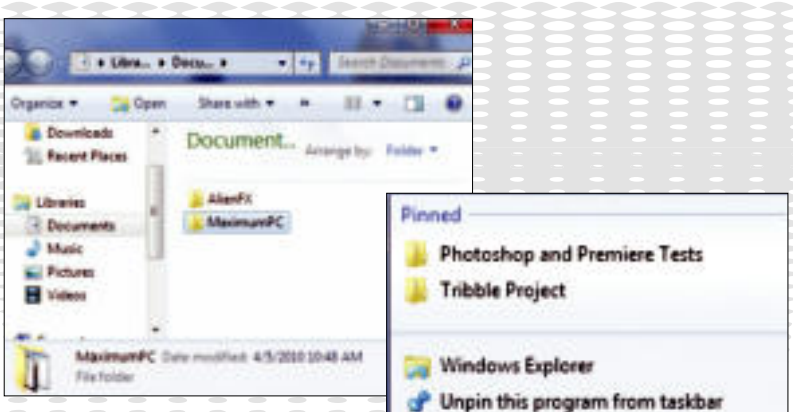


Arrange Files by Type, Month, Artist, and Other Options

Windows Vista introduced the concept of using the Details folder view to group files by criteria such as name, date modified, type, size, and other options. These choices are still available in any folder by right-clicking inside the folder and selecting them from the options menu. But Window 7 does Vista one better with its new Libraries scheme, which enables you to view the contents of *multiple* file locations in a single logical folder. And as you'd expect, each Library comes correct with contextual file-arrangement options that vary according to what's being viewed. For example, in the Pictures library, you can choose from Day, Rating, Tag, and Month. For videos, maybe arranging by Length, as in our screenshot, is most relevant. You get the point.

PIN FOLDERS TO FAVORITES AND START MENU

Explorer's Jump List shows your seven most frequently visited folders, but you can manually bookmark some favorites to the top of the list by pinning folder locations. Just right-click any folder—either on your desktop or from an open instance of Explorer—and drag that folder icon to the Explorer shortcut on the Taskbar. You'll see a message that reads "Pin to Windows Explorer" before you release the mouse button. The folder will appear under a Pinned section of the Jump List, and you can remove it by clicking the "Unpin from this list" icon on the right side of the panel. You can also right-click and drag a folder directly to the Start button to pin that folder to the general Start list.



Put an OS in Your Pocket

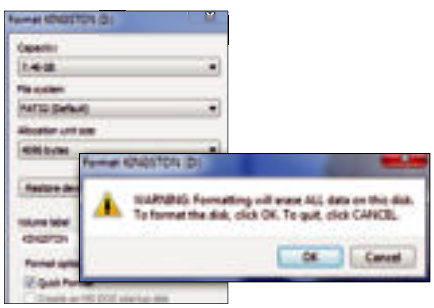
How to load Windows 7 onto a bootable USB key

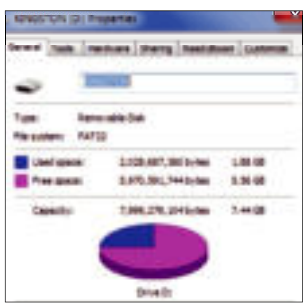
To complete your Windows 7 power-user experience, you may consider dropping the whole darn OS onto a USB drive. Whether you carry it around in your pocket or toss it in a desk drawer, it's a perfect boot disk for emergency installs—including those times when you're working with a netbook or some other computer that lacks an optical drive. Even better, your install times will be significantly reduced, thanks to your key's flash memory—we shaved off minutes from our total install time.

Here's how to create a schmancy-fancy boot key for either Windows 7 or Vista—but not for other OSes, so please don't try! We've run a truncated version of this article in the magazine before, but because it was so incredibly popular—and so germane to this feature story—we've decided to share it again, this time with more detail and screens.

1 Format Your USB Key

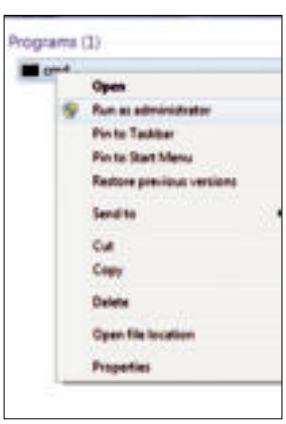
Plug in your USB key and back up any existing data stored on it. You'll need to format the key (thus erasing existing data) before you can make it a bootable device. We used an 8GB key, but a 4GB key will also work.





2 Partition that Key in CMD

Open up a command prompt as an Administrator. You can do this by searching for cmd.exe in your Windows/System32 folder, right-clicking the executable, and selecting "Run as administrator." Alternatively, type CMD in the Start Menu search field and activate the command prompt using Ctrl + Shift + Enter.



You should now be under C:\Windows\system32 (assuming your Windows partition is the C drive). Type `diskpart` in the command line to enter the Disk Partition command-line tool, which lets you format and create partitions on active disks. Now type `list disk` to reveal a list of all your active disks, each of which is associated with a number. Make a note of which one is your USB key, based on the capacity. In this screenshot, our USB drive is Disk 2.

3 Format Away (Command-Prompt Style)

It's now time to enter a load of commands to properly partition the key, and format for the NTFS (did you know this stands for "New Technology File System"?). In succession, enter the following—and type carefully, Jimbo!

`Select Disk #` (where # is the number of your USB disk. We typed `Select Disk 2` for this job)

`Clean` (this removes any existing partitions from the USB disk, including any hidden sectors)

`Create Partition Primary` (creates a new primary partition with default parameters)

`Select Partition 1` (focuses operation on the newly created partition)

`Active` (sets the partition to active, informing the disk firmware that this is a valid system partition)

`Format FS=NTFS` (formats the partition with the NTFS file system. This may take several minutes to complete, depending on the size of your USB key)

`Assign` (this gives the USB drive a Windows volume and next available drive letter, which you should write down. In our case, drive "L" was assigned)

`Exit` (quits the DiskPart tool)

4 Copy Windows DVD to a Desktop Folder

Insert the Windows 7 installation DVD into your drive, and view the files that it contains. Copy all of the files to a folder on your Desktop. We put the disc contents in a folder named Windows 7.

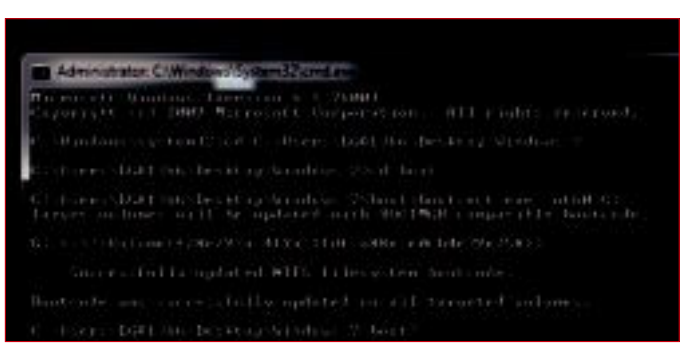
5 Turn Your Key into a Bootable Device

Now, go back to your command prompt, running it as an Administrator. Using the `CD` command, navigate your way to the folder where you placed the Windows disk ISO files. Your command line path should look something like `C:\Users\USERNAMEHERE\Desktop\Windows 7\` if you followed our lead on folder placement. Now type the following commands:

`CD Boot` (this gets you into the boot directory)

`Bootsect.exe /nt60 L:` (this assumes L is the drive letter assigned to your USB key from the previous step)

In case you're wondering, Bootsect infuses boot manager–compatible code into your USB key to make it a bootable device. Also be aware that if you're currently running 32-bit Windows Vista or 7, Bootsect will *only* work if you use the files from the 32-bit Windows 7 install disc. The Bootsect executable from the 64-bit version will *not* run in 32-bit Vista. Don't forget it!



6 Load the USB Key with Your Install Files

Copy all of the extracted ISO files into the USB drive. You don't need to do this from the command prompt. Just drag and drop the files from the Windows 7 folder into the USB drive using Windows Explorer. We also recommend copying your hardware drivers onto the same key so the installation wizard can find them.

Your USB key is now all ready to go! Plug it into your target system and make sure you enter the BIOS (typically by hitting F2 or F12) to temporarily change the boot order to allow booting from the USB key before your primary hard drive or optical drive. Now, when you plug the key into a machine, your system should automatically begin speedily downloading setup files off of the USB key and entering Windows 7 installation.

NVIDIA PLAYS ITS

Nuclear Option

At long last, Nvidia's Fermi GPU is available for consumers in the form of the GTX 480. Is this 3-billion-transistor monster that eats power supplies for lunch everything gamers have been waiting for?

BY LOYD CASE

Enrico Fermi gained fame as a key player in the Manhattan Project, which gave the world nuclear fission and the first atomic bomb. Nvidia's Fermi GPU architecture—now seeing the light of day as the GeForce GTX 480—seeks to create its own chain reaction among PC gamers looking for the latest and greatest graphics card.

Originally code-named GF100, the GTX 480 has had a long and controversial gestation that's seen numerous delays, but Nvidia's new graphics card has finally arrived. Sporting 1.5GB of fast DDR5 memory, an exotic heat pipe–based cooling system, and a staggering 3 billion transistors, the GPU still manages to fit onto a card just 10.5 inches long.

Can Nvidia's long-awaited GTX 480 capture the graphics performance crown? And if it can, is the price of glory worth it?

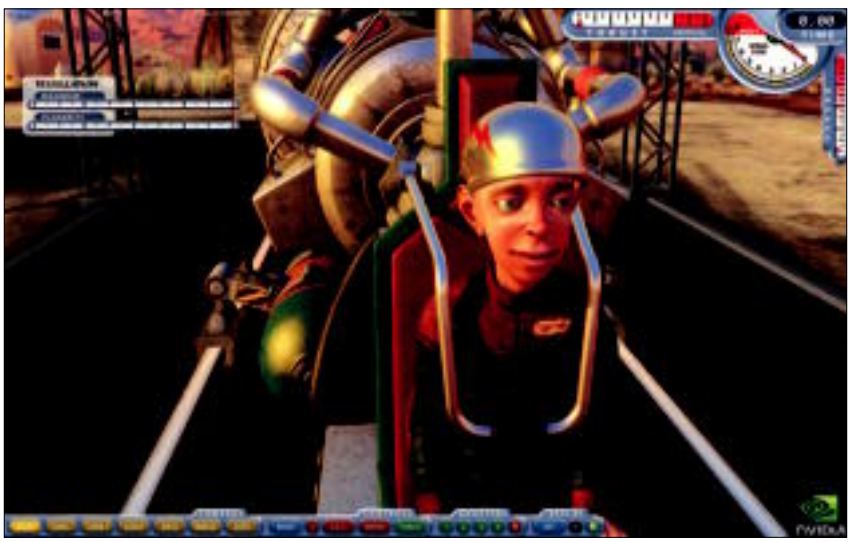
The GTX 480 Dissected

Deep inside Nvidia's new monster GPU

Nvidia designed the GTX 480 from the ground up as a new architecture, with the goal of combining best-of-class graphics performance with a robust component for GPU compute applications. The architecture is modular, consisting of groups of ALUs ("CUDA cores") assembled into blocks of 32, along with texture cache, memory, a large register file, scheduler, and what Nvidia calls the Polymorph Engine. Each of these blocks is known as an SM, or streaming multiprocessor.

The warp scheduler ensures that threads are assigned to the compute cores. The Polymorph Engine takes care of vertex fetch, contains the tessellation engine, and handles viewport transformation and stream output.

Each CUDA core inside the SMs is scalar, processing only one data item at a time, but there are many of them. The SMs are built with a pipelined, integer ALU and a floating-point unit (FPU), which is fully IEEE 754-2008 compliant. The FPU can handle both single- and double-precision floating-point operations. Each SM has a 64KB memory pool. When used for graphics, the 64KB is split into 16KB of L1 cache and 48KB of shared memory.



With hardware tessellation, character heads look properly curved, as do object like pipes.

The SMs belong to blocks of four graphics processing clusters (GPCs) connected to the raster output engines. The GPCs share 768MB of L2 cache. Six memory controllers manage access to the GDDR5 memory pool.

IT'S ABOUT GEOMETRY PERFORMANCE

Prior generations of GPUs built on DirectX 10 and its predecessors radically improved texturing and filtering performance over time. Better image quality came through

BEHIND THE SCENES

The Role of Drivers in GPU Performance

Drivers—those magical software packages that actually enable our cool GPUs to work—are a critical part of the performance equation. And driver updates enable a GPU's performance to improve over time. Take AMD's just-released Catalyst 10.3 drivers, for example, which offer big performance improvements in a number of popular games. AMD has had a good nine months to tune and tweak its DX11 drivers, and the timing of their release couldn't be more fitting. In fact, both AMD and Nvidia have historically released performance-enhanced drivers just as the competitor was about to ship a new card.

In time, we expect to see the GTX 480 perform better in some of the gaming tests where it doesn't currently shine, although some games that have a stronger CPU element, such as real-time strategy games, may not see massive performance gains from driver updates.

Both Nvidia and AMD have extensive engineering staffs dedicated to writing and debugging drivers. AMD has committed to a monthly driver release, but is willing to release hotfix drivers to improve performance on new, popular game releases. Nvidia's schedule is somewhat irregular, but the company has stepped up the frequency of its driver releases in the past year, as DirectX 11 and Windows 7 have become major forces.

Developing drivers for a brand-new architecture is a tricky process, and engineers never exploit the full potential of a new GPU at launch. As we've seen with Catalyst 10.3, an optimum driver update can make an existing card seem new all over again.

effects like bump mapping to create the illusion of greater detail with flat textures.

DirectX 11 supports hardware tessellation. Hardware tessellation works with a base set of geometry with predefined patches. The DX11 tessellation engine takes that patch data and procedurally generates triangles, increasing the geometric complexity of the final object. This means that heads become rounder, gun barrels aren't octagons, and other geometric details appear more realistic.

The hardware tessellator that's built into the Polymorph Engine is fully compliant with DX11 hardware tessellation. Given that both major GPU suppliers are now shipping DirectX 11–capable parts, we may finally see the end of blocky, angular heads.

IMAGE QUALITY ENHANCEMENTS

The GTX 480 increases the number of texture and ROP units, as well as scales up raw computational horsepower in the SMs. This allows the card to take effects like full-scene antialiasing to the next step. Nvidia suggests that 8x antialiasing is possible in most games with only a slight performance penalty over 4x AA. The new GPU will also enable further AA capabilities, such as 32x CSAA (coverage sample antialiasing) and improved AA with transparent objects.

SPECIFICATIONS

	GTX 470	GTX 480	RADEON HD 5870
Transistors	3.0 billion	3.0 billion	2.15 billion
Compute Cores	448	480	1,600*
Texture Units	56	60	80
ROPs	40	48	32
Core Clock	607MHz	700MHz	850MHz
ALU Clocks	1,215MHz	1,401MHz	N/A
Memory Clock	837MHz	924MHz	1,200MHz
GDDR5 VRAM	1,280MB	1,536MB	1,024MB
Memory Interface	320-bit	384-bit	256-bit
Process	40nm	40nm	40nm
Thermal Power	215W	250W	188W

** Compute cores aren't directly comparable.*

As with prior Nvidia GPUs, the company is talking up performance in GPU compute. This translates directly into more robust image-quality effects, including physics and post-processing enhancements such as better water effects, improved depth of field, and specialized effects like photographic background bokeh. (For more details, check out our original story on the GF100 at Maximumpc.com http://bit.ly/4yQZyj)

THEN AND NOW

When Nvidia rolled out the GF100 (Fermi) graphics architecture in January, it talked about a chip with 512 CUDA cores. As it turns out, the GTX 480 is shipping with just 480 cores enabled—one full SM is disabled. It's uncertain whether this is because of yield problems. Even using a 40nm process, the GTX 480 chip is massive. Alternatively, Nvidia may have disabled an SM because of power issues—as it is, the GTX 480 consumes 250W at full load, making it one of the most power-hungry graphics cards ever made.

Note that the "480" in GTX 480 doesn't refer to the 480 CUDA cores. Nvidia is also launching the GeForce GTX 470, which ships with 448 active computational cores. (The chart above shows how these two cards compare to each other in speeds and feeds, as well as to the Radeon HD 5870.) What's notable, beyond the sheer number of transistors in Nvidia's cards, is the number of ROPs—both cards' exceed what's available in the Radeon HD 5870. It's also worth noting the maximum thermal design power. In the GTX 480, it's rated at 250W, or 62W more than the Radeon HD 5870. In practice, we found the differences to be higher (see the benchmarking analysis on page 43 for power consumption numbers.)

POWER AND CONNECTIVITY

Since the new cards are so power-hungry, Nvidia engineers designed a sophisticated,

THE FPS EFFECT

Average vs. Minimum Frame Rate

A few years ago, Intel commissioned a study to find out what the threshold of frustration was when it came to playing games. At what point does a lower frame rate affect a player's experience? The research uncovered two interesting points. First, if a game could maintain a frame rate above 45fps, then users would tend to remain immersed in the gaming experience. That is, unless the second factor comes into play: wide, sudden variations in frame rate.

If you're humming along at 100fps and the game suddenly drops to 48fps, you notice, even though you're still above that magical 45fps threshold.

Modern game designers spend a ton of time tweaking every scene to avoid those sudden frame-rate judders. Given the nature of PC gaming, with its wide array of processors and GPUs, it's impossible to completely eliminate the possibility of low frame rates or sudden drops in performance. The goal is to keep those adverse events to a minimum.

One older benchmark we no longer run, but which is worth checking out for these effects, is the RTS World in Conflict. The built-in benchmark has a real-time bar that changes on the fly as the test is run. Watching the bar drop into the red (very low frame rates) during massive explosions and flying debris is illuminating.

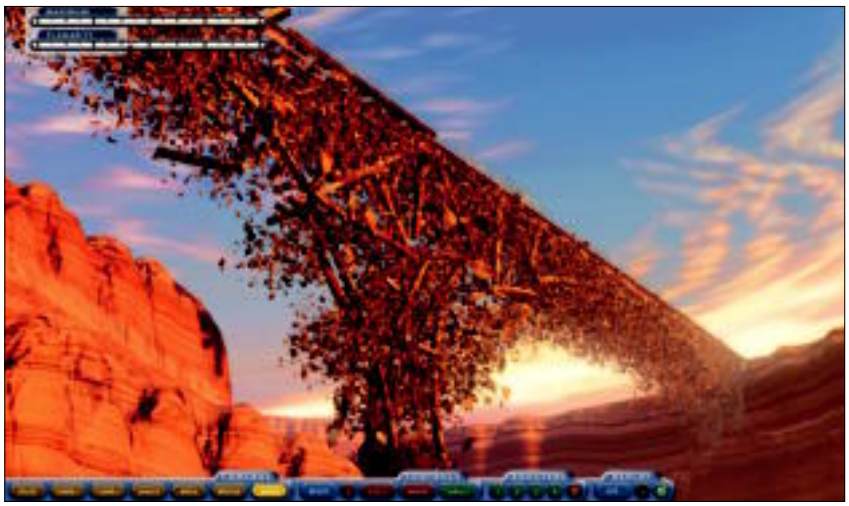
While we're generally happy to see very high average frame rates—a game that will run at a 100fps average will more likely stay above that 45fps barrier—it's no guarantee that you won't still see frame rate drops in certain scenes.

heat pipe–based cooler to keep the GPU and memory within the maximum-rated 105 C operating temperature. When running full bore, the cooling fan spins up and gets pretty loud, but it's no worse than AMD's dual-GPU Radeon HD 5970. It is noticeably louder than the single-chip Radeon HD 5870, however.

The cooling-system design helped Nvidia build a board that's just 10.5 inches long, a tad shorter than the Radeon HD 5870 and much shorter than the foot-long Radeon HD 5970. Given the thermal output, however, buyers will want to ensure that their cases offer ample airflow. Nvidia suggests a minimum 550W PSU for the GTX 470 and a 600W-rated power supply for the GTX 480. The GTX 480 we tested used a pair of PCI Express power connectors—one 8-pin and one 6-pin.

Unlike AMD, Nvidia is sticking with a maximum of two displays with a single card. All the cards currently shipping will offer two dual-link DVI ports and one mini-HDMI connector. Any two connectors can be used in dual-panel operation. Current cards do not offer a DisplayPort connector.

Nvidia is also beefing up its 3D Vision stereoscopic technology. Widescreen LCD monitors are now available with 120Hz refresh support in full 1920x1080 (1080p) resolution. One card will drive a single 1080p 3D panel. If your wallet is healthy enough to afford a pair of GTX 400–series cards, 3D Vision is being updated so that you can have up to three displays running in full stereoscopic mode.



You can use tessellation to generate large amounts of debris, and GPU compute to create realistic physics effects, as seen in this screen from Nvidia's Rocket Sled demo.

What's the price of all this technological goodness? Nvidia is targeting a $500 price point for the GTX 480 and $350 for the GTX 470. Actual prices will vary, depending on supply and overall demand.

The burning question, of course: When can you get one? Rumors have been flying around about yields and manufacturing issues with the Fermi chip. Nvidia's Drew Henry stated categorically that "tens of thousands" would be available on launch day. We'll just have to wait to see what that means for long-term pricing and availability.

It's possible we're seeing the end of the brute-force approach to building GPUs. The GTX 480 pushes the edge of the envelope in both performance and power consumption—and that's with 32 compute units disabled. So even at 250 watts or more, we're not seeing the full potential of the chip.

In the end, the GTX 480 offers superlative single-GPU performance at a suggested price point that seems about right relative to the competition. It does lack AMD's Eyefinity capability and its hunger for watts is unparalleled. Is the increased performance enough to bring gamers back to the Nvidia fold? The performance of the Radeon HD 5870 is certainly still in the "good enough" category, and that card is $100 cheaper and consumes substantially less power. If raw performance is what counts, the GTX 480 will win converts. Only the time, availability, and user desires will show us which approach wins out over the long haul.

DIRECTX 11

Games for the New Generation

PC game developers seem to be taking up DirectX 11 more quickly than past versions of DirectX. There are some solid reasons for that. Even if you don't have a DX11 card, installing DX11 will improve performance, since the libraries themselves are now multithreaded.

Here are a few of our favorite DX11 titles:

Metro 2033 This Russian-made FPS is one of the more creepily atmospheric titles we've fired up recently. The graphics are richly detailed, and the lighting effects eerie and effective.

Dirt 2 The game offers colorful and detailed graphics and good racing challenges, although the big deal made about the water effects was overblown.

Battlefield: Bad Company 2 While it's had a few multiplayer teething problems, BC2 has consumed vast numbers of hours of online time, plus has a surprisingly good single-player story.

STALKER: Call of Pripyat This is the actual sequel to GSC's original STALKER title. It seems like a substantial improvement over the Clear Sky prequel. The tessellation certainly helps immersion as you fight alongside or against other stalkers.

Aliens vs. Predator The new release of the venerable title from Rebellion and SEGA makes use of hardware tessellation—the Aliens look even more frightening and all too realistic.

Putting the GTX 480 to the Test

In both DX10 and DX11, Fermi scores best overall single-GPU performance

We tested six different graphics cards, including a standard Radeon HD 5870 and the factory-overclocked XFX Radeon HD 5870 XXX edition. We also included results from older Nvidia cards, including the aggressively overclocked EVGA 285 GTX SSC and a reference 295 GTX. And for good measure, we tossed in an HIS Radeon HD 5970, built with two Radeon HD 5870 GPUs.

For the most part, the Radeon HD 5970 dominated the benchmarks. Interestingly, we observed that in the recently released Unigine 2.0 DX11 test, when we scaled up tessellation to "extreme," the GTX 480 edged out the dual-GPU AMD solution.

Compared to the single-GPU Radeon HD 5870, the GTX 480 won about half the benchmarks and essentially tied in the rest. Where it does win, it generally wins big.

The GTX 480 "won" in another test, too—power consumption—but not in a good way. The system idled at 165W with the GTX 480, exceeded only by the dual-GPU HD 5970's 169W. And at full load, the GTX 480 gulped down 399W—35W *more* than the 5970 and fully 130W more than the Radeon HD 5870 at standard speeds.

We also pushed all the cards to a punishing 8x MSAA setting at 1920x1200. Every card took a performance hit moving to 8x MSAA, but the drop in frame rate on the GTX 480 was pretty small. That's an impressive achievement. (To see our expanded benchmark chart, go to http://bit.ly/c7vELo.)

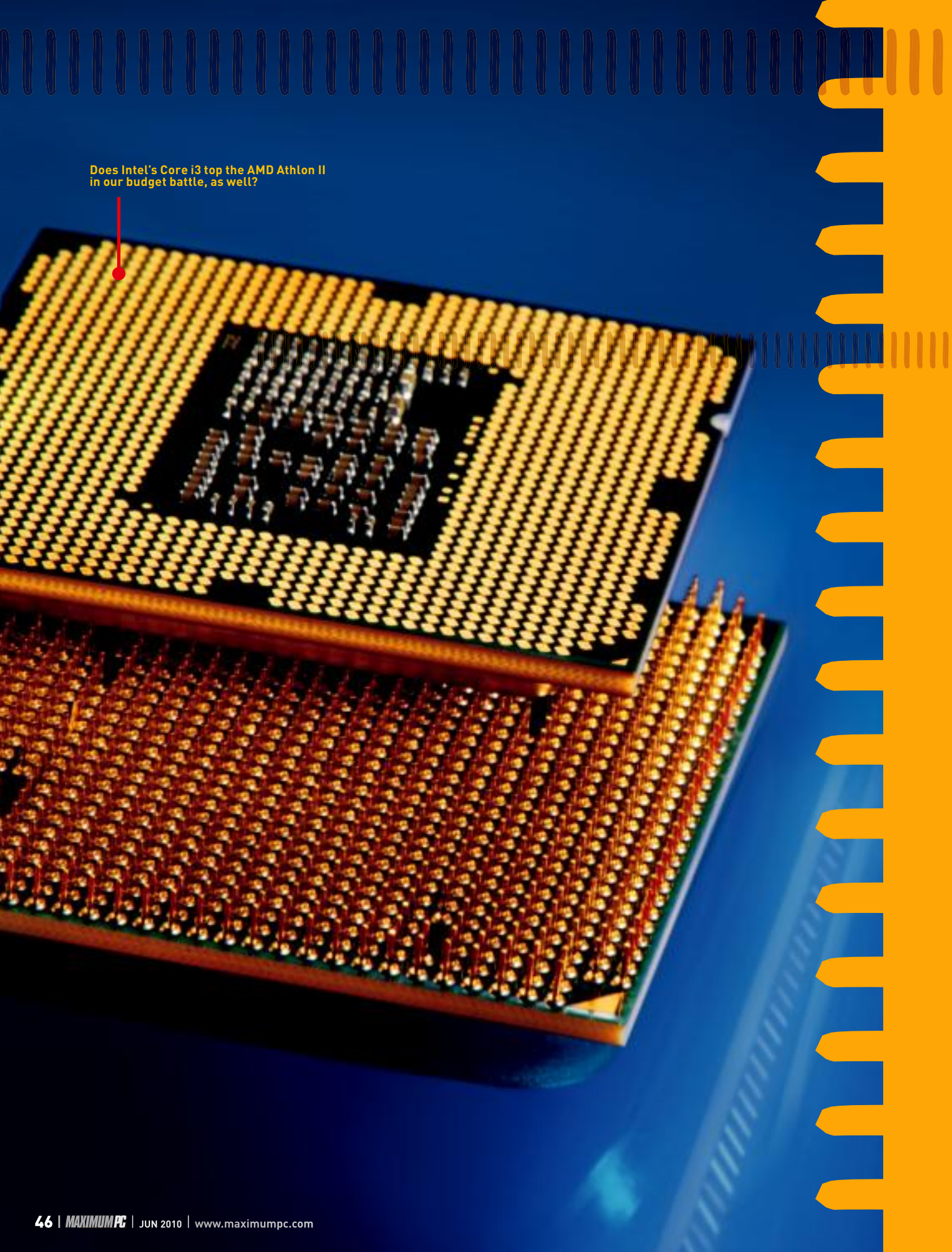
In the end, the GTX 480, given the current state of drivers, is priced about right—assuming you can actually buy one for $500. It's about $100 cheaper than the Radeon HD 5970, and users won't have to worry about dual-GPU issues. At $100 more than a Radeon HD 5870, it's the fastest single-GPU card we've tested. If raw performance is what you want, then the GTX 480 delivers, particularly at high AA and detail settings.

The real kicker, however, is power consumption. Performance counts, but efficiency is important, too. The GeForce GTX 480 kicks out high frame rates, but the cost in terms of watts per FPS may be too high for some.

BENCHMARKS

	GTX 480	HIS Radeon HD 5970	XFX Radeon HD HD 5870 XXX	Stock Radeon HD 5870	EVGA GTX 285 SSC	GTX 295
3DMark Vantage Performance	18,231	**23,530**	19,282	18,862	13,964	19,065
3DMark Vantage Extreme	9,223	**13,678**	9,473	9,058	6,238	9,090
DIRECTX 11						
Unigine Heaven 2.0 (fps)	**30**	28	18	17	N/A	N/A
Battle Forge (fps)	61	**73**	49	47	N/A	N/A
STALKER: Call of Pripyat (fps)	39	**54**	38	36	N/A	N/A
Dirt 2 (fps)	87	**92**	73	72	N/A	N/A
DIRECTX 10						
Far Cry 2 / Long (fps)	102	**114**	78	76	56	78
Far Cry 2 / Action (fps)	**75**	**75**	65	63	48	60
Tom Clancy's HAWX (fps)	105	**128**	92	88	59	91
Dawn of War 2: Chaos Rising (fps)	71	74	**78**	74	69	71
Crysis (fps)	31	**44**	33	32	21	30
System Idle Power (W)	165	169	142	**134**	N/A	N/A
System Full Load Power (W)	399	364	290	**268**	N/A	N/A

Best scores are bolded. All tests were run at 1920x1200 at 4x AA. Our test system consisted of a Core i7 975 at 3.3GHz, with 6GB of DDR3/1333 memory, running on an Asus P6X58D Premium motherboard, with a Seagate 7200.12 1TB drive, an LG Blu-ray ROM drive, a Corsair TX850w 850W PSU, and Windows 7 Ultimate 64-bit.


Does Intel's Core i3 top the AMD Athlon II in our budget battle, as well?

BUDGET IS IN THE EYE OF THE BEHOLDER

BY GORDON MAH UNG

Low-cost processors from Intel and AMD prove their relative worth in a toe-to-toe contest of performance, platforms, and features

Ain't technology grand?

In 1998, Intel was proud to hawk its budget alternative to the high-end Pentium II CPU: the strippo Celeron for "basic PC" computing.

That single-core, 266MHz Celeron ran on a 66MHz front-side bus, had no external cache, and even lacked the fancy plastic cover found on the Slot 1 PIIs, yet it still cost $155. Today, for $99, you can get a quad-core CPU running at 10 times the frequency of the original Celeron. Shoot, for $113 you can buy into Intel's new 32nm process (the first Celeron was built on a *250nm* process) and get a CPU that features a graphics core capable of outstripping the most powerful discrete videocards of yore—even in SLI.

Baby, we've come a hell of a long way.

That doesn't mean all things budget are good, though. To identify the absolute best budget CPU at (or near) the $100 mark, we locked AMD's Athlon II X4 630 in a cage with Intel's Core i3-530 for a benchmark battle to the death!

BUDGET PROCS COMPARED

	INTEL CORE I3-530	AMD ATHLON II X4 630
Clock Speed	2.93GHz	2.8GHz
Cores / Threads	2 / 4	4 / 4
L2 Cache	1MB	2MB
L3 Cache	4MB	N/A
Package	LGA1156	Socket AM3
Graphics Core Speed	733MHz	N/A
TDP	73 watts	95 watts
Process	32nm	45nm
CPU Die Size	81mm^2	169mm^2
GPU Die Size	114mm^2	N/A
CPU Transistor Count	383 million	300 million
GPU Transistor Count	177 million	N/A
Price	$113	$100

Athlon II vs. Core i3: Fight!

Can a dual-core beat a quad-core? Let's find out

At the high altitudes where the Core i7-980X soars, there is no competition. But let's face it, there are few consumers who can pony up the $1,000 for that CPU's six-core air superiority. The real war between Intel and AMD is being fought in the $100 range. And there it's unrelenting, hand-to-hand, jungle warfare. Despite AMD's inability to sortie anything remotely close to the Core i7-980X, the company knows how to fight a guerilla war against its much larger enemy—it's done that for practically its whole existence.

But Intel isn't content to cede victory here, either. Having decommissioned its obsolete Core 2 Quads, Intel is counting on a newcomer—the dual-core Core i3-530—to take out AMD's insurgency force. The Core i3-530 is the company's cheapest "Core i" CPU. Clocking in at 2.93GHz, it features an integrated graphics core, as well as on-die (in the GPU) PCI-E and memory controller. On the compute side, it has dual 32nm cores. Being a budget chip, there's no Turbo Boost feature, but at least Hyper-Threading is enabled.

Its primary competitor in the AMD camp is the 2.8GHz Athlon II X4 630. It was introduced alongside the original $99 quad-core, the 2.6GHz Athlon II X4 620, but recent price cuts have helped push the 630 to the point where it's just $1 more than the 620 version. And for $1 more, we'll take the extra 200MHz. The Athlon II X4 630 is essentially a Phenom II X4 but without the extra 6MB of L3 cache attached. It's an AM3 part but is backward compatible with most AM2+ and some AM2 motherboards.

INFRASTRUCTURE

CPUs don't exist in a vacuum, though. You also need a good budget motherboard to go with your budget CPU. While AMD has traditionally had a budget advantage with motherboards, we found boards for both CPUs to be on par in pricing. For example, the two boards we used for our integrated graphics showdown (see sidebar), an MSI 890GXM-G65 and an Asus P7H55D-M EVO, were each selling for $125. However, in specsmanship, the MSI board aces the H55-chipset-based board. Both boards feature USB 3.0, but the MSI board also features native SATA 6 support, thanks to the AMD 890GX chipset, and a secondary x16 physical PCI-E slot. It should be noted that cheaper boards for both CPUs are available, with some dipping to $80.

UPGRADES

Most system builders usually try to get one or two upgrades out of a platform over its lifetime. In this department, AMD also wins out, theoretically. If you were to build a budget box using a Core i3-530 and a budget LGA1156 motherboard, you could swap out to a quad-core Core i5 or Core i7 CPU in a year when you have the funds and when the prices have dipped. Today, the kick-ass Core i7-870 is $562, but in two years, it could be $250. Sound good? Yes, but if you built an AM3-based system with the Athlon II X4 630, you could eventually move up to a Phenom II X6 hexa-core processor. To move to a six-core Core i7-980X, you'd have to dump your current LGA1156 board and buy an LGA1366 board. The sticky question, however, is whether a hexa-core Phenom II X6 will actually be faster than a quad-core Core i7-870. We won't know that until we actually get a Phenom II X6 chip. What we do know is that the Athlon II's Socket AM3 seems the more flexible of the two platforms today.

INTEGRATED GRAPHICS

Whose IGP Sucks Less?

An integrated graphics "battle" is a misnomer. It's more of a watch-the-paint-dry contest. Still, we did want to know whose IGP was better. So we installed the Core i3-530 in an Asus P7H55D-M EVO board, where the proc's integrated graphics core would do the work, and set the AMD system to use the IGP in the MSI 890GXM-G65 board's chipset.

Our conclusion? The AMD part turned in higher scores in both older 3DMark titles and World in Conflict in DX9 mode, but the Intel part surprised us by achieving higher performance in DX10 mode with Resident Evil 5.

In other words, there's no change: Integrated graphics still stink and bragging about one being faster is, well, like saying your kid is only in jail for assault with a deadly weapon, not armed robbery.

BENCHMARKS

	Core i3-530	Athlon II X4 630
3DMark 2003	1,744	**2,133**
3DMark 2005	3,430	**4,617**
Resident Evil 5 DX10 12x10 (fps)	**9.6**	6.6
World in Conflict 10x7 Low (fps)	38	**49**

Best scores are bolded.

The Performance Story

In a battle of the benchmarks, the budget CPUs trade strengths

For our benchmark battle, we built two systems using identical parts: For the AMD part, we used an MSI 890GXM-G65 with 4GB of Corsair DDR3/1333, a Western Digital Raptor 150, and an EVGA GeForce GTX 280 card on Windows 7 Professional. The Intel system used the same RAM, hard drive, and graphics card, but for the motherboard, we used an Asus Maximus III Formula board on the Intel P55 chipset. We originally intended to use an Intel DH55TC board, but our H55-based board was DOA.

We ran the same benchmarks we used for our Core i7-980X review in the May issue. The workloads ran the gamut from video editing to encoding to gaming to 3D rendering and synthetic memory tests. (As a reality check, we included the benchmark scores for the quad-core Core i7-870 in the chart below. That chip is way out of the league of these budget CPUs, but the scores help illustrate what you get for the money.)

The results were not surprising. The dual-core Core i3-530 proved to be the better of the two in gaming, thanks to its slightly higher clocks and the wider Nehalem microarchitecture.

But when we got to the multithreaded applications, the Core i3's combination of two real cores and two virtual cores couldn't compete with the Athlon II 630 quad-core. The latter processor was faster than the Core i3-530 by double digits in most of our benchmarks. There were a few surprising upsets, though. ProShow Producer 4 and Bibble 5.0 both favored the Intel chip by 8 percent to 9 percent. Both are multithreaded apps, so we were surprised to see the Core i3 take it here. The Core i3 also did surprisingly well in our multithreaded Sony Vegas Pro 9 benchmark. Despite its two-core advantage, the Athlon II 630 beat the dual-core Core i3 by just 3 percent. That should give AMD fans a bit of a worry.

Of course, when you see the Athlon II 630 with a 30 percent advantage in our HandBrake benchmark and a 29 percent advantage in Cinebench 11.5, you're reminded that those virtual cores still can't compare to the real deal. The Athlon II also had significantly better bandwidth and better memory latency.

The upshot is that the Athlon II 630 is the better budget chip for most multithreaded workloads and most applications. The Core i3, however, is generally better for gaming and surprisingly fast in some newer applications. We know people like a clear winner/loser assessment, but the truth is that you should pick the chip based on how you use your PC. In either case, we can safely say that budget buyers have it pretty good these days.

BENCHMARKS

	2.93GHz Core i3-530	2.8GHz Athlon II 630	2.93GHz Core i7-870
Price	$113	$100	$562
Premiere Pro CS3 (sec)	967	**855**	539
Sony Vegas Pro 9.0c (sec)	7,310	**7,083**	3,531
Cinebench 10 64-bit	9,261	**10,301**	19,197
Cinebench 11.5 64-bit	2.46	**3.17**	5.54
POV Ray 3.7	1,902	**2,719**	4,496
HandBrake 0.9.4 DVD to iPhone (sec)	2,804	**2,144**	1,247
Main Concept 1.6 (sec)	4,663	**3,952**	2,486
Photoshop CS3 (sec)	**142**	157	100
Adobe Lightroom 2.6 (sec)	535	**512**	422
ProShow Producer 4 (sec)	**2,112**	2,309	1,290
Bibble 5.02 (sec)	**261**	284	122
PCMark Vantage 64-bit Overall	**7,098**	6,990	9,120
Everest Ultimate 5.30.1900 Mem Copy (MB/s)	8,187	**9,741**	14,693
Everest Ultimate 5.30.1900 Mem Latency (ns)	85.3	**52.6**	52.5
Fritz Chess Benchmark (KiloNodes/s)	5,344	**6,682**	11,995
Valve Map Compilation (sec)	176	**154**	106
Sisoft Sandra RAM Bandwidth (GB/s)	11.1	**12**	17.1
3DMark Vantage Overall	**14,590**	14,168	14,795
3DMark Vantage GPU	**12,215**	11,782	12,164
Valve Particle Test (fps)	**94**	74	159
Resident Evil 5 low-res (fps)	**76.5**	70.8	126.6
World in Conflict low-res (fps)	**180**	124	253
Dirt 2 low-res (fps)	147.3	**151.6**	153.3
Far Cry 2 low-res (fps)	**94.6**	79.5	153.3

Best scores are bolded.

SOLID STATE OF THE UNION

We take stock of today's SSDs—what they have to offer, how they've progressed, and which should have dominion in your PC **BY NATHAN EDWARDS**

At the end of our November 2008 solid-state-drive roundup, we concluded that those NAND-flash-based drives just weren't ready for prime time, thanks to astronomically high prices, small capacities, and flaky first-gen controllers.

Flash forward to mid-2010. Not only have newer drive controllers thoroughly washed the bad taste of the first-gen SSDs out of our mouths, but performance has shot through the roof. And the slowdowns that early SSDs experienced when writing to memory blocks where data had been deleted have been vanquished by the TRIM command. Implemented in moderns SSDs as well as in Windows 7 and Linux, TRIM's garbage-collection functionality has helped SSDs overcome one of their remaining hurdles.

Of course, there's still the matter of price. While solid state drives have several advantages over their mechanical hard drive brethren—durability, reliability, and speed among them—they still cost a lot more. A one-terabyte mechanical hard drive costs less than $100, but a 256GB SSD can cost close to $800. Nevertheless, today's SSDs have significantly dropped in price, and combined with the technological advances, are a much improved value. Is that enough to get your purchasing dollars? We were compelled to find out, *Maximum PC*–style.

We gathered five newly released SSDs to see how far the field has come since late 2008. We ran each through a gamut of tests: HDTune 4.01 for sustained read and write speeds as well as random-access times and 4KB random reads and writes (historically the Achilles' Heel of SSDs); PCMark Vantage x64 to simulate performance during common Windows tasks; and Adobe Premiere Pro CS3 to measure sequential writes by writing an uncompressed AVI to the disk. We'll tell you how they compare to our current Best of the Best pick, the 128GB Patriot Torqx (the cumulative benchmark results can be found on page 56), and even explore a budget-SSD option. So let's see how the state of the SSD union fares.


PLEXTOR
WD SiliconEdge™ Blue™
256 GB SATA
SC-D0256SC-2100
WEG1J2001529
5001 4EEF 0400 0725
WD
28
Solid State Drive

WD SiliconEdge Blue 256GB

WD's first consumer SSD is a mixed blessing

Western Digital added a bit of style to its SSD by foregoing a commodity chassis.

Western Digital has finally dipped its toe into the SSD pond, a move we've been expecting since last year's acquisition of SiliconSystems. The first consumer SSD to be born of this acquisition is the SiliconEdge Blue. Can one of the biggest names in mechanical hard drives compete in the solid state world?

Western Digital seems to be banking on two things with the SiliconEdge Blue: first, that seeing Western Digital's name on an SSD will draw consumers, and second, that the strength of its custom firmware and rigorous performance testing will enable it to compete with drives running the high-performing SandForce and Barefoot Indilinx controllers. WD won't say whose controller the SiliconEdge Blue uses, but it's not developed in-house and it isn't SandForce or Barefoot.

Whatever's powering the drive, it's TRIM-compatible, has speedy DDR2 cache, and its read speeds top out at 213MB/s—not shabby by any metric, and close to the 220MB/s of the Torqx. Writes are a little erratic, though. The SiliconEdge isn't entirely immune to the strange stuttering that plagued first-gen SSDs—while sustained write speeds topped out at 171MB/s in our testing, they sometimes dropped as low as 1.1MB/s, resulting in an average of just 109MB/s. And random-access write times averaged 3.3ms, another telltale sign of stuttering.

With an MSRP of $1,000 (although its street price hovers around $800), and obvious jitter, it's hard to recommend the SiliconEdge Blue. Given its "Blue" designation, a speedier SiliconEdge Black is doubtless on the way. Whatever controller WD uses for that one, we just hope it doesn't stutter.

VERDICT

WD SILICONEDGE BLUE

$1,000, www.wdc.com

6

Plextor PX-128M1S 128GB

ey of a thousand miles begins with a single misstep

We're not mad. We're just disappointed. When Plextor announced in February that it, too, was entering the SSD market, we were cautiously optimistic. After all, more competition is always a good thing, and Plextor wouldn't put out a subpar product just to try to capitalize on a trend—would it?

The Plextor PX-128M1S is the first drive we've tested that is built on the Marvell 88SS8014-BHP2 "Da Vinci" controller—and if its performance is indicative of the platform as a whole, we hope it's the last.

Although read speeds were respectable for a last-gen drive at 135MB/s average sustained reads, average sustained writes were a sub-mediocre 50MB/s. And though the controller has its own garbage-collection and wear-leveling algorithms, it doesn't support the TRIM command.

We like that the Plextor drive ships with a copy of Acronis True Image to facilitate upgrades, but that hardly makes it unique, and the drive just can't compete with modern SSDs.

Given that the 128GB PX-128M1S doesn't offer top-tier performance, we were surprised by Plextor's decision to charge $400 for it. The price dropped to $335 within a few weeks, which makes it slightly more reasonable, but not enough so. You can get the 128GB Torqx for just $30 more, and get much better performance and TRIM support, to boot.

VERDICT

PLEXTOR PX-12M1S

$335, www.plextoramericas.com

5

The PX-128M1S feels like a 2008-era SSD that fell through a time warp.

OWC Mercury Extreme Enterprise 100GB

Marketed for Macs, but this bad boy supports TRIM anyway

The SSD market is a meritocracy. Controller companies live and die on the strength of their products. Who had heard of Barefoot before its Indilinx controller pushed SSD speeds to new heights? SandForce is another promising young company whose controllers have started appearing in drives, including this month's OCZ Vertex LE and the OWC Mercury Extreme Enterprise.

OWC markets mainly to Mac users, but don't hold that against its SSD. It's a modern, SandForce SF-1500-powered drive that supports TRIM. And given that OS X doesn't support TRIM, well, we don't even think that platform deserves performance this good.

The Mercury's average sustained read speeds don't quite hit the level of Indilinx-powered drives like our Best of the Best Patriot Torqx, but 191MB/s average, with bursts of more than 200MB/s, is certainly nothing to sneeze at. And the Mercury really excels at writes, with average sustained writes of more than 220MB/s—the best we've seen. 4KB random reads and writes are reasonable, at around 5,000 IOPS (input/output operations per second), and it Premiere Pro and PCMark Vantage HDD sub scores are competitive. And the OWC Mercury does this all without cache—the SandForce controller doesn't need it.

So why get the Mercury over, say, the OCZ Vertex LE? Well, OWC doesn't seem to be limiting the number of Mercury drives produced. And it's a prettier color. Other than that, it's your call.

OWC overuses the Mercury designation, but this SandForce-powered drive does it proud.

VERDICT

OWC MERCURY EXTREME
$400, www.macsales.com

9

MOVING ON UP

6Gb/s SATA: Does It Make a Difference?

Say you're one of the increasing number of users with 6Gb/s SATA ports on your fancy new motherboard. But what you don't have—yet—is a drive with a 6Gb/s SATA controller. Can you put those onboard ports to use anyway? Some drive vendors claim that even SATA 3Gb/s drives benefit from the improved native command queuing and greater bandwidth of 6Gb/s SATA. To put this claim to the test, we took two drives from our roundup—the SandForce-toting OCZ Vertex LE and the Marvell-controlled Plextor PX-128M1S—and retested them on a mobo with both SATA 3Gb/s and SATA 6Gb/s ports onboard.

Our tests showed that some benchmark scores for both drives were better on the 6Gb/s SATA controller, but not significantly so. The Vertex drive showed higher average and maximum sustained read speeds on a 6Gb/s port, but average sustained writes fell, as did 4KB random writes. The Plextor drive showed slight improvement in 4KB random reads and writes. Premiere Pro and PCMark Vantage HDD test scores for both drives were higher on the 6Gb/s controller. Most other scores were nearly identical on either controller.

We'll soon start seeing SSDs with native SATA 6Gb/s controllers, and those will likely see marked improvements in SATA 6Gb/s mode compared to 3Gb/s. Until then, the only reason to run in SATA 6Gb/s mode (other than very minor gains in some areas) is if you need to use your 3Gb/s ports in IDE or RAID mode and want an AHCI-enabled SATA port for your SSD.

BENCHMARKS

	VERTEX LE (SATA 3Gb/s)	VERTEX LE (SATA 6Gb/s)	PLEXTOR (SATA 3Gb/s)	PLEXTOR (SATA 6Gb/s)
HDTUNE 4.01				
Avg Read (MB/s)	191.5	**196**	135.5	**137.6**
Random Access Read (ms)	0.2	0.2	0.2	0.2
Burst Read (MB/s)	202.6	**214.4**	126.9	**132.2**
Avg Write (MB/s)	**216.8**	204.4	**46.8**	45.4
Random Access Write (ms)	0.2	0.2	0.3	0.2
Burst Write (Mb/s)	201.5	**215.1**	136.8	**138.7**
4KB Read (IOPS)	5,296	**5,392**	4190	**4,359**
4KB Write (IOPS)	**5,431**	5,378	1069	**1,190**
PREMIERE PRO (SEC)	277	**260**	495	**476**
PCMARK VANTAGE HDD	31,880	**34,790**	21,093	**23,107**

Best scores are bolded. All tests performed on an Asus P6X58D Premium motherboard with a Core i7-X980 CPU @3.33GHz with 6GB DDR3/1600 running Windows 7 Professional 64-bit. SATA 3Gb/s tests performed on onboard Intel chipset; SATA 6Gb/s tests performed using onboard Marvell 9123 chipset.

OCZ Vertex LE 100GB

Limited Edition? I'll take eight!

OCZ clearly hopes the perceived rarity of its Limited Edition Vertex drive will increase desire for the product. A limited run of 5,000 is one way to do that. But if you've got a drive with performance this good, wouldn't you want everyone to buy one?

Like the OWC Mercury Extreme Enterprise, the OCZ Vertex Limited Edition is a 100GB drive built on the SandForce SF-1500 controller. It's the same architecture as OCZ's cancelled Vertex 2 Pro, and when the 5,000 Limited Edition drives run out, there will doubtless be a successor waiting.

The Vertex LE offers performance near-identical to the OWC Mercury: 197.5MB/s average sustained reads, with write speeds over 220MB/s, and 4KB random read and write IOPS in the 5,000 range. Its minimum read speeds were slightly higher in our tests; the Mercury dipped to a still-excellent 135MB/s minimum sustained read, while the Vertex' slowest sustained reads were more than 170MB/s. These speeds would have been unheard of a little more than a year ago—we're pleased as punch at how far SSDs have come.

We're not going to tell you to run out and grab a Vertex Limited Edition as fast as you can, just because they're awesome and fast and have TRIM and availability is limited. But you certainly won't regret getting one. And at street prices already under $400, if you can find one, snatch it up. Or wait until OCZ's next SandForce-toting drive comes out. It'll likely be just as awesome.

VERDICT

OCZ VERTEX LE

$430, www.ocztechnology.com

9

The Vertex LE is another great SandForce SSD, but it ain't much to look at.

Corsair Nova V128 128GB

'Nova,' as in 'new,' might be a misnomer—but the old ways are good, too

With all the fancy new controllers out there—the SandForces, Toshibas, Da Vincis, and what have you—we were a little concerned that vendors would forget the little controller that made it all possible: the Indilinx Barefoot controller. Yep, the one that powers our current Best of the Best Patriot Torqx, as well as every other top-performing SSD of the past year. In this land of the new, can Corsair's Nova V128, which sports the classic Barefoot controller, still push bits with the best of 'em?

Yep. Though the SandForce-based drives in the roundup push the best sustained write speeds yet, the Nova V128's Indilinx controller with 64MB of cache still sustains the fastest reads of the drives in this roundup, averaging 210MB/s on our test bed (the Torqx' read speeds are slightly higher). And the V128's average writes of 163MB/s are right up there with the 128GB Torqx.

Though the Indilinx controller's 4KB random-read IOPS averages 7,000 (as does Marvell's Da Vinci), its 4KB random writes get just 2,800 IOPS, lower than the Torqx and about half the speed of the SandForce-based drives. And nothing competes in IOPS with Intel SSDs, which regularly achieve random-write IOPS over 15,000.

While the SandForce-based drives in our roundup have the edge in write speeds, an Indilinx-based drive like the Corsair Nova V128—especially now that TRIM support is standard—remains a compelling (and slightly cheaper) option. And really, when your choice is between stupid-fast and ridiculous-fast, there are no bad choices.

VERDICT

CORSAIR NOVA V128

$370, www.corsair.com

8

Aging Indilinx platform aside, the Nova V128 is still a good buy.

Crunching the Numbers

Talk is cheap—it's the benchmarks that matter

We poked, prodded, and pummeled these drives with our benchmarks—we even discarded a whole week's worth of testing when we discovered a mysterious bug with our original test bed—all in our tireless effort to determine which SSD is best for you. In the process, we learned a lot about the state of the SSD market, and even a little bit about ourselves.

OK, we didn't actually learn anything about ourselves. But we did learn that if you have the cash, a solid state drive is a lot more compelling than this time last year, thanks mainly to advances in controller technology. Of the five drives in our roundup, the highest all-around scores went to the two with SandForce SF-1500 controllers, with sustained write speeds averaging around 225MB/s and sustained read speeds of just under 200MB/s. They didn't have the fastest random reads, but in random writes, only the Intel X-25M is superior. If you want fast random writes (and who doesn't), you'll pay a slight premium over Barefoot-controller drives like the Corsair V128 or our current champion Patriot Torqx—the OWC Mercury and OCZ Vertex LE are both around $400 on the street, while the Corsair Nova and the Torqx are closer to $370 for 128GB. And for their part, the Barefoot drives have faster reads.

Beyond the SandForce and Barefoot drives, however, lie dragons. Plextor's PX-128M1S, which uses Marvell's 88SS8014-BHP2 controller, is just a bad drive. Whether it's the firmware or the controller, its read speeds are last-gen and its writes are worse than your average mechanical hard drive—yet it's barely cheaper than the Corsair drive. You're better off with a Western Digital VelociRaptor.

Speaking of Western Digital: We can't currently recommend the SiliconEdge Blue. Whether it's the fault of the controller or the firmware, the drive stutters during extended writes. That's unacceptable in 2010.

At $4 per GB, SSDs are still a lot pricier than their mechanical counterparts. But capacity is going up, performance has never been better, and given Windows 7's TRIM support and easy-to-configure Libraries, an SSD boot drive with enough capacity to hold your favorite games and apps is more feasible than ever. My fellow *Maximum PC* power users, the state of the union is solid.

BENCHMARKS

	WD SILICONEDGE BLUE	PLEXTOR PX-128M1S	OWC MERCURY	OCZ VERTEX LE	CORSAIR NOVA	PATRIOT TORQX	WD VELOCIRAPTOR
CAPACITY	256GB	128MB	100GB	100GB	128GB	128GB	300GB
CONTROLLER	Unknown	Marvell Da Vinci	SandForce SF-1500	SandForce SF-1500	Indilinx	Indilinx	WD
HDTune 4.01							
Avg Read (MB/s)	204.3	136.7	191.4	197.5	210.8	**220**	101.6
Random Access Read (ms)	0.2	0.2	0.2	**0.1**	**0.1**	**0.1**	7.1
Burst Read (MB/s)	143	138.3	205.2	207	**222.8**	220	221
Avg Write (MB/s)	109.6	51.7	**227.1**	223.5	163.9	162.3	109
Random Access Write (ms)	3.3	**0.2**	**0.2**	0.3	**0.2**	**0.2**	7.1
Burst Write (MB/s)	142.9	136.6	209.6	191.8	**223**	221.7	**223.4**
4KB Read (IOPS)	4,508	7,392	5,245	5,050	**7,439**	7,084	153
4KB Write (IOPS)	1,330	1,144	**5,319**	5,271	2,829	3,435	302
PREMIERE PRO (SEC)	452	530	383	381	**361**	364	387
PCMARK VANTAGE HDD	24,037	22,057	32,140	**35,655**	24,796	23,674	6,188

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

Fiscal Conservatism

How do two budget SSDs compare to a single high-performance model?

Intel's X-25V value SSDs, like the rest of the X-25 line, prioritize random writes over sequential.

In the midst of our SSD test-stravaganza, a letter arrived from Intel with an intriguing idea. Why buy one expensive SSD, it asked, when you can buy two 40GB X-25Vs and run them in RAID 0? You'll get better performance, the argument went, and for a lower cost. Well, let's consider that. One 40GB X-25V (the V is for Value) costs $125, so $250 nabs you 80GB of storage, versus about $330 for a 128GB Patriot Torqx. So is it worth it to buy two of the value drives?

Since the whole point of running two value SSDs in RAID 0 is to save money, we decided against using an add-in RAID card—instead, we built RAID 0 arrays using the Intel south-bridge on our test bed and the Gigabyte-branded Marvell-manufactured onboard RAID controller, and tested them under the same conditions as the other drives in our roundup.

While a single Intel X-25V drive got 161MB/s average read speeds and 40MB/s average sustained writes—acceptable for a value drive—a two-disk RAID 0 on the Intel SATA controller did nearly twice as well. Sustained average reads were pushed to over 240MB/s, while writes approached 75MB/s. But random writes are where Intel drives have always excelled, and the X-25V, despite its "value" moniker, is no exception. Both a single drive and a RAID 0 array produced 4KB random writes of more than 15,000 IOPS—three times the speed of any other drive in the roundup, as well as the Patriot. Sustained writes, especially in our Premiere Pro encoding test, were less impressive.

So is a RAID 0 array of value Intel SSDs actually a value? It depends. Read speeds and random writes are fantastic, of course, while sustained writes will likely leave you frustrated. But you won't be doing too many sustained writes to an 80GB drive, now will you? Your SATA chipset will play an important role as well—the Intel SATA chipset on our test bed gave us the best numbers, while sustained writes on a RAID built on the Gigabyte-branded RAID controller were half as fast.

There's another catch, too: By using a RAID array, you're giving up OS-level TRIM support, as TRIM commands aren't passed through the RAID controller. You can manually optimize your drives with Intel's tools, but until TRIM commands can be passed to RAIDed SSDs, Windows 7 users should consider a single-drive solution. A 64GB Indilinx-based drive with TRIM support can be had for as little as $200. If 64GB is enough for you, we think that's the better deal.

BENCHMARKS

	SINGLE INTEL X-25V	TWO X-25VS (RAID 0)	TWO X-25VS (RAID 0)	PATRIOT TORQX
CAPACITY	40GB	80GB	80GB	128GB
CONTROLLER	Intel	Intel chipset	Marvell chipset	Indilinx
HDTUNE 4.01				
Avg Read (MB/s)	161.5	**242.1**	125.3	220
Random Access Read (ms)	0.1	0.1	0.1	0.1
Burst Read (MB/s)	123.4	115.3	70.5	**220**
Avg Write (MB/s)	40.6	73.5	78	**162.3**
Random Access Write (ms)	**0.1**	**0.1**	0.4	0.2
Burst Write (Mb/s)	115.9	111	27.8	**221.7**
4KB Read (IOPS)	6,112	6,634	5,211	**7,084**
4KB Write (IOPS)	**16,115**	15,238	11,037	3,435
PREMIERE PRO (SEC)	635	450	470	**364**
PCMARK VANTAGE HDD	10,135	**27,928**	15,970	23,674

Best scores bolded. All drives tested on our hard drive test bench: A stock-clocked Intel i7-920 CPU on a Gigabyte GA-EX58-UD3R with 6GB DDR3, running Windows 7 Professional 64-bit. All tests performed using Intel south bridge SATA chipset with Windows 7 default AHCI drivers, unless specified. For the Intel RAID array, updated Intel RAID drivers were used. For the Gigabyte RAID array, the drives were controlled by an onboard Marvell SATA controller in RAID mode.

WHITE PAPER

Advanced Format Drive Technology

How hard drive makers are taking the next step toward more reliable and higher-capacity hard drives—and why you should care -PAUL LILLY

Solid state drives (SSDs) might very well be the future of storage, but mechanical hard drives aren't going the way of the dodo anytime soon. In fact, there's a major shift taking place in the underlying architecture of HDDs, one that will result in greater reliability and, eventually, higher capacities.

Essentially a new formatting standard proposed by the International Disk Drive Equipment and Materials Association (IDEMA), this long overdue change represents the biggest format shift in three decades, according to hard drive makers. Every hard drive maker has committed to making the transition by early 2011, and Western Digital has already embraced the standard, which the company is calling Advanced Format. But what exactly does this format shift entail?

Put simply, Advanced Format technology changes how data is stored. Most of today's hard drives store information in 512-byte chunks called sectors, a scheme that made sense when HDDs were measured in megabytes. But as capacities have ballooned in size, so too has the need for much larger sectors. The next generation of hard drives will address this issue by significantly increasing the size of the sectors on the media to store 4,096 bytes (4K) of data, and as you might have heard, that could be a problem for Windows XP users (we'll tell you why in a moment).

WHY THE NEED FOR CHANGE?

One reason why hard drive makers originally decided to format hard drives into blocks of 512 bytes is because that was the standard sector size of floppy disks. But now that HDDs are orders of magnitude more capacious and have entered the terabyte era, Advanced Format technology paves the way for much better efficiency.

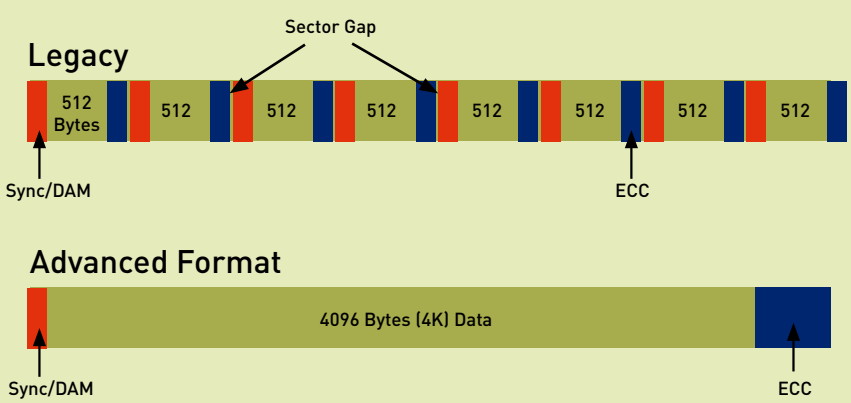
To understand why, we need to look at how sectors are composed. Each 512-byte sector is made up of three parts: a Sync/DAM block header responsible for data addressing, error correction code (ECC) tasked with maintaining the integrity of the data within the sector, and a tiny inter-sector gap between each block. Spread out over a 2TB hard drive, this arrangement breaks down into almost 4 billion sectors. That's a lot of overhead to contend with, and by expanding the sector size to 4KB—equivalent to an eightfold increase—hard drive makers are able to remove a large number of Sync/DAM blocks, inter-sector gaps, and ECC blocks. Think of it as trimming the fat.

So, what's the big deal? Larger hard drives, for one. Western Digital tells us that switching to 4K sectors translates into approximately 7 to 11 percent more disk capacity, though don't expect to suddenly gain additional space by installing an Advanced Format drive. As WD explains it, "the increase in disk space is not realized or gained in the drives today, but is the next move to larger capacity drives."

Put another way, hard drives are quickly reaching the threshold where it doesn't make sense to add more capacity. That's because the bigger the hard drive, the more important ECC becomes to ensure your data stays error-free. Larger hard drives require a lot more space for ECC, and any small gains in capacity at this point end up going almost entirely to ECC, leaving very little additional space for user data. But by reduc-

HOW IT WORKS

Legacy vs. Advanced Format Structure



Switching to 4K sectors solves two fundamental problems intrinsic to legacy 512-byte sectors. First, it allows hard drive makers to drastically reduce the number of Sync/DAM and inter-sector gaps, resulting in much less wasted space. And second, it allows for longer ECC blocks, better equipped to catch and eradicate data errors.

ing the number of blocks, less overhead is needed to maintain data integrity. To give you an idea of what we're talking about, it takes about 100 bytes of ECC data for a 4K sector compared to 320 bytes for eight 512B sectors. That's a pretty significant savings when you're talking about multiple terabytes.

It should also be noted that larger sectors makes it possible to develop more efficient ECC schemes with longer algorithms. Most errors have a tendency to come clumped together in "bursts," and according to Western Digital, one of the biggest benefits of Advanced Format is that burst error correction is improved 50 percent through the use of larger ECC code blocks.

POTENTIAL PITFALLS

If you're looking for a caveat, here it is. Users of older operating systems—primarily Windows XP—can expect a somewhat bumpy transition to Advanced Format. You shouldn't have any problem running an Advanced Format drive on Windows Vista, Windows 7, any flavor of Mac OS X from Tiger on up, and all Linux kernels released after September 2009. Windows XP, on the other hand, was developed before hard drive makers decided on using 4K sectors.

To ensure backward compatibility, Western Digital has implemented an emulation scheme that maps eight 512B logical sectors into a single 4K physical sector. This is how all OSes will see the drive, and while WD claims the benefits remain, XP users will see a performance hit by as much as 10 percent. That's because before Vista, Microsoft set the default partition to start at sector 63, a number that isn't divisible by 8. Using eight-sector clusters in XP tends to result in misaligned partitions, causing data to overlap across two 4K sectors instead of one.

Western Digital thought of this, too, and has made available a software utility designed to correct alignment issues. In some cases, such as a clean install, you may need to apply a jumper across certain pins, and if you're using a cloning utility, you'll need to run WD's alignment app even in Vista and Windows 7. If this all sounds overwhelming, don't fret—Western Digital has put together a handy chart (http://bit.ly/7JGX22) detailing what you need to do for different configurations.

Sonos ZonePlayer S5

The Sonos Digital Music System is one of the best and least-expensive

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

CONTEXT-MENU CLUTTER

ALEX CASTLE
ASSOICATE ONLINE EDITOR

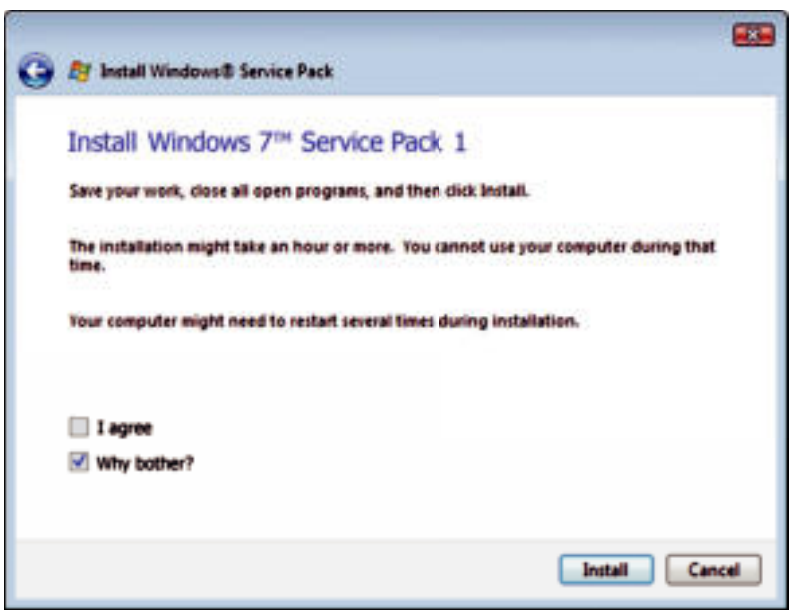
Hey, Microsoft, why is it that we users have such little control over the contents of the Windows context menu? This menu, which pops up whenever you right-click something, is one of the most frequently used menus in the whole operating system. Software we install puts whatever items it wants in the list, and the only easy way to get rid of them is to uninstall what might otherwise be a very useful program.

Do you know what you have to do to manually remove a useless item from the context menu? First, you have to open the registry editor by typing regedit into the Run dialogue field. Next, you've got to navigate to HKEY_CLASSES_ROOT*\shellex\ContextMenuHandlers. Finally, you have to delete the registry folder containing the unwanted context item, which can be nerve-wracking.

So please, Microsoft, give us a better tool for managing our context menu items. We'll use it responsibly—we promise.

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 7 Service Pack One

Microsoft has finally announced plans for the first service pack for Windows 7, with a possible release in Q4 2010. Don't get your hopes up for Vista-level improvements from this pack, though—according to Microsoft, it will bring "only minor updates, among which are previous updates that are already delivered through Windows Update."

Recover from a Soda-Spill Disaster

There are few moments in life quite as sickening as realizing that you've spilled a beverage on one of your gadgets. The feeling can range from mild infuriation (spilling a Bud Light on your PlayStation controller) to near-coronary levels (knocking over a Mountain Dew: Code Red onto your brand-new laptop). Either way, it's never something you want to go through. Because of that, we've put together a simple disaster plan for dealing with beverage-soiled electronics. We hope you never have to use it, but if you do, you'll be glad you read it. –ALEX CASTLE

1 ACT FAST

Yeah, we know. You're pissed. You just splashed merlot on your expensive gaming laptop. And while we do feel your pain, there's no time to sit around and pout. Every second you waste is another second that whatever you've spilled gets to dry into a sticky, short-circuiting, corrosive mess. So act fast.

Start by unplugging your gadget from the wall, if it's plugged in. If it's a laptop, remove the battery. If it's a keyboard, disconnect it from the PC. Liquid will create short-circuits inside your electronics, so getting it unplugged quickly will improve the chance of recovering your gadget intact.

2 ASSESS THE DAMAGE

Now that you've unplugged your device, take a second to assess the location and quantity of the spill. If it's just a few drops on a keyboard, you might be able to get away with prying off the surrounding keys (image A) and wiping down the affected area. For this, we recommend alcohol swabs, which break up stains and dry very quickly. You can get enough to last for years for about $4 in the first-aid section of a drug store, so get some now, before you need them.

If it's just a matter of washing down some keys, remember to wipe off both the keyboard and the keys that you've pried off. Your keyboard might be safe from electrical harm, but if you don't thoroughly clean off every contaminated surface, your keys will start to stick as the mess dries.

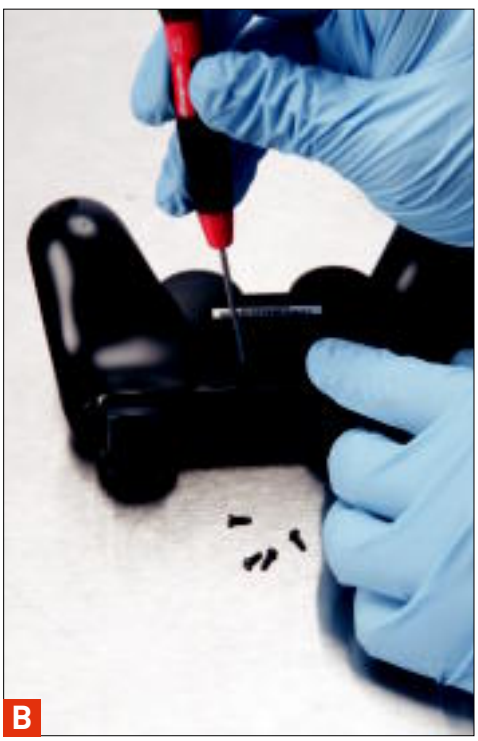
If the spill doesn't appear to be limited to the surface of your device, then scrub up—it's time for surgery.


A

3 TAKE IT APART

You can't clean a bespoiled device without first taking it apart. If the thought of opening up your expensive toys scares you, that's understandable, but just remember that any chance is better than no chance at all, which is what you've got if you let that spill just sit there. Of course, if you don't know which end of a screwdriver goes where, it might be worth calling a more electronically handy friend to help you out.

Using your tiny screwdriver (you *do* have a tiny screwdriver, don't you?) open up the device (image B). Obviously there's no one-size-fits-all guide for taking apart gadgets, but here are a few guidelines to follow:


B

- You may need to use some force to pry apart your device, but be careful, especially with circuit boards. If something seems to be taking more force to pull apart than it should, check again for hidden screws.
- Be careful to save all your screws as you go. Don't just throw them all into a coffee mug, either, because most gadgets have several different-size screws in them, and you'll need to remember which goes where when you put everything back together.
- If something is particularly complicated, and you're afraid you won't be able to put it back when you're done, grab a digital camera and snap some photos before you start taking stuff apart.
- Your ultimate goal is to expose any circuit boards or other electronics that might have gotten spilled on. If you're taking apart a laptop, this means you'll need to isolate the motherboard and any daughterboards.

4 WASH IT OFF

Once you've exposed the circuitry in your device, you'll have to clean off the stain. If you can see that the stain


C


D

is contained in a certain part of the board, you can use alcohol swabs, as described above, to clean it off (images C and D). If an entire circuit board is soiled, you'll need to resort to more drastic measures: completely disconnect it from the rest of the gadget and run it under soapy water.

Yes, that's right, run it under water. We're all conditioned to want to keep our electronics away from liquids, and that's generally a good policy, but sometimes you've got to fight fire with fire, so wash that sucker off. Don't scrub, just gently wipe, and let the soapy water do its thing.

When you've removed the stain, rinse off the soapy water. For the best chance of success, you'll want to rinse with distilled or deionized water, which can be bought at most supermarkets. Tap water will leave deposits on your circuit board when it dries.

You'll want to see whether your device will work right away, but you'll have to wait a little longer. The next step is to make sure every part that you washed is completely dry. It's best to air dry it, since cloth or paper towels can leave behind lint, although you can speed up the process by packing the wet parts in a desiccant, such as silica gel or plain old white rice. You can also speed the drying process by using a fan or even a hair dryer, although if you do, be sure to do so from a distance and using the low-heat setting, as you don't want to warp the circuit board.

Finally, once all the components are clean and dry, it's time to put everything back together. Refer to your photographs if you took them, and make sure that everything fits back together securely. We can't guarantee that your device will be working again, but at least you'll know you did everything you could.

Manage Your Music with Foobar

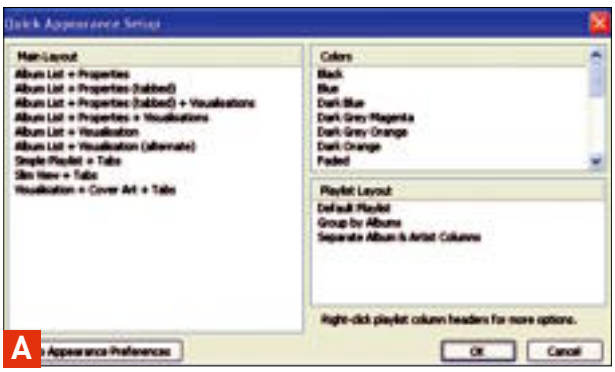
Apple has done everything in its power to convince the public that when it comes to music hardware and software, there's only a single choice: the iPod and iTunes, respectively. And while we do admit that the iPod is an excellent MP3 player, we're not so enamored with iTunes. That's why we're going to show you how to use Foobar, a popular open-source program with a powerful, modular design, to manage your music files, rip CDs, and even manage your iPod. –ALAN FACKLER

1 MOVE YOUR SONGS AND ALBUMS FROM ITUNES

First, you'll need to download Foobar (www.foobar2000.org) and install it. Since you've probably already got a huge collection of music stored on your PC, in long-forgotten folders and playlists, you're going to want to start by moving that music into Foobar. There are a couple of ways to go about doing this.

The first time you open Foobar, you'll be asked to select a UI configuration (image A). Selecting Simple Playlist + Tabs from the Main Layout box will set you up with a blank white screen, with the upper left-hand corner tabbed "Default." This is your starting point, and will eventually contain a list of music files to play. Right-clicking the Default tab will allow you to create new tabs, which can be named anything you'd like.

The simplest way to play songs from iTunes is as follows: Open iTunes, and drag a song or album to your desktop. Once there,



A

just grab the files, and drag them into Foobar's interface. If you don't want the song to appear under the Default tab, simply create a new tab. This drag and drop system will allow you to play any of your iPod songs in Foobar easily. You can create different tabs for different playlists, and populate those tabs with any songs you want to.

But wait a minute. We know what you're thinking: "I have a 5,000-song library and 20 playlists, I don't want to sit around all day dragging and dropping individual songs or even albums!" Luckily, you won't have to. To show Foobar where all your music is, click Library > Configure from the main screen. In the preferences window that pops up, you'll see a field for Music Folders (image B); click the Add button, and select your root music folder. Now, check the Enabled button under Library Viewer Selection Playlist. When you press OK, Foobar will load all your music from your music folder and you can browse through it using either the Search or Album List options that have become available in the Library menu.

2 MOVE YOUR PLAYLISTS FROM ITUNES

If you want to transfer all of your playlists to Foobar, you'll have to use a handy little program called iTunes Export, which you can download at http://bit.ly/ddNG02.

The program works in three simple steps:

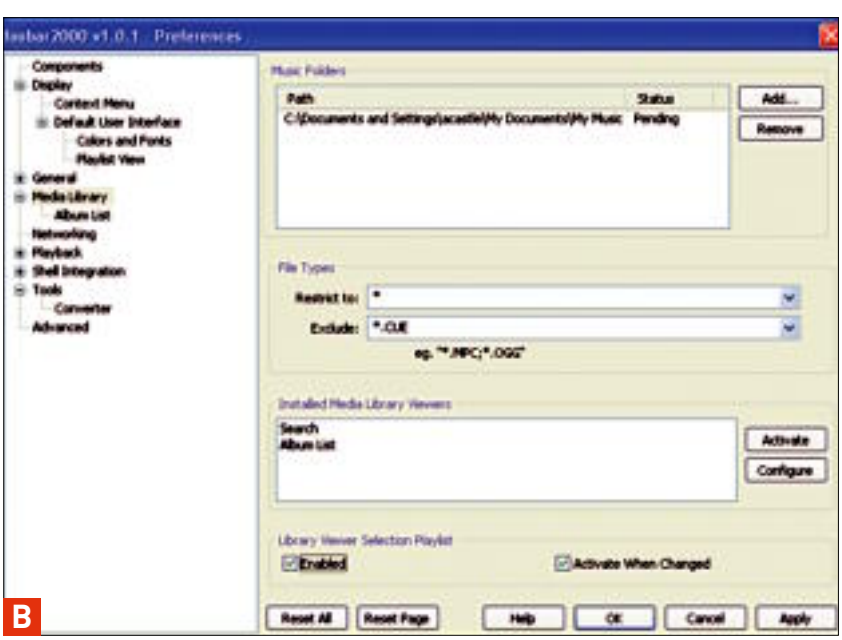
First, you select the iTunes library you want to export from. You do this by selecting the iTunes library.xml file, which acts as a sort of index for all of your music files. Ours, for example, was located at C:\My Documents\My Music\iTunes\iTunesMusicLibrary.xml.

Once you've found your library, click Next. You'll now be asked which iTunes playlists you'd like to export (image C). By default, it will export all playlists.

Finally, you'll be asked to select an output directory for the playlists. Choose one, leave the rest of the settings untouched, and hit Finish to save your playlists in .m3u format.

Now that you've exported your playlists, it's time to load them into Foobar. In Foobar, go to File and hit Load Playlist. Now, simply find the playlists you exported with iTunes Export. Select whichever .m3u files you want to import, and click Open. Foobar will automatically create new tabs for each one of your preset playlists.

C

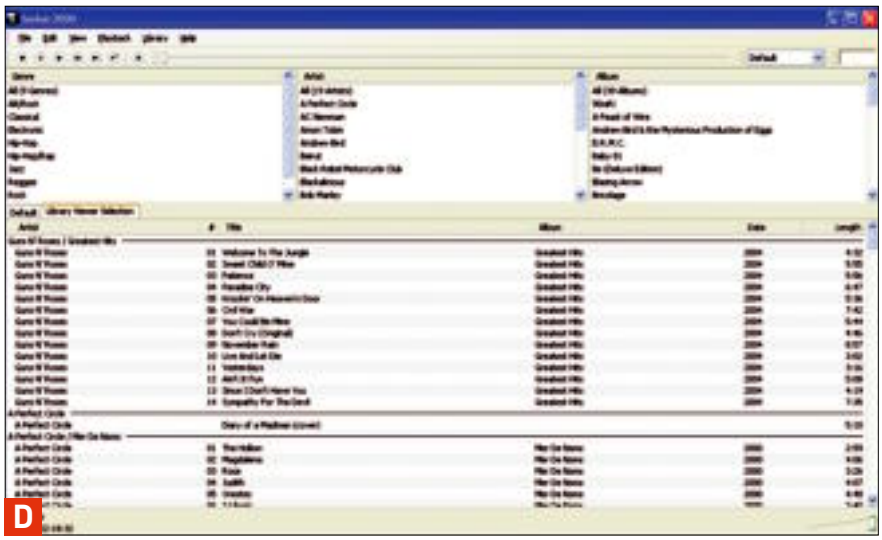


B

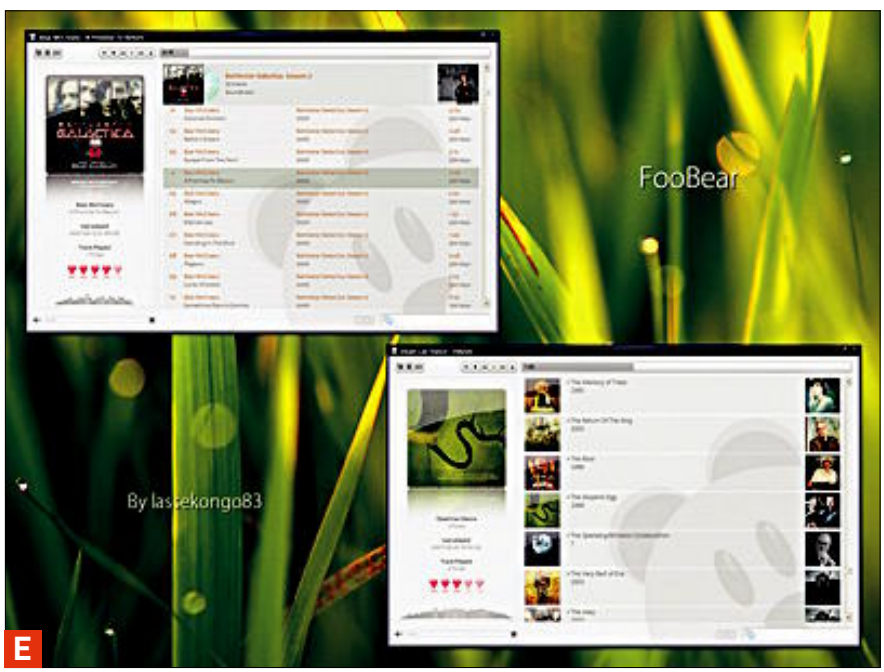
3 CUSTOMIZE FOOBAR

One of Foobar's greatest strengths is its modularity, which allows you to add whatever functionality you want to the program, without bloat. Every person's ideal Foobar setup is different, but we'll show you how to get started modifying yours, by highlighting some add-on modules that will give it more of the look and feel of iTunes.

The first thing we'll install is a module called Columns UI, which can be found at http://yuo.be/columns.php. This user-interface module includes customizable columns that alter the look of Foobar, adding iTunes-esque genre, artist, and album navigation (image D). Like other downloadable add-ons for Foobar, Columns UI will download as a compressed file. We recommend using 7-Zip to unzip the file.



D



E

F

Program Files\foobar2000\components.

Now that you've installed the add-on, re-open Foobar. A new user-interface selection dialog will appear, which will give you the option to select Columns UI. Browse through the different interfaces until you find a look that works for you. Already, Foobar's UI is looking a lot less bland.

Note that there are many options for enhancing the look of Foobar that go beyond adding interface elements. At the highest level, skins can be added to dramatically alter the look and feel of Foobar. However, skinning your player is a bit more complicated than adding a simple module. Creating an awe-some-looking player is a topic of discussion in countless online communities, and those experienced with Foobar's scripting language have come away with some amazing results (images E and F).

Skins are available all over the web, but many of them require various prerequisite modules for proper use. Below are some plugins that are commonly required before installing skins:

- **foo_ui_columns.dll** – Used in this tutorial.
- **foo_ui_panels.dll** – Gives Foobar floating windows rather than columns. A must-have for new skins.

- **foo_cwb_hooks.dll** – Allows global title formatting.

- **foo_uie_powerpanels.dll** – Creates a separate Seek panel and Volume panel.

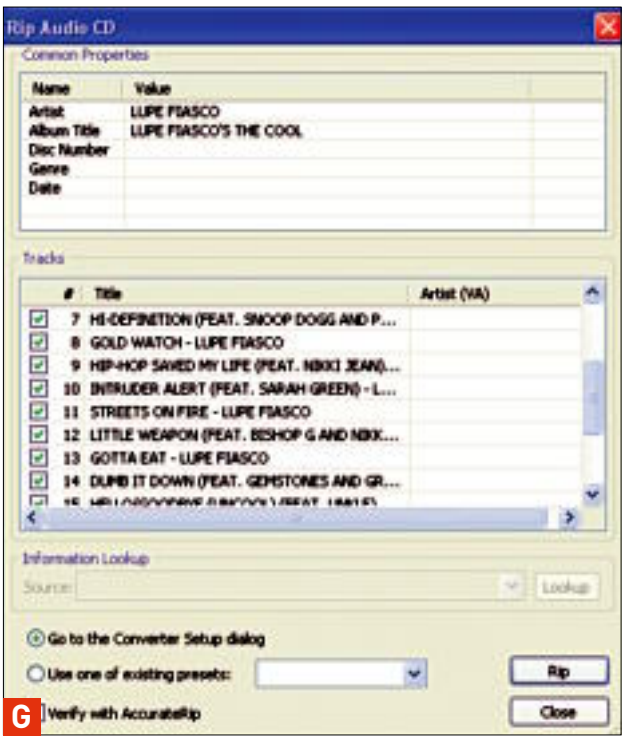
- **foo_uie_quicksearch.dll** – Allows you to search for a playlist of your choice.

- **foo_uie_lyrics** – Panel used to show downloaded lyrics.

If you want to see more, visit http:// customize.org/foobar and check out tons of great interfaces, each with links to download the base skin and a list of modules used. Pay attention to the prerequisites, though; the majority of these skins won't work without them!

4 RIP MUSIC FROM CDS USING FOOBAR

Next, we'll walk you through the process of ripping MP3s from a CD using Foobar. First, pop your CD into your optical drive. In Foobar, scroll over to



G

H

which songs you would like to rip from your album. All of the songs will be checked by default, so deselect any songs you don't want to save. You can also edit the artist name and album title, as well as fill in any other relevant information, including disc number, genre, and date. When you're done, hit Rip.

Next, you'll see the Converter Setup tab (image H). There are a couple of interesting and customizable options listed in this tab, but most of them can remain untouched. The Output Format tab will allow you to choose what type of media file you would like to export the songs as. Foobar will default to .wav files, but you can choose from a wide variety of options. Assuming you'd like to rip to .mp3, you'll have to have the LAME encoder installed on your machine. You can learn more about LAME at http://lame.sourceforge.net.

A second important field in the Converter Setup window is labeled Output Path. This allows you to select the location on your computer where the finished files will be saved. When you're done, hit OK.

When Foobar is done ripping your album, a Converter Output screen will pop up, which will allow you to access your ripped files directly.

File and select Open Audio CD. A pop-up menu will appear asking you to select a drive. Make your selection and hit Rip.

This will bring you to the Rip Audio CD tab (image G), where you can choose

5 MANAGE YOUR IPOD USING FOOBAR

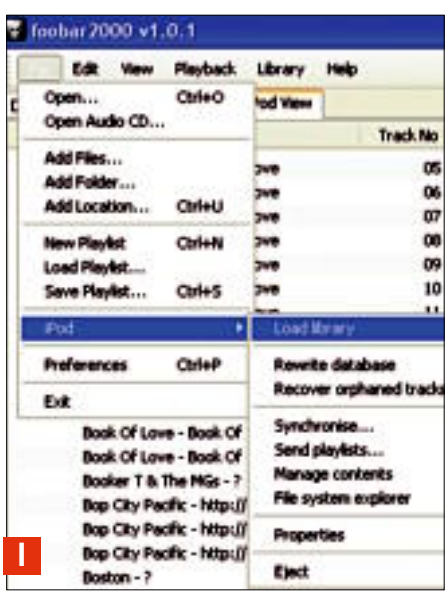
We all know how easy it is to synch an iPod (Apple product) with iTunes (Apple software). But there are plenty of open-source programs that allow you to do the same thing, without having to subject yourself to Apple-authored software. Foobar is a great example of this, although you'll need go through a few steps before you can sync it to your iPod.

First, you'll need to download an iPod-manager plugin known as Foo_Dop, which allows you to not only transfer your music, but also organize your playlists and albums and synch them to your iPod with little effort.

You can download the plugin at http://yuo.be/wiki/dop:start. Once again, installation is as simple as extracting the foo_dop.dll file to your Foobar components directory, and then restarting Foobar. Plug your iPod into the computer.

If you're using either an iPhone or iPod touch, you will need to open the iPod Manager setting in the Properties window, and check the box that reads Enable Mobile Devices Support.

With Foo_Dop installed, you can simply click File > iPod > Load Library (image I), and voilà! The entire contents of your iPod is now displayed right there on the screen. Now, the changes you make to your library, whether you're deleting songs or creating new playlists, will be transferred over to your iPod. This makes it extremely easy to manage and organize your tracks and playlists.



I

REVIEWS

Tested. Reviewed. Verdictized.

INSIDE

ONLINE

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

Maingear Shift

Tri-SLI Fermi and Gulftown will make any boy smile

Maingear's slick new custom enclosure inverts the three GPUs to aid in cooling.

It's no secret that Nvidia's GeForce GTX 480 cards are the hottest piece of technology people want to gawk at right now. Hell, we were barely able to obtain one of these coveted babies for our feature on Fermi this month.

So we were pretty impressed to crack open Maingear's new Shift system and find *three* GTX 480 boards running in tri-SLI. That the company could rate such bounty is testament to its street cred among power users.

The Shift isn't just about the Fermi cards, though. Maingear also managed to get that other big star of the PC world in for the ride: Intel's Core i7-980X, which, with help from the Acetek water cooler, Maingear pushes from the stock 3.33GHz to 4.2GHz.

Also in the box is 6GB of Kingston Hyper-X DDR3/1333, a massive 1,500-watt Silverstone PSU, and an EVGA Classified X58 SLI motherboard. For storage, there's Crucial's new C300 drive coupled with a 2TB Western Digital Caviar Black drive. The C300 is noteworthy because it's one of the first SSDs to support SATA 6Gb/s data rates. And that's where we ran into one of the first faux pas in the system. This iteration of the Classified X58 SLI doesn't support SATA 6Gb/s speeds, only SATA 3Gb/s. Since there's no room for an add-in card, no SATA 6Gb/s for you!

The GTX 480 cards are the highlight here, though. Although ATI's Radeon HD 5970 is still the fastest card, the GTX 480 is the current fastest *single*-GPU card. The GTX 480 especially shines in DX11 titles at high resolution with antialiasing turned on. Even though our videocard benchmarks have shown the GTX 480 to be a cut above the Radeon HD 5870 cards, the gaming scores from the Shift were roughly even with those of the Digital Storm HailStorm rig we reviewed in May, which featured a three-way CrossFireX config.

Like the HailStorm, the Shift made a mockery of our zero-point's gaming scores, with performance leads of more than 60 percent.

In our apps tests, the Shift's scores were close to the HailStorm's scores, but still slightly behind. That's likely due to the HailStorm's slightly higher 4.4GHz overclock. That 5 percent clock difference amounted to scores that were roughly 1 percent to 2 percent slower.

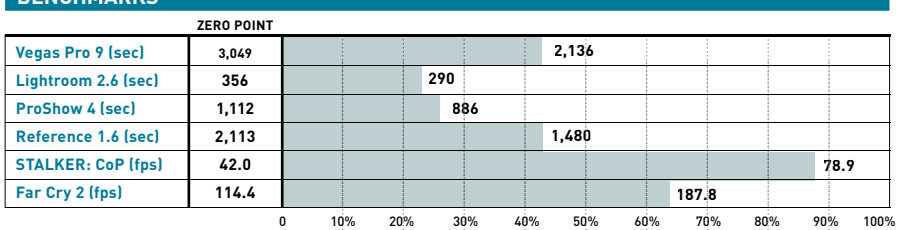
What are the Shift's major flaws? Heat and noise. With the Digital Storm HailStorm, a double (but ungainly) radiator system cooled the CPU and three Radeon HD 5870 cards to make for near-silent computing. The Shift is equally quiet running CPU-heavy apps. But once you crank up a game, the howl from the GTX 480s lets you know your videocards are working. The hot exhaust from cards also makes the rear top of the case uncomfortably warm. We saw 120 F temperatures during tests

What Maingear gives you over the Digital Storm is a pretty good price break. While the HailStorm pushed the $7,800 mark, the Shift eases in below $6,900. That's quite a savings. Of course, for many folks that's like getting a $10 million price break on a $60 million Gulfstream G550 jet—you still can't afford it. But for those folks who can, the Maingear Shift is a pretty sweet deal. **–GORDON MAH UNG**

SPECIFICATIONS

Processor	Intel 3.33GHz Core i7-980X (overclocked to 4.2GHz)
Mobo	EVGA Classified X58 SLI
RAM	6GB DDR3/1600 in tri-channel mode
Videocard	Three GeForce GTX 480 in tri-SLI
Soundcard	Onboard Realtek
Storage	256MB Crucial C300 SSD, 2TB Western Digital Black
Optical	LG Blu-ray combo drive
Case/PSU	Custom / Silverstone 1,500W PSU

BENCHMARKS



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

MAXIMUM PC KICK ASS!

MAINGEAR SHIFT

VERDICT 9

MAIN STREET	WALL STREET
Tri-SLI Fermi and 4GHz Gulftown equals pure joy.	Loud in gaming; puts out enough heat to cook bacon.

$6,885, www.maingear.com

XFX Radeon HD 5830

A polished, if pricey, take on AMD's oddball GPU

You have to give AMD credit for trying to make lemonade out of lemons. The Radeon HD 5830 is the odd duck of AMD's 5000-series GPUs. The card itself is as long as the high-end HD 5870, and consumes more power at idle than the Radeon HD 5850. But that's what you'd expect of a card built on a "salvaged" chip.

Salvaged chips are produced by taking chips that fail to pass muster as the highest-end part and selling them as lower-end parts. This can be seen in the Radeon HD 5830, which has 1,120 stream processors active, as opposed to 1,440 for the HD 5850 or 1,600 for the 5870.

Unlike AMD's lower-end HD 5770, which uses the Juniper GPU, with 1.05 billion transistors and 800 stream processors, the 5830 sports the same 2.15-billion-transistor GPU as the 5870/5850, with more functional units disabled.

The potential performance bottleneck of the 5830 isn't fewer computational units. The HD 5830 has only 56 texture units and 16 ROPs, as compared to the 72 texture units and 32 ROPs of the Radeon HD 5850. This ultimately is what may limit throughput.

To sum up: The Radeon HD 5830 is very much a cut-down Radeon HD 5870 on a large board with higher idle power than the slightly more expensive HD 5850—and with performance that's likely to be much lower.

XFX's take on the HD 5830 adds some flair to this unlikely and still overpriced graphics card. The cooler on the GPU and memory is shorter than in AMD's reference design. So while the actual board is as long as an HD 5870 (10.6 inches), the shorter cooler does make for a less bulky product. XFX delivers its HD 5830 at stock clock speeds: 800MHz core and 1,000MHz memory clocks.

Given these limitations, how does XFX's HD 5830 perform? We dropped the card into our graphics test system to find out, comparing it to the Radeon HD 5850 and HD 5770. All our tests were run at 1920x1200 with 4xAA.

The card performed pretty much as you'd expect—somewhat faster than the HD 5770, but noticeably slower than the HD 5850. It's also $100 more than a 5770, and just about $50 less than the Radeon HD 5850. The performance was closer to an HD 5770 across the board. More notably, the HD 5830 consumed about 15W more at idle than the HD 5850.

Ultimately, it looks like the HD 5830 is a pared-to-the-bone salvage HD 5870 that AMD decided to offer at a gap-filling price point. The performance is about right for the specs—certainly better than an HD 5770—but the price really needs to come down at least $20–$30 before we'd recommend it. And don't forget: You'll actually need a larger case than you would with a HD 5850. —LOYD CASE

BENCHMARKS

	XFX Radeon HD 5830	XFX Radeon HD 5870	XFX Radeon HD 5770
3DMark Vantage Extreme	6,229	**6,579**	4,661
3DMark Vantage Performance	**14,425**	14,416	10,963
Unigine Heaven (fps)	19	**23**	17
Battle Forge / AA on (fps)	30	**39**	24
FC2 / Action AA on (fps)	42	**53**	38
FC2 / Ranch Long, AA on (fps)	47	**61**	42
HAWX / AA on (fps)	50	**58**	42
STALKER: CoP / AA, tess on (fps)	53	**68**	47
Crysis / AA on (fps)	21	**25**	17

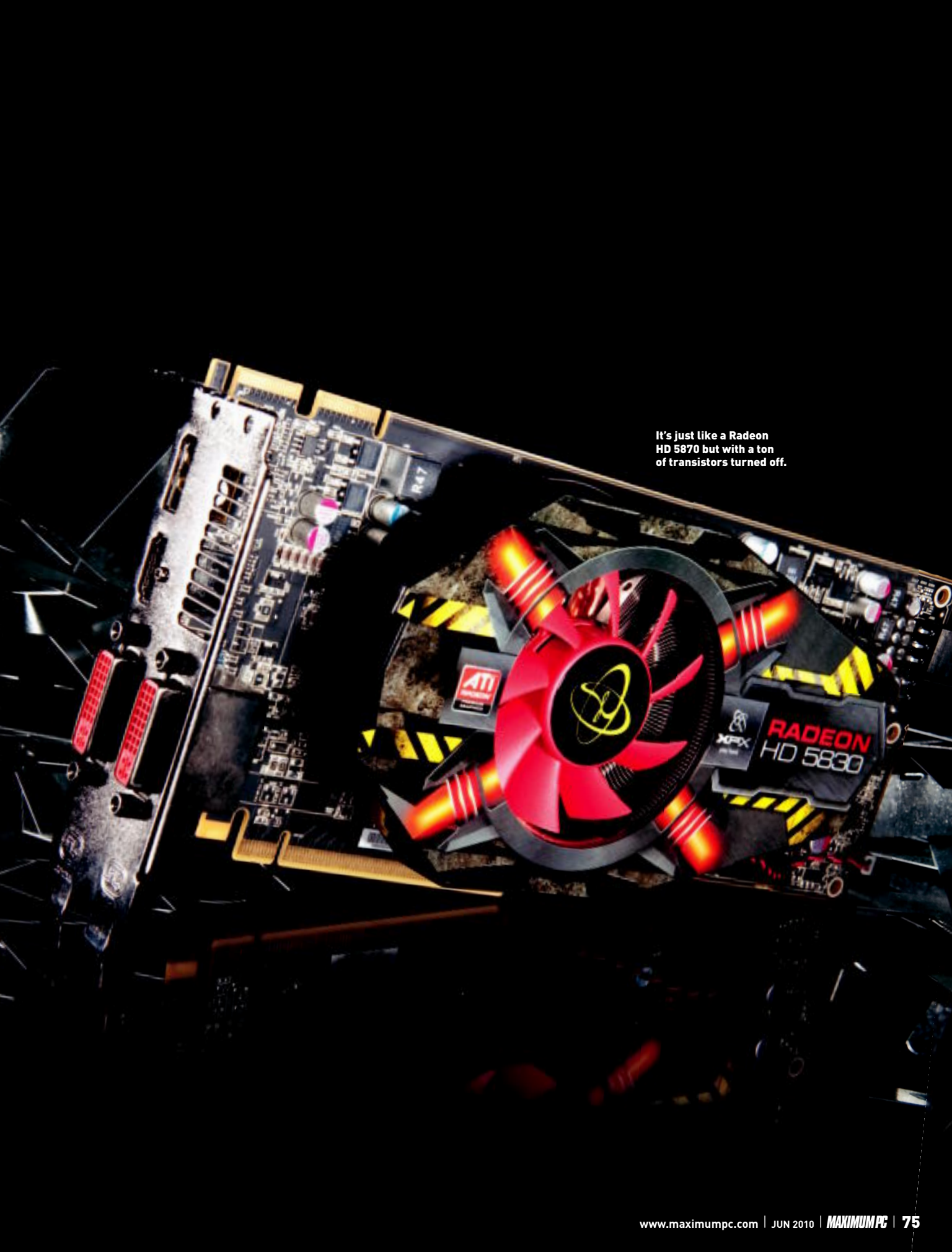
Best scores are bolded. All of our tests were run at 1920x1200, with 4x AA where noted. Our test bed has a 3.33GHz Core i7-975 Extreme Edition on an Asus P6X58D Premium with 6GB of DDR3/1333 and 64-bit Windows 7 Ultimate.

VERDICT 6

XFX RADEON HD 5830

+ LOST	− LOST IN SPACE
Good performance; XFX warranty; interesting cooler design.	Priced too high for the performance; needs more space than a 5850.

$260, www.xfxforce.com



It's just like a Radeon HD 5870 but with a ton of transistors turned off.

AVADirect X1800

Big size, big performance, big price

The X1800's keyboard is bordered by a row of touch-sensitive buttons across the top and eight programmable buttons for gaming macros along the side.

In September 2009, we saw AVADirect push the boundaries of portable computing with its honkin' Core i7-975 Extreme Edition–equipped D900F desktop replacement. That behemoth was both a back breaker (at 15 pounds) and a benchmark buster (at least in our applications tests).

This month, we're presented with AVADirect's X1800F—a rig that's similarly monstrous but boasts a completely different character. The X1800F features a Core i7-820QM, a true mobile quad-core part. Intel's Clarksfield chips have obvious advantages in a mobile platform, including a lower price and a much lower TDP (thermal design point)—45W max vs. 130W—than the desktop Nehalems. There's also more emphasis on Turbo Boost. So, although the i7-820QM has a base clock of 1.73GHz, it can theoretically reach 3.06GHz in single-threaded apps. Photoshop is our only mostly single-threaded application benchmark, and you can see from the numbers that the X1800F performed 20 percent better in that test than our 3.06GHz Core 2 Duo zero-point rig did. But in the multithreaded tests, where the X1800F didn't have the full advantage of Turbo Boost, the applications scores were even more punishing—with the X1800F achieving leads in excess of 50 percent—such is the power of those two extra cores, plus HyperThreading, plus a superior microarchitecture.

Of course, when compared to the 3.33GHz Core i7-975 in AVADirect's D900F, the X1800F gets soundly beat in the apps, by 28 percent (in Photoshop) to 39 percent (in MainConcept). Flipping from apps to games though, the X1800F has the upper hand, thanks to its two GeForce GTX 285M videocards in SLI. While this config offsets any power savings achieved by the mobile CPU—this would be a perfect place for Nvidia's Optimus technology, if you ask us—the config pays off handsomely in games, turning the tables on the D900F's single GTX 280M with wins of 79 percent and 87 percent in Far Cry Duty 2 and Call of Duty 4, respectively. Naturally, our zero-point's GTX 260M was even less of a competitor. Even at the X1800's native res of 1920x1080, with performance set to very high and overall quality set to ultra high, we saw an average 55.4fps in Far Cry 2. Impressive for a notebook.

The X1800's emphasis on gaming is evident in its other appointments. Whereas the D900F had more of a workstation vibe, the X1800 has some aesthetic flash. The mammoth 17.25x12x2.5-inch chassis has a mirror-black finish inside and out and is accented with LED-lights that cycle through different colors when the "light show" is initiated. The chiclet keyboard is flanked on the left by eight programmable gaming buttons. An HDMI-in port lets you run your game console on the notebook's glossy 18.5-inch HD screen. Or use the HDMI-out for playing games or even Blu-ray movies on an external display.

Sadly, the X1800 could barely hold its charge for an hour when playing a standard-def DVD in power-saving mode. And this sucker is heavy, topping 15 pounds with its power brick. But if you like to LAN party, this is far better solution than lugging around both a PC and a screen, not to mention peripherals—and it gives you performance commensurate to its girth. —KATHERINE STEVENSON

SPECIFICATIONS

CPU	1.73GHz Core i7-820QM
RAM	8GB DDR3/1066MHz
Chipset	Intel PM55
Drives	Crucial 256GB SSD, WD 640GB Scorpio (5,400rpm)
Optical	LG Blu-ray combo drive (HL-DT-ST BDDVDRW)
GPU	Two Nvidia GeForce GTX 285M in SLI
Ports	VGA, HDMI, HDMI in, Ethernet, three USB, one USB/eSATA, FireWire, headphone, mic, line-in, 7-in-1 media reader, Express Card/34 slot
Lap/Carry	12 lb, 10.8 oz / 15 lb, 3.6 oz

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	1,320	780
Photoshop CS3 (sec)	153	127
Proshow Producer (sec)	1,524	878
MainConcept (sec)	2,695	1,751
Far Cry 2 (fps)	32.7	61.9
Call of Duty 4 (fps)	58.2	129.4 (+122.3%)
Battery Life	100.0	61 (-39%)

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

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

MAXIMUM PC KICK ASS!

VERDICT 9

AVADIRECT X1800

+ THE BIG LEBOWSKI

Mobile quad-core rocks; best gaming performance from a portable; fully equipped for any chore.

– BIG MOMMA'S HOUSE

Size and weight aren't all that portable; poor battery life; costs more than some desktops.

$3,950, www.avadirect.com

Dell Inspiron Zino HD 400

Can this mini PC handle fat, bloated Adobe and Apple code?

We've come to realize that there is no single ideal build for a home-theater PC. Some folks want an HD tuner, while others want Blu-ray. Some even expect their HTPC to function as a full-tilt boogie gaming rig. Then there are the users who want nothing more than the ability to browse the web on their glorious 60-inch TV set and dive into the vast sea of streaming content.

For these latter folks, Dell's Inspiron Zino HD seems like a perfect fit. Like a chubby Mac Mini, the Zino HD is quiet, small, and easy to tuck away in the AV rack. It's outfitted with a dual-core 1.5GHz Athlon X2 3250e, 2GB of DDR2/667, and AMD's 780G chipset with integrated Radeon HD 3200 graphics. Instead of relying on a diminutive (and performance-sapping) 2.5-inch drive, the Inspiron Zino HD can fit a full-size 3.5-inch desktop drive. Our review model featured a 250GB drive, but options up to 1TB are offered, and we see no reason why a 2TB drive could not be used.

The unit has Gigabit Ethernet, two eSATA ports, VGA, HDMI, analog audio–out, and mic in on its behind. In front, the Zino has two USB ports, a headphone jack, and a multiformat card reader. Unfortunately, there's no Wi-Fi as standard but 802.11g can be added for $25, and 802.11n for $45.

Although the Zino HD can be used as a mini desktop PC anywhere, the inclusion of HDMI instead of DVI makes it pretty clear that the unit is meant to be connected to an HDTV. But why use a PC when so many excellent streamers like the Roku and WD Live! are already available for a lot less? The HTPC's strength is that it has 100 percent fidelity with everything on the net. Netflix, YouTube, Vimeo, and, umm, those unmentionable websites can all be viewed from an HTPC. You can't do that with any streaming box today.

That's how it should work—in theory, anyway. One problem we ran into with the sexy Polywell Giada Ion-100 (reviewed March 2010) involved its lackluster dual-core Atom 330. The Giada could barely play Blu-ray, and streaming of any high-def content was terribly choppy. We had high hopes that the dual-core Athlon X2 would do better, but it didn't. While the Zino HD could play Blu-ray flawlessly, the unit annoyingly dropped frames when playing HD streamed from websites—even when fully buffered.

What's the deal? Blame bad, unoptimized code in Adobe's Flash. Even Adobe's GPU-accelerated Flash beta didn't help out the Zino HD (it didn't help the Polywell Giada, either.) As part of our evaluation, we set up the Giada, the Zino HD, and a Gateway Core i3-based SX2840 PC with integrated graphics side by side. With all three playing the same content on the same network segment, only the Gateway's Core i3 ran without a hitch. The Zino HD and Giada both choked on 1080p. Even playing a local QuickTime movie trailer in 1080p tripped up both the Zino HD and Giada. Here, the blame lies with the craptastic QuickTime player, which has no GPU acceleration and pegged both cores at 70 percent during playback. With the GPU-accelerated Windows Media Player 11, we were able to play the file just fine.

You could blame Adobe and Apple, but the harsh reality is that the Zino HD doesn't have the CPU horsepower to get the job done with today's apps. That may change in the next 12 months, but it's a pretty big negative against what would otherwise be a pretty sweet HTPC.

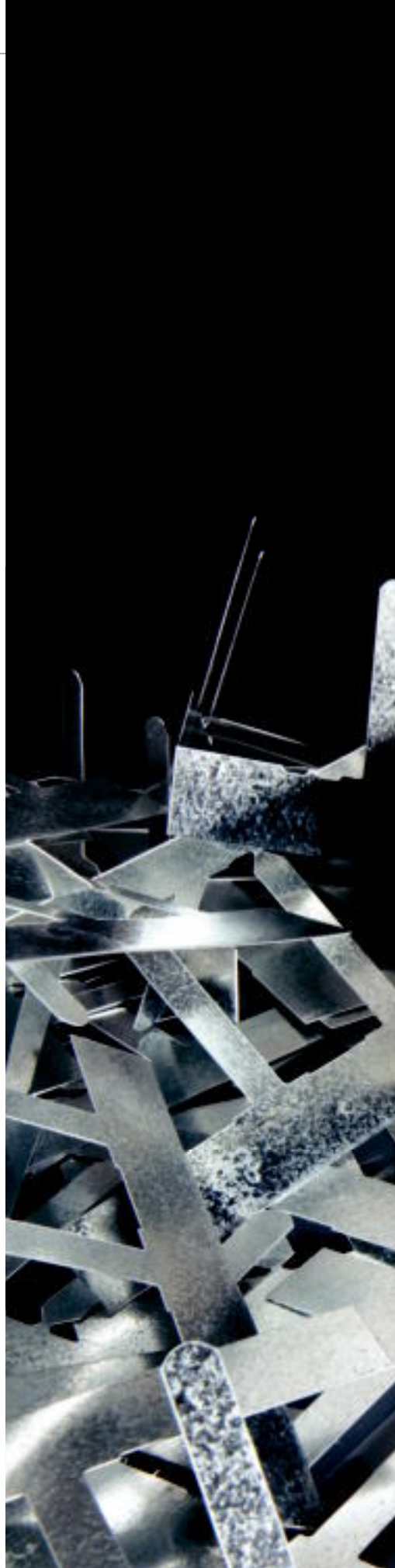
For folks with 720p, the Zino HD would be fine, but how many people are sticking with that tired-old standard? **—GORDON MAH UNG**

VERDICT **6**

DELL INSPIRON ZINO HD 400

+ LOST IN SPACE	− LOST
Small and quiet enough for easy living-room deployment; low price.	Low-clocked Athlon X2 doesn't have the juice to run unoptimized code well.

$325, www.dell.com



BENCHMARKS

	Dell Inspiron Zino	Polywell Giada Ion-100
Photoshop CS3 (sec)	**449**	552
Main Concept (sec)	**7,080**	8,858
3DMark 2003	2,540	**3,371**
Quake III (fps)	**192**	118
Quake 4 (fps)	28.6	29

SPECIFICATIONS

Processor	AMD 1.5GHz Athlon X2
Ports	Four USB 2.0, two eSATA, Gigabit, VGA, HDMI, mic in, stereo out, headphone out, card reader
RAM	2GB DDR2/667 in two SO-DIMM slots
Graphics	Integrated Radeon HD 3200
Storage	250GB Western Digital 7,200rpm 3.5-inch hard drive
Optical	HL-DT-ST GTION
Case/PSU	Proprietary / external power brick

The Zino HD 400 is dead silent, and at about 8x8x3.5 inches is easy to hide just about anywhere you want to put it.

Asus Eee 1201N

Proof positive that not all netbooks are created equal

Yes, Virginia, there is a dual-core netbook with (relatively) decent gaming performance.

What differentiates one netbook model from any other of the same size? There are only a few flavors, after all: last-gen netbooks, with Atom N270 or N280 processors and Windows XP; current-gen netbooks, with Pine Trail Atom processors and Windows 7; and Ion-based netbooks, with Nvidia mobile graphics and middlin' battery life. Well, you could wait for second-gen Ion netbooks, which promise excellent gaming power and 10-hour battery life. Or you could go for the Asus Eee 1201N, which offers first-gen Ion performance and—get this—a friggin' dual-core processor.

The 12-inch 1201N is the first netbook we've tested with an honest-to-goodness dual-core processor inside—Intel's 1.6GHz Atom N330, which you may remember from bare-bones Ion boards and nettops. Paired with the N330 is Nvidia's first-gen Ion platform, which turns a 12-inch netbook into something approaching a gaming platform (if 7-year-old titles fit your idea of games). The last Ion device we reviewed, the HP Mini 311 (February 2010), used a single-core N280, while upcoming second-gen Ion netbooks will use single-core Atom N450s. So is there a niche for a dual-core Atom netbook with Ion?

We're gonna say yes. The Eee 1201N seems like the electronic offspring of a notebook/netbook union. With a 12.1-inch LED-backlit screen at 1366x768, 2GB of RAM (finally!), a 250GB HDD, and Windows 7 Home Premium, it trends more toward the usability end of the netbook spectrum than the portability end—although at a lap weight of three pounds, 3.5 ounces, it's hardly a backbreaker.

The dual-core Atom really shined in our Photoshop and MainConcept tests, besting our zero-point system by 28 percent and 66 percent, respectively, and setting netbook performance records. The Ion-powered graphics performance was slightly lower than that of the HP Mini 311, most likely due to the Mini 311's faster front-side bus and DDR3 memory. The 1201N even outperformed the Toshiba Satellite T115 ultraportable (reviewed March 2010) in everything but Photoshop. Put that in your calabash and smoke it, netbook haters.

Unfortunately, that processing power comes at a price. The 1201N's six-cell Li-ion battery withstood our full-screen DVD-quality video-playback test for just three hours, 11 minutes. In an age of Pine Trail netbooks, which get more than seven and a half hours from a six-cell, that's a major bummer. Still, until second-gen Ion netbooks (with their Optimus battery-saving tech) are available, that's still ample time for a bit of fun on the plane.

The 1201N's chassis is everything we'd expect from an Asus seashell-type netbook: thin, decent chiclet keyboard, responsive touch pad, and smudge-prone glossy-black finish. It's attractive, though not particularly innovative. It's also nice that Asus didn't gimp the 1201N with a Starter version of Windows 7, and both SO-DIMM slots are easily accessible for RAM upgrades.

At $500, the 1201N hits the upper end of the netbook range. But that buys you Ion graphics, dual-core processing power, 2GB of RAM, a real version of Windows 7, and a screen that can display 720p video. Next-gen Ion systems will have better battery life, but will they be dual-core? We've gotta give Asus credit for releasing a 12-inch netbook with moxie and proving that Atom isn't dead yet. **—NATHAN EDWARDS**

SPECIFICATIONS

Processor	Intel Atom N330 Dual Core @1.6GHz
Chipset	Nvidia Ion LE
Graphics	Nvidia Ion LE
Display	12.1-inch LED-backlit WXGA LCD @1366x768
RAM	2GB DDR2/533
Storage	250GB 5,400rpm HDD
Ports	Three USB 2.0, HDMI-out, VGA-out, SD reader, audio
Wireless	802.11b/g/n, Bluetooth 2.1+EDR
Lap/Carry	3 lb, 3.5 oz / 3 lb, 11.5 oz

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	708	550
Main Concept (min)	251	151
3DMARK03	710	4,070 (+473.2%)
Quake 3 (fps)	60.9	121.4
Quake 4 (fps)	3.6	33(+816.7%)
Battery Life (mins)	255	191 (-25.1%)

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

Our zero point netbook is a Lenovo IdeaPad S12 with a 1.6GHz Intel Atom N270, 1GB of DDR2/667 RAM, a 160GB hard drive, Intel GMA950 integrated graphics chipset, and Windows XP Home SP3.

VERDICT 9

ASUS EEE 1201N

+ MOXIE

Dual-core performance; thin profile; comfortable keyboard; Ion graphics; 2GB RAM.

– BOXY

Middlin' battery life; hard drive not easily upgradable; smudge-prone.

$500, www.asus.com

CoolIt Eco A.L.C.

Eco ekes out a win, but is air better?

Back in the prehistoric times (April 2009), we reviewed the Domino A.L.C, an all-in-one liquid CPU-cooling system with three different speeds and an LCD screen. It worked well and was easy to install, but the screen (and attendant fan control) was, in our opinion, poorly thought-out. To see the apparatus, your case needed a side window, and to use it, you'd need to remove your side panel entirely—in which case, why not just use air? But the Domino performed well, so we let it slide.

Those features are gone in CoolIT's new Eco A.L.C. In fact, the Eco bears a strong resemblance to Corsair's H50 all-in-one that we reviewed in September 2009.

Like the Corsair H50, the Eco consists of a heat exchanger and pump that mount directly to the CPU socket, a radiator connected to the pump by a closed cooling loop, and a 12cm fan that connects to the radiator. The radiator and fan replace the rear 12cm or 14cm exhaust fan that's standard in most ATX cases. The pump is powered by a 3-pin connector attached to any motherboard fan header, while the exhaust fan has a 4-pin PWM connector and attaches to the CPU_FAN header—just like with the H50.

Unlike the fan on the H50, which Corsair recommends be mounted as an intake, CoolIT advises you to mount the Eco A.L.C.'s fan as an exhaust fan, just like the one it's replacing in your case. This has the added benefit of not screwing up your case's existing airflow. The fan is pre-attached to the radiator with screws, but is easily removable if you prefer your own fan or just want to flip it to an intake fan. The radiator also comes with mounting holes on the opposite side, so you can add a second fan.

The Eco's install process isn't terribly complicated. The fan and radiator mount with four screws in place of your rear exhaust fan. The heat exchanger's mounting screws slide to three different positions to accommodate Sockets 775/1156/1366 (with a separate mounting bracket for AMD CPUs), and the box includes backplates for each socket. One note: Although the manual we received says to hand-tighten each screw, we only got good results when we bottomed out all four mount screws, a process that puts a fair bit of strain on the motherboard. CoolIT told us it's updating the manual to reflect this.

We tested the Eco against the Corsair H50 (its logical competitor), our champion air cooler (the Cooler Master Hyper 212+), and the stock Intel cooler. And the Eco performed well. Idle temperatures were 3 C lower than with the stock cooler, while at 100 percent burn, temps were more than 16 C lower. But the Corsair H50's idle temps were 2 C lower than the Eco's, and its burn temps averaged just a quarter of a degree higher—within the margin of error. Both all-in-one water coolers, though, (to our surprise) were pantsed by the Hyper 212+.

It's worth noting that the Eco we derived these results from was the second one we tested. The first had some sort of mechanical defect and didn't perform well. Regardless, we were surprised by the ultimate results. We're pleased that the $75 Eco performs almost identically to the $80 Corsair H50, but surprised that both are spanked by a $30 air cooler. However, the liquid coolers are potentially quieter. We like the Eco, but the amount of force needed to fully tighten the heat exchanger, as well as the noisy stock fan, keep this all-in-one from a Kick Ass award.

—NATHAN EDWARDS

BENCHMARKS

	CoolIt Eco	Corsair H50	CM Hyper212+	Stock
Idle (C)	31.75	29.5	**27.75**	35
100% Burn (C)	45.75	46	**44.5**	62.25

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 Corsair 800D case with stock fans.

COOLIT ECO A.L.C.

VERDICT 9

+ ECCO THE DOLPHIN	− ECOTERRORISM
Compares well to its competitors; relatively simple install.	Can't beat Best of Best air cooler in performance or price; noisy stock fan.

$75, www.coolitsystems.com

The Eco A.L.C. eschews the mostly useless LCD display of the Domino, its predecessor.

Lenovo IdeaCentre D400 Home Server

Been there, done that

One sure sign that Windows Home Server has gone mainstream: You can buy Lenovo's IdeaCentre D400 at Walmart. The D400 is remarkably similar in looks and features to Acer's Aspire easyStore, which you'll also find on the big-box retailer's website (yes, HP's MediaSmart Server LX195 is there, too).

Intel's Atom 230 processor appears to be the CPU of choice among mainstream home-server builders, since Acer, HP, and Lenovo have all tapped the 1.6GHz chip. Lenovo pairs it with 1GB of 800MHz DDR2 memory (the motherboard is capable of addressing 2GB of memory, but there's only one slot). The D400 ships with either one or two 1TB drives; the machine we reviewed was outfitted with two (thereby enabling Microsoft's Drive Extender Technology to automatically duplicate shared folders across multiple drives). That leaves two internal, hot-swappable, 3.5-inch bays for future expansion.

Fill those bays and you can add even more storage using the eSATA port and the four external USB 2.0 ports in back (there's a Gigabit Ethernet port there, too). Plug a drive into the fifth USB port (in front) and push a button and the server will inhale its contents and automatically sort the files for storage in the appropriate locations (JPEGs in the shared Photos folder, MPEGs in the shared Videos folder, and so on). Acer's easyStore servers boast a very similar feature.

Performance-wise, Lenovo's box proved to be just a little faster than our home-brew machine in our real-world tests, where we use a stopwatch to time both read and write operations. The home-brew rig is a Lab cast-off consisting of an Asus A8R32 motherboard, a 2.6GHz AMD Athlon 64 FX-60 CPU, and 2GB of DDR-400 memory. We connected both machines to a Gigabit Ethernet home network utilizing a Netgear WNDR3700 router and a 24-port SMC Networks SMCGS24 gigabit switch.

A low-power, single-core CPU and a paucity of memory will hold back Lenovo's home server when it comes to multitasking.

The WHS add-in universe has grown tremendously since the OS was first shipped, but that doesn't lessen our disappointment in Lenovo's slim collection of bundled apps. Of the apps it offers, we like the nifty utility that augments the Windows Home Server console, reporting stats such as CPU utilization, memory and storage consumption, CPU and motherboard temps, voltages, and fan speed. You'll also find the ubiquitous iTunes server and the freeware power-management add-in LightsOut (which will put the server into hibernation when it's not in use) pre-installed. We appreciate Lenovo's EasyAccess client utility, too, because it simplifies the mapping of server shares. But unlike the offerings from Acer and HP, Lenovo doesn't provide a DLNA-certified media server; and unlike HP's MediaSmart home servers, you can't schedule Mac backups—at least not right out of the box. **—MICHAEL BROWN**

BENCHMARKS

	Lenovo IdeaCentre D400 Home Server	Home-brew Windows Home Server
Small Files Upload (min:sec)	**0:29**	0:36
Large Files Upload (min:sec)	**0:57**	1:03
Small Files Download (min:sec)	**0:15**	0:21
Large Files Download (min:sec)	**0:50**	1:01

Best scores are bolded. Home-brew server based on an Asus A8R-32 motherboard, 2.6GHz AMD Athlon 64 FX-60 CPU, and 2GB of DDR-400 memory. We used the contents of Maximum PC's November 2007 CD for the small-file testing and a single 2.79GB file for the large-file testing. All scores are averages of three transfer trials.

VERDICT 7

LENOVO IDEACENTRE D400 HOME SERVER

+ MULTI-CORE	− SINGLE-CORE
Hot-swappable drive bays; one-touch USB backup; handy mapping software for client PCs.	Single-core Atom; only 1GB RAM; lacks a DLNA-certified media server.

$530, www.lenovo.com

Samsung P2770HD

Strong on features, weak on performance

We had high hopes for Samsung's P2770HD. After all, its 23-inch little brother rose to the top of a sea of crappy TN displays in our December 2009 roundup. With its street price of $400, the P2770HD looked like a strong value for folks with non-critical applications.

We stand by our opinion that twisted-nematic (TN) technology is inferior to in-plane switching (IPS), as well as our recommendation that you shouldn't rely on a TN-panel monitor for critical applications such as photo and video editing (especially if your livelihood depends on it). On the other hand, TN panels like this one do deliver unarguably faster pixel response rates, which is great for gaming, and lately, they've become insanely cheap.

This Samsung model also includes an integrated HDTV tuner, built-in stereo speakers, a Dolby Digital decoder, and nearly all the A/V inputs you could want, albeit only one each of HDMI, DVI, and S/PDIF on the digital side, and VGA, composite, and component on the analog side. As we found with the P2370HD, each of the P2770HD's ports are set at right angles to the rear panel, which makes for easy connections—we're really tired of turning monitors upside down to plug in cables. Unfortunately, the panel is mounted atop an egregiously flimsy stand that's not up to the task of holding it at a 90-degree angle without flopping forward.

Samsung doesn't show any love for DisplayPort, and the bezel—while attractive—is too wide to consider using in a side-by-side multi-display configuration. There's no integrated USB hub or media-card reader, either. But since this is a TV as well as a monitor, the P2270HD comes with an infrared remote control, which makes adjusting its brightness, contrast, and other controls supremely easy—this is a far superior solution to mashing buttons on the bezel.

As is our wont, we used DisplayMate Multimedia with Test Photos (www.displaymate.com) to evaluate the display, and the first flaw we detected was an inability to render colors uniformly over the entire monitor. While displaying low-saturated colors (bright shades of gray and very light cyan, for instance) an arc of darkness drooped from the top edge of the panel. We encountered a similar problem while rendering DisplayMate's 256-step grayscale screens (despite the name, this test also displays red, blue, green, cyan, and yellow scales, not just gray). No matter which scale we were viewing and no matter which direction the scales progressed (right to left, top to bottom, etc.), the same arc of darkness bowed out from the edge toward the center of the screen. We also encountered problems at the high end of the grayscale, where very light shades of gray blew out to white.

We didn't notice this shortcoming while playing games or watching movies, because there are few occasions in those scenarios where one color remains static across broad stretches of the display's borders. It could be a serious problem, however, if you're trying to match colors while painstakingly editing a photograph. And while we've yet to find any TN panel that we could recommend for that type of work, this monitor's 23-inch cousin performed far better. —MICHAEL BROWN

The Samsung P2770HD is a 6-bit TN panel, but Samsung maintains that its proprietary Hi-FRC frame-rate control enables it to display 16.7 million colors just like an 8-bit IPS model.

SPECIFICATIONS

Viewable Area	27 inches
Native Resolution	1920x1080
Panel Type	TN
Color Gamut	80 percent of NTSC
Color Depth	6-bit with Hi-FRC
Gray-to-Gray Response Time	2ms
Video Inputs	DVI, HDMI, VGA, composite, component

VERDICT 6

SAMSUNG P2770HD

+ WEEBLES	− WEEVILS
Integrated HDTV tuner; plethora of digital and analog inputs; remote control.	Mediocre color uniformity; poor gray-scale performance; feeble stand.

$400, www.samsung.com

NZXT Panzerbox

Tiny enclosure holds a whole lotta stuff

NZXT's Panzerbox is understated and elegant; two adjectives not always associated with NZXT cases.

NZXT's Panzerbox is akin to a Mini Cooper. It might look diminutive, but it has a surprising amount of space and is feature-packed, to boot. The Panzerbox is smaller than a mid-tower yet it has a slide-out motherboard tray, is made entirely of aluminum, and includes support for 12.2-inch videocards and even water cooling. At $120, it's even affordable. On paper, the NZXT Panzerbox seems like the perfect case to house your LAN gaming rig. But is there a catch?

At 9.6 inches wide by 17.9 inches deep and 17.9 inches high, the Panzerbox's all-aluminum chassis is one of the most compact modern ATX cases we've seen in years. And as mentioned above, that tiny chassis holds a lot of stuff, and still manages to offer decent airflow.

The Panzerbox ships with three fans: a 19cm front intake fan, a 19cm top exhaust fan, and a 12cm rear exhaust fan—a pretty standard configuration. It has four 3.5-inch hard drive bays and three 5.25-inch bays. The lower two-bay hard drive cage is removable, and we recommend using it only if you've already filled the top two: The bottom drives sit on their sides, perpendicular to the motherboard, blocking airflow to your second GPU (if you're running one).

With the use of two included adapters, the 19cm top fan can be replaced with a dual-fan radiator (you'll have to buy the fans separately)—but with only three optical drive bays, there isn't much room for an internal reservoir.

To achieve the Panzerbox's miniscule footprint, NZXT had to make compromises, most notably in the power supply mount. The power supply mounts on its side, flush with the case's left side panel; there's a mesh exhaust hole in the panel to accommodate this, and a riser to support the PSU's weight. But for most power supplies we tested, the riser was a few millimeters too short to actually hold the PSU's weight when the mounting screws were fastened; the case's rear panel ends up taking the brunt and bows slightly. Worse, once the PSU is installed, it effectively blocks access to the videocards and everything south of them. In order to swap out a videocard, you'll have to either remove enough power, SATA, and front-panel connectors to pull out the motherboard tray, or—more likely—remove the PSU entirely.

If you choose to install everything possible into the Panzerbox (dual 5970s, anyone?) don't be surprised if you have a very cramped case on your hands. There's hardly anywhere to route cables or tie them down. Anyone who's swapping out parts frequently will mourn the PSU placement and the lack of toolless hard drive and optical bays.

The Panzerbox tries to be all things to all people. It's a lightweight, low-profile aluminum chassis that can hold a whole lot of rig, but you'll hardly be toting it to LAN parties with a dual-GPU water-cooled system inside. And if you have more than one optical slot full, well, hello external coolant reservoir, goodbye portability. For such a small case, the Panzerbox isn't all that luggable—there's no handle, for example.

Still, the Panzerbox is one of the least expensive, most expansive small aluminum chassis we've seen. Build quality is high, stock air-cooling is workable (especially if you don't use the lower HDD chassis), and the motherboard tray is a useful feature. This is a great case if you're looking for a smallish chassis you can cram a burly rig into, but there are roomier options for a stay-at-home rig, and more portable options for the dedicated LAN gamer. **—NATHAN EDWARDS**

It's a little cramped, but the Panzerbox will fit today's longest GPUs.

VERDICT 8

NZXT PANZERBOX

+ PANZER DRAGOON	− PANZERBJORN
Water-cooling support; fits giant GPUs; good stock cooling; small and lightweight.	Inconvenient PSU placement; toolless HDD/ODD bays would be nice.

$120, www.nzxt.com

Rocketfish WirelessHD Adapter

Fish or cut bait?

House brands are a common sight at the grocery store: Shop Safeway (a large chain on the west coast) and you can buy name-brand yogurt, or buy Lucerne and save a few pennies. Best Buy has been doing the same thing with consumer electronics products with its Insignia and Rocketfish brands.

Best Buy is now expanding beyond commodity products such as A/V cables to offer highly specialized components. The $600 Rocketfish WirelessHD Adapter (model RF-WHD100), for example, can stream an HDMI signal (with surround sound and 1080p video) across a room without wires. It's comparable to the $1,000 Gefen Wireless for HDMI UWB (you can read our full review of that device here: http://bit.ly/ZP4mz).

In fairness to Gefen, Best Buy's RF-WHD100 doesn't offer as many features and isn't as well constructed. Nonetheless, both products are strictly point-to-point devices capable of streaming media a maximum of 33 feet inside a single room—their signals can't penetrate walls. The Rocketfish is based on the WirelessHD standard and the Gefen product uses proprietary technology (although Gefen offers a different wireless HDMI device that is also based on the WirelessHD standard). You should also be aware of a competing standard on the horizon: WHDI (Wireless Home Digital Interface) promises to deliver a wireless HD media network with a range of 100 feet that can operate all around the home. But WHDI products aren't expected to hit retail channels until the third quarter of this year.

Now that you have the lay of the land, let's discuss performance. Like Gefen's solution, Best Buy's consists of a transmitter with an HDMI input, and a receiver with an HDMI output. Both company's boxes are actively cooled by muffin fans (Best Buy's emits a pronounced whine, although the fan on our video projector was considerably louder).

In addition to HD video, the RF-WHD100 has enough bandwidth to stream up to eight channels of LPCM audio with 24-bit resolution and a sampling rate of 192kHz. It can't stream Dolby TrueHD or DTS-HD Master Audio, but that won't matter if you have an A/V receiver in the same cabinet as your HTPC or standalone Blu-ray player.

Best Buy recommends that the transmitter and receiver be placed facing each other at the same level in open spaces (not inside cabinets). In our tests, we took the HDMI output from a home-theater PC (and a standalone Blu-ray player after that) and input it to a Sherwood RD-7503 A/V receiver; we then routed the receiver's HDMI output to the RF-WHD100 transmitter. The RF-WHD100 receiver, in turn, was plugged into a ceiling-mounted Epson PowerLite Cinema 500 video projector. The system worked as advertised as long as we left our entertainment center's wooden cabinet door open, but we experienced drop-outs when we closed the door (we like our gear to be experienced more than seen).

If you must have a wireless HDMI solution today and you can live with the limitations of current technology, Best Buy has a solid and comparatively inexpensive solution. If you can wait, WHDI sounds like a much better solution: Yes, it's currently vaporware, but it smells awfully good. —MICHAEL BROWN

VERDICT 7

ROCKETFISH WIRELESSHD ADAPTER

+ UP IN SMOKE	− THE CORSICAN BROS.
Delivers wireless HD-video streaming today; comparatively inexpensive.	Signal can't penetrate physical obstacles; can't stream Dolby TrueHD or DTS-HD MA.

$600, www.rocketfishproducts.com

The WirelessHD chipset at the heart of Best Buy's Rocketfish WirelessHD Adapter operates on the 60GHz frequency band—and that's no typo.

Sound Blaster WoW Wireless Headset

Sound like an orc with the best World of Warcraft headset money can buy

Normally, designing a headset for one specific game would limit you to a relatively small segment of the gaming community. But we're talking World of Warcraft here—a game whose massive popularity makes a game-specific headset seem viable.

Enter the Sound Blaster World of Warcraft Wireless Headset from Creative Labs. The headset uses a small USB dongle that broadcasts in the 2.4GHz range. We found the reception to be fairly good, allowing us to walk into a different room during use without static.

The headset itself feels solid and fits snugly on the head. Thick, squishy padding on the headband and around each of the cans keep things comfy throughout even the longest gaming sessions—Creative obviously knows its target demographic. The headset is rechargeable and runs about nine hours between charges and can be used while recharging, as well.

The cans themselves are larger than average, which combined with the deluxe padding, provide excellent sound isolation. The 40mm neodymium drivers deliver clear, powerful surround sound—some of the best we've heard from a gaming headset.

But, at $120, you're buying more than just a pair of headphones—you're buying branding, which is apparent the second you hold the WoW headset in your hands.

First, the headset's design is far from subdued. Adorned with the same plastic plate-mail aesthetic as the SteelSeries WoW MMO Gaming Mouse (an earlier Blizzard collaboration), the WoW headset also sports giant, swappable, backlit Alliance- or Horde-themed lenses on each ear. Even the downloadable control panel looks like it's been ripped straight out of World of Warcraft, borrowing the game's iconic fonts and interface elements. The control panel allows you to change the color and intensity of the headphones' jewels, apply THX effects, and even morph your voice using included voice effects with names like "female blood elf" and "male orc." There are 17 voice morphers—more than enough to drive even your most level-headed raid buddies insane.

In other words, you probably already know if the Creative World of Warcraft headset is for you. If you're a big fan of the game, and looking to drop more than a Benjamin on a pair of headphones, then sure, go for it—you won't be disappointed with the set's construction, comfort, or sound quality, and the styling and feature set could well seal the deal. On the other hand, if you don't know the difference between a murloc and a makrura, you might as well save some dough and look elsewhere.

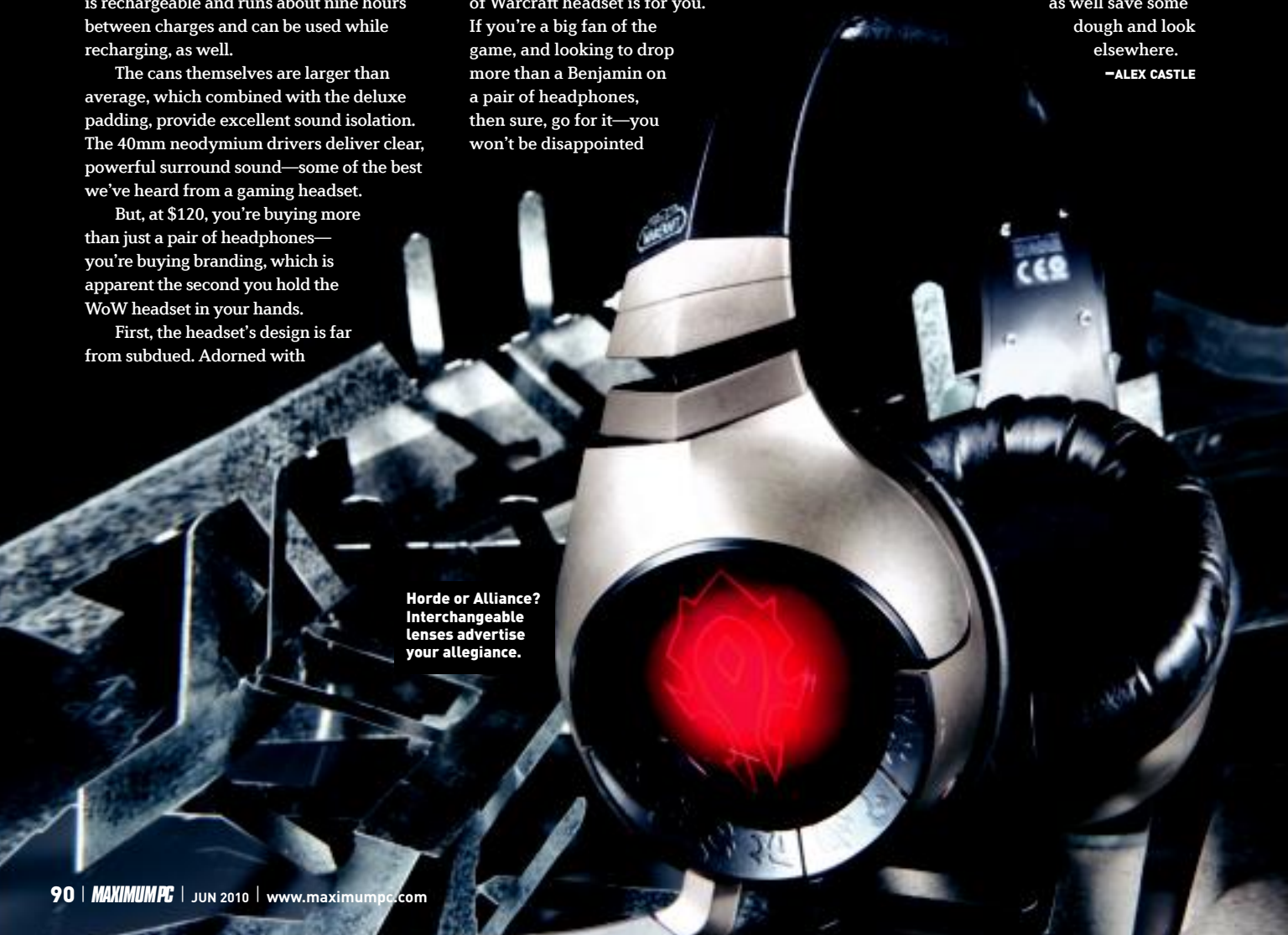
—ALEX CASTLE

VERDICT 8

SOUND BLASTER WOW HEADSET

+ WoW	- OW
Large, comfortable cans; clear sound; good wireless signal.	Gaudy aesthetics; pricier than comparable (non-WoW) headsets.

$120, www.creative.com



Horde or Alliance? Interchangeable lenses advertise your allegiance.

Assassin's Creed II

Even restrictive DRM doesn't stop this game from soaring

Assassin's Creed II, like its predecessor, is an ambitious third-person action adventure game with a clever conceit: You're a modern-day bartender reliving your assassin ancestors' adventures. But where the first game fell short—in repetitive, sometimes-monotonous gameplay—the sequel soars. It's not revolutionary by any means, but it's one hell of a fun ride.

This time around, you primarily play as goofy-charmer-turned-hooded-murder-machine Ezio Auditore. He's got personality in spades, but that has its drawbacks—the first few hours of the game devoted to Ezio's character development come at the expense of any truly exciting or pulse-pounding moments. Folks who want to leap straight into the face-stabbing will have to stow their bloodlust for a bit.

Leonardo Da Vinci: The Q to Ezio's Bond.

Once you make it past the slow start, though, the game really hits its stride. As with the first game, Assassin's Creed II takes place across multiple meticulously constructed cities (although this game is set in Renaissance Italy). In the first game, the problem was that the cities were nice to look at, but they essentially lacked substance. Assassin's Creed II, meanwhile, fills its locales with so many side missions, collectables, and other nooks and crannies for you to sniff out that it's nearly overwhelming. Hell, some of these "optional" portions of the game are its most enjoyable.

But what about the main story missions—which were, without a doubt, the original game's biggest failing? Well, unless you actually liked grinding your teeth while collecting flags for the 20th time, you'll be happy to hear that Assassin's Creed II's missions are both fun and relevant to, you know, assassination. Indeed, this time around, a larger portion of your missions actually involve killing people. Which is not to say the game lacks variety. Sometimes you'll be tasked with silently offing key figures, while other assassinations turn into colossal multi-man melees, with you and your quarry duking it out mano-a-mano on a rooftop while the battle rages below. Other missions might task you with tailing people and eavesdropping on their conversations, while hiring prostitutes and thieves to distract guards for you. And you'll run into a number of historical figures, chief among them Leonardo Da Vinci.

Ezio and his best friend reenact *The Sword in the Stone*.

We suppose you could criticize the game for featuring essentially the same combat system as the first game, but even that's been tweaked and polished—especially with the addition of upgradeable weapons and armor.

As a game, Assassin's Creed II is absolutely fantastic. As a piece of software, however, Assassin's Creed II's worth is debatable. Why? Three letters: DRM. Assassin's Creed II requires an Internet connection at all times during gameplay as part of its copy protection. Fortunately, if you lose your connection mid-game, it resumes right where you left off once you reconnect. And even on a pretty shaky wireless connection, we were only interrupted a couple of times. Still, if you're a fan of gaming on-the-go, this could be a deal-breaker. On top of that, recent downtime-laden "server attacks" have called into question the stability of Ubisoft's setup.

But even DRM woes were not enough to keep us from having an absolute blast playing Assassin's Creed II. It's an excellent game, and it's a damn shame Ubisoft is forcing PC gamers to jump through so many hoops in order to experience it.

—NATHAN GRAYSON

VERDICT 9

ASSASSIN'S CREED II

+ PARTY IN THE FRONT	− KNIFE IN THE BACK
Tons of things to collect; gigantic, lovingly crafted cities to explore.	Ubisoft's infamous DRM—while not quite as awful as feared—is still a pain in the neck.

$57, assassinscreed.com, ESRB: M

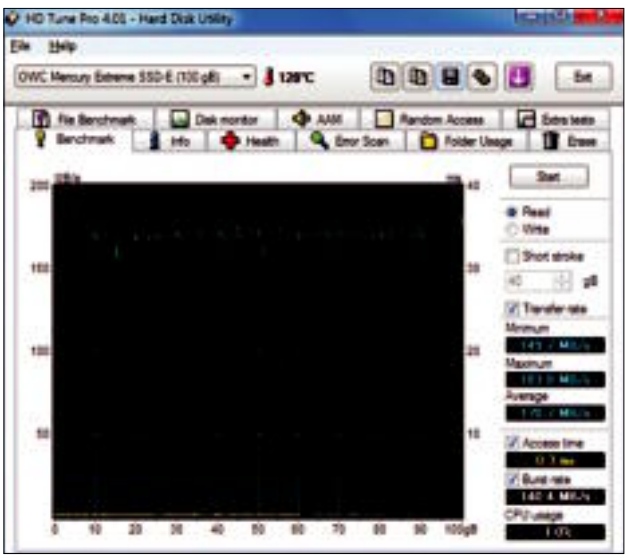
LAB NOTES

Why the New SSD Test Rig?

Hunting down a mysterious error

NATHAN EDWARDS
SENIOR ASSOCIATE EDITOR

You might have noticed that we didn't use our new hard drive test rig for this month's SSD roundup. That's because in the course of benchmarking the drives, we noticed that both the Intel P55 PCH and Marvell controller on our test bed's Asus P6P55D Premium board were giving much lower results in our drive benchmarks than we'd experienced in other test rigs. After a few days of reinstalling Windows and drivers and using different ports and cables, we still experiencing the same baffling problems, so we had no choice but to turn to Plan B. We wound up using a stable X58 board for all of our SSD tests (which you can read about in the feature on page 50). Meanwhile, we will continue to try and diagnose the faulty test bed. We're still not sure whether it's a problem with the P55's south bridge, the Asus P6P55D Premium board, or just our board in particular. Regardless, we'll be using the X58 board until further notice, as it produces far more consistent results.



Read speeds on our P55 board were nearly 25MB/s slower than on the X58 board.

MICHAEL BROWN
REVIEWS EDITOR

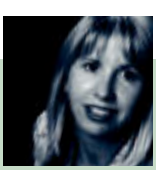
Music explorers: Check out B&W's Society of Sound (http://bowers-wilkins.com). A $60 annual fee buys two new album downloads per month from Peter Gabriel's Real World Studios and the London Symphony Orchestra, plus access to a rich back catalog. Everything is encoded in FLAC and Apple Lossless; some—including Gabriel's brand-new *Scratch My Back*—are available in studio-master quality (24-bit, 48KHz FLAC).

ALEX CASTLE
ONLINE MANAGING EDITOR

The iPad is finally here, and although I'm not normally an Apple fan, I splurged and bought the 32GB model. Even my credit card company thought the purchase was uncharacteristic: They put a hold on my account until I called and convinced them that I really had spent 600 of my PC-loving dollars at the Apple store.

GORDON MAH UNG
SENIOR EDITOR

After playing with two incredibly fast gaming machines in a row now—Digital Storm's HailStorm and Maingear's Shift—I'm thinking of replacing or supplementing our system gaming benchmarks with something that will drag these wickedly fast PCs back down to Earth. Within two months of releasing our new benchmarks, we're already seeing 200fps at 2560x1600!



KATHERINE STEVENSON
DEPUTY EDITOR

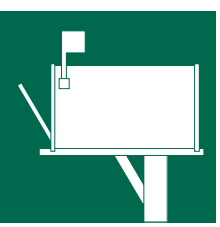
This month, I got a demo of the new Nero 10 multimedia suite. The most dramatic change in this latest iteration is that Nero has consolidated the suite into three main products—Burning ROM, BackItUp&Burn, and Vision Xtra (for video editing)—which makes for a much less cluttered package. And for the first time ever, Nero is also selling these apps separately.

JON PHILLIPS
EDITORIAL DIRECTOR

It doesn't multitask, and it won't run the PC-only data-acquisition software that I use at the race track, but my new iPad still solves a world of problems. Touch-driven data entry is perfect for computing whilst on the couch, and the device's form-factor is imminently portable. My iPad review appears next month, and I have already asked HP for an early look at its Atom-based Slate tablet.

We tackle tough reader questions on...

PC Stress Testing
Squirt ES4
Cooling with Water



24 Hours Is Too Long

I have a problem with how you guys test systems for stability. I understand you use Prime95. If the system crashes within a 24-hour (or however long you run it) test then you factor this into your decision when you give the system a verdict. My issue is that a system from company A is just as likely to crash on the third 24-hour run of Prime95 as in the first 24-hour run.

There is no way to know if the system is 100 percent stable or not. So when *Maximum PC* sets out to run a test for 24 hours, and the test crashes on the 18th hour, this should not influence the score you give the system. Any amount of time past a one-hour run is just a roll of the dice. Manufacturer B may send you a system that does not fail, that doesn't mean that if you ran it again for 24 hours it wouldn't fail. You can run the test for two weeks and if it crashes on the 12th day, does this mean the system is not stable? The manufacturer has no way of telling if it will fail when they sell the system. If a system passes a one- or two-hour test, than 99 percent of the time, it will not be any less stable than a system that passes 24 hours.

I have been overclocking for years now and am an experienced user cooling my system with everything from cascades to LN2. It makes me kind of mad every time I see a system get a lower ranking because it failed on the 18th hour.

—Byron Todd

Senior Editor Gordon Mah Ung Responds: Byron, I'm not sure where you're getting the impression that we only flunk a system if it blows up at 18 hours. The vast majority of overclocked PCs that have failed usually blow up within a few minutes to a few hours. In fact, I can't think of a recent machine that we had that could make it past a few hours that would not withstand multiple overnight or 48-hour runs. Are they 100 percent stable? No, but they're pretty rock-solid.

Battle-Tested and Approved

As you can tell by my signature, I'm one of those geeks who gets down and dirty with technology here in Afghanistan. Your April review of the Leatherman Squirt ES4 (Quick Start) is a good joke around here. My whole shop carries Leatherman Waves thanks to them being way more robust. The Wave is a lot better than the Leatherman Squirt series for real hard-core emergency comm and IT repairs. Sure, the Squirt has some good wire strippers, but by using your finger as a buffer, you can do the exact same thing with the Wave. If you want, our shop can send in articles for products that are really Geek Tested in the most extreme of conditions and emergencies.

—Jason E. Dorfler, ITT Systems/Commo, FOB Orgun-E

Editorial Director Jon Phillips Responds: For those who don't read military acronyms, James works at a Forward Operating Base, basically a fortified, semi-permanent encampment that supports tactical operations. He's clearly working in a brutal testing environment, and we concur that the Wave is a kick-ass multi-tool—which is exactly why it appeared in last month's The List section as an essential tool on all our Lab benches. The Squirt is in no way a replacement for the Wave, but it's a lot smaller and lighter—light enough for carrying in one's pocket.

In fact, it's an option for guys whose wives and girlfriends won't let them wear belt sheaths for knives and cell phones.

Don't Drink the Water

I was just reading the water-cooling how-to in your April 2010 issue (page 66). I would like to add a tip you seem to have forgotten, but which is one of the most important things any water-cooling newcomer can do: Use de-ionized water. You buy it down at the supermarket. It comes in five-gallon jugs. Tap water in various parts of the nation can vary wildly in mineral content (calcium, iron, hydrogen sulfide, algae, random goldfish tank sludge, etc.), and you don't want to have to disassemble your system and flush it out with vinegar every month if your town has crappy tap water.

—Ben Hadley

Online Managing Editor Alex Castle responds: Looks like you missed the paragraph in the materials section where we mention that our cooling system used a coolant instead of water. Specifically, we used Feser One cooling fluid, which, like most PC coolants, contains an anti-corrosive agent. Coolants are also available in different colors, and in ultraviolet-reactive varieties. They're generally pretty inexpensive (especially compared to the overall price of a water-cooling setup), and available everywhere liquid-cooling supplies are found. De-ionized water does work, if you're in a pinch, and is far preferable to using tap water, which can corrode, short-circuit, or gunk up your system.

YOUR APRIL REVIEW OF THE LEATHERMAN SQUIRT ES4 IS A GOOD JOKE AROUND HERE

Convince Me to Subscribe. I Dare You!

I went to your website with intent to subscribe to the magazine. Once there, I saw articles, back issues, and other things I associate with paid subscriptions—but all for free. I'd be glad to pay for a subscription, but it almost looks like you don't care either way since it's all available for free. Would subscribing benefit me in any way, or get me more than I would already get for free? I'd prefer a PDF subscription rather than print, but you have made back issues freely available in PDF already.

—Troy King

Editorial Director Jon Phillips Responds: All fair questions. Here are some responses. First, PDF issues typically don't go online any sooner than two months after an issue has been pulled from newsstands. If timeliness is a concern, you can't rely on the PDF archives, which are meant to function as a pure archiving service for folks who want to recycle old print copies.

Second, many parts of the magazine never make it to our website. Reviews, features, how-tos, and white papers all appear online, but they're dribbled out over an extended period. Some content is posted as soon as the magazine hits subscribers and newsstands, but other stories get posted many weeks later. Again, if timeliness is an important factor, you'd do well to subscribe.

Third, the print magazine offers an entirely unique *Maximum PC* experience. It's imminently portable. It depends on reflected (not projected) light, making it easy on the eyes. Its content is presented linearly, making for a more orchestrated, editorialized user experience (similar to a movie or story with different acts). And it presents features and reviews in big, bold, visual packages, with only the real art direction that a print magazine can provide.

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 ALTERNATE TIMELINE, FLASH SIDEWAYS JULY ISSUE

Real-World Upgrades

It's fun to ogle the latest cutting-edge hardware, but few of us can afford the cost of admission. Fortunately, there's an upgrader sweet spot, where you can get near-top-notch performance for a reasonable price. You won't want to miss our parts recommendations.

The Power of Six

We'll have AMD's Phenom II X6 hexa-core proc in our hot little hands. Can it possibly topple Intel's mighty Core i7-980X?

Monitor Myths Smashed

Forget everything you thought you knew about your digital display. We're going to expose and explain a surprising number of commonly held monitor misconceptions.

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MID-TOWER CAS

NZXT Hades

The NZXT Hades is a $100 case with a lot of oomph. Its four fans include 20cm front and side intakes, and you can toss in a dual-fan water-cooling radiator if you'd like. Its hard drive mounting system, while not toolless, accommodates 12.2-inch videocards, à la the ATI Radeon 5970, and its good looks inside and out are a nice bonus. Did we mention the CPU backplate cutout, cable-routing holes, onboard temperature sensors, and Vader-esque design? It's a fantastic deal and proves you don't have to break the bank to get a swanky mid-tower case. www.nzxt.com

THE REST OF THE BEST

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

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

Budget Processor
Intel 2.66GHz Core i5-750
www.intel.com

LGA1366 Motherboard
MSI Eclipse SLI
www.msi.com

LGA1156 Motherboard
Asus Maximus III Formula
www.asus.com

Socket AM2 Motherboard
MSI K9A2 Platinum
www.msi.com

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

Midrange Videocard
ATI Radeon 5850
www.ati.com

Budget Videocard
ATI Radeon 5770
www.ati.com

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

Performance Storage
Patriot Torqx 128GB SSD
www.patriotmem.com

DVD Burner
Samsung SH-S223
www.samsung.com

Blu-ray Drive
Plextor B940SA
www.plextor.com

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

30-Inch Display
NEC LCD3090
www.nec.com

Gaming Mouse
Logitech G9x Laser Mouse
www.logitech.com

2.1 Speakers
Klipsch ProMedia 2.1 Wireless
www.klipsch.com

Games we are playing

Assassin's Creed II
www.pixelassassination.com

The Settlers 7: Paths to a Kingdom
http://thesettlers.us.ubi.com

Mass Effect 2
www.masseffect.bioware.com

Battlefield: Bad Company 2
www.badcompany2.ea.com

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

MAXIMUM PC (ISSN 1522-4279) is published 13 times a year, monthly plus Holiday issue following December issue. Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Phone: (650) 872-1642. Fax: (650) 872-2207. Website: www.futureus.com. Periodicals postage paid in South San Francisco, CA and at additional mailing offices. Newsstand distribution is handled by Time Warner Retail. Basic subscription rates: one year (12 issues) US: $20; Canada: $32; Foreign: $44. Basic subscription rates including monthly CD, one year (12 issues/12 CD-ROMs) US: $30; Canada: $42; Foreign: $54. US funds only. Canadian price includes postage and GST (#R128220688). Subscriptions do not include newsstand-only specials. POSTMASTER: Send changes of address to Maximum PC, PO Box 5159, Harlan, IA 51593-0659. Standard Mail enclosure in the following edition: None. Ride-Along enclosure in the following editions: B1, B2, B3, B4. Canada Post PMA #40612608. Returns: Bleuchip International, PO Box 25542, London, ON N6C 6B2, Canada. Future US, Inc. also publishes Guitar World, Mac|Life, Nintendo Power, PC Gamer, PlayStation: The Official Magazine, Pregnancy, Revolver, Windows: The Official Magazine, The Official Xbox Magazine and others.
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