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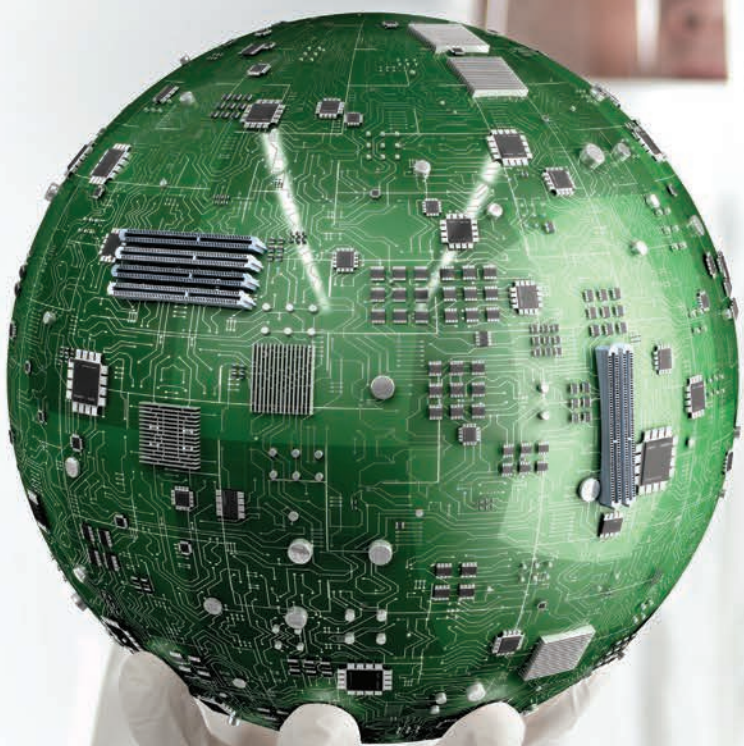

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MAXIMUM PC

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Goodbye, Black & White

As usual, there's been a healthy back and forth in our Lab these days. Also as usual, Gordon Mah Ung and Nathan Edwards are at the center of it. The topic? NAS boxes versus Windows Home Server devices. Somewhat surprisingly, we've seen more than a few NAS boxes crap out on us over the last few years, taking gobs of data with them. It's making us wonder if maybe the Windows Home Server route isn't a more prudent choice for data serving, media streaming, and backup. To resolve the issue of which is better for your home, we tapped Mike Brown as an objective arbiter.

Maybe it's because I just finished editing this year's Tech Preview, but I can't help but see Gordon's and Nathan's polite, profanity-free discussion (ha!) as analogous to the greater PC landscape, which is undergoing a tectonic shift right now. There used to be a clear line between "right way" and "wrong way" for PC builds, projects, and upgrades. That's clearly not the case anymore. As our devices and data become connected, interconnected, and decentralized, we're seeing more "correct" solutions than ever.

Consider CPUs**.** Over the next 12 months, we're going to have front-row seats for an epic CPU brouhaha, and it's going to be harder than ever to separate the winners from the losers because of the broader context these chips fit into. Both Intel and AMD will release progressive new chip designs as they battle for market share and superior performance per watt per dollar. The very notion of an accelerated processing unit that merges multiple CPU/GPU cores is novel and interesting. But what's the performance hit? And what's the right choice for your next PC build? And what kind of impact will SoC design, a game changer by all accounts, have on more traditional CPU microarchitecture? Again, there may not be a clear-cut right or wrong answer. (Thankfully, Gordon will have some hands-on data for AMD's first Fusion chips next month, so at least we'll have some information.)

MY MUST-READS FOR THE MONTH

Intel's CPU-Unlocking Scheme
page 8

2011 Technology Preview
page 30

Duke Nukem Forever
page 46

And then there's the smartphone, which is peripheral to our coverage, but will continue to dominate headlines in 2011. A few years ago, it was hard to imagine any device or mobile OS unseating Apple. The fact that Android has essentially done this in less than a year is startling. But as much as people are writing off Windows Phone 7, I don't see WP7 as an automatic failure. Millions of people just want a phone that works. Even if you're dogmatically anti-Apple, you'll now have not one but two interesting choices.

I could go on and on, but I'm curious: What's your take on the next 12 months? Give our Tech Preview a read and then drop me a line. I'd love to hear from you.

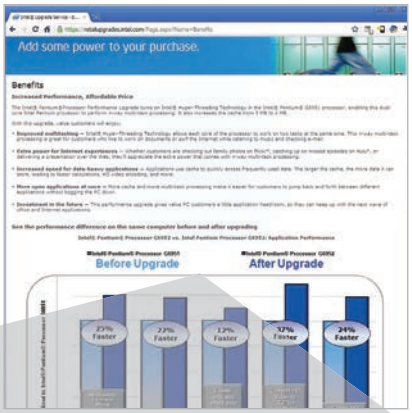
George

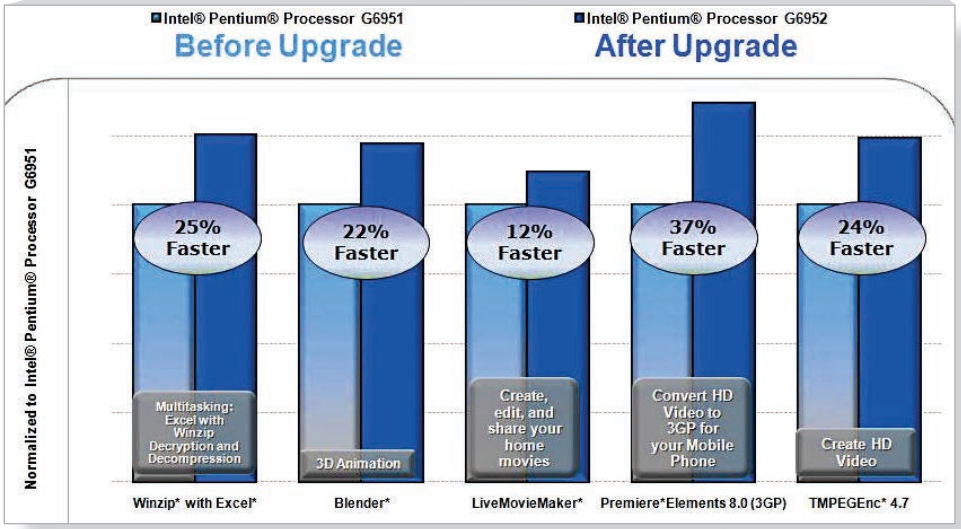
LETTERS POLICY Please send comments and questions to george@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Unfortunately, George is unable to respond personally to all queries.

THE NEWS

Intel Tests Software-Upgradeable CPUs

Will consumers pay for a card that lets them unlock additional features in their new computer? —GORDON MAH UNG





Intel's software upgrade promises significant performance boosts for multithreaded applications.

If consumers are willing to pay to unlock additional features and options in games and operating systems, why not hardware, too?

That's what Intel was hoping to quietly find out when it started a small pilot program to test the waters of end-user software upgrades of its CPUs. The pilot program, run in certain Best Buy stores and with participation from select system OEMs, gives consumers the option of buying an upgrade card at checkout.

Consumers take the card home, download an application, and once the keys from the card are entered, the 2.8GHz Pentium G6951 in their machine is "upgraded" to a 2.8GHz Pentium G6952. The $50 upgrade on the Clarkdale-based chip increases the L3 cache from 3MB to 4MB and unlocks Hyper-Threading. The resulting performance boost is about 20 percent, according to the company.

As fast as you can say Internet, people caught wind of the pilot program and grabbed their pixelated pitchforks and torches. Some folks in the press called it boneheaded while consumers said it was money-grubbing and just what they expected from "Greedtel."

"The features should be turned on by default. If that means paying a little more up front, then I might consider buying into it. But to have them disabled before the fact only smacks of greed and nickel and diming," wrote one angry poster.

Reacting to the outrage, Intel officials defended the test and said the pilot program is fairly small—involving only a few Best Buy stores and OEMs.

"Intel is exploring a way to give customers the flexibility to determine the level of performance they want in their processor, without having to change hardware. This gives customers an extra configuration option that isn't available on standard Pentium processors," an Intel spokesman said. The company isn't backing off the idea, and sees merit in giving people the chance to upgrade without having to crack open the box.

PC Analyst Rob Enderle said that despite the negative reaction, the idea definitely has upsides for the people selling the machines. "OEMs don't have to field as many SKUs, which keeps the inventory costs down. Instead of two or four configurations, the OEM can field just one," Enderle said. Enderle said one question he has is how long it'll be until the program is hacked.

"Nothing is unhackable, but we're pretty confident," said Intel spokesman Bill Kircos. Kircos said the test will only run through early next year. Right now, it's limited to point-of-sale upgrades and Intel has no plans to let consumers go back to the store in 12 to 24 months to buy upgrade cards, as it would be too difficult to manage. He said consumers who don't like the program can also simply change their mind and buy a machine with the upgraded processor already in it, so it's not like they're forced to buy it. Kircos said that if the pilot program is a success, the company could even look at future iterations where additional cores are unlocked in a chip.

Could other vendors adopt a similar approach? Not today, at least. "[We have] no plans, at this time, for AMD to charge consumers to unlock existing features on their CPUs," said company spokesman Phil Hughes.

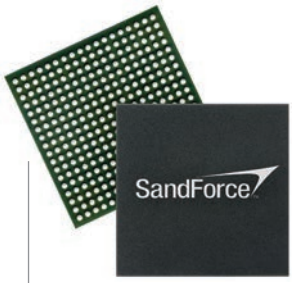
Windows Phone 7 Ready for Launch

Microsoft pulled the lid off Windows Phone 7, revealing a brand-new interface, a host of new features, and nine new phones that will be available at launch on November 8. The core interface looks very much like the Zune HD's, and the home screen consists of six hubs—People, Pictures, Games, Music & Video, Marketplace, and Office—as well as a series of customizable "live" tiles that contain notifications, status updates, and more. These tiles can be created and assigned to specific people and other activities. HTC, Samsung, LG, and Dell will have WP7 devices ready for launch in form-factors ranging from large-screens to keyboard sliders. Apps and games will be supported across all six hubs. **—GJ**

Adobe to Sandbox Reader

What's the biggest exploit magnet: Adobe Reader, Internet Explorer, or Word? If you picked anything other than Adobe Reader, you're wrong. In recent years, Adobe Reader has become such a high risk for exploitation that security experts often recommend simply uninstalling the popular but unsafe PDF reader.

Adobe hopes to change that later this year with the release of Reader 10.0, which will use a sandboxing technique to prevent exploits from infecting the host PC. Sandboxing puts a wall of sorts around the application in hopes of keeping sand from spilling out. It might improve things, but based on the technique's effectiveness in Office 2007, Office 2010, Google Chrome, and especially Java, it won't be a cure-all. **—GU**



SandForce Readies Second-Gen Controller

SandForce, whose SF-1200 controller was the secret sauce in virtually every great SSD of 2010, has announced its second generation of solid-state drive controllers—the SF-2000 series. The new controllers feature 6Gb/s SATA support and will boost SSD speeds up to 500MB/s, and incorporate greater encryption (AES-256 and -128) and error-correcting algorithms to accommodate ever-smaller NAND fabricating processes—down to 23nm MLC. The new controller is targeted at enterprise and industrial applications, but expect at least one OEM to announce consumer SSDs based on the second-gen chip by the end of the year. **—NE**

HTC's Surround Windows Phone 7 device will have a 4.3-inch screen, pop-up stereo speakers, and a kickstand.

Intel's Sandy Bridge Has Firm Footing

AMD and Intel have unveiled their next-generation microarchitectures, and it looks like AMD's Bulldozer won't be digging a hole in Intel's Sandy Bridge. If anything, Intel has a slight advantage. For many people, however, the newly integrated GPUs will be more important than the CPUs.

Intel is taking a more conventional approach to CPU design. Sandy Bridge is a single-core building block with which Intel can build multicore chips with a dozen or more CPUs. In contrast, AMD's Bulldozer inseparably joins two CPUs in a novel dual-core cluster with many shared elements. If single-core PC processors are as obsolete as floppy disks, why start with a single core? That difference won't stop Intel from building chips with as many cores as AMD's, but I think Bulldozer's approach to multicore scaling is more visionary.

AMD's execution may not match its vision, however. Bulldozer will probably need both CPU cores to beat a single Sandy Bridge core. Both designs can execute four integer instructions per clock cycle. Both can execute two hardware threads—Bulldozer with its dual-core cluster, Sandy Bridge with Hyper-Threading. Both designs reorder instructions for better efficiency. Both include the new 256-bit Advanced Vector Extensions (AVX), and both can execute 16 floating-point operations per cycle.

One mystery is pipeline depth. Deeper pipelines generally permit higher clock speeds, at the expense of greater penalties if the processor mispredicts a branch instruction. Bulldozer's pipeline probably resembles the K10's (about 12 stages). Gut instinct tells me that Sandy Bridge is deeper, so I think it has a little more clock-frequency headroom in 32nm fabrication technology.

The biggest difference between these CPUs, however, won't be the CPUs—it will be their integrated GPUs. Both companies are combining their CPU cores with a GPU on the same chip, eliminating the need for a discrete graphics card. AMD should have the advantage here. But for power users (e.g., *Maximum PC* readers), the integrated GPU won't matter, because you'll add a graphics card (or two) anyway. That means your decision will rest on slim differences between the CPUs, and those differences are slim indeed.

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

FatCat ChargeCard

Today's smartphones chew through batteries like beavers through birch. The FatCat ChargeCard ($50, www.fatcatpower.com) is a lithium-polymer power source that can recharge the battery in almost any small device: Charge the ChargeCard via your PC's USB port, then use the portable power source to charge your device using the appropriate tip (it comes with 12). But its dimensions (two inches wide, 3.75 inches long, and 0.31 inch thick) render it nearly as large as the Samsung Captivate we tested it with. After three hours plugged into our PC, and one hour and 50 minutes plugged into our phone, the phone was replenished to just 42 percent capacity. Unless your device is sealed, you'd be better off with a spare internal battery. —MB

Internet Address Makeover in 2012

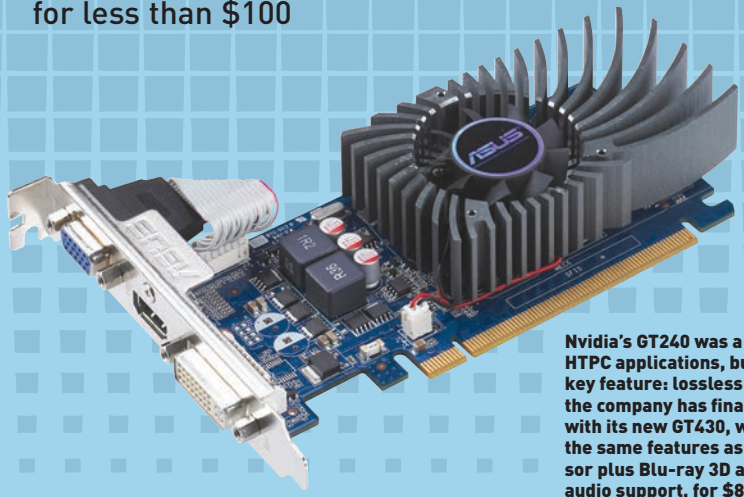
Plans are moving ahead to radically alter the way web addresses are structured in the coming years. As early as 2012, the importance of .com might wane as generic top-level domains (GTLD) begin to show up. Instead of going to a .com address, the domain could be the name of the company. For example support.microsoft might exist as a legitimate address.

Companies that use GTLDs would not just buy the domain from a registrar. They would have to apply to Internet Corporation for Assigned Names and Numbers (ICANN) directly—and at a steep fee of nearly $200,000.

Unlike the wild west of domain names now, ICANN will work to ensure that branded names, like IBM, McDonald's, and Google, aren't bought up by third parties. —RW

Now Hear This: Nvidia's GT430

New HTPC card offers HDMI 1.4a and lossless audio for less than $100



Nvidia's GT240 was a great card for HTPC applications, but it lacked a key feature: lossless audio. Now the company has finally fixed that with its new GT430, which has all the same features as its predecessor plus Blu-ray 3D and lossless audio support, for $80. Yum. —GU

GAME THEORY

Tradition, Innovation, and How to Rock

I can be pretty bipolar when it comes to PC game design, alternating between a love of tradition and an appreciation of innovation. Tradition means the form has roots, which indicates depth and permanence. Innovation means the form has branches, which promises growth and continued life. Both elements play an important role in the future of PC gaming.

I was there through the entire computer gaming revolution, jumping straight from an Atari 2600 to a TI-99/4 and then a Commodore 64 without ever owning another console machine until the N64. In those early days of PC gaming, developers were like garage bands, pumping out innovative computer games imprinted with their own distinct personalities and sending them out in ziplock bags with xeroxed instructions. I wouldn't go back to that time: Games are simply better now. But they had a freshness that's simply gone from mainstream PC gaming.

Thankfully, it's not gone altogether. The annual Independent Games Festival is the single most important aspect of the entire PC gaming landscape. This is where the garage band spirit still lives, and just watching the videos for upcoming games like Monaco, Miegakure, Limbo, and Vessel is like hearing a demo for an unsigned band. There's fresh life there, and it is good.

But then we swing to the other side of the pendulum, and see just how deep and brilliant our tradition can be. Starcraft II and Civilization V are the very opposite of innovation: They are rooted in the past. But those roots are so strong, and the teams behind them so gifted, that they take the familiar forms and make them live again. Their format may be familiar, but they pulse with genius, like a craftsman who has spent years honing his art. One session with the wall of fire or rising lava levels of Starcraft II, or one battle with Civ V's new tactical combat elements, proves what a firm grounding in established forms can achieve.

It reminds me of watching a concert a few years ago. The Who followed some young band, and simply blew them off the stage. It was as if they said, "Nice work, son. Now we'll show you how it's done."

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

France Subsidizes Digital Music

Hopes to train young to pay for content

While other countries are busy devising punitive measures to stop music piracy, France is taking a different tack. In a two-year program targeted at citizens between the ages of 12 and 25, the French government will pay half the cost for subscription-based music websites. Prepaid cards that come with €50 of credit will be available to youths for just €25. **—KS**

FCC Challenges 'Bill Shock'

Cell carriers resent the meddling

You've probably heard the horror stories, or even experienced it. The cell phone bill comes, and it's unexpectedly massive. This is called "bill shock" and it happens a lot. An FCC survey found that 30 million Americans have experienced it. Now the agency wants to take action.

The FCC is proposing rules that will force carriers to alert users via voice or text when they are about to exceed their plan's limits and incur extra fees. The carriers are not particularly pleased with this possibility. The VP of CTIA (an industry trade group) said in an interview with Bloomberg that, "The industry continues to develop tools to keep customers informed about their level of usage," while cautioning against "prescriptive and costly rules." We're not sure what needs to be developed—SMS works fine as it is. **—RW**

WD Intros Bootable 3TB Drive

It's not the first 3TB drive on the market, but Western Digital is the first to bring a *bootable* 3TB drive to the market with its 3TB Caviar Green. Getting past the 2.19TB volume limit requires a 64-bit OS, UEFI, and GPT partitions, and WD ships the drive with an add-in card to ensure compatibility. If your rig meets all the requirements, welcome to the future. **—NE**

Foxconn's iPrison

Employees of Foxconn, the China-based company known for producing iPhones and other gadgets, call the working conditions prison-like, according to a leaked survey. Following a rash of employee suicides, the survey of 1,800 workers at 12 Foxconn factories found that workers felt repressed and exploited and many used the words "cage" and "prison" to describe the company. **—GU**

BYTE RIGHTS

...And Censorship for All

Some laws are good, some are bad, but man does the one being debated now in Congress take the cake and come back for pie. The Combating Online Infringement and Counterfeits Act (COICA) would create the first Internet censorship system to be run by the U.S. government, banning websites believed to infringe intellectual property. Not just the part that infringes, but the whole site.

COICA sets up two lists. The first is a list of sites that the government would demand all U.S. service providers block access to for all Americans, via DNS. Online payment and ad companies face prosecution if they try to do business with a site on the list. It requires a court order to be put on that list, but it's unclear how a site can get off it. Possibly even creepier is the second list—websites that the Attorney General just lists with a recommendation to block. There's no due process with that list, just the heavy hand of implication, and log files showing who complies.

DNS isn't the site itself, but the system on the net that matches names to IP numbers and lets us find each other. Without the ability to wipe sites they don't like off the Earth, rights holders and their senatorial supporters will settle for wiping them off the map.

If you haven't already said it, let me help you: What the hell? This is America, we simply don't do this sort of thing. We've always been willing to take a little extra chaos because we don't want even a little Stalin. It's our tradeoff.

Now we're going to trash the First Amendment over Thepiratebay.org? I was hoping that if we had to lose our most sacred right, it could be over something a little more substantial than trying to make sure some coked-up Hollyweird fat cats don't feel insecure about torrents of *Transformers 2*.

Head over to Demandprogress.com or EFF.org to find out how to help stop this abomination, before we have to DDOS the AG to get our real Internet back.

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

THE LIST

9 Things to Know about Windows Phone 7

9 SPELL CORRECTION
Works just like it does in Windows.

8 NO COPY AND PASTE FOR YOU!
(until 2011 update)

7 AUTO PICTURE UPLOADS
To Facebook, your friends, and more.

6 STREAMING U-VERSE MOVIES AND TV SHOWS
Non-subscribers can pay around $10/month for access.

5 UNIVERSAL UPDATES
Every phone gets updated at the same time.

4 LOST/STOLEN PHONE TRACKING VIA WINDOWS LIVE

3 NATIVE INTEGRATION WITH MS OFFICE

2 VOICE SEARCH
Hold down Start and speak your query. Instant Answers does the rest.

1 ZUNE AND ZUNEPASS
Provides unlimited streaming and downloads.

DEATHMATCH

Windows Home Server vs. NAS Box

There was a time when a NAS box was just that, a headless box containing one or more hard drives, a low-power processor, and a NIC to provide mass storage for any machine on your local network. Today's NAS boxes do a heck of a lot more than that: They have graphical user interfaces, they can stream audio and video, support video surveillance cameras, automatically back up the hard drives on networked clients, and a whole lot more. In fact, the typical NAS box now looks and functions very much like a full-fledged server.

Microsoft tackles network storage from the opposite tack: Windows Home Server scales down the server, stripping out technical features that enterprise users require and putting a friendly user interface on top. Which approach delivers the best value for today's tech enthusiast? We threw Synology's DiskStation DS410 4100 NAS into the ring with Lenovo's IdeaCentre D400 home server to find out. —MICHAEL BROWN

Windows Home Server
(represented by the Lenovo IdeaCentre D400, $530)

ROUND 1

BACKUP AND RECOVERY We don't need to tell you about the importance of backing up your data. This is a core application for both storage solutions, but Windows Home Server is capable of performing image-based backups while NAS boxes perform file-based backups. What's the difference? If you lose your operating system, Windows Home Server offers the option to boot your machine from a CD and perform a bare-metal restore. You can restore all your data from a file-based backup created with a NAS box, but you'll need to reinstall your OS, device drivers, and apps.

WINNER: WINDOWS HOME SERVER

ROUND 2

FILE TRANSFER SPEED Better NAS boxes and Windows Home Server machines will both have gigabit NICs, and that's certainly the case with Synology's DiskStation DS410 4100 and Lenovo's IdeaCentre D400. Both machines have relatively fast CPUs, too: a 1.6GHz Intel Atom 230 in the latter and 1.06GHz Freescale mpc8533e in the former. But Synology's NAS box comes from the factory with four 1TB drives in RAID 5, while the Lenovo is outfitted with two 1TB drives (and two open drive bays) and Microsoft's Drive Extender technology enabled to automatically duplicate shared files across multiple drives. As you can see from our benchmark chart, RAID 5 rules. **WINNER: NAS BOX**

ROUND 3

FAULT TOLERANCE

The Synology DS410 4100 came from the factory configured as RAID 5, which would enable you to recover all your data in the wake of the failure of one of its four drives. You could gain even more fault tolerance by reconfiguring the array as RAID 6, in which case your data would survive the failure of two drives. As we mentioned in Round 2, Windows Home Server's Drive Extender technology will automatically duplicate shared files across multiple drives, but if your client machine takes a dump and your last backup becomes corrupted, you're screwed because backups are not automatically duplicated (nor is there a native tool for backing them up). However unlikely such a double whammy might be, RAID 3, 4, 5, or 6 configurations in a NAS box will allow you to recover your data, while Windows Home Server's Drive Extender will not.

WINNER: NAS BOX

ROUND 4

MEDIA SERVER FEATURES

While it's not true of every NAS box, Synology's DS410 4100 comes with a great set of media-server tools, including a DLNA-compliant server (for streaming media to a networked A/V receiver or to an Xbox 360) and an iTunes server. Windows Home Server doesn't come with these features built in, but affordable third-party add-ons abound (Lenovo bundles an iTunes server, but not a DLNA-compliant server). We're awarding Windows Home Server the win in this category by virtue of third-party software support and its tight integration with Windows Media Center.

WINNER: WINDOWS HOME SERVER

ROUND 5

THIRD-PARTY SOFTWARE SUPPORT

Windows Home Server rules this category, thanks to strong support from third-party developers offering all manner of add-in software. You'll find media servers, such as Tversity (free) and TwonkyServer ($20); server power-management utilities, such as LightsOut (free); home-control management programs, such as mControl ($130); and plenty more. Microsoft offers a free software development kit (SDK) to encourage further development. Although most NAS boxes run on Linux, third-party support is much more limited in scope.

WINNER: WINDOWS HOME SERVER

BENCHMARKS

	Lenovo IdeaCentre D400 Home Server	Synology DiskStation DS410 4100
Client to Server / small files (min:sec)	1:22	**0:36**
Client to Server / large file (min:sec)	7:52	**1:21**
Server to Client / small files (min:sec)	0:34	**0:32**
Server to Client / large file (min:sec)	1:17	**0:14**

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

NAS Box (represented by the Synology DiskStation DS410 4100, $900)

And the Winner Is...

If you're running a small business and your primary application for centralized storage is to automatically back up a bunch of client PCs, a strong NAS box such as Synology's DS410 4100 is a great fit: It's fast, efficient, supports both Macs and PCs, provides great fault tolerance, and it's well-supported by its manufacturer.

Tech enthusiasts need a strong automatic backup solution, too, especially those of us with multiple PCs in the house. Windows Home Server is absolutely fabulous for that, especially on those occasions when your machine is so completely thrashed that it requires restoration from the operating system up. And unlike a NAS box, Windows Home Server was expressly designed for digital-media consumers like us. It's the best solution for streaming media around the house, it offers tight integration with Windows Media Center, and it boasts strong support from third-party developers.

The next version of Windows Home Server, code-named Vail and in beta testing now, will be even better. The code base will shift to the 64-bit version of Windows Server 2008 R2 and the OS will include server backup, a DLNA-compliant media server capable of streaming media outside your home, a raft of user-interface improvements, and more.

This month the Doctor tackles...

Home Network Management
Fried RAM
Heatsink Trimming

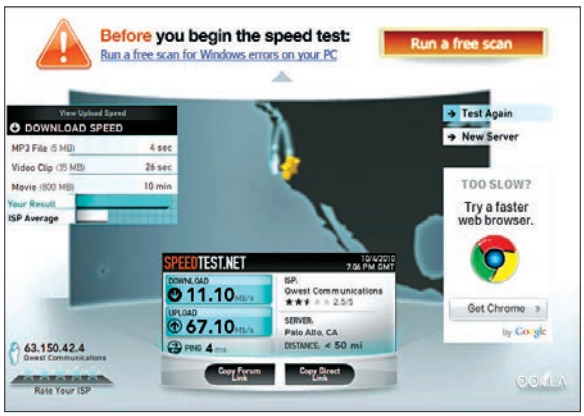
Do I Need a Hybrid?

I download large files with a 100Mb/s connection. I use uTorrent and usually download six to nine files at a time to maximize my download speed to 6MB/s. I know I can reach 11MB/s but I'm sure I'm being limited by the hard drive's IOPS (my laptop runs on a 5,400rpm 640GB hard drive with an 8MB cache).

One way to fix this is to get an SSD, but that's a bit out of my price range. I'm thinking that the Seagate Momentus XT would be a perfect fix for my problem. I understand that files and programs that are used frequently get placed on the 4GB of flash memory on the drive. Would the download files be put on the SSD while downloading, but then moved to the HDD later? Or would the download files go straight to hard drive space, which would ruin the whole point of me getting this hybrid drive?

—James

There's no need to upgrade to a hybrid hard drive, James. Your bottleneck is your Internet connection, not your hard drive. A 100Mb/s connection is around 12.5MB/s, so you're approaching your best-case transfer speed when you see 11MB/s, but 6MB/s sounds more reasonable. ISPs often exaggerate; a 100Mb/s line rarely actually performs at 100Mb/s for more than a few seconds at a time. A 5,400rpm drive will write at around 50 or 60MB/s, if not higher. So you definitely don't need to get a faster drive.



Services like Speedtest.net can help you determine your actual Internet connection speed—not just what your ISP claims you have.

What's more, the Momentus XT's flash memory usage isn't user-controllable—you can't dictate whether a file gets saved there or not. Seagate's algorithm moves frequently accessed files (like Windows startup stuff), so your drive gets speedier over time. Alas, it won't work the way you're suggesting. The only way to do that would be to get a separate SSD to download onto. But again, your drive speed is not the bottleneck here, nor is your SATA connection. 'Fraid it's your Internet connection, old chap. To see the kind of performance you can actually expect from your ISP (as opposed to what it claims), run a speed test like the one found, fittingly, at Speedtest.net.

Gigabit Home Networking?

I have an HTPC and my Amahi Home Server wired to my router with Cat5e. The router is only capable of 100Mb/s, but I would like Gigabit. Can I add a Gigabit switch and plug the HTPC and server into it, or will the network default to the router's highest speed? I'm happy with the router's performance otherwise and would rather not drop $100+ on a new router when I can get a switch for $25.

—Tim Martin

If both computers have Gigabit NICs and both are connected directly to the Gigabit switch, then any communication between them should occur at Gigabit speeds, regardless of the speed of the switch in the router. If one of the machines is connected directly to the router, or if one of the machines has only a Fast Ethernet NIC, then communication would be limited to 100Mb/s.

Cutting Corners, Ruining Things

I recently bought the Cooler Master Hyper 212+ thinking it would fit in my case. Unfortunately, it was just a little too large, so I thought I'd just trim the little copper nubs off the top. I wrongly assumed those heat pipes were solid copper and it appears that the inside of those copper tubes are lined with some "foamy" copper material, as well.

Although the cooler now fits inside my case, trimming the nubs off made the heatsink worthless. It does not conduct heat at all anymore. My temperatures soared past 100 C. Why would trimming the nubs off affect the conductivity? Are the copper tubes filled with some sort of highly conductive gas? If so, what is it? Or is there something else going on?

—Todd

Ouch. Todd, cutting the ends off of your heat pipes, as you feared, caused the magic to escape. Cooler Master's Bryant Nguyen confirmed the worst. According to him, each heat pipe is a closed system that contains a heat-absorbing liquid. The liquid goes into the heat exchanger and is vaporized. The hot coolant rises to the top of the heat pipes and is cooled by the fans and heat-dissipation fins. It condenses in the foamy material you saw and flows back down to the heat exchanger, ready to absorb more heat. By trimming the end of the heat pipes, you allowed the liquid to escape, ruining the cooler. Good thing you picked an inexpensive part to experiment with. Also, yikes.

Matching Memory

Last year, I built a new system with a Core i7-940 processor and 6GB (3 x 2GB) Corsair Dominator GT 1866 memory on a Gigabyte GA-EX58-UD5 motherboard and 64-bit Windows 7 Professional.

Since the motherboard has an additional three memory slots, I figured I'd fill them with three matching modules for a total of 12GB. I called Corsair, and they told me that they did not recommend this for two reasons. First, it was not enough to have the three modules in each bank matched, but that all six modules had to be matched to ensure proper performance. So, to use both banks, I'd have to ditch my present memory and buy six matched 2GB modules.

Second, they didn't recommend using the second bank at all. I was told that using the second bank would actually reduce performance because the memory controller would have to look at two separate banks to pull data instead of just one. I was told that if I wanted to upgrade to 12GB, the best way to do it would be to remove my present memory and replace it with three matched 4GB modules instead of six 2GB modules.

This sounds wacky to me. Why go through the expense of putting the extra slots on the board if it's only going to hurt performance? Can you please explain this to me?

—Steve Vanetti

If you intend to run your 1866 memory at the overclocked speeds, the best route in general is to run matched modules. However, on Core i7 (and many other CPUs with on-die memory controllers), running all of the slots full is not the optimal configuration. This is because the on-die memory controller will not let you run the RAM at speeds over DDR3/1333 with all of the slots loaded. However, if you—like many people—simply run your modules at DDR3/1333 speeds and not at 1866, filling the other three slots will work fine.

Conversely, if you need to run your RAM at higher clock speeds, you will indeed have to run three pairs of 4GB DIMMS. The Doctor notes that the difference between standard and overclocked RAM is negligible for the average Joe and Jane, unless you are running an app or game that is bandwidth-constrained, so most folks are fine with 12GB across all slots.

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.

Missing Drivers for Nonexistent Hardware

I bought an upgrade copy of 32-bit Windows 7 Home Premium from Microsoft's student site and downloaded the ISO. I then used Microsoft's USB installation utility to create a bootable Win7 install drive on a 4GB SanDisk Cruzer.

When I try to install the OS on my HP Mini 1000, I get the following message: "Required CD/DVD device drivers missing," and it prompts me to search for them. I don't even have an optical drive on this netbook! Help!

—Naomi

Naomi, if you don't have an optical device on your netbook, that error message usually indicates a corrupted ISO. If you're within the 30-day download window that Microsoft's digital distribution allows, re-download the ISO (you should find a link in the confirmation email Microsoft sent you). Try re-creating your USB boot disk with Microsoft's tool. Or, if you have access to an external DVD burner, try re-burning the ISO to a DVD at the lowest possible burn speed to reduce errors, then use the external drive to install the OS to your netbook.

2011 A TECH ODYSSEY

PC Users are on the brink of a massive shift in technology and performance. We identify the most game-changing technologies and life-changing products for the coming year

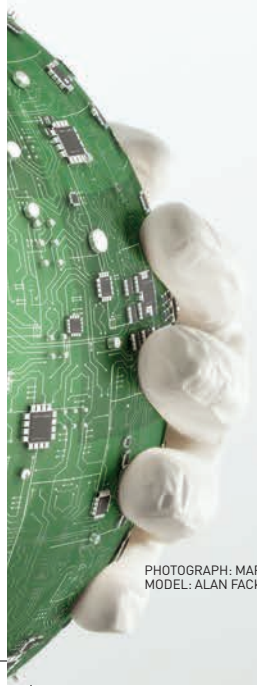
BY THE MAXIMUM PC STAFF

To the PC doubters and doomsayers throughout the land, we have but one thing to say. You are incorrect. Misguided. Flat-out wrong. As we started to investigate the technologies, products, and processors that will appear in PCs and related devices in the year ahead, we realized that, from this moment on, our beloved Personal Computer is more important and more relevant than ever.

It's not that the times aren't changing. They most assuredly are, and the infusion of so many new platforms and usage models into the home and the personal-computing equation is concentrating a lot of power and flexibility in our hands.

Not surprisingly, the PC ethos we all embrace—nonlinear, flexible, interconnected, and constantly evolving—lies at the center of the crossover. We mean that literally and figuratively. Desktops. Laptops. Tablets. Smartphones. Accelerated Processing Units. 60GHz networks. Personal servers. These days, each of us is essentially walking around with a tiny supercomputer, Internet, and cloud-computing scheme in our hands. To which we say, "Bring it on." We've been waiting for this moment for years.

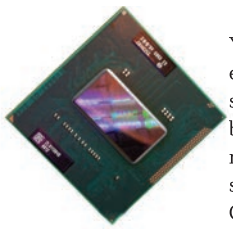
As always, the near future of PC technology is coalescing around three key axes: performance, power, and interconnectivity. Back in the day, you could sacrifice one or maybe even two of these criteria. Not anymore. Over the next 10 pages, we're going to explain what, why, when, where, and how.



PHOTOGRAPH: MARK MADEO
MODEL: ALAN FACKLER

CPUs

2011 will bring a true battle royal for CPU supremacy. Here's an early scouting report



Sandy Bridge is based on Intel's existing 32nm process, but is the "tock" in the company's tick-tock design cadence, meaning it should offer significantly enhanced benefits over today's CPUs.

Yeah, we know: Everyone is hyper-excited about netbooks, tablets, smartphones, phablets, and blah blah blah. We couldn't care less about that noise, because in 2011, we're going to see an epic battle between AMD's new CPU, code-named Bulldozer, and Intel's Sandy Bridge and Sandy Bridge E procs.

We know that Bulldozer will be a significant update for AMD and is considered the company's first all-out "new" chip since the original Athlon was introduced. The major change is the adoption of a new dual-chip "module" approach. Typical CPU cores are stand-alone affairs, isolated islands. If core 1 is busy on a single-threaded application and core 2 is twiddling its thumbs, core 1 won't be able to access core 2's resources. With Bulldozer's dual-core modules, CPU core resources that aren't being utilized can be thrown at the single-threaded application core 1 is working on, thereby increasing performance.

AMD says its dual-core modules are a way to one-up Intel's Hyper-Threading, which shares the resources of a core by creating a virtual second core to make it seem like one core is two. In the end, though, it's still just the resources of one core. If AMD is correct, Bulldozer will give power users the best of both worlds by offering performance greater than a Hyper-Threaded core without the power consumption or heat generation that comes with using two full and distinct cores.

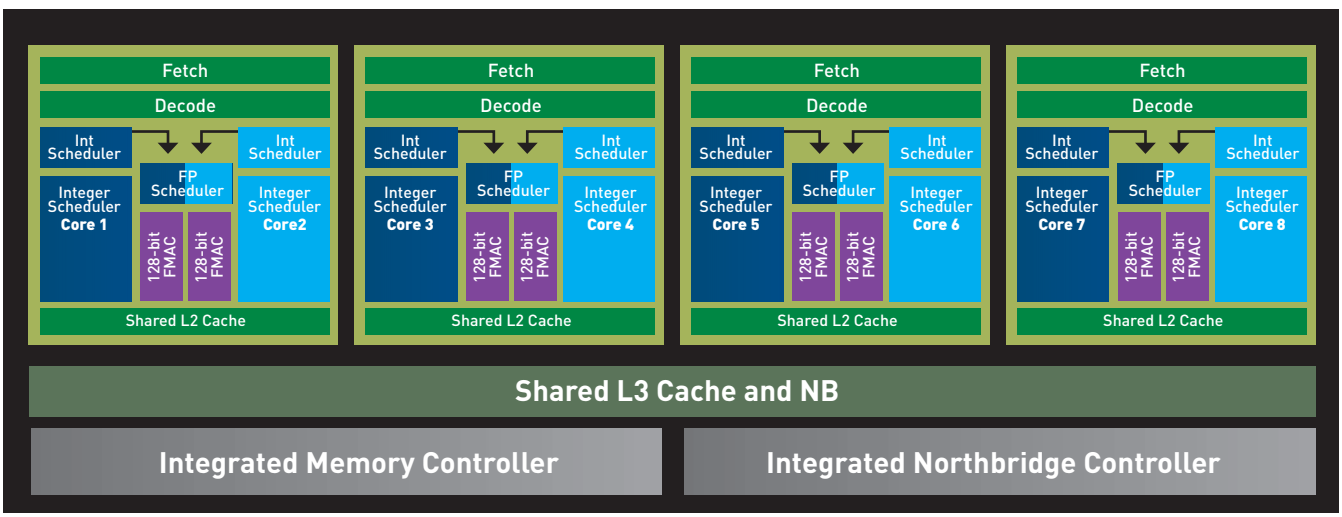
We'll know the true value of Bulldozer early next year when parts are expected to ship. It, as they say, is on.

SANDY BRIDGE

Despite releasing preliminary details about its next-gen CPU, code-named Sandy Bridge, Intel is still keeping a lot under wraps. What we know for sure is that Sandy Bridge will be built on the same 32nm process used to fabricate today's hexa-core Core i7 chips. Architecturally, it's somewhat similar to a current Core i3 and Core i5 chip (code-named Clarkdale) but will integrate graphics under the spreader. The big difference is that where Clarkdale used two adjacent chips connected via QPI, Sandy Bridge actually fuses the graphics core with a compute core. Instead of communicating over an external QPI link, the graphics and compute core talk at the cache level.

Sandy Bridge also brings new vector extensions (known as AVX) and an improved Turbo Boost mode. AVX will offer significant performance boosts when used, but the functionality will only be exposed on operating systems running SP1 of Windows 7 (due in early 2011) and new Linux distributions. We know for sure that the new Turbo Boost will push CPUs far harder than previous iterations did. Previously, processors would not clock up if all of the cores were under load. With this new Turbo Boost, Sandy Bridge chips are capable of running overclocked even when all cores are loaded up. It's only when a chip approaches overheating that the Turbo Boost will fall back.

Sandy Bridge chips will continue



We expect to see AMD's all-new Bulldozer CPU early next year. It may be the first processor to offer consumers an octo-core solution. It will also be the first chip to use a new duplex approach to computing.

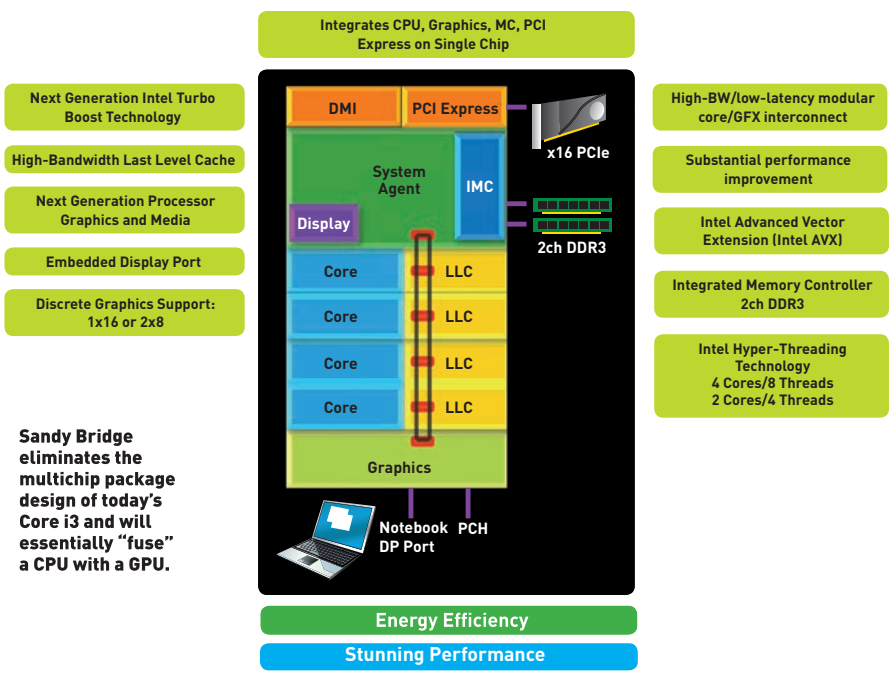
to feature a dual-channel DDR3 memory controller and 16 lanes of x16 PCI-E onboard. Like existing Lynnfield and Clarkdale chips, Sandy Bridge parts will come in dual and quad configurations, with the high-performance tier receiving Hyper-Threading capability.

We expect Sandy Bridge's graphics performance to run several magnitudes faster than existing Core i3 and Core i5 chips and, like the compute cores, the graphics core will also support Turbo Boost and will be able to clock up when under load. So, what isn't official yet? Clock speeds, cache sizes, and prices remain unannounced, but we expect them to fit into the same categories as existing Core i3/i5/i7 chips.

E FOR ENTHUSIAST

Unfortunately, we won't see a Sandy Bridge E (for Enthusiast) CPU until later in 2011, but at least it's shaping up to be a doozy. Paralleling today's LGA1366 chips, the Sandy Bridge E series will come in quad- and hexa-core configurations, and we've heard enough speculation about an eight-core version to start believing it's really going to happen.

Like the mainstream Sandy Bridge chip, it will include AVX and an enhanced Turbo Boost mode. Since it is a Xeon cutout, there is talk of the new part having a quad-channel memory controller but Intel has neither confirmed nor denied these reports. Also unconfirmed, but expected, is native PCI-E 3.0 in the new Patsburg chipset. This enthusiast-class chip won't be introduced until the second half of the year, but it will, of course, require a new socket (see below).



Sandy Bridge eliminates the multichip package design of today's Core i3 and will essentially "fuse" a CPU with a GPU.

UPGRADE ADVISORY

What to Buy? and When?

GORDON MAH UNG
SENIOR EDITOR

Among the questions I get from readers every year, the most frequently asked is: "Should I wait for X processor before I buy a motherboard?" I suspect that many of you thinking about pulling the trigger on a new machine are mulling this over yourselves. As always, my advice depends on the platform you're looking at and what your current needs are. Let's get into the guidance.

LGA1366 = HOLD For desktop use, the most stable platform today is Intel's LGA1366. As the only Intel desktop socket capable of taking a hexa-core today, the company has no plans to retire the original Nehalem socket right now. It's home to the wickedly fast Core i7-980X, and I suspect it will see at least another product bump in the coming year. The LGA1366's run will end late next year, however, when Intel releases the enthusiast version of Sandy Bridge, which will utilize the new LGA2011 socket. This still gives you six or eight months before the 1366 gets retired. Gamers looking for a stable, upgradeable platform should look here.

LGA1156 = SELL With LGA1155 destined for arrival early next year, my recommendation is to wait for the new socket at this point or to buy an LGA1366 socket if you are concerned about longer-term upgrades. LGA1156 fans, don't take it too hard. It's still a wonderful platform and with the excellent price-to-performance ratio of LGA1156 parts, I think its fine for someone who isn't obsessive-compulsive about the socket becoming obsolete.

AM3 = SELL AMD buyers should carefully weigh their options right now. AM3 will be replaced by AM3+ early next year. AM3+ boards will work with AM3 procs, but AM3+ procs will not work in AM3 boards. So should you wait? Unless your circumstances include replacing a dead system now or some requirement that you spend the cash now, I say it's a good idea to wait on a new motherboard purchase. While AM3 has a little more life left than LGA1156, it's still not long for this world.

Motherboards

New features, new sockets, same ol' ATX

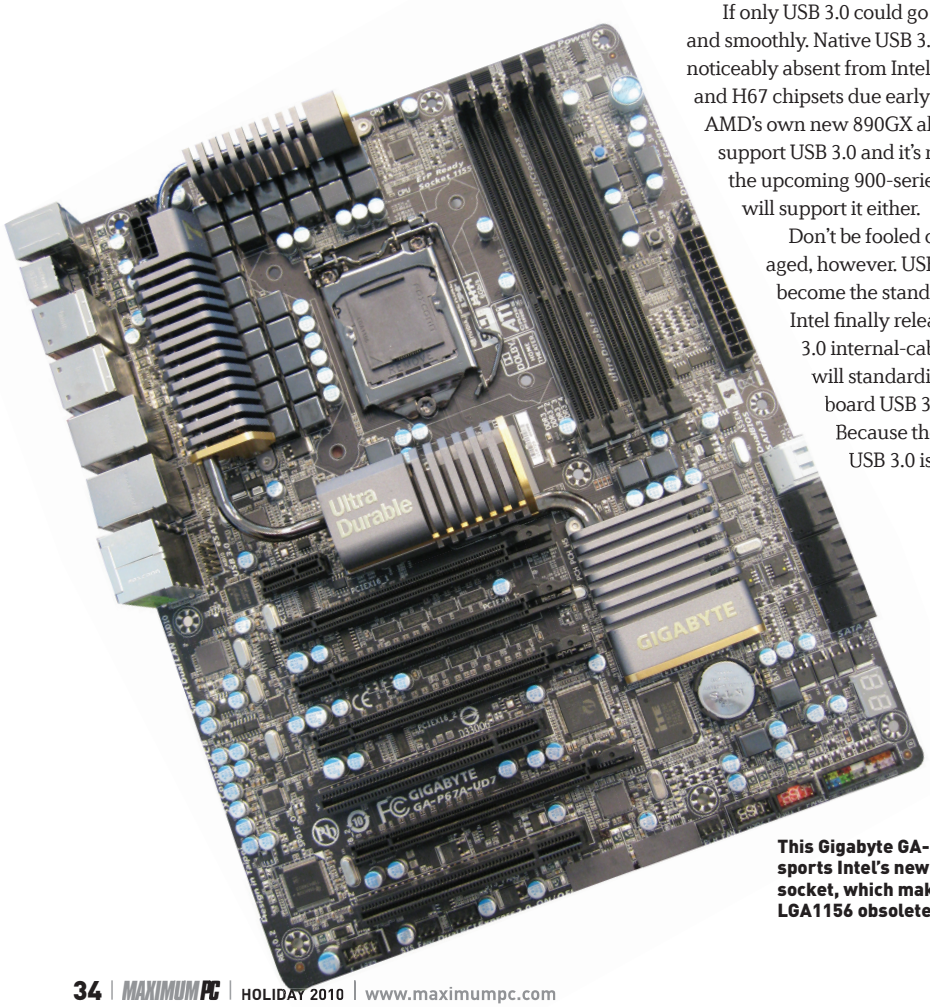
We'll see no major shifts in form-factor for mobos in 2011. Expect ATX to hang tough. Instead, look to PCI-E 3.0, USB 3.0, SATA 6Gb/s, and the socket itself.

It's a given that native SATA 6Gb/s support will become the standard on new chipsets in 2011. AMD already has SATA 6Gb/s in its current 890FX/GX chipsets and Intel will join the party when its P67 and H67 chipsets are released early next year with consumer and mainstream Sandy Bridge chips. What's the difference between native SATA 6Gb/s and what you have on the board you purchased last year? Your board uses a discrete ASIC (application-specific integrated circuit) to enable SATA6Gb/s, and thus only a few ports support the higher bandwidth. Native support means more of your SATA ports will run at the higher speed setting.

It's likely both Intel and AMD chipsets will support PCI Express 3.0 in the next year. PCI-E 3.0 essentially doubles the speed of PCI-E 2.0 using a pretty clever trick. Even though PCI-E 3.0's throughput moves only 8 gigatransfers per second versus PCI-E 2.0's 5GT/s, PCI-E 3.0 banks 20 percent in encoding bandwidth to double the actual data transfer rates. Don't worry—PCI-E 3.0 is backward compatible, and since PCI-E has been incredibly low on drama, we expect this transition to go smoothly.

If only USB 3.0 could go as quickly and smoothly. Native USB 3.0 will be noticeably absent from Intel's new P67 and H67 chipsets due early next year. AMD's own new 890GX also does not support USB 3.0 and it's not clear if the upcoming 900-series chipset will support it either.

Don't be fooled or discouraged, however. USB 3.0 will become the standard. In fact, Intel finally released a USB 3.0 internal-cable spec that will standardize motherboard USB 3.0 headers. Because the pin-out on USB 3.0 is different than USB 2.0, most cases have relied on using pass-through cables to get USB 3.0 ports onto the front.



This Gigabyte GA-P67A-UD7 sports Intel's new LGA1155 socket, which makes LGA1156 obsolete.

SOCKET UPDATE

Big changes await folks who use Intel's workhorse LGA1156 socket. When the Sandy Bridge series of CPUs launch early next year, we'll see a new and incompatible LGA1155 socket. That won't make your existing Lynnfield or Clarkdale machine suddenly worthless, but there's very little chance you'll be able to drop in a fast new Sandy Bridge proc.

The good news is that LGA1366 owners won't get pushed overboard at the same time. Don't get us wrong, the platform is still a dead man walking, but at least it looks like LGA1366 will get one more CPU update in 2011. However, by the end of next summer, expect Intel to introduce its LGA2011 socket for enthusiast-class Sandy Bridge chips.

AMD fans have had it easier with motherboard upgrades, enjoying a relatively painless migration from Athlon 64 all the way to Phenom II X6. AMD will continue this trend with AM3+ by allowing you to run an older AM3-based Phenom II as well as the company's upcoming Bulldozer chip in an AM3+ board. It's important to note that Bulldozer chips will not work in existing AM3 boards, so if you're buying an AM3 board today, you will probably top out on Phenom II X6. AMD's new Fusion combo GPU/CPU part will also require a new socket since the chip will incorporate integrated graphics functionality, which will require additional pins to the CPU socket.

The long and the short of it is that 2011 will be a turbulent year for builders who have an eye toward longevity. Just remember to keep it in perspective. A new socket and CPU doesn't make your Phenom II X6 or Core i7 stop working. It just limits your ultimate upgrade path.

Storage

A steady mainstreaming of last year's cutting edge

6Gb/s SATA ports, like the one on this Seagate Barracuda XT, will become the rule rather than the exception.

Capacities go up and prices go down: so goes the law of the storage jungle. While magnetic storage still beats out solid-state in cost per gigabyte, 2010 saw a dramatic uptick in the reliability and speed of SSDs, thanks to widespread adoption of the Trim command and the appearance of the rock-solid, blazing-fast SandForce SF-1000-series drive controller. The next year will bring SandForce's SF-2000 series, which boasts 500MB/s transfer speeds and 6Gb/s SATA and SAS interfaces. While the SF-2000 series will target the enterprise and industrial sectors, we'd be very surprised if an OEM like OCZ or Corsair didn't introduce a top-level consumer drive based on the chipset.

SSD capacities will increase past 512GB—including a 600GB Intel drive based on a 23nm process—but just as 128GB was the sweet spot for 2010, expect aggressive marketing and pricing of 256GB SSDs as flash memory costs continue to drop, precipitating wider-spread adoption.

On the mechanical side, all major vendors will ship 3TB bootable internal drives in 2011, and 2.5-inch hard drives will hit 1.5TB. Seagate is already shipping a 1.5TB 2.5-inch external drive. Of course, "bootable" for volumes over 2TB is predicated on use of UEFI bootloaders, 64-bit OSes, and GPT partitions, but 2011 is the year the BIOS finally dies—maybe.

It is also the year of 6Gb/s SATA. Though 6Gb/s SATA interfaces weren't uncommon on drives in 2010, our sources tell us to expect a "mass migration" to the spec in Q1 2011.

On the optical front, expect even greater storage potential from Blu-ray discs, which have been capped at 50GB for some time. Sharp has begun shipping 100GB discs in Japan. The three-layer discs, which conform to the BDXL format, are capable of storing 12 hours of digital TV and are currently priced at $60 apiece. Four-layer 128GB discs are expected to follow. Of course, you will need new hardware to take advantage of BDXL. Right now, Sharp and Sony are the only vendors to offer compatible recorders.

Displays

3D? Bah. LED? Yes

WLEDs, white light-emitting diodes, use an effect called electroluminescence to provide high brightness across visible, ultraviolet, and infrared wavelengths.

Forget about 3D. 2011 is going to be the year of the LED, with companies like NEC, HP, and Gateway/Acer all indicating they will be moving forward in integrating the cheaper, greener option of using LED backlighting in their displays. Utilizing LED not only allows manufacturers to put out ever-slimmer display models, but also helps them meet increasingly strict energy efficiency—and recycling—standards. Case in point: NEC told us it was intent on making some of the greenest displays the industry has seen, while HP told us it expects to see an increase in the adoption of white LEDs.

Another term that's getting tossed around in display circles is "connectivity." NEC told us it intends to increase its adoption of DisplayPort connectivity, as did HP. Gateway/Acer intends to move forward with the development of a "connected" monitor, which essentially means a monitor that can be used for lightweight web surfing without powering up a PC. LG is also on the Internet-connected bandwagon, saying it plans to build on the momentum and demand that has already been shown for Internet-connected TVs and 3D to something a little more ambitious, and that we'll hear details about this new product line at CES. Vizio will be joining the 3D front; the company has indicated an interest in both active and passive 3D solutions as well as for 21:9 displays in larger sizes.

Tablets

Tomorrow's fingerprint-collectors will go dual-core

When it ships, Velocity Micro's Cruz tablet should have a Tegra 2 CPU.

Next year's fastest tablets will be running dual-core system-on-chip processors based on ARM's A9 architecture. The most promising dual-core SoC contenders include Samsung's Orion (1GHz, support for 1080p video, HDMI, and three displays), Nvidia's Tegra 2 (1GHz, GPU acceleration for 3D games, HD video, and Adobe Flash) and two chips from Qualcomm, the QSD8672 (1.5GHz) and the MSM8x60 (1.2GHz).

The specs are intoxicating, but we're concerned about exactly when we'll see these chips deployed. For example, by the time you read this, Samsung should have already begun shipping its Galaxy Tab with a single-core, 1GHz, A8-based chip—thus begging the question: How long must we wait for a dual-core Galaxy Tab 2? Meanwhile, Nvidia's Tegra 2 was announced almost a year ago at CES 2010, but we haven't yet seen it in a tablet. Finally, the most audaciously clocked SoC of all, the 1.5GHz Qualcomm QSD8672, may not appear in a consumer product until the end of 2011—a year behind schedule. Or so reports Engadget.

On the display front, we wouldn't expect any large tablet to be running a copycat of Apple's 326dpi "Retina Display." It would simply be too cost-prohibitive to produce this pixel density in large screen sizes at high yields (though rumors persist that Apple itself will deploy the Retina Display in a seven-inch iPad sometime early next year). Instead, look for Samsung's Super AMOLED displays in best-case scenarios (even though these too could be cost-prohibitive through 2011), and Samsung's Super TFTs and Sony's Super LCDs at a bare minimum.

Finally, the best Android tablets should be running the 3.0 version of the OS. Increasing resolution support from 854×480 to 1366x768, version 3.0 (aka Gingerbread) will be imperative for Android tablets to battle the 1024x768 iPad.

CRYSTAL BALL GAZING

4 Technologies to Watch from 2012 to 2014

Don't get us wrong. We're excited about the PC technological advances coming in 2011. But it's always a good idea to have one eye peering farther out. Here are our picks for notable tech we'll get our hands on in 2012 and beyond.

IVY BRIDGE Not content with its 32nm Sandy Bridge parts, Intel is already talking about fabricating a line of CPUs on a 22nm process technology. The first processors in this series are currently code-named Ivy Bridge and may debut as early as late next year in notebooks and mainstream desktop chips. The 22nm process will also be the basis of Intel's next big "tock," which is code-named Haswell, and will likely debut in 2012.

ETHERNET 10GBASE-T AND LIGHTPEAK Yes, it cost more than $1,000 per port in 2008, but by 2012, 10 Gigabit Ethernet (10GE or 10GbE) will be standard on motherboards. Yeah, really, 10x the bandwidth of Gigabit Ethernet fer freaking free! We won't bet the bank on it, but we also believe that by 2012, Intel's LightPeak will be available as a pretty low-cost add-in and may even be standard on some higher-end motherboards.

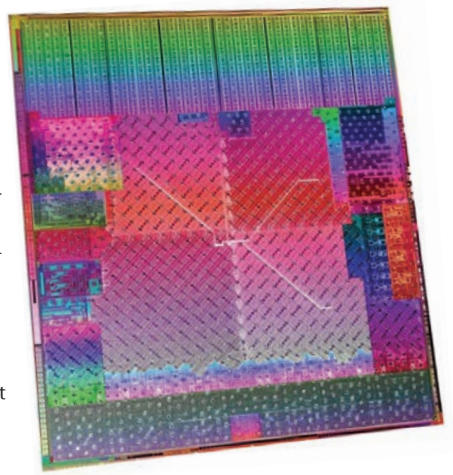
SATA 12 With SATA 6Gb/s here, the SATA International Organization is already looking to open up the throttle even more. The next speed notch isn't set in stone, but the roadmap targets speeds of 10Gb/s or 12Gb/s. When will it happen? We're guessing 2013 to 2014.

4K RESOLUTION In 2015 or so, we'll likely start seeing 4K video take hold. This higher-resolution "standard" will offer four times the pixels of 1080p and pack more pixels than a 30-inch panel running 2560x1600 resolution. It's too early to say for sure, but we're hearing about resolutions approaching 4096x3072. No, this won't happen overnight, but with 4K videos already on YouTube, you can bet this resolution revolution will happen faster than you think.

Mobile CPUs

AMD's Zacate ups the mobile CPU ante

When AMD purchased ATI, many thought the merger was a mistake. Today, those who called bull are eating their hats. The first direct result of the merger is the upcoming Zacate chip. Dubbed an accelerated processing unit, or APU, Zacate blends a fairly powerful graphics chip with a decent, but not cutting-edge dual-core processor. The compute cores aren't based on the all-new core used in Bulldozer. Instead, it's an iteration of the existing K10 core that, while capable, is a bit lacking when pitted against Intel's best and brightest. But hey, the future is all about tight integration between graphics and compute cores, right?



AMD describes its upcoming Zacate chip as an advanced processing unit, or APU, which fuses fast graphics with a dual-core processor.

In terms of graphics performance, AMD certainly has something it thinks will leapfrog Intel. In press demonstrations held in the fall, a Zacate machine was capable of playing some fairly modern titles at acceptable frame rates. The same titles running on existing Core i5 notebook PCs with integrated graphics paled in comparison. AMD has indicated that, when it's finalized, Zacate will exhibit even better graphics, run at even lower temperatures, and sip miniscule amounts of power. We shall see. AMD says it expects Zacate to be used in tweener products—high-end netbooks and lower to mid-range notebooks.

The most appealing thing about Zacate is the price. AMD anticipates that notebooks with Zacate will reside in the $500 range, and that these products will easily beat up $700 to $800 notebooks with Intel integrated graphics. That's graphics performance, of course. We see no reason to doubt the graphics capability of Zacate, as measured against today's Core i3 and Core i5 notebooks (which are based on the Arrandale core). Intel's Sandy Bridge chip, which is coming early in 2011, promises graphics-performance boosts that are several magnitudes better—and next-gen CPU performance to boot. Truth be told, the first enthusiast-class Sandy Bridge chip isn't all that exciting. It won't have a hexa-core option and its PCI-E options for multicards are limited. For road warriors, however, Sandy Bridge will offer all of the goodness of its desktop counterpart: AVX vector extensions, a closer integration of graphics and compute cores on one chip, and a much improved Turbo Boost feature. That's a big deal for laptops.

Like the desktop proc, Sandy Bridge's mobile incarnation will improve upon Turbo Boost by overclocking under heavier loads. While Clarkdale and Arrandale's Turbo Boost dialed performance back significantly if all cores were loaded up, Sandy Bridge will continue to run "overclocked." In fact, all indications are that Sandy Bridge notebook CPUs should run overclocked at even greater levels than their desktop counterparts.

In 2011, Intel will continue to push its popular Atom chips into even smaller devices with the new Oak Trail chip. Oak Trail is an Atom-based system-on-chip that combines an Atom core with a graphics engine, display controller, memory controller, HDMI, USB, HD Audio, SATA security, and legacy I/O into, well, one chip.

EMBEDDED PROCESSORS

Handheld Forecast: Sunny—and Smarter

TOM HALFHILL
CONTRIBUTING WRITER

Beauty is only screen deep. Beneath the colorful LCD of your smartphone or tablet is some brutish microprocessor muscle. This "application processor" runs your apps, talks to wireless networks, accelerates the graphics, plays audio and video, and hosts a sophisticated operating system. Essentially, one chip nearly duplicates the functions of an entire PC—while sipping only 1 or 2 percent as much power, so it can run for hours on a tiny battery without scorching your hands.

Most of today's fastest application processors use the ARM Cortex-A8 or Cortex-A9 CPU cores, or a custom-designed ARM-compatible core. Example: the Texas Instruments OMAP4 series, which has dual Cortex-A9 cores running at speeds up to 1.0GHz. That's fast, but users want more. Up next is ARM's new Cortex-A15 Eagle.

With a freakish instruction pipeline up to 24 stages deep, the Cortex-A15 can reach 2.5GHz when fabricated in 28nm technology. It can issue eight program instructions per clock cycle and address 1TB of memory. It supports CPU clusters with dozens of cores. New virtualization extensions allow it to host multiple operating systems on a hypervisor.

Eagle will claw its way to market against several challengers in 2011 and 2012. Apple acquired Intrinsity and its swift Hummingbird processor, which is compatible with ARM's Cortex-A8. Watch for a successor to Apple's A4 chip that taps Intrinsity's expertise and the engineering talent from P.A. Semi, another Apple acquisition.

In other forward-looking news, Intel is prepping Medfield, its next-generation Atom-based series of smartphone chips, which will likely beat competitors to 32nm fabrication technology. Marvell's new Armada 628 is the industry's first tri-core application processor, and its ARM-compatible CPUs can hit 1.5GHz. Nvidia's Tegra-2 has dual Cortex-A9 cores and fast graphics. MIPS Technologies just introduced the MIPS32 1074K, a processor core designed for clusters with two to four CPUs that should match the Cortex-A15's clock speed. Finally, Qualcomm is continually improving its ARM-compatible Snapdragon chips, which should hit 1.5GHz in 2011. Smartphones are about to get a lot smarter.

Crowd Sourcing

What Are You Looking for in 2011?

Maximum PC Hey readers, EIC George Jones here. We're working on a Maximum PC feature about tech forthcoming in 2011. I'll throw it to you guys: What tech or products are you most looking forward to in the coming year? Alternatively, what kind of components, gear, or even projects are you looking to climb into next year?

October 8, 2010

View 5 comments

Ryan Hansard I would say I'm interested in all these set-top boxes and media-player accessories for the TV. I've always wanted to build a Media Center PC, but if a cheap box could do it for me....

Like

Paul Olinger Jr I hope AMD Fusion technology pays off. I want a netbook with some decent gaming capability.

Like

Doug Hackworth I'm getting interested in home servers, using either Windows or Linux, for both file storage and media streaming—would love to see up-to-date articles/how tos on these in the next year. I'm sick of tablet hype. Please skip it in the magazine until there are actually tablet products (i.e., more than one) available, rather than 1,000 product announcements.

Like

Lenoir Preminger Nvidia making a comeback with a well-made 600-series GPU.

Like

Ryan Hoffman I really want to make a car computer that not only serves as the AV hub, but also the diagnostic and monitoring hub. It should play movies, music, some games, keep mileage and other stats, act as a GPS, and finally show trouble codes and help with diagnostics. Phew!

Like

Networking

It's all about wireless in 2011

The bulk of the activity on the networking front this year will occur in the wireless space. Duh. Unlike in years past, however, we don't expect to see much happening in the 2.4GHz and 5GHz frequency bands. We do expect to see more three-stream routers claiming 450Mb/s TCP throughput (150Mb per second per stream), but they won't be interesting until we see USB client adapters with three antennas that can take full advantage of them.

The far more interesting action will be in the 60GHz spectrum. We've already seen some proprietary hardware using this frequency band to stream high-definition video (you can read our review of the Rocketfish WirelessHD Adapter at http://bit.ly/97Dpzv), but the WiGig Alliance's shrewd decision to team up with the Wi-Fi Alliance should lead to the development of a host of interoperable devices capable of streaming massive amounts of data—we're talking upwards of 7Gb/s—over a wireless network.

That awesome bandwidth is available only at relatively short range, however, and the signals have a very difficult time penetrating physical obstacles, such as walls. So, rather than replacing Wi-Fi, you'll see a new class of tri-band routers equipped with 2.4-, 5-, and 60GHz radios. You'll use the 2.4GHz band for range, the less-crowded 5GHz band for streaming standard-definition audio and video to other rooms, and the 60GHz band for streaming HD audio and video over short distances (from a home-theater PC to your TV or video projector, for example).

Look for new developments in wired networking, too. The HomePlug Powerline Alliance is promising to deliver gigabit speeds over electrical power lines with its new HomePlug AV2 standard.

Three-stream routers like Trendnet's TEW-691GR promise 450Mb/s throughput. Here's hoping 2011 will deliver the three-stream USB client adapters needed to take full advantage of them.

Videocards

AMD's Radeon 6800 series makes its debut

AMD famously—albeit temporarily—surrendered the high-end of the GPU market to Nvidia back in 2007. When the company finally launched the much-delayed R600 series of GPUs, the performance of the top-of-the-line Radeon HD 2900 XT fell far short of Nvidia's top two cards: the GeForce 8800 Ultra and the GeForce 8800 GTX.

AMD swears it's not repeating old history with the first GPUs in its Northern Islands lineup, code-named Bart, and rumor has it that the company will have a new high-end product (code-named Cayman) later in 2011. For now, however, the company has clearly gone back to targeting the lower midrange of the market. Given the crappy state of today's economy, it's hard to argue with that. AMD's branding strategy, on the other hand, is bound to confuse buyers.

AMD's Radeon HD 5850 whacks the 768MB version of Nvidia's GeForce GTX 460, delivering more memory and more performance while consuming a whole lot less power.

NEWER, NOT FASTER

When it comes to GPUs, consumers have been conditioned to equate "new" with "faster," but the brand-new Radeon HD 6850 and Radeon HD 6870 are not much faster—and in some benchmarks they're actually slower—than the existing Radeon HD 5850 and Radeon HD 5870. Meanwhile, the dual-GPU Radeon HD 5890 will remain AMD's top-shelf offering.

That's largely because the architecture underlying Northern Islands is basically the same as the Evergreen architecture that AMD introduced in 2009. AMD's engineers have made a few tweaks to the shader cores: AMD claims the new microarchitecture is better and more efficient at tessellation, and that it's faster and more accurate at anisotropic filtering. AMD is also introducing hardware support for morphological antialiasing: MLAA will use DirectX 11's DirectCompute API, so the process is not tied to 3D rendering. Lastly, the new GPUs consume less power than the previous-generation parts: With the 6870 installed, our benchmark system drew just 122 watts at idle, and 267 watts under load. Compare that to Nvidia's GeForce GTX 460 (1GB memory configuration), which drew 157 watts at idle and 277 watts under load.

AWESOME PRICE/PERFORMANCE

The better news—for consumers as well as AMD—is that these new cards give Nvidia a solid beat-down in terms of price/performance ratios (check the benchmark charts on page 44 for details). The Radeon HD 6850 will retail at $180 and the Radeon HD 6870 will go for $240. That puts tremendous price pressure on Nvidia's 768MB and 1GB GeForce GTX 460 SKUs. The bad

BEYOND 3D VISION

Nvidia Targets CE Market with 3DTV Play Software

Nvidia CEO Jen-Hsun Huang was uncharacteristically frank at Nvidia's 2010 GPU Conference, revealing that Nvidia's next GPU is code-named Kepler and that it will see the light of day in the second half of 2011. The new part will be fabricated using a 28nm manufacturing process and should be 1.5X to 2X faster than today's Fermi chips. Huang also revealed that Kepler will be followed in 2013 by a part code-named Maxwell, which will be fabricated using a 22nm process. Maxwell, he said, promises to deliver a 6X performance-per-watt increase over Fermi.

In the shorter term, Nvidia is doubling down on its 3D-video bet by introducing 3DTV Play, a $40 software package that delivers stereoscopic support with 3D-enabled games, 3D television programming, 3D photographs, and Blu-ray 3D movies played on any PC equipped with an Nvidia GPU. Nvidia tells us the software will work with any 3D display and any manufacturer's 3D glasses—active or passive—but it won't work at all with AMD GPUs. "We're not taking 3D Vision glasses and trying to make them work with 3D TVs," said Nvidia 3D Vision product manager Andrew Fear. "TV manufacturers are building and branding their own glasses, so we decided we want to enable 3D Vision on

news—for consumers as well as AMD—is that these are the only new GPUs AMD has to offer right now.

FINALLY, 3D

As good as they are, price/performance ratios aren't the whole story behind Northern Islands: AMD is (finally) launching a push to promote 3D in games and Blu-ray movies, and it is renewing its effort to drive consumer acceptance of its Eyefinity multimonitor technology. On the stereoscopic 3D front, AMD is relying on third parties to provide both middleware (iZ3D and TriDef) and hardware (the 3D glasses and emitters required to sync those glasses to the display). We think this is a mistake on AMD's part, because it leaves Nvidia in the driver's seat when it comes to fostering the nascent 3D market: Nvidia provides almost everything you need—the GPU, the drivers, the glasses, and the emitter—to enjoy 3D video. The only third-party contribution is the display.

AMD is in a much stronger position on the multimonitor front, thanks to its Eyefinity technology, and the company is intent on pressing that advantage in the coming year. AMD is working with game developers to encourage them to support the very wide aspect ratios that Eyefinity is designed to deliver (e.g., three 1920x1080 monitors daisy-chained to deliver resolution of 5760x1080). Both the Radeon HD 6850 and 6870 reference-design

SPECIFICATIONS

	Radeon HD 5850	Radeon HD 6850	Radeon HD 5870	Radeon HD 6870
Process Size	40nm	40nm	40nm	40nm
Transistors	2.15 billion	1.7 billion	2.15 billion	1.7 billion
Stream Processors	1,440	960	1,600	1,120
ROPs	32	32	32	32
Core Clock Speed	725MHz	775MHz	850MHz	900MHz
Total Memory	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5
Memory Clock Speed	1,000MHz	1,000MHz	1,200MHz	1,050MHz
Memory Bus Width	256-bit	256-bit	256-bit	256-bit
Display Outputs	DVI (2), DisplayPort, HDMI	DVI (2), Mini DisplayPort (2), HDMI	DVI (2), DisplayPort, HDMI	DVI (2), Mini DisplayPort (2), HDMI
Board Thermal Design Power (idle/load)	27/151 watts	19/127 watts	27/188 watts	19/151 watts
Power Connectors	Two 6-pin	One 6-pin	Two 6-pin	Two 6-pin

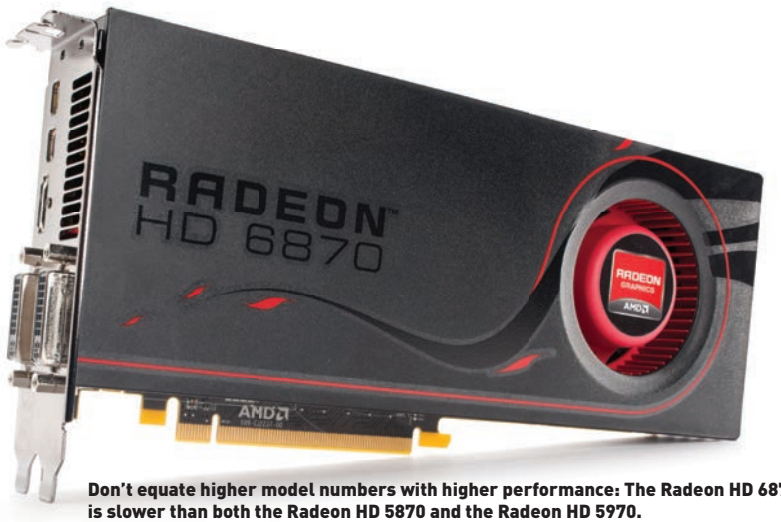
televisions using our software architecture."

If you've already purchased one of Nvidia's 3D Vision kits, or if you already own a 3D-capable notebook powered by an Nvidia GPU (from Acer, Asus, Clevo, or Toshiba), you'll be able to download the software for free. Nvidia expects system builders will bundle the software with their rigs, and the company announced on October 21 that Dell will offer the software with a new XPS notebook. Interestingly enough, this new machine has a conventional 2D panel, but it sends 3D data out to an external monitor through HDMI 1.4.

Nvidia continues to see 3D (in games, TV, and Blu-ray movies) as one of its most important initiatives in 2011.

cards AMD provided for us to benchmark include two DVI ports, one HDMI, and two mini DisplayPort connectors. A single GPU can support as many as six monitors, provided that monitors beyond the first two are outfitted with DisplayPort connectors.

AMD expects the most common Eyefinity configuration to utilize three inexpensive DVI monitors, using both of the card's DVI ports, one of its DisplayPort connections, and a $20 mini-DisplayPort-to-DVI dongle. The new GPUs also support DisplayPort 1.2, which features multistream video transmission. This enables them to send independent video streams to multiple monitors using a single cable from a single DisplayPort. Here's how that works: Monitors that support DisplayPort 1.2 have both DisplayPort inputs and DisplayPort outputs, so they can be daisy-chained. The new GPUs will support two DisplayPort 1.2 monitors with maximum resolution of 2560x1600 at a 60Hz refresh rate, four DisplayPort 1.2 monitors with maximum resolution of 1920x1200 at 60Hz, or even more displays at lower resolution—from a single DisplayPort connection on the mounting bracket.



Don't equate higher model numbers with higher performance: The Radeon HD 6870 is slower than both the Radeon HD 5870 and the Radeon HD 5970.

This is rank speculation on our part, but we expect AMD to introduce a higher-end GPU by the second quarter of 2011. It has to—the company can't afford to be seen as forever playing second fiddle to both Intel and Nvidia. We think convincing lots of gamers to buy multiple monitors is a much tougher challenge than nudging them to buy 3D glasses—especially with the TV industry pushing 3D video as hard as they are now.

BENCHMARKS

AMD VS. NVIDIA

	Reference Design Radeon HD 6850 1GB	Asus GeForce GTX 460 768MB	Reference Design Radeon HD 6870 1GB	Galaxy GeForce GTX 460 1GB
Unigine Heaven 2.0 (fps)	15.8	**17.7**	18.6	**19.0**
Far Cry 2 / Long (fps)	62.9	**66.2**	**70.8**	69.5
Far Cry 2 / Action (fps)	**53.6**	52.4	**59.3**	56.6
Just Cause 2 (fps)	**29.8**	25.1	**34.0**	31.4
Aliens vs. Predator DX11 (fps)	**23.1**	20.5	**27.0**	22.7
STALKER: CoP (fps)	**31.6**	27.6	**37.7**	31.8
System Power Usage (watts idle)	122	**117**	**122**	157
System Power Usage (watts load)	**243**	293	**267**	277
Price	$180	$175	$240	$240

Best scores in each of the two categories are bolded. Our test bed is a 2.8GHz Core i7 930 CPU in an Asus P6X58D Premium motherboard with 6GB of DDR3/1333 Corsair XMS3 memory and an 850-watt Antec TPQ-850 power supply. The OS is 64-bit Windows 7 Home Premium. All games are run at 1920x1200 with 4x AA.

AMD VS. AMD

	Reference Design Radeon HD 6850 1GB	Reference Design Radeon HD 5850 1GB	Reference Design Radeon HD 6870 1GB	HIS Radeon HD 5870 1GB
Unigine Heaven 2.0 (fps)	13.9	**15.8**	**18.6**	16.5
Far Cry 2 / Long (fps)	59.9	**62.9**	**70.8**	69.7
Far Cry 2 / Action (fps)	51.7	**53.6**	**59.3**	57.9
Just Cause 2 (fps)	**31.2**	29.8	34.0	**43.7**
Aliens vs. Predator DX11 (fps)	**33.9**	23.1	27.0	**30.3**
STALKER: CoP (fps)	**33.9**	31.6	37.7	**38.6**
System Power Usage (watts idle)	122	122	122	129
System Power Usage (watts load)	257	**243**	**267**	288
Price	$180	$260	$240	$350

Duke Nukem: The Once & Future King?

The inside story on PC gaming's greatest comeback—and a look at the game itself

BY NATHAN GRAYSON

Thrills, drama, a long grind, and a twist ending—these are the sorts of things you normally expect from a videogame. They are not what you expect from the story behind a game. But then, Duke Nukem isn't any ordinary game, and the saga of its development has been anything but normal. For more than 13 years, the gaming world's been waiting for Duke, and now the end is in sight. But first, let's review what's happened until now.

It all started back in 1996, with Duke Nukem riding high. The game for which he was known, Duke Nukem 3D, was a megaton hit, and gamers clung to the cocksure hero's every machismo-laden word. He was, quite literally, the king. He was on top of the world. Then in 1997, the follow-up, Duke Nukem Forever, was announced and, shockingly enough, it was all downhill from there. Duke disappeared. Year after year passed, and short of a few quick glimpses of the game, Duke was a disappointing no-show. His once-loyal fan base declared him dead. Anticipation rotted and festered, boiling over into angry cynicism.

The nail in Duke's supposed coffin, however, came in the form of developer 3D Realms closing up shop in 2009 and a subsequent lawsuit from publisher Take-Two Interactive. And then everything went silent. Game Over. Continue? 5... 4... 3... 2... 1...

But wait! At the last second, Borderlands developer Gearbox Software stepped in and saved the day. Now, Duke Nukem Forever's back on track and—get this—it's actually going to come out this time. So, how's the game? Who's in charge now? After more than a decade of waiting, will it all be worth it?

We traveled deep into the heart of Texas—to Gearbox's only-slightly evil lair—for three interviews with the men responsible for the past, present, and future of Duke Nukem. We'll tell you what they have to say about the legendary franchise *and* we'll share the details of our hands-on experience with the upcoming game. Yes, Duke fans, it's safe to dream again.

Duke Nukem Then

Original Duke Nukem designer George Broussard explains the series' turbulent development history

MAXIMUM PC: We have to ask... what took so long?
GEORGE BROUSSARD: I wish there was an easy or dramatic answer for what took so long but there just isn't. It was just never ready. We had lots of development issues along the way. It wasn't a quest for perfection as that silly article in *Wired* implied last year ["Learn to Let Go: How Success Killed Duke Nukem," http://bit.ly/bqyhkC]. I think what hurt us the most was licensing engines and trying to change them too much. Shit happens, and after delays the options are to continue or kill the game. I never wanted to kill the game.

MPC: What do you think makes Duke so endearing as a character?
GB: Just like Darth Vader is an ultimate archetype of a villain, Duke follows the archetype for the alpha male action hero. When we created Duke's character outline we wanted him to be a combination of Arnold Schwarzenegger, Clint Eastwood, and John Wayne. Combine those characters with a distinct look, attitude, and one-liners, and the result is that Duke is just an iconic character.

Expect to relive this football stadium battle in Duke Nukem Forever.

MPC: Do you worry that, in your pursuit of technological superiority, you allowed Duke Nukem to become a relic himself?
GB: Duke offers contrast and something very unique and different from the cookie-cutter, cardboard, generic game heroes that don't have an ounce of personality. It's OK to not like Duke or think him juvenile, but at least he's not boring and vanilla. Most people play games to escape and enjoy a fantasy for a while.

When we created Duke's character outline, we wanted him to be a combination of Arnold Schwarzenegger, Clint Eastwood, and John Wayne.

—GEORGE BROUSSARD

MPC: How'd the Gearbox deal come about?
GB: First, Randy [Pitchford] worked for us from 1996 to 1997, and I play poker with him and some other Gearbox guys every week. Second, we were in a bitter lawsuit with Take-Two that was going to last for years, as they had shown no interest in being reasonable. Third, behind the scenes, there were nine or so ex-3D Realms guys—Triptych Games—who were working on DNF in secret, on their own money, out of a house, because they believed in the game. Summer of 2009, I played Borderlands at Gearbox, prior to release. That afternoon, Randy and I talked about the suit and how things were going. He mentioned that he'd love to help or get involved, and while it wasn't clear what that meant, it was clear he was passionate to somehow get involved with Duke.

A couple weeks later, I mention Randy's interest in passing to my partner Scott Miller and everyone got to talking. Around Christmas 2009, a strategy was planned that would leverage Gearbox's positive relationship with Take-Two—due to Borderlands' success—settle the suit, and get the game published.

MPC: Is it difficult letting someone else finish up your creation?
GB: Sure, but it is what it is, and at some point you get enough distance and perspective to let things go. It took about a year. I'm just glad we worked it all out.

For our complete interview with George Broussard, go to www.maximumpc.com/article/DNF.

Duke Nukem Now

Gearbox cofounder Brian Martel predicts how Duke will adapt after his long absence

MAXIMUM PC: Duke's been out of action for a long, long time. Do you think he is still relevant to modern gamers? Where does Duke fit in?

BRIAN MARTEL: I think he's still relevant. On the one hand, he's a reaction to the 1980s action hero, and he's an embodiment of all those sorts of things—the people that George Broussard was inspired by and all that kind of stuff. But at the same time, when you have characters like the Doom marine and the Wolfenstein guy—both of whom never said anything—and Duke, having him actually comment on what was going on, was novel then. And I think we're sort of in the same place again. You know, when we look at Gordon Freeman, he's awesome, but everyone else is reacting to Gordon. He's not saying anything. He's just the vessel for the player. Now, we have Duke again.

MPC: With Duke going MIA for so many years, why do you think no one really took that ball and ran with it? Why do we instead have all these mute, blank slate–type characters running around saving the world?

BM: Basically, there's this way of thinking where the character shouldn't say something that the player may be thinking. A lot of people fall in this category of "the player should be the one thinking it, and the character shouldn't be saying it." And that when the character says it, it's a little disembodied.

MPC: So would you call Duke Nukem Forever a Gearbox game? Is it your baby, or is it just some kid you adopted from 3D Realms?

That's the crux of Duke: He's having a good time and he's saving the world, and it's fun to save the world. —BRIAN MARTEL

BM: Well, it's hard not to call it a Gearbox game, because we're obviously adding our own bits to it and our flavor to it, and making sure it reaches a high quality level. Those are things we would put under our brand. Yes, I think it is a Gearbox game.

MPC: Do you think Duke has the potential to turn things around, and make the industry take a good, hard look in the mirror and say, 'Hey, we're taking ourselves a bit too seriously'?

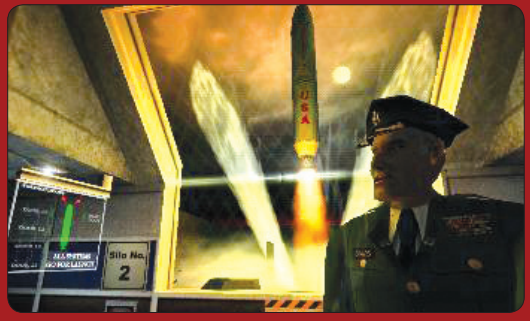
BM: Yeah, I think that when you play Duke, you'll realize that games are supposed to be fun. And it's pretty much as simple as that. Yeah, sure, there's room for serious games and games that are irreverent and just fun. Duke's on that threshold.

Look at movies; think of, you know, true drama. That's what these games are trying to be—you know, the action equivalent of a true drama. Heavy Rain, that's a little further over. [Duke] is more like *The Hangover*. It's got its moments that may be moderately serious, but the rest is just having a good time. That's the crux of Duke: He's having a good time and he's saving the world, and it's fun to save the world.

For our complete interview with Brian Martel, go to www.maximumpc.com/article/DNF.

Duke Through the Ages

In his earliest incarnation, Duke looked a lot like former Raiders great and NFL commentator Howie Long.



Back in 2001, when Duke was only a few years late, 3D Realms surprised gamers with a two-and-a-half minute trailer set in Las Vegas. This version of the game utilized a new version of the Unreal engine.

George Broussard and developers released a series of wallpaper images of Duke back in 2008. Curiosities were piqued, but legal battles and financial woes held up development.

Duke Nukem Forever

Gearbox president Randy Pitchford discusses plans for the franchise going forward

MAXIMUM PC: You now own the Duke Nukem license in its entirety. Congratulations! So, what does the future hold now that you're in control?

RANDY PITCHFORD: My goal with the franchise is, I really want to lower the bar. [Laughs] I think you know what I mean by that. Duke can get away with so much that's not possible with so many game franchises. Everybody's taking themselves so seriously.

My hope is to create entertainment—to have the world entertained by that. I think Duke is one of the most iconic characters in all of videogames. We'll see what happens with DNF, but I think we're going to have a lot of fun with it, and I think Duke's going to continue to be relevant.

MPC: What's it like taking control of a franchise with so much history attached? Is it a burden in some ways?

RP: I think when you have something that's important to people and it has a history, you have that dichotomy. You know, you don't want to break it, but on the other hand, if you don't use it, then why does it exist? I can understand that some folks would be worried that some things are fragile. But important things aren't fragile. So we'll be having quite a good time with Duke.

When I played through the content that existed when I got involved, I was like "This is fing great! I need Duke right now!***

—RANDY PITCHFORD

MPC: Where do you see PC gaming itself going in the coming years? Do you think it's "dying" like some people claim?

RP: Let's see, the "dying" comment.... I think there's a lot of clear evidence that the number of customers we are reaching on the PC compared to the number of customers we're reaching on other platforms, that ratio is different today than it's been in the past. And it can cause one to conclude that there's a downward trend on the PC side of that equation, and that's troubling for people that like PC games.

However, that isn't the entire story. The entire story is that the PC platform has a lot of opportunity on it, as well. And it has a lot of freedom in how we find a way to create business models and to reach our customers. And that freedom means we can apply creativity in doing things there.

And, you know, it's commercial entertainment, and everyone doing it is also in a business. If folks get in a situation where they're spending more money creating entertainment than they're making or can make, they will cease to be in business.

So, what does all that mean? It means that there's opportunity on the PC. The opportunity is different than the traditional packaged-goods model in terms of big opportunity. But because it's different and harder to see, it's more difficult for people making big bets to make those big bets there. So you'll find a lot of those big bets are being made on the consoles, because those are reliable and predictable bets.

MPC: Where do you *hope* Duke will be in five years?

RP: My hope and my expectation is that Duke Forever will immediately remind everyone how relevant Duke is. It's interesting because he's been gone so long, but he almost stands out. It's like even though he's been there all this time and what's there is so easy and obvious, the whole rest of the industry is trying so hard to be serious and locked down that Duke's almost like a breath of fresh air.

When I played through the content that existed when I got involved, I was like, "This is f***ing great! I need Duke right now!" I didn't even realize how much I needed him right now, you know, as a gamer. So I think it's going to work well and that's going to make a lot of other things easier. It's going to make it easier to make a big bet on successor games, to try things with the brand, and even take some risks—but also understand what works and what we want from Duke.

In five years, you know, games take a while to make, so we'll definitely have played Duke Nukem Forever. We'll be playing it next year. That alone is a world I never expected.

For our complete interview with Randy Pitchford, go to www.maximumpc.com/article/DNF.

In 2009, a final batch of pre-bankruptcy screenshots made its way onto the Internet. This was the last new Duke material we saw before the surprise Gearbox announcement.

preview

But How's the Game?

We got hands-on play time with the game that's not supposed to exist

An early sequence in DNF combines the two American pastimes: football and battling giant monsters.

There are certain things you probably expect to do in the course of your life: go to college, get married, wonder how M. Night Shyamalan still gets work—that kind of thing. And then there are the moments that take you completely by surprise. Moments that feel utterly surreal—as though your alarm clock's gonna start wailing for you to wake up at any second—even as they're happening. What we're trying to say is, we played Duke Nukem Forever.

Holy sh**, we actually played Duke Nukem Forever.

Big whoop, though, right? With 13 years of expectation, baggage, and broken promises scattered in Duke Nukem Forever's wake, it'd have to be unquestionably the greatest game of all time for people to even consider that it *might* have been worth the wait. Honestly, though, that's not the point. Duke Nukem Forever isn't trying to be the *Citizen Kane* of gaming. After more than a decade of pursuing perfection, it's finally stopped trying to be the biggest or the best. And that's key, because Duke Nukem Forever is effortlessly fun—no strings attached.

The demo we played started off not with a bang, but a frothy dripping sound. The King's triumphant return saw him standing over a urinal, casually taking a leak. Duke's been out of action for 13 years, but the series' sense of humor hasn't aged a day. Which is great, because unlike pretty much every shooter out there, Duke Nukem Forever doesn't take itself seriously for a single second. For example, we emerged from the bathroom just in time to overhear some soldiers discussing their plan to take down a giant extraterrestrial baddy. "What's the last step?" asked one. "Um... profit?" another chimed in. The game's first spoken line of dialog is an Internet meme. Fantastic.

What kind of truck would Duke drive? If you answered anything but a monster truck, this game probably isn't for you.

After an explosion and a few quick glimpses of our foes, we found ourselves in a football stadium going toe-to-talon with the giant alien boss monster. It put up a fight, but soon decided he'd had his fill of rockets and politely died, at which point Duke proceeded to kick the beast's eye through a nearby field goal.

Next up, we got to try a sequence from later in the game, which saw Duke put down his dukes and hop into a monster truck. The driving itself, unfortunately, felt a bit stiff, but there's still plenty of time for Gearbox to tweak it. As for the path we drove down, it was fairly uneventful. No flaming rings to jump through, no enemy vehicles to destroy. For all the game's focus on spectacle thus far, the lack of imagination in this bit kind of took us by surprise.

After Duke got out of the truck, however, things heated up again. The red, sandy canyon's enclosed walls gave way to a clearing, and we were quickly surrounded by Pig Cops. Fortunately for us, we had some classic Duke firepower on our side: the one and only Shrink Ray. A few well-placed zaps later, and we went from fighting giant pigs to literally stepping on pigs so small that we finally understood where bacon bits come from. We got to try out the

rail gun and shotgun, but both paled in comparison to the mounted minigun, which started a shooting gallery sequence, with a small army of Pig Cops attempting to overcome our fire hose of hot metal death. Pick on something our own size, you say? Well, that's the helicopter that swooped in next. Honestly, its giant rocket launcher made us feel pretty inadequate with our puny pea shooter of a minigun, but not Duke. As he faded into unconsciousness after being blasted backward, he raised his hands feebly toward the sky. At the end of the day, even Duke Nukem's only human, huh? Nope. He then gave the helicopter two big middle fingers. End of demo.

So, the take-away points? Duke Nukem Forever isn't a revolution. It is, however—based on what we played—a fast-paced, incredibly fun shooter that'll have you blasting tears of laughter out your eyes nearly as often as you blast baddies. In a nutshell, it's everything you've always loved about Duke, but bigger, prettier, and funnier. Will it be worth more than a decade of waiting? Probably not. But if that's your attitude toward videogames, of all things—a medium that was invented to give you a good time—then you should probably go take up residence under a rock, because frankly, life's never gonna be able to satisfy you. Us, we like having fun. Duke Nukem Forever is incredibly fun. That's more than enough to earn our approval.

Wild&Woolly USB THUMB DRIVES

Looking for the perfect geek gift? Well, look no further. USB thumb drives offer that magical mix of functionality and flair. Available in an awe-inspiring array of shapes, sizes, and themes, there's a thumb drive out there to fit any personality

BY AMBER BOUMAN

WOODEN CLIP FLASH DRIVE

Clip and carry!

Simple, yet highly practical, there's no forgetting your data when you've got it clipped to a stack of papers, the strap of your messenger bag, or the cuff of your sleeve. It goes where you go.

$20 (2GB), $21 (4GB), $34 (8GB), http://bit.ly/og1fn

LACIE IAMAKEY

If it's good enough for Gordon, it's good enough for you

As a member of LaCie's "key" family which also includes the WhizKey, the CooKey, and the itsaKey, in various key-inspired shapes), the iamaKey—a favorite of our own Senior Editor Gordon Mah Ung—fits neatly onto a key ring, which makes it easy to carry with you at all times. And don't worry about the iamaKey bouncing around with all your other keys, it's got a sturdy metal build and is water- and scratch-resistant.

$20 (4GB), $30 (8GB), $55 (16GB), $100 (32GB), www.lacie.com

KINGSTON 256GB DATATRAVELER 310

Big things can come in small packages

Kingston's DataTraveler 310 is big—in every way. Aside from its capacity of 256GB (yes, gigabytes), the DataTraveler 310 is housed in thick, rounded plastic and has a similarly giant price point. The highest-capacity drive on the market will set you back between $500 and $760 (depending on which online retailer you grab it from). That price includes the Password Traveler software that can be used to create a password-protected section of the drive called the Privacy Zone, and the ability to tell friends: "Keep your hands off my Privacy Zone."

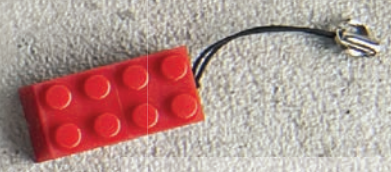
$755, www.kingston.com

USB 8GB FLASH DRIVE LIGHTER

Perfect for the PC-lovin' pyro

It seems like a sketchy idea to us to attach something so... flammable to your computer, but some of you Evil Knievel types will get a kick out of this. The USB connector slides from the bottom of the metal case and holds 8GB of flash capacity; the lighter portion is refillable, natch. It might be dangerous but it's hard to resist something that's so dually useful.

$40, www.thinkgeek.com



USB MEMORY BRICK

Lego my thumb drive!

Nothing brings out the kid in us like the holidays, and those childhood memories are sure to be sparked at the site of this familiar nubby form. Yes, everyone's favorite building block now holds 4GB of memory. Good for holding data, or for building a tiny house for your Lego man.

$40 ($30 for black), www.thinkgeek.com

VICTORINOX FLASH

Dad always said to carry a Swiss Army knife

Everyone knows how useful it is to have a Swiss Army knife on hand. Why not increase your trusty red friend's repertoire by adding the oft-needed tool of flash memory? Victorinox's Flash has a small blade, a nail file, scissors, a ballpoint pen (clever!), and an LED light in addition to the flash drive. The LED light requires a silver-oxide 1.55V battery, included, and the flash drive itself can be gently twisted off the rest of the tool for use on its own. Also available in silver, and up to 8GB.

$55 (2GB), $70 (4GB), $100 (8GB), www.thinkgeek.com

2GB USB DOG TAG NECKLACE

Camo-casual

Perfect for when you're down in the trenches with your data, this dog-tag necklace puts 2GB of flash memory within easy reach. Only one of the metal tags holds a flash drive, which is retractable, but both can be engraved to add personalization, at no extra cost.

$50, http://bit.ly/azZROG

RAVI RATAN FLASH DRIVE CUFF LINKS

Never be without your data at a dinner party again!

The Ravi Ratan collection of men's luxury cuff links now includes a stylish set for the PC geek. Available in gunmetal, silver-plated, and gold-plated options, the USB drive cuff links hold 2GB of memory each. To make the posh presentation complete, the cuff links arrive in a swank hexagonal box and can be engraved with up to eight characters for an additional $8.

You'll feel like James Bond himself, knowing you *could* be holding state secrets on your wrists.

$195, www.cufflinks.com

SUPERTALENT PICO USB DRIVE

If you tend to lose things, this drive is not for you

So small it could get lost in a pocket, this lil' guy is less than 4mm thick. But it's no wimp. Besides being shock- and water-resistant, it comes in generous 8GB, 16GB, and 32GB capacities. Looking for some wee bling? SuperTalent also makes a special-edition Pico-C, which is gold plated and holds 64GB (for $170 online).

$25 (8GB), $70 (16GB), $140 (32GB), www.thinkgeek.com

USB BULLET KEYCHAIN FLASH DRIVE

Right on target

There are many bullet flash drives out there, but if you want one that really gets the point across—what point that is, we're not sure—the most realistic likeness we could find comes from USB Brando. It's available in silver and copper and comes in sizes up to 8GB. It can also be outfitted with a black plastic tip that doubles as a stylus. **$16 (2GB), $19 (4GB), $31 (8GB), http://bit.ly/d70oXA**

ECO SQUARE

Pretty? Not so much. Green? More than most

If you drive a Prius, compost, wear Birkenstocks, and have a zero carbon footprint, then this drive will fit right in with your green lifestyle. The Eco Square drive is made from recycled newspaper and can hold up to 8GB worth of data. Unfortunately, or ironically, depending on how you look at it, the chip parts inside are not so nice for the environment.

Only sold in bulk (256MB to 8GB), http://bit.ly/93G4UG

USB PISTOL GUN FLASH DRIVE

Guns don't kill people... and neither do gun-shaped flash drives

For all you Second Amendment fans, hardcore thugs, and law-enforcement officer types, there's the USB Pistol Gun Flash Drive to defend your data. You can pry it from our cold, dead hands. Or maybe just ask nicely.

$20 (2GB), $22.00 (4GB), $33 (8GB), http://bit.ly/aHI7B2

MARIA USB

Hail Mary, full of data

Blasphemy aside, if you need a patron saint for your data, this here's your girl. The product of Spain-based design studio Luiseslava, this holiest of memory sticks (available in 2GB and 4GB capacities) is meant to "combat the dehumanization that technology brings to our lives" and create a "human link by moving away from the cold feeling of electronics." The Maria USB comes enshrined in an acrylic dome and has a red LED "heart" that beats when connected to a PC.

$80 (2GB), $110 (4GB), http://bit.ly/14xIOR

STAR WARS DARTH VADER USB FLASH DRIVE

Luke, I am your USB drive

No, seriously, this tiny representation of everyone's favorite Dark Lord uses the power of the dark side to hold 4GB of your photos, documents, video, and music. Also available in Stormtrooper, Boba Fett, and Yoda flavors.

$40, www.thinkgeek.com

VOLTRON 2GB USB DRIVE

Defender of the USB-niverse... yeah, that was a stretch

Voltron. Really, what more needs to be said? Well, maybe that this is the only drive here with moveable arms and legs. And it comes loaded with a remastered *Voltron: Defender of the Universe* episode. And he carries a sword. To access the USB key, you need to separate his upper and lower halfs. We'll admit, he's a little bulky to plug into a laptop—especially if you need access to other nearby USB ports—but it's hilarious to see Voltron's upper body hanging out of the side of your PC.

$37, http://incubot.com/voltron.html

USB GOLD BAR

When your data is worth its weight in gold

Eureka! We've hit gold with this capless drive! Nestled within this miniature version of a 999.9 gold bar is a 4GB or 8GB memory stick, which slides out for use and in for protection. Is it real gold? Do we really have to answer that? No, of course not—although the 8GB version costs nearly the same as one gram of the precious metal. But will one gram of gold hold all your documents and photos? No, we didn't think so.

$25 (4GB), $33 (8GB), http://bit.ly/905PAL

USB BOTTLE OPENER

What goes together better than computing and a beer?

We love a thumb drive that's multipurpose, and whether you're working, playing games, or just surfing the net, few things are as handy to have around as a bottle opener. Just pop it out of your USB port, where it's done its job of providing you with as much as 8GB of data storage, and use the hefty metal prong to pop open a cold one. From beers and bytes to drafts and downloads, this drive has you covered.

$19 (2GB), $22 (4GB), $33 (8GB), http://bit.ly/bbJVCM

WHITE PAPER

Nanowick Cooling

A micro solution to a macro problem –ZACK STERN

Heat is the enemy of modern electronics. As integrated circuits consume more electrical power and become ever smaller, with their constituent components packed closer and closer together, they generate more and more heat. If that thermal energy isn't effectively dissipated, it will damage and eventually destroy the circuitry.

Today's most popular cooling solutions utilize heatsinks and heat pipes, often augmented by powered fans. But that technology is rapidly reaching its practical limit and is threatening to impede the chip industry's progress. Enter nanowick cooling: While fundamentally based on the same mechanics as the heat pipe, a nanowick cooler is capable of dissipating 10 times more heat. We'll explain conventional cooling techniques, how nanowick cooling functions, and why it performs so much better.

OLD-SCHOOL COOL

Look inside your PC and you'll find passive heatsinks and/or heat pipes, typically fabricated from aluminum or copper, clinging to your motherboard chipset and maybe even your RAM. For components that generate even more heat—your CPU and videocard, for example—the coolers are usually augmented by fans. A heatsink simply uses thermal conductivity to draw heat from the point-of-contact to a cooler area at the opposite end of the metal. Segmenting that far end into a host of very thin fins increases the heatsink's total overall surface area, making it easier for the heat to pass into the air; adding a fan draws the heat away even faster.

Heat pipes, typically fabricated from copper, operate on a similar principle, and are often used in conjunction with a heatsink. The pipes contain a small amount of fluid—often water—and are sealed at a low atmospheric pressure, which means the fluid will boil at a relatively low temperature while it's in close proximity to the heat source. The resulting steam transfers the heat to the far end of the tube, where it condenses back into a liquid. Gravity and other forces cause the liquid to flow back to the heat source and the cycle repeats.

NANOWICK COOL

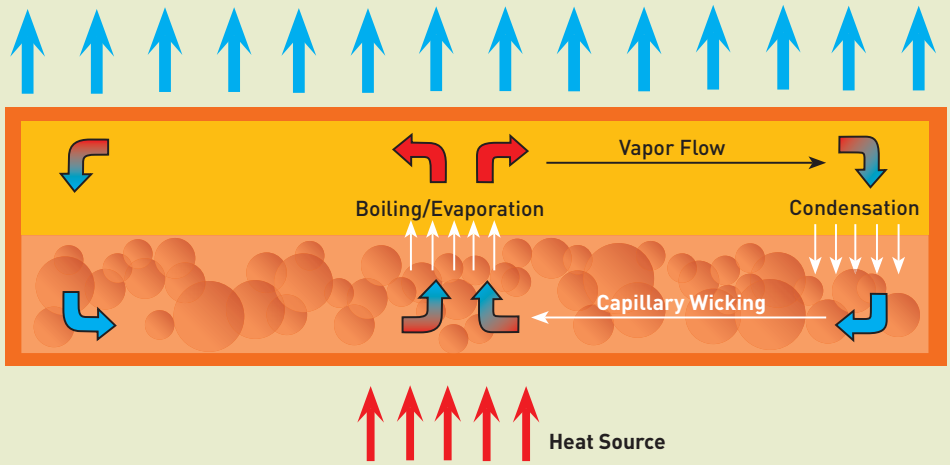
A nanowick cooling system is based on the same physics; but as its name implies, it operates on a vastly smaller scale, with pipes and fins that are nearly as thin as cell membranes. A nanowick draws a liquid coolant toward the hot surface of the chip via capillary action, a phenomenon that moves fluids through small spaces based on molecular charges. Since capillary pressure increases as the channel through which the fluid moves narrows, nanowick pressure can be orders of magnitude greater than a conventional heat pipe.

Nanowicks are created through a sintering process in which tiny copper spheres are fused together to form a porous sponge. To make the pathways even smaller, carbon nanotubes with a diameter of about 50 nanometers are inserted into the mix. Since carbon repels liquid, the nanotubes are coated with another substance, often copper. The specific pattern and channel size affects the wicking speed. Nanowicks can even be designed to separate different fluids or to filter substances.

The ultimate nanowick design will be the perfect balance of material, surface area,

HOW IT WORKS

The Nanowick Cooling Cycle



A nanowick cooler operates in a fashion very similar to a conventional heat pipe: Fluid in a sealed chamber boils and vaporizes, carrying heat away from the source as it rises. The vapor then condenses back into a fluid and returns to the plate that's in direct contact with the source of the heat and the cycle repeats.

and capillary channel size: A thick wick has a large contact patch that increases the area over which it can draw heat, but the corresponding downside is a reduced capillary effect. Researchers are still searching for the perfect balance.

The rest of a nanowick system echoes the design of a typical heat pipe. The heated liquid—often water—evaporates and travels to the opposite end of a sealed tube, where the liquid condenses. The nanowick then draws the fluid back to a plate—also known as a thermal ground plane—that's in direct contact with the component that's being cooled. And then the process repeats.

A conventional heat pipe is capable of absorbing roughly 50 watts of energy per square centimeter. Researchers at Purdue University's Birck Nanotechnology Center recently developed new nanowick materials that have proven capable of absorbing more than 550 watts per square centimeter without any occurrence of dryout, the point at which the coolant completely disappears from the loop and the system fails. This suggests that the researchers have only scratched the surface of nanowick technology's capacity for absorbing heat.

APPLYING THE SCIENCE

The first nanowick cooling systems are being deployed in high-power electronic devices developed for the automobile and defense industries. In the auto industry, such applications include the switching transistors that drive the electric motors in hybrid and battery-powered cars. Military applications include the electronic components embedded in radar and laser devices used in vehicles and aircraft. The integrated circuits used in both applications can generate more than 300 watts per square centimeter—far more than conventional heat pipes are capable of dissipating.

Nanowick coolers for consumer-electronics devices will likely reach the market within the next two years, a development that could enable the design and manufacture of even faster CPUs, GPUs, and other chips—especially those designed for mobile applications where cooling is always a challenge. One day, even your smartphone might harbor one of these small wonders.

SteelSeries 7H USB Gaming Headset

If you're into multiplayer gaming, you need a quality headset with a microphone, not just a pair of headphones, so you can strategize with teammates and smack-talk your opponents. A decent gaming headset doesn't run cheap, but comes with plenty of amenities. Here's what's inside the SteelSeries 7H USB gaming headset.

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

SHARING IS CARING

ALEX CASTLE
ONLINE MANAGING EDITOR

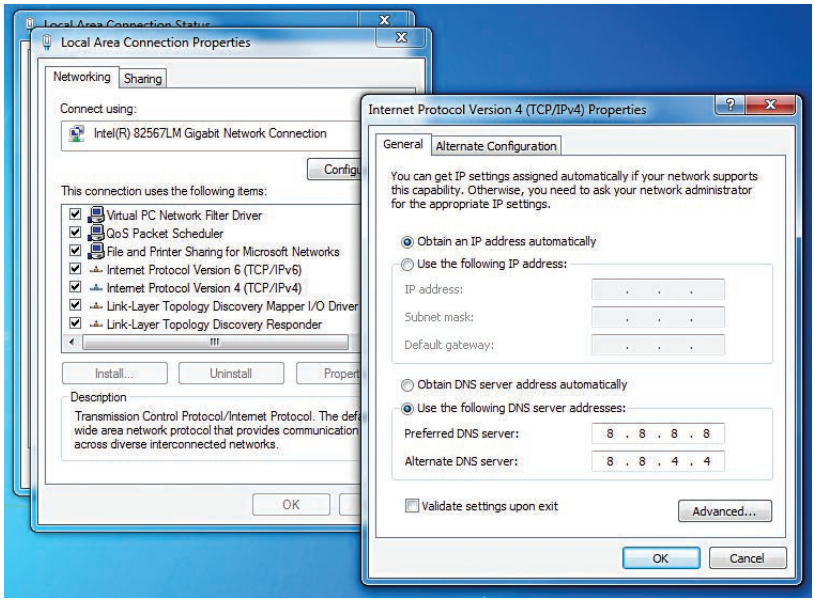
This month in the How To section, we're focusing on one of the least appreciated facets of the PC universe—networking. Now, we know it's not as sexy as, say, overclocking, but there's a number of networking tips and tricks that can help you get the most out of your PC or laptop, whether you're at home or on the road.

We've broken the how-tos down into bite-size chunks for you, but the basic idea is that people forget how easy it is to share between PCs—whether that's sharing files over an ad-hoc wireless network, or sharing your Internet connection itself—using software that's built into Windows. We also introduce you to one of the handiest networking apps around, which lets you turn your regular laptop into a wireless access point, even allowing you to share access to mobile hotspots.

Your mother *did* teach you to share, right?

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



Switch to Google's DNS

Your Domain Name Server (DNS) is what tells your computer which IP address is associated with a URL. If you go into your router's settings and change the DNS to 8.8.8.8, and the backup DNS to 8.8.4.4. Google claims you'll see faster lookup speeds, but we mostly appreciate the increased security.

Create an Ad-Hoc Wireless Network

What's the best way to transfer files from one computer to another? You can use a USB thumb drive or an Internet service like Dropbox, but a network connection is almost always the most efficient choice. You might think that both computers need access to a common network to use network sharing, but that's not actually the case. Thanks to ad-hoc networking (a built-in feature in Windows) any two Wi-Fi-enabled laptops can shares files and play games as though they were on a LAN.

Setting up an ad-hoc connection in Windows Vista or 7 is a surprisingly simple affair. We'll show you how.
–ALEX CASTLE

HOST AN AD-HOC NETWORK

On the computer that you want to host the network, click the wireless-signal connection-strength icon on the right side of the task bar. Select Open Network and Sharing Center, and then choose "Set up a new connection or network." If this is the first time you've used ad-hoc networking, you'll be asked to choose a network name and password for your network (image A).

That's pretty much all you have to do—click through the rest of the setup process and your network should be ready to go. Note that you'll be disconnected from any other wireless networks you were connected to.

CONNECT TO AN AD-HOC NETWORK

You connect to an ad-hoc network just like you'd connect to any other secure wireless network. Just select it from the wireless networks menu, and enter your password. That's it!

AD-HOC NETWORKING USES

What it's good for:

- **Transferring files between computers.**
- **Playing LAN games on multiple laptops.**
- **Streaming media from a friend's laptop.**
- **Sharing a single wired Internet connection.**

What it's NOT good for:

- **Replacing a router (the primary computer has to be powered on to use any of the others).**
- **Sharing a mobile hotspot (the primary computer can't connect to two wireless networks at once).**

Use Internet Connection Sharing

Ad-hoc networking is even more powerful when combined with Internet Connection Sharing (ICS), a built-in feature of Windows that allows multiple computers to share a single Internet connection.

When do you need to share an Internet connection? It can be useful any time you've got a single wired Internet connection and multiple laptops you'd like to connect. Some hotels, for instance, still only provide a single Ethernet cable for Internet access. Additionally, ICS can allow you to share a VPN connection, and it can provide a way to connect a computer without a wireless card to a Wi-Fi network. –ALEX CASTLE

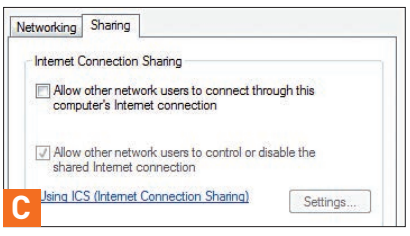
SET UP INTERNET CONNECTION SHARING

To set up Internet Connection Sharing, open the Network Connections menu, which can be found in the Control Panel, under Network and Internet, and Network and Sharing Center (image B). Note that you won't be able to access this menu if you only have a single network connection currently available to your computer. This makes sense because ICS requires two connections—one to connect to the Internet and one to connect to other computers (to share the Internet connection).

In the Network and Sharing Center, right-click the Internet connection to share, and click Properties. Select the Sharing tab, then check the box marked "Allow other network users to connect through this computer's Internet connection" (image C). Now, any computer networked with this one will be able to connect to the Internet using this connection.

One thing to keep in mind is that any computer using this Internet connection needs to be set up to accept a dynamic IP address. If you've changed that setting in the past, you'll need to go back to the network connection properties window and change it back.

By combining this feature with the previously discussed ad-hoc networking, you can easily use a single wired connection for multiple wireless devices—no new hardware or software needed.



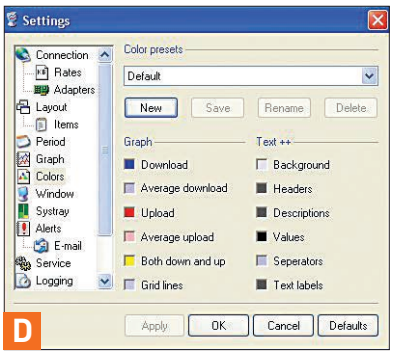
Monitor Your Bandwidth Usage Using Open-Source Software

If you use some of the Internet-sharing techniques we've shown you in this how-to section, you might find yourself running afoul of your ISP's bandwidth limits. To help you stay on the network's good side, we'll introduce you to some free, open-source software that will allow you to keep a watchful eye on your connection. —ALAN FACKLER

BANDWIDTH MONITOR PRO

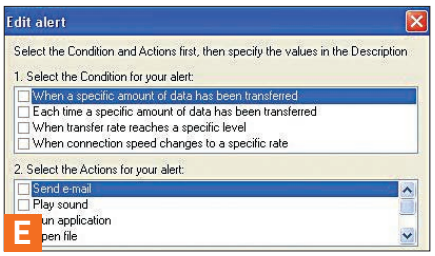
Bandwidth Monitor Pro Version 3.2 is a handy, open-source utility that we found to be the simplest and easiest to use. Installation is quick and painless, and upon an initial launch, you'll be treated to a simple layout screen.

Don't let the simplicity (or lack of any press-able buttons) of the interface fool you. A wide range of settings are only a right-click away. In the Settings menu, there are tons of options to play with (image D). You can customize the look of your readout and of the Bandwidth Monitor Pro window itself.



D

Another useful option is the one called Period, which allows you to choose a period of time to set the readout for. By default, Bandwidth Monitor Pro measures periods of 24 hours, or daily usage. But this can be altered—with a few clicks, you can choose a day of the month you'd like to start monitoring and when you'd like the monitoring to end.



E

There are multiple facets of Bandwidth Monitor Pro that you can customize, but arguably the most important option in the Settings menu is the email alert system. Clicking to the Alerts tab (image E) will pull up a menu that allows you to choose conditions that warrant an email alert—for instance, you want to be notified when you are approaching your bandwidth cap.

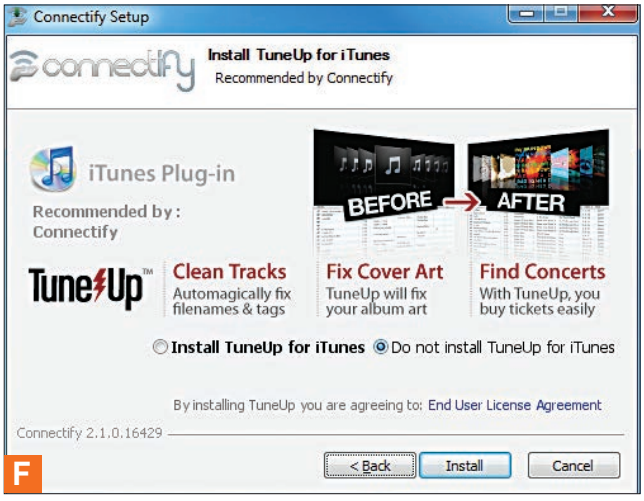
Share a Wireless Hotspot with Connectify

So far, we've shown you some excellent tools built into Windows for creating, accessing, and sharing networks. However, if you've been following along, you'll notice that there's one capability that's conspicuously absent—the ability to share a Wi-Fi Internet connection wirelessly.

Although there's nothing about ad-hoc networking or Internet sharing that would make this inherently impossible, the simple fact that most computers are not equipped to access more than one network at a time means that you need some extra help, in the form of a free program called Connectify.

Why would you want to share a Wi-Fi Internet connection wirelessly, you ask? Well, primarily, it allows you to share access to a network that might be hard to come by. For instance, a paid wireless hotspot in an airport or hotel. We'll let the ethical and legal implications of that wash over you.

Even if you don't want to share a hotspot with multiple users, you can use Connectify to use multiple gadgets on a single connection. For instance, with Connectify you can give your Wi-Fi-only smartphone access to a Wi-Fi hotspot you've paid for on your computer, or to a wired broadband connection. –ALEX CASTLE



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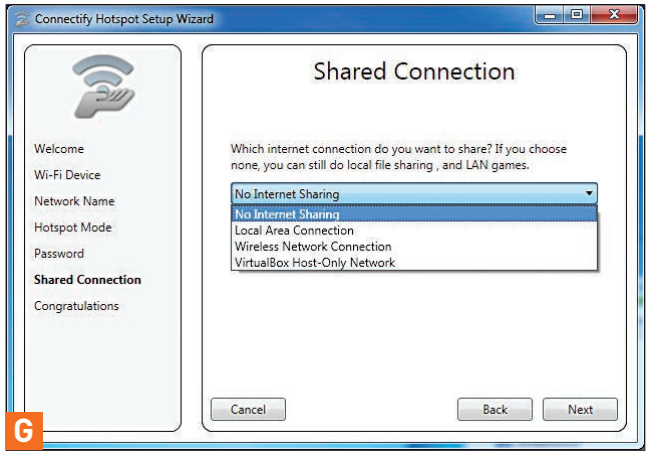


G

SET UP CONNECTIFY

First, go to www.connectify.me, and select the download link on the right of the page, then run the installer. The installation is straightforward, but be aware that it tries to install some bloatware in the process, so keep an eye out for the "no thanks" button (image F).

Once you start up Connectify for the first time, it'll automatically run the setup wizard. This asks you for basic information like network name and password, but it will also ask you what kind of shared connection you'd like to set up (image G). Here are the options:

▶ No Internet Sharing This option does no Internet sharing (as you might have guessed) but it still establishes an ad-hoc network, allowing you to do file transfers and LAN gaming.

▶ Local Area Connection This option shares access to the LAN that the host computer is currently connected to. Choose this option if you want to share a wired connection wirelessly.

▶ Wireless Network Connection This is the option you're most likely interested in—it allows you to share access to a wireless network, such as a mobile hotspot.

▶ VirtualBox Host-Only Network Allows you to share a special kind of a virtual network used by the VirtualBox virtualization software. You probably don't need it.

After setup, when you run Connectify, it will go straight to your system tray. If you click it, it'll open a configuration panel where you can change your network options, and also view anyone who is currently connected to your network, or who has connected in the recent past (image H). If you right-click one of these users, you can block them, give them a special icon, or click the Explore button to see shared folders on that computer.

STRENGTHEN YOUR WIRELESS NETWORK

Another way to use Connectify is to expand the signal strength of your home Wi-Fi network. Because Connectify can turn any computer into an access point, you can turn that old laptop into a free Wi-Fi range extender.

H

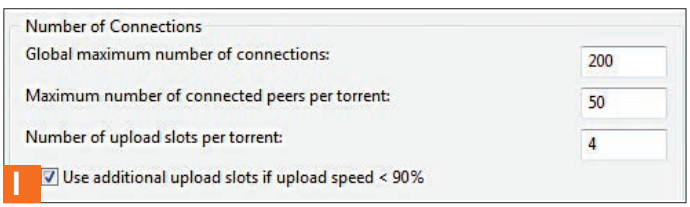
Troubleshoot Your Internet Connection

In this wired day and age, there's nothing quite as frustrating as finding yourself unwillingly unplugged. What's worse, with a busted Internet connection, you frequently don't have much of an idea what's going on—web pages don't load, but it's up to you to figure out why. Networking is tricky business, and there are dozens of complicated things that can go wrong, but a lot of time the root cause is one of a few simple problems. With that in mind, here's our basic Internet troubleshooting checklist. –ALEX CASTLE

RESTART YOUR ROUTER

Most computer users already know this, but it's so important that it's worth stating anyway. Before spending any time trying to figure out what the problem is, do a complete power cycle on your router and your modem. Hopefully, that will fix your problem, and you're done with this guide. If it doesn't, read on.

If you find yourself routinely having to restart your router, you may be overloading it. In particular, BitTorrent and other programs that open lots and lots of simultaneous connections can overwhelm an old or crappy router. Lowering the maximum number of uploads and downloads in your BitTorrent client might fix the problem—at the expense of some download speed (image I).



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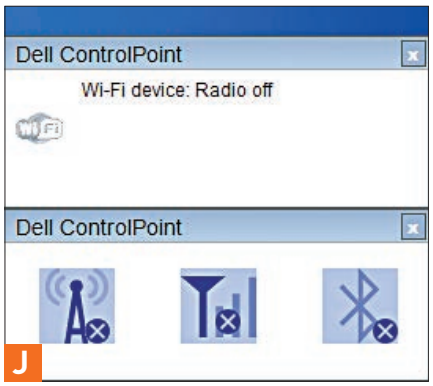
IS IT YOUR WI-FI?

If you're trying (and failing) to connect to a Wi-Fi network, whip out your trusty Ethernet cable and jack in. Hopefully, your Internet connection will now work, and you'll have narrowed down your problem considerably. If this is the case, consider the following possible causes of Wi-Fi failure.



J

▶ **Can you see other wireless networks?** If you can see other wireless networks but not your own, then the problem is with your router. Consult your user guide for more info on troubleshooting the router itself.

▶ **Is your Wi-Fi adaptor enabled?** It sounds silly, but a lot of laptops feature a combination of custom Wi-Fi interface (image J) and a too-clever-for-its-own-good hardware Wi-Fi switch that can make it all too easy to inadvertently turn off your Wi-Fi card. Don't worry, it happens to the best of us.

▶ **Is your wireless driver correct?** If you've recently reformatted your laptop, and now can no longer connect to Wi-Fi networks, you may be lacking the proper driver for your wireless card. Hit up the laptop manufacturer's website and look for the motherboard, chipset, and wireless drivers for your model.

IF IT'S NOT THE WI-FI...

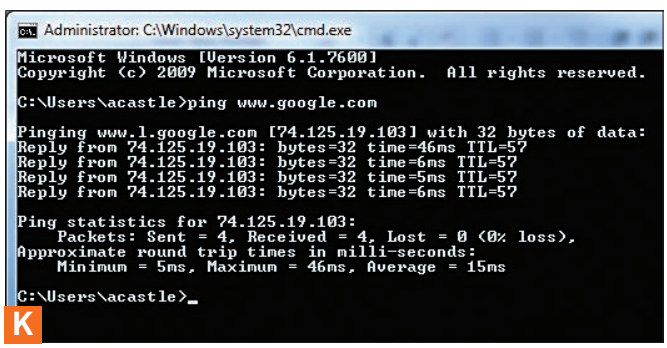
Something might be wrong with your router, your Internet connection, or your computer's settings. Here's what to look for.

▶ **Is it your network settings?** Open up your network setting panel (Control Panel > Network and Internet > Network Connection, then right-click Local Area Connection, select IPv4, and click Properties). In your router settings, you can see if your network uses dynamically assigned IPs (most home networks do). If it does, make sure that the "Obtain an IP address automatically" setting is selected in the IPv4 properties.

▶ **Is it your DNS server?** Open a command prompt (Windows key + R, type cmd and hit Enter), then try to ping a known IP address. If you don't know a working IP address off the top of your head, you can use a working computer to ping a website (for instance, ping Google by entering `ping www.google.com`) and it will return an IP address (image K). Now, try to ping that address on the computer that can't connect. If you get a response by pinging the IP address but not the domain name, the problem may be in your DNS settings. Check them out in your router.

▶ **Is it your broadband provider?** And of course, the problem could always be out of your hands. If nothing else seems to be working, try giving your ISP a call and asking if there's a problem on its end.

Now, we know this is hardly an exhaustive list, but the steps we've described here should catch all the most common problems you might have with your Internet connection. Good luck!



K

LENGTH OF TIME
2 HOURS

LEVEL OF DIFFICULTY
INTERMEDIATE

BUILD IT

A Digital Photo Studio

We show you the complete system configuration for the photographer who wants to create more than snapshots and Facebook photos

LOYD CASE
CONTRIBUTING WRITER

THE MISSION As a digital photography and video enthusiast, I needed a system that could handily withstand the rigors of Photoshop and make my occasional work in Adobe Premiere Pro CS5 move more smoothly. High-end enthusiast PC parts seemed like the way to go, allowing me avoid the crushing cost of professional workstation components.

But a fast PC isn't the only ingredient. I also needed to consider the peripherals. For instance, by going with an ultra-high-resolution display, my editing can be much more exact, saving me time in the long run, and enabling me to produce high-quality results. A high-end photo printer gives me a means for displaying my masterworks with poster-size prints.

INGREDIENTS

✔ **Case** Corsair Graphite 600T www.corsair.com	$160
✔ **PSU** Corsair AX750 www.corsair.com	$170
✔ **Mobo** Asus Sabertooth X58 www.asus.com	$200
✔ **CPU** Intel Core i7-970 www.intel.com	$880
✔ **Cooler** Corsair Hydro H50 www.corsair.com	$75
✔ **RAM** Corsair CMP24GX3M6A1600C9 24GB DDR3 Kit www.corsair.com	$1,100
✔ **Optical Drive** Plextor PX-B940SA www.plextor.com	$200
✔ **Boot Drive** Crucial 256GB RealSSD C300 www.crucial.com	$570
✔ **Storage** Two Seagate Barracuda XT 2TB in RAID 1 www.seagate.com	$400
✔ **GPU** EVGA GeForce GTX 470 www.evga.com	$350
✔ **OS** Windows 7 Professional 64-bit OEM www.microsoft.com	$140
✔ **Monitor** HP ZR30w 30-inch IPS LCD Display www.hp.com	$1,300
✔ **Printer** HP DesignJet 130R www.hp.com	$1,350
✔ **Photo/Video Editing Software** Adobe CS5 Production Premium www.adobe.com	$1,700
✔ **Image Noise Plug-in** Noiseware Professional www.imagenomic.com	$70
Total for PC	$4,245
Total for system plus peripherals and software	$8,665

Choosing the Hardware

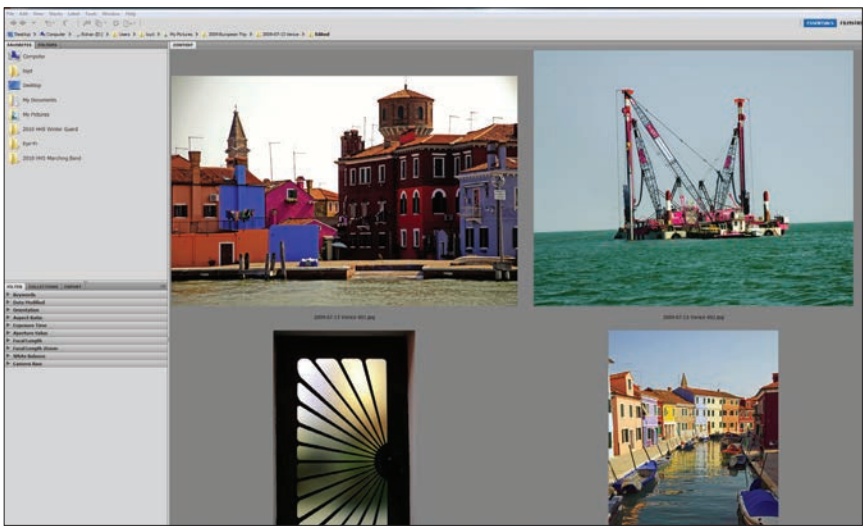
Choosing the components for the PC was pretty easy. Perhaps the most exotic choice was the Corsair 24GB kit, consisting of six 4GB DDR3 DIMMs. Using a solid-state boot drive, which also holds the apps, is *de rigueur* these days. Using a RAID 1 configuration for the hard drives rather than RAID 0 was the result of some careful thought; I ended up opting for a little security over write performance. Had this been primarily a video-editing system, RAID 0 might have made more sense.

I went with the EVGA GTX 470 because the GTX 470 is currently the minimum graphics card officially supported by Adobe Premiere Pro CS5 for full CUDA acceleration of Adobe's Mercury playback engine. That acceleration provides a huge improvement in responsiveness over past versions of Premiere Pro.

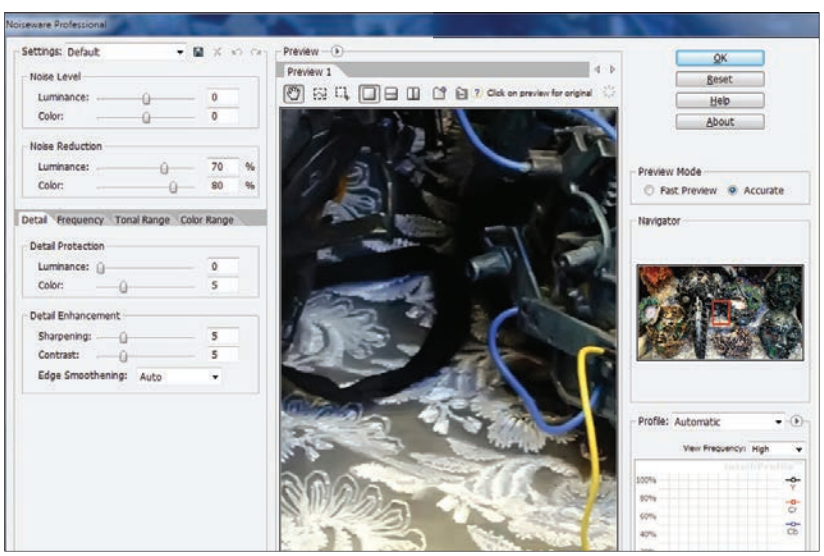
The ZR30w LCD is in the mix for its huge size and color fidelity, though you may want to calibrate the display for serious photo or video work. The star of the show is the 24-inch, roll-fed DesignJet 130r printer. This is a bulky monster, but that's the price for getting gorgeous 18x24 or 24x30 poster prints.

The Software Side

This system is aimed squarely at turning editing and printing with Adobe Photoshop CS5 into a smooth experience. Its second purpose is to make working with Premiere Pro CS5 less frustrating. I'm currently shooting with a Nikon D300s, and often shoot action shots in poor light—like indoor gyms and football fields at night—which means using high ISO settings. All my images are shot in raw format. My workflow relies on Adobe Bridge as the browser, and Camera Raw to bring photos into Photoshop. The lens-correction engine is one of the features in the latest version of Camera Raw I find myself using a lot. I'm not using it for automatic corrections, but rather going to the manual tab and using the horizontal and vertical correction sliders to tweak the angles of some images.



Adobe Bridge provides a handy browser window that helps me organize my workflow.



Noiseware helps mitigate high noise levels in images shot in poor light at high ISO settings.

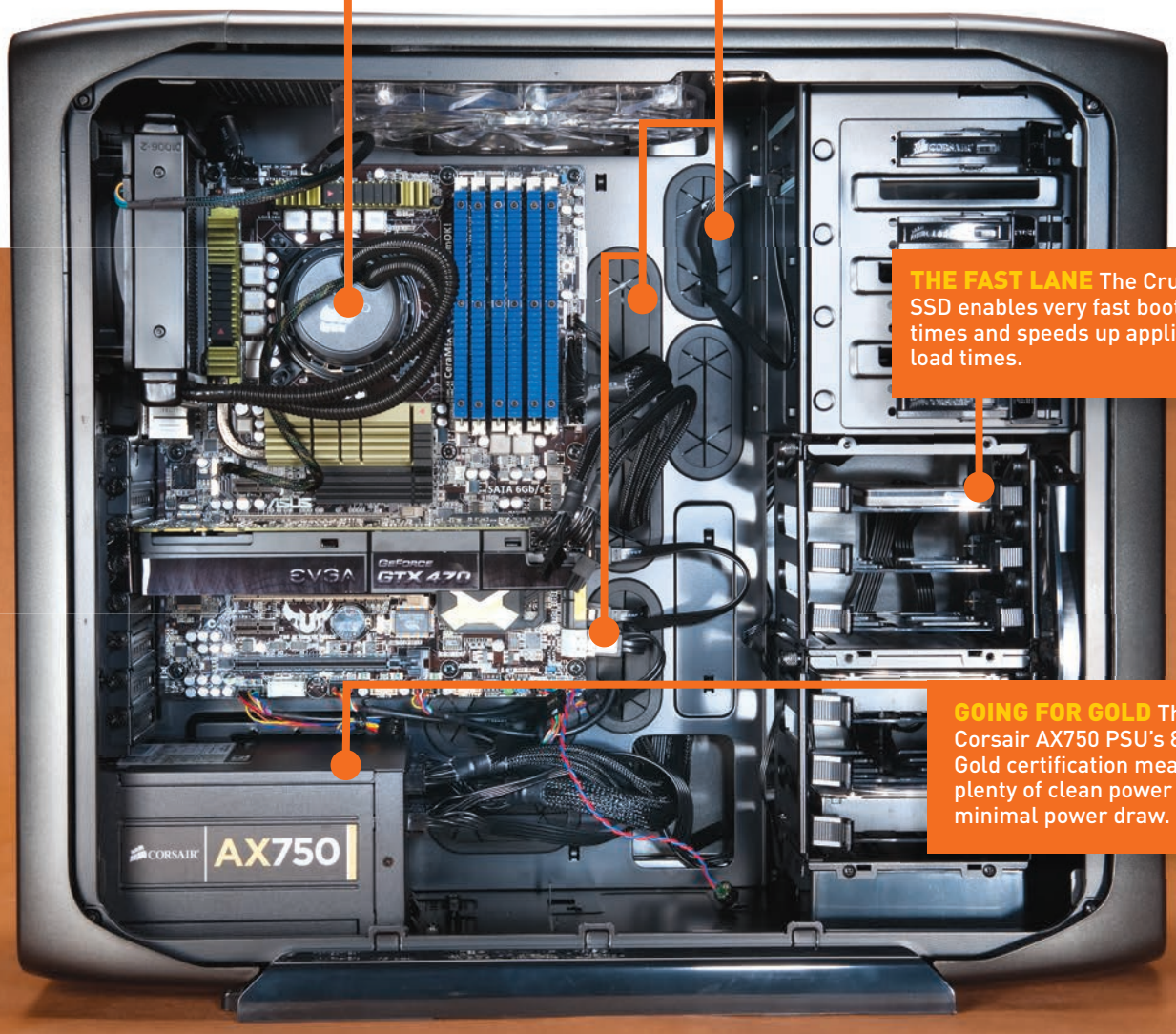
High-ISO shooting often generates lots of digital noise in the images, so part of my mix is Noiseware Professional noise-reduction software. Noise-reduction software is not a panacea—used too aggressively, shots of people resemble wax dummies. It's worth spending some time tweaking in Camera Raw first.

I don't use any special add-ons for Premiere Pro; my needs are modest, albeit somewhat more involved than a standard consumer-level editor. And I've grown accustomed to the silkiness of the Mercury playback engine on an Nvidia card. Switching to software in which I'd have to wait for preview renders isn't particularly appealing. I also use Adobe Encore to build Blu-ray discs capable of playing in a consumer Blu-ray player.

The Inner Workings

COOL AND QUIET Corsair's H50 CPU cooler facilitates airflow through the case and keeps noise to a minimum.

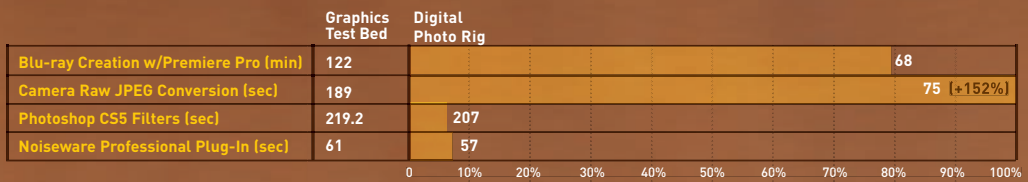
NEAT AND TIDY It's easy to route cables so the interior of the case remains uncluttered, improving airflow (and aesthetics).



THE FAST LANE The Crucial SSD enables very fast boot times and speeds up application load times.

GOING FOR GOLD The Corsair AX750 PSU's 80 Plus Gold certification means plenty of clean power with minimal power draw.

BENCHMARKS



Our current graphics test bed consists of a quad-core 3.33Hz Core i7-975X running at 3.3GHz, 6GB of Corsair DDR3/1333 on an Asus P7X58D Premium motherboard, an ATI Radeon HD 5870 graphics card, a 1TB Seagate 7200.12, and 64-bit Windows 7 Ultimate.

THE BIG PICTURE

Why the HP DesignJet 130r?

The HP DesignJet 130r is one of a generation of fine-arts printers. At roughly $1,350, it's one of the least expensive 24-inch roll-fed printers you can get. HP makes a lower-cost model, the DesignJet 111, which is intended more for office use than fine-arts photography. There's also the 24-inch Z2100, with its built-in spectrophotometer for paper auto-calibration, but that's priced well north of $2,000.

The 130r uses six inks, and output looks very good. Since the Nikon D300s I use is *only* 12 megapixels, print output was around 160dpi for a 24x18-inch print, which looked terrific even fairly close up.

Bear in mind that this class of printer is also physically large. The 130r weights more than 50 pounds, and requires two people to move because of its bulk.

Of course, HP isn't the only company selling large-format printers. Canon and Epson both build high-end printers for fine-arts output. If you don't need 24-inch-wide printing, the 17-inch, roll-fed Canon iPF5100 looks intriguing, but costs about $1,800.

Epson just announced the Stylus Pro 4900, which is certified to cover 98 percent of the Pantone color guide, something primarily of interest to professional graphics designers. However, large, gorgeous output is not cheap—in this case, it will cost you $2,450.

If you don't need—or don't have the budget for—a mega-expensive roll-fed printer, the Canon Pixma Pro 9000 Mark II is under $500 and is capable of gorgeous photo reproduction at sizes up to 13x19 inches.

Bringing It All Together

Building the system was about as easy as it gets. The Corsair 600T case is a genuine pleasure to work with, and routing cables behind the motherboard tray is a snap, making it simple to create a clean-looking interior. I set up all the fans, including the H50 cooler radiator fan, to be controlled by the BIOS. Since I wasn't overclocking, I ran in silent mode. The noise levels and temperatures were quite low, though the EVGA GTX 470 fan kicked in pretty hard when I tried the system out for some gaming.

The Asus Sabertooth X58 proved to be a real surprise. Its layout is clean, although Senior Editor Gordon Mah Ung thinks the PCI slot could be better located. It's easy to set up, stable, and fully supports the six-core CPU plus 24GB of RAM—all for about 200 smackers.

A couple of tests—JPEG conversion and building a Blu-ray disc with Adobe Encore—saw huge performance gains on the six-core digital photo system versus our quad-core graphics test bed. On the other hand, the Photoshop filters batch test and the Noiseware plug-in benchmarks posted only about six percent gains. Noiseware itself seems to only support two cores. The Core i7-970 clocks 133MHz lower than the test bed's i7-975X, but the cache is larger, which may have been the main advantage on the filters testing.

I didn't run comparative benchmarks for printing, but a high-quality, 24x18-inch print takes about 15 minutes to print on the HP DesignJet 130r. The output is quite stunning even at print resolutions as low as 160 pixels per inch.

If I dropped the $880 CPU and opted for a Core i7-960, that would have resulted in substantially slower performance on the Blu-ray build and batch JPEG conversions, but only marginal performance losses on day-to-day use. It's also likely that 12GB would have been more than enough DRAM. So, if you opt for a Core i7-960 and 12GB of RAM, you can build a very similar system for about $1,200 less. Dropping the SSD would net another $560 savings.

Still, I'd be loath to drop down to a lesser system. As more apps get tuned for Intel's 32nm CPUs, we'll likely see more performance gains, particularly for photo- and video-editing applications. The combination of six-core CPU plus GPU compute is just too damn compelling to give up.

NEVER BUILT A PC BEFORE?

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

With this power trio at your disposal, you can perform serious photo- and video-editing chores and produce high-def prints and discs.

SUBMIT YOUR IDEA Have an awesome idea for Build It? Let us know at comments@maximumpc.com.

REVIEWS

Tested. Reviewed. Verdictized.

INSIDE

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- BREAKING TECH NEWS
- NO BS PODCAST

AVADirect Custom Gaming PC

The Dream Machine's evil clone?

They say imitation is the sincerest form of flattery. We'd like to believe that's what AVADirect was thinking when it sent us the Custom Gaming PC.

After all, it's a dual 3.33GHz Xeon X5680 machine running in EVGA's epic Classified SR-2 mobo. Sounds a lot like this year's Dream Machine, doesn't it?

The truth is, we can't claim credit for the idea of building a personal supercomputer using EVGA's SR-2 board. Once EVGA announced the board, every enthusiast PC builder and PC vendor started pondering the what-ifs. AVA had actually broached the idea of sending us a system with the SR-2 while we were spec'ing out the Dream Machine in our Lab.

Quad SLI and 12 cores are just the highlights of the Custom Gaming PC.

How does the Custom Gaming PC compare? The full specs are below but the highlights include two hexa-core Xeons, 12GB of Mushkin DDR3/1600 RAM, two 256GB Crucial C300 SSDs in RAID 0, a 1,500-watt Silverstone Strider PSU, and the kicker—four EVGA GeForce GTX 480 cards in quad SLI. This year's Dream Machine had only three such cards.

For cooling, the Dream Machine's custom Danger Den liquid-cooling certainly beats the AVADirect box, which is strictly air-cooled. Under full load, the Dream Machine's acoustic signature is akin to a typical desktop PC's. Put the AVADirect under full load and it gets loud. Not shrill, small-fan, rack-server loud, but between the huge fans on the Prolimatech Megahalems and the four GPU coolers, you practically have to shout to be heard over the din.

In performance, the AVADirect rig turns in a head-ripping experience. Our current benchmark suite can't stress all 24 threads available in the system, but that doesn't make it slow. In our MainConcept Reference encoding test, the AVADirect machine set a new record and bumped the Dream Machine aside. The real eye-popper was the STALKER benchmark. The previous record holder was the Dream Machine, which produced 101fps using three heavily overclocked EVGA GeForce GTX 480 cards. The quad SLI in the AVADirect produced 133fps. That's earth-shatteringly fast, folks.

So, what's the bad news? Besides the price, which will always be painful when you're talking about this much hardware, we had a heartbreaking experience with stability. Although AVADirect claimed the overclocked system was stable before being put in the box, we immediately experienced sporadic failures to POST. Only by clearing the CMOS and reloading the profile could we get it running again. We also had the machine spontaneously reboot after a graphics benchmark run. Once we backed the clocks from 4.2GHz to 4GHz though, the rebooting issues with gaming went away.

These issues aren't good in a $1,500 box and they're a hell of a lot worse when you're paying nearly $10,000 for a machine. We originally thought it was shipping damage, but we believe it's more related to an issue with the overclocking. As good as the Megahalems are, that's a lot to ask of air-cooling, especially with finicky Xeon's.

That puts us in a bad spot. As much as we love seeing this much hardware congregated in one place and the resulting record-breaking performance, we have to seriously ding the AVADirect Custom Gaming PC. Yes, it's got kick-ass performance but instability in an expensive machine is unforgivable. **–GORDON MAH UNG**

SPECIFICATIONS

Processor	Two Intel 3.33GHz Xeon X5680 (overclocked to 4.2GHz)
Mobo	EVGA Classified SR-2
RAM	12GB Mushkin DDR3/1600
Videocard	Four EVGA GeForce GTX 480 SuperClocked in SLI
Soundcard	Onboard
Storage	Two 256GB Crucial C300 SSDs, 2TB Seagate 7,200rpm drives
Optical	LG WH10LS30, Samsung SH-S243N
Case/PSU	Lian Li Armorsuit PC-P80 / Silverstone Strider 1500 Watt

BENCHMARKS

	ZERO POINT	
Vegas Pro 9 (sec)	3,049	WNR
Lightroom 2.6 (sec)	356	261
Proshow 4 (sec)	1,112	887
Reference 1.6 (sec)	2,113	1,325
STALKER:CoP (fps)	42.0	133.1 (+217%)
Far Cry 2 (fps)	114.4	167

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

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

VERDICT 7

AVADIRECT CUSTOM PC

CELEBRATE	CELIBRATE
Quad SLI and dual Xeons!	Unstable and loud!

$9,917, www.avadirect.com

Malibal Nine X7200

Small vendor, humongous machine

With two GeForce 480M cards and a big 1920x1080 glossy screen, the X7200 is a natural for gaming.

Prior to receiving the Nine X7200, we were unfamiliar with Malibal, and its motto, "Enlighten Transmute," was equally mysterious. But the company claims to make the World's Fastest Laptop, a concept that needs no explanation—only proof.

To be honest, calling this 17-inch desktop replacement a laptop is somewhat ludicrous, as you'd probably do bodily harm bearing this machine's 13-plus pounds atop your lap for any extended period. Shoot, you could strain a muscle just lugging this beast from one room to the next (remember, lift from the knees!). Yes, we're talking about one of Clevo's characteristically burly workstations here.

The portability issue aside, Malibal's X7200 is indisputably fast. How can it not be when housing Intel's top-dog Core i7-980X desktop processor? This hexa-core CPU is clocked at 3.33GHz, giving it a beyond-unfair advantage over our zero-point notebook in all the benchmarks. The only benchmark where the X7200's scores didn't enjoy a lead that was near to or exceeding 200 percent was in Photoshop, which isn't optimized for multithreading. There, the X7200 was *only* 86 percent faster.

This kind of CPU power isn't unprecedented in a notebook. The Eurocom D900F (another Clevo system) we reviewed in August sported the same CPU. But Malibal's X7200 is the first system we've received with Nvidia's new Fermi-based 480M GPU—well, actually, two of them. Each 480M has 352 CUDA cores and a 256-bit memory interface to 2GB of GDDR5 RAM. That's a lot of graphics muscle for a notebook of any size. It certainly far outpaced the needs of our gaming benchmarks, where the X7200 hit average frame rates of more than 100fps. When we upped the ante by running Far Cry 2, the more challenging of our game tests, at the notebook's 1920x1080 native res, with detail settings maxed out, the X7200 still hit an impressive 77.18fps. Looking for something even more demanding, we ran Unigine's DX11 Heaven benchmark, which stresses hardware tessellation, and we were pleasantly surprised by the 41.2fps result, not to mention the relative speed and smoothness at which the benchmark ran.

Other hardware choices that reflect the X7200's go-for-broke philosophy include 12GB of DDR3/1333 and a 6x Blu-ray burner. Two Intel X25-M SSDs in RAID 0 offer up maximum speed in data access times, but in a machine that's otherwise loaded for bear, 160GB of total storage capacity seems a little unbalanced. You can add a third drive to the mix for additional storage, but at an added cost. Since the sticker is already at $5,300, we'd have been happier with a single 80GB SSD for the OS and other select apps, paired with a 750GB or even 1TB hard drive. But that's just us.

It might be big, heavy, and incapable of lasting even an hour on battery, but Malibal's X7200 proves itself to be the fasted notebook that we know of. —KATHERINE STEVENSON

SPECIFICATIONS

CPU	3.33GHz Intel Core i7-980X
RAM	12GB DDR3/1333MHz
Chipset	Intel X58
Drives	Two Intel X25-M SSD drives (80GB each) in RAID 0
Optical	Matshita BD burner (BD-MLT UJ240AS)
GPU	Two Nvidia GeForce GTX 480M
Connectivity	HDMI, DVI, Ethernet, two USB 3.0, three USB 2.0, eSATA, FireWire, Bluetooth, Wi-Fi, headphone, mic, line-in, S/PDIF out, media reader, webcam
Lap/Carry	13 lb, 3.2 oz / 17 lb, 2.0 oz

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	1,320	457 (+188.8%)
Photoshop CS3 (sec)	153	82
Proshow Producer (sec)	1,524	458 (+232.8%)
MainConcept (sec)	2,695	897 (+200.4%)
Far Cry (fps)	32.7	105.7 (+223.2%)
Call of Duty 4 (fps)	58.2	145.7 (+150.3%)
Battery Life	100.0	35 (-65%)

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, a 500GB Seagate hard drive, a GeForce GTX 260M, and Windows 7 Professional 64-bit. Far Cry 2 tested at 1680x1050 with 4x AA; Call of Duty tested at 1680x1050 with 4x AA and 4x anisotropic filtering.

MAXIMUM PC KICK ASS!

MALIBAL NINE X7200

VERDICT 9

+ A BIG WIN	− THE BIG ONE
Fastest processor; fastest mobile graphics; equipped for anything.	It's a huge, heavy power-hog; needs more storage; expensive.

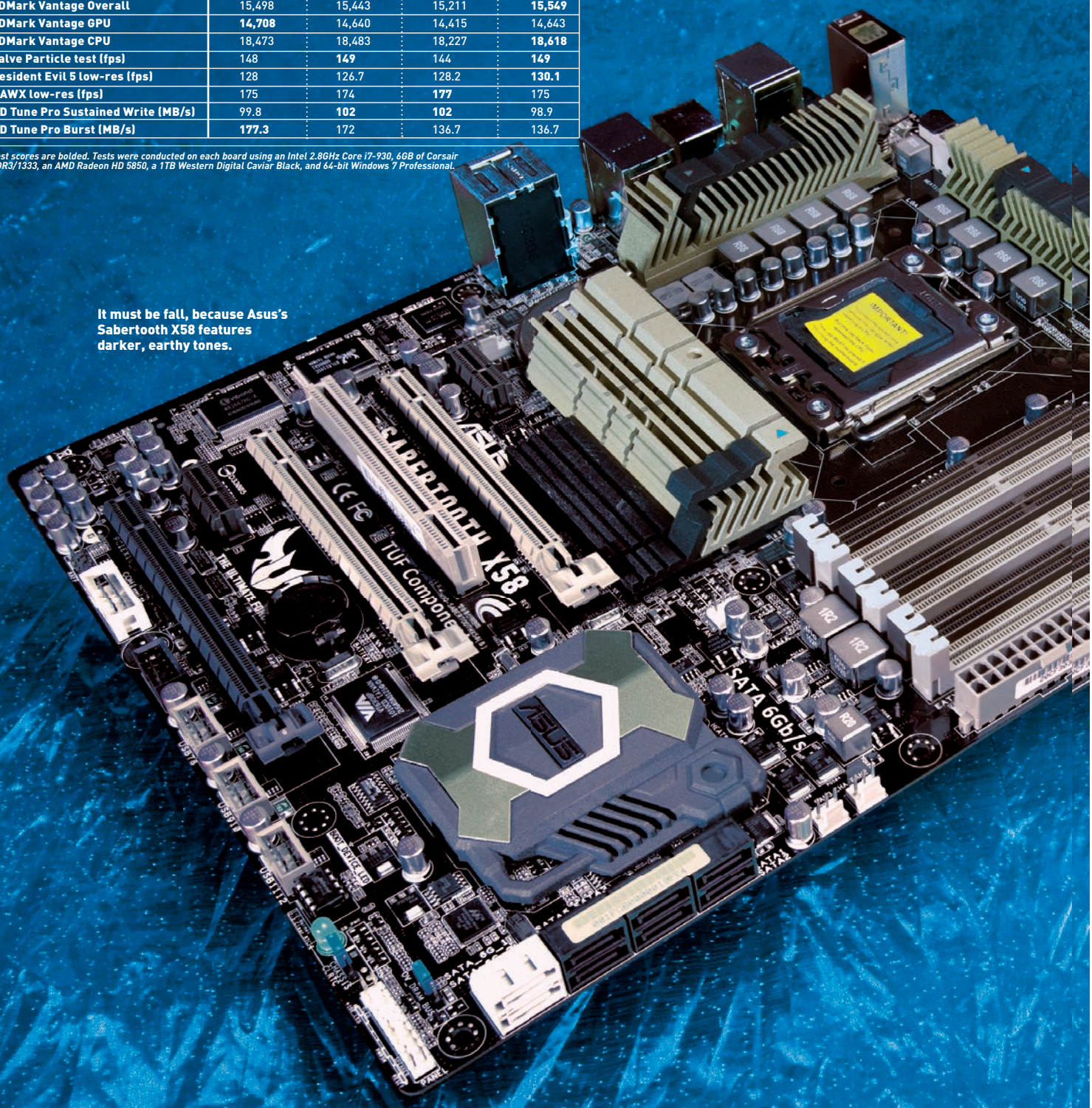
$5,325, www.malibal.com

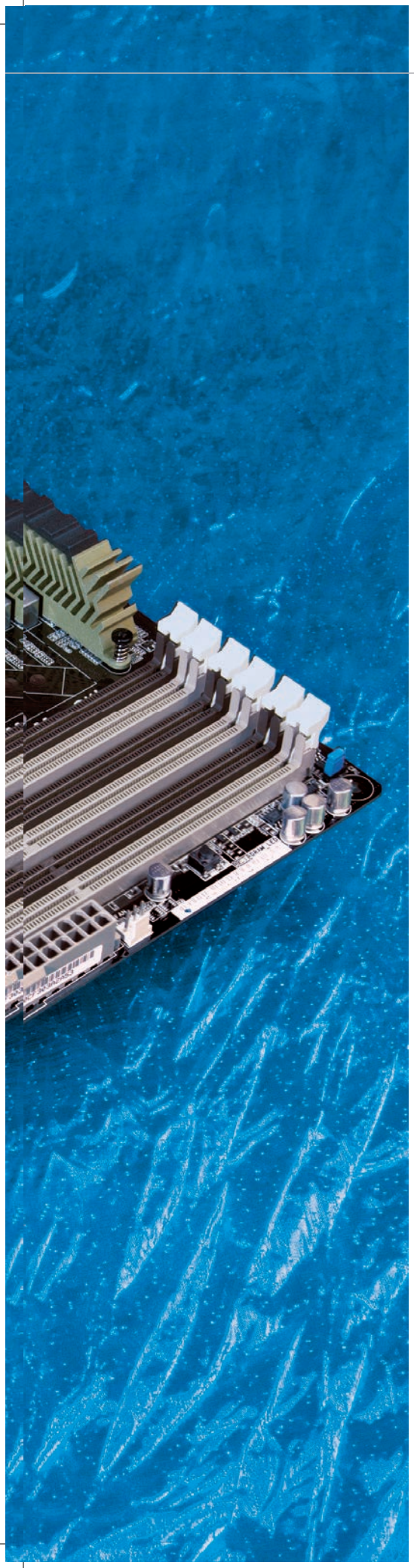
BENCHMARKS

	Asus Sabertooth X58	Asus Rampage III Extreme	MSI Big-Bang Xpower	Gigabyte X58A-UD7
PCMark Vantage 64-bit Overall	8,827	8,940	8,903	**8,993**
Everest Ultimate Mem Read (MB/s)	14,310	14,628	**15,406**	14,618
Everest Ultimate Mem Write (MB/s)	11,962	12,194	**14,776**	12,076
Everest Ultimate Mem Copy (MB/s)	16,727	**17,062**	**17,036**	16,470
Everest Ultimate Mem Latency (ns)	60.4	60.5	60.2	59.8
SiSoft Sandra RAM Bandwidth (GB/s)	22.7	23	22.6	22.8
3DMark Vantage Overall	15,498	15,443	15,211	**15,549**
3DMark Vantage GPU	**14,708**	14,640	14,415	14,643
3DMark Vantage CPU	18,473	18,483	18,227	**18,618**
Valve Particle test (fps)	148	**149**	144	**149**
Resident Evil 5 low-res (fps)	128	126.7	128.2	**130.1**
HAWX low-res (fps)	175	174	**177**	175
HD Tune Pro Sustained Write (MB/s)	99.8	**102**	**102**	98.9
HD Tune Pro Burst (MB/s)	**177.3**	172	136.7	136.7

Best scores are bolded. Tests were conducted on each board using an Intel 2.8GHz Core i7-930, 6GB of Corsair DDR3/1333, an AMD Radeon HD 5850, a 1TB Western Digital Caviar Black, and 64-bit Windows 7 Professional.

It must be fall, because Asus's Sabertooth X58 features darker, earthy tones.





Asus Sabertooth X58

The nicest budget X58 board?

Budget X58 motherboards have come a hell of a long way in two years. When LGA1366 was introduced, a "budget" X58 board cost north of $250 and had to skimp on such essentials as RAM slots. Yes, RAM slots. Instead of the six slots that the triple-channel Nehalem CPU deserved, many early boards gave you just four slots to keep costs down.

Asus's Sabertooth X58 makes no such compromise. Besides the full six RAM slots, the Sabertooth X58 also gives you such niceties as ceramic-coated heatsinks, a five-year warranty, and mil-spec components. The ceramic coating helps wick heat from the heatsinks by offering greater surface area over standard anodized heatsinks, Asus says.

Despite its fairly low cost of $200, the Sabertooth X58 feels like a board that costs $100 more. It's still clearly a budget board, however. For example, there's no surface-mounted power-on or reset button, no fancy mobile-phone overclocking option, and no POST LED controller—all things you can get on a luxury board. You do, fortunately, get USB 3.0 using an NEC controller and SATA 6 through a Marvell chip. There's also a JMicron part for the eSATA ports.

The board's slot layout is both good and bad. We like that the board's heatsinks stay clear of the x1 PCI-E slots. This should allow you to insert a fairly long soundcard or other x1 PCI-E in the slot. Many board makers assume you'll never use any card longer than three inches in the top slot. Now for the bad: Asus plops the board's sole PCI slot right next to the top x16 PCI-E slot. If you run a double-wide GPU, your access to the PCI slot is blocked. Yes, we know that PCI is that last guest at the party that just won't friggin' leave, but that doesn't mean we're kicking him out on his butt. Plenty of people still run PCI soundcards, so placing the two slots together means SLI or CrossFireX is a no-go with any PCI device.

In performance, the board does well. That's no surprise. Boards based on the same chipset rarely vary in performance at stock speeds. We found the Sabertooth X58 pretty even with its pricier sibling, the Asus Rampage III Extreme, which we reviewed in October. Without performance as a deciding factor—at stock speeds, anyway—it's more about the pieces of flair, the price, and, well, the looks these days.

The Sabertooth X58 may not have all the bells and whistles that pricier boards boast, but do you really need all that stuff? If not, the Sabertooth X58 is a very satisfying board that doesn't scream "budget." In fact, your friends are likely to think you spent $100 more than you did. **—GORDON MAH UNG**

SPECIFICATIONS

Chipset	Intel X58
South Bridge	Intel ICH10R
Audio Controller	Realtek ALC892
LAN Controller	Realtek 8110SC
FireWire Controller	VIA VT630P
Other I/O	Marvell 88SE9128, JMicron JMB262, NEC PD720200

VERDICT **8**

ASUS SABERTOOTH X58

+ KOJAK	− MCCLOUD
Long warranty; does away with the blinged-out aesthetic.	Poorly placed PCI slot; no surface-mounted controls.

$200, www.asus.com

Palit GeForce GTX Sonic 2GB

Is it worth doubling the RAM in your GPU?

Most people don't need 2GB of frame buffer—if they're gamers. Palit's GeForce GTX 460 Sonic 2GB card isn't aimed solely at gamers, however. Like any GTX 460 card, it does a bang-up job in most modern 3D games. But at roughly $250, it's about $20 more than the equivalent 1GB card from Palit—which also runs at a higher core clock.

Don't think of that 2GB of RAM as just frame buffer, though. The card was designed for the emerging class of applications that take advantage of GPU compute.

The Palit Sonic 2GB offers a core clock speed of 700MHz, which is just 25MHz above the reference clock and 100MHz slower than the 1GB Palit Sonic Platinum card. The memory clock runs at the standard 900MHz—which is actually fairly impressive given the frame buffer size.

We tested the Sonic 2GB against a Gigabyte GTX 460 that we reviewed in November, and the differences in normal games was minimal at 1920x1200. It's close enough that we're not even going to report those scores here, although we should mention that you do pay a power penalty. The 2GB frame buffer pushes total system consumption to 281 watts, compared to 256 watts for the Gigabyte card. (For our standard games benchmark chart, see the online review of the card at MaximumPC.com.)

But how does the 2GB Palit card perform in GPU-accelerated apps? There aren't a lot of existing benchmarks to test this, but we tried one test called ComputeMark (www.computemark.com). We also tried a real-world, GPU-accelerated app: CyberLink's MediaExpresso 6.0, which uses the GPU to accelerate video transcodes.

In addition, we ran two game benchmarks: Batman: Arkham Asylum with Nvidia PhysX GPU–accelerated physics maxed out, and Just Cause 2 with two additional, Nvidia-specific options turned on. These two options, Bokeh and GPU-accelerated water, put additional load on the GPU. We ran both of these at 2560x1600 with 4x AA to really punish the card, and compared those results to a 1GB reference card.

Palit's GeForce GTX Sonic 2GB is about an inch shorter than most GTX 460 cards.

Note that ComputeMark's "extreme" setting simply wouldn't finish on the 1GB card. It would crash, or we'd get the dreaded "Your graphics driver has stopped working and restarted" error. So, not only did the 2GB card get somewhat higher numbers (even though the core clock is lower), but it could actually complete ComputeMark on its "extreme" setting. The results with the two games were pretty much a wash, so loading in compute-rich features, even with AA and high resolution, doesn't appear to have much impact.

However, the Palit card took longer with MediaShow Expresso. What's probably going on is that MediaShow is streaming the data to the GPU, so the extra memory doesn't come into play—but the higher core clock in the Gigabyte overclocked GTX 460 does help.

So, is the Palit Sonic 2GB GTX 460 for you? At only a $20 differential, we'd give it a cautious thumbs up. It may be the right card to have as we see more GPU compute–intensive apps come on line. Although it might be hard to justify buying a card based on potential future uses, it only costs $20 more than a 1GB card—and it plays games quite well. **—LOYD CASE**

BENCHMARKS

	Palit Sonic 460 GTX	GeForce GTX 460 Reference
ComputeMark / Normal	**2,130**	2,050
ComputeMark / Complex	**1,167**	1,106
ComputeMark / Extreme	**458**	DNR
MediaEspresso 6.0 / HD to iPhone H.264 (sec)	468	**454**
Batman: Arkham Asylum (fps)	**43**	41
Just Cause 2 / Bokeh + Water (fps)	14	14

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

VERDICT 8

PALIT GEFORCE GTX SONIC 2GB

+ HOT ROD	− ROLLER SKATE
2GB GDDR5; smaller than the stock card; future potential.	No real performance gain in today's apps; slightly more expensive than overclocked 1GB cards.

$250, www.palit.biz

USB 3.0/SATA Adapter Altercation

Three USB 3.0-to-SATA adapters duke it out for a space in your toolkit

It happens to everybody. Sooner or later, you're going to need to rescue data from a SATA drive, and you won't necessarily have a spare SATA port or the patience to take apart your rig to get to one. A USB-to-SATA adapter is a critical part of any geek's toolkit and enables you to access any SATA drive as long as you have a free USB port. It's perfect for rescuing files from borked computers and even just backing up your machine. Too bad it was limited to molasses-slow USB 2.0 until recently.

Thankfully, USB 3.0 removes the 33MB/s-access bottleneck and enables transfer speeds approaching that of an internal SATA connection. If you've got a USB 3.0 port and a USB 3.0-to-SATA adapter, you can get bare-drive access speeds in seconds. Not all adapters are created equal, however. Here we put three contenders from Thermaltake, Vantec, and PhotoFast through their paces to see which is worth adding to your rescue gear.

Previous USB 3.0 enclosures have been good at operating close to the bare-metal performance of mechanical hard drives, but haven't been able to match the speed of a SATA connection for solid-state drives. We tested all three adapters using the USB 3.0 ports on our standard storage test-bed, with two drives: a 3.5-inch 2TB Seagate Barracuda XT and a 2.5-inch 100GB Patriot Inferno, a SandForce-based SSD. We compared the average read and write speeds of each drive in each dock as well as with each drive connected directly to the motherboard's SATA ports. At least, that was the goal. Read on to find out which of these adapters is worthy and which to avoid at all costs. **—NATHAN EDWARDS**

Thermaltake's BlackX 5G is the Cadillac of USB 3.0 adapters.

THERMALTAKE BLACKX 5G

Like its predecessors in the BlackX SATA dock lineup, Thermaltake's BlackX 5G is big, black (duh), and feature-packed. Unlike the other two adapters in this roundup, which lean toward the compact, the BlackX 5G is clearly designed to sit proudly atop your desk rather than be stowed away in a cable bag somewhere. It's 2.8 inches high, 5.3 inches wide, and 3.4 inches deep and can accommodate a 3.5-inch or 2.5-inch hard drive. It comes with a bright blue USB 3.0 cable, a power adapter, and—why not?—silicon covers for the portions of your 2.5-inch and 3.5-inch drives left exposed when docked. An on/off switch with a bright blue LED ensures you don't undock the drive while it's running. Its solidity is reassuring compared to the wispier feel of the other adapters we've tested.

Of the three adapters in our roundup, the BlackX performed the fastest in every benchmark, and the closest to the bare-SATA speeds of the individual drives. Its performance with the 2TB Barracuda XT, in fact, was indistinguishable from that drive's SATA speed. The BlackX also posted the highest speeds with the Patriot SSD; though—like every USB 3.0 adapter we've tested so far—it was significantly slower than the bare drive cabled directly to a SATA port. 154MB/s reads and 165MB/s writes are fantastic numbers for an external drive of any type, but on a SATA connection, that drive reaches 193MB/s reads and 221MB/s writes.

The BlackX is the fastest USB 3.0 adapter we've tested, but it's also the bulkiest, and—at $60—the most expensive. But if you need regular access to bare drives, it's your best bet.

THERMALTAKE BLACKX 5G
$60, www.thermaltakeusa.com

VERDICT **9**

VANTEC NEXSTAR SUPERSPEED SATA-TO-USB 3.0 ADAPTER

This isn't the first USB 3.0-to-SATA adapter from Vantec we've tested. The first was Vantec's NexStar 3 SuperSpeed (May 2010)—an aluminum enclosure capable of accommodating 3.5-inch hard drives. This time, Vantec skipped the enclosure part altogether; this NexStar adapter is little more than a SATA-to-USB chip, a hardwired SuperSpeed USB 3.0 cable, and a detachable AC adapter with on/off switch. It's a more portable option than Vantec's previous offering—or Thermaltake's BlackX docking station, for that matter—but not as portable as the PhotoFast Gbox, which is even slimmer and eschews the wall wart entirely in favor of a two-headed power and data USB cable, but we'll get to that later.

The Vantec NexStar SuperSpeed adapter performed respectably in our tests, but lagged slightly behind the Thermaltake BlackX 5G. Thanks to the AC adapter, it handled our power-thirsty 7,200rpm 2TB Barracuda XT with aplomb, pulling down read speeds equivalent to the bare drive and write speeds just 5MB/s lower. Its solid-state performance was less impressive, though 138MB/s reads and 157Mb/s writes are still

Vantec's NexStar Super-Speed is short on frills but offers solid performance.

well within the realm of respectable.

At $25, Vantec's offering is the least expensive in our roundup, and it's more portable than the Thermaltake BlackX 5G while being more reliable than the Photo-Fast Gbox. If you don't mind slightly slower read and write speeds than the BlackX in exchange for the $35 price cut, the Vantec's your huckleberry.

BENCHMARKS

	Thermaltake BlackX 5G	Vantec NexStar SuperSpeed	PhotoFast Gbox	Bare Drive
SSD Read Avg (MB/s)	**154.8**	137.9	WNR	193.8
SSD Write Avg (MB/s)	**165.7**	157.8	WNR	221.2
HDD Read Avg (MB/s)	110.8	110.6	WNR	110.7
HDD Write Avg (MB/s)	**104.1**	97.4	WNR	102.7

Best scores are bolded. All drives tested on our hard drive test bench: a stock-clocked Intel i7-930 CPU on an Asus P6X58D Premium motherboard with 6GB DDR3, running 64-bit Windows 7 Professional, with NEC USB 3.0 controllers and drivers. HDTach 4.0.1 used for read/write benchmarks. SSD is a 100GB Patriot Inferno drive; HDD is a 2TB Seagate Barracuda XT.

VERDICT **8**

VANTEC NEXSTAR SUPERSPEED
$25, www.vantecusa.com

PHOTOFAST GBOX MINI USB 3.0-TO-SATA ADAPTER

When we first got ahold of the PhotoFast GBox, we were excited to see the slimmest, least bulky USB 3.0-to-SATA adapter ever. Its interface was even more minimal than the Vantec NexStar's: just a slim plastic box with SATA ports on one side and a USB Super-Speed port on the other. And forget about the wall wart or on/off switch—the Gbox just uses a Y-cable with one USB 3.0 connector and one USB power connector. Looks like the perfect addition to a tech's go-bag, right?

If only. The lack of a dedicated power adapter means that the Gbox doesn't draw enough juice to run a 3.5-inch drive. That would be OK, we guess, if it could run *any* drive in USB 3.0 mode without screwing up something. We weren't able to run our HDTune benchmark on any drive we connected to the Gbox, on any computer, without it aborting at a read error. We couldn't create or format a partition on any drive connected to the Gbox, and previously formatted drives connected via the Gbox only worked sporadically—usually, the host computer couldn't recognize their partitions. Connecting the drives to the computer via the other adapters or a SATA port worked fine.

For what it's worth (not much), the Gbox worked just fine in USB 2.0 mode on 2.5-inch drives. But that's not the point of a USB 3.0 adapter, is it? We hoped the first review unit that was sent to us was a fluke, but a second review unit we received exhibited the same problems. Our tests aren't exactly far-fetched usage cases, so we're surprised these devices are so flaky. Save $10 and get the Vantec adapter, or spend $25 more and get the Thermaltake. Just don't waste your money on this Gbox.

VERDICT **3**

PHOTOFAST GBOX MINI
$35, www.dvnation.com

Sadly, PhotoFast's GBox Mini proved flaky to the point of worthlessness.

Thermaltake Frio

WE'RE SORRY, WE CAN'T QUITE HEAR YOU

The Thermaltake Frio is a hefty cooler in the dual-fan skyscraper tradition. With both fans attached, it's a staggering 4.75x5.37x6.5 inches and clocks in at two pounds, 10.6 ounces. It's not the biggest we've ever tested—Noctua's NH-D14 and Scythe's Mugen 2 share that dubious distinction—but it's among the heaviest. Its plastic fan mounts and trim add unnecessary weight, though most of the heft comes from the five meaty heat pipes and stack of heat-dissipating fins.

The two 1,200–2,500rpm 12cm fans that ship with the Frio attach to its preinstalled plastic casing via rubber mounting posts, which add bulk but are easier to use than wire clips. Unlike most skyscraper coolers, which screw down from the top (and thus require removing the fans to get to the mounting screws), the Frio's mounting system uses screw-on nuts that mount behind the motherboard backplate, so you can leave the fans on during installation. This does mean you have to have hands on both sides of the motherboard during install so the cooler doesn't fall off, but that's what motherboard tray cutouts are for, right?

With our test bed's CPU overclocked to 3.2GHz and running Intel's Lynnfield-torturing internal thermal core test at 100 percent, the Thermaltake Frio dropped our long-suffering CPU's core temp to 63 C—about midway between the performance of the Cooler Master Hyper 212+ and Prolimatech's Armageddon in their respective two-fan modes. This seems fitting, since the Frio's $60 price point is smack dab between the $30 Hyper 212+ and the $90 you'll pay for the Armageddon and two 14cm fans.

Unfortunately, the Frio's best temperatures were obtained with both fans' variable-speed controls set to the highest setting, a ridiculously loud 2,500rpm. Temperatures at a more tolerable-sounding medium speed were 2 C higher. Given the 3-pin connectors and manual-only fan-speed controllers, switching between bearable noise and maximum cooling is a tedious proposition.

Its position between the cheap-and-awesome Hyper 212+ and expensive-and-awesome Armageddon makes the Frio a solid buy, but PWM fans—or just quieter ones—would make it a much better deal.

—NATHAN EDWARDS

BENCHMARKS

	Thermaltake Frio (two fans)	Prolimatech Armageddon	Cooler Master Hyper 212+ (two fans)
Idle (C)	34.25	34.25	**33.75**
100% CPU Burn (C)	63.0	**59.25**	66.0

Best scores are bolded. Idle temperatures were measured after an hour of inactivity; load temperatures were measured after an hour running Intel's internal Lynnfield thermal testing utility at 100 percent load. Test system consists of Intel Core i5-750 overclocked to 3.2GHz on an Asus P7P55D Premium board in a Corsair 800D case with stock fans. Temperatures taken with HWMonitor.

THERMALTAKE FRIO

VERDICT 8

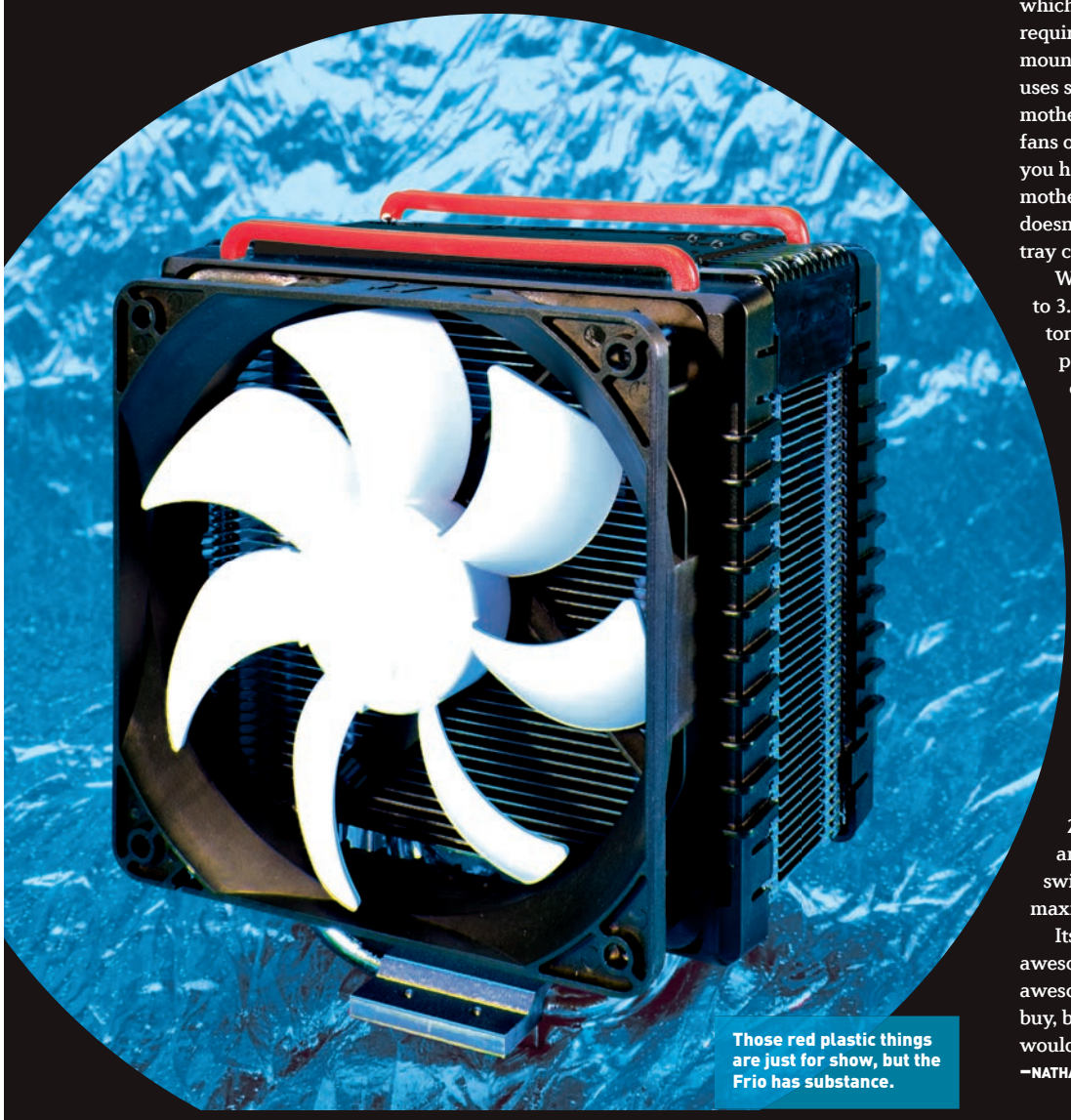
+ FREEZE

Performance/price firmly in midpoint between two excellent coolers; good looks.

- THAW

IT'S VERY LOUD; no PWM on the fans.

$60, www.thermaltakeusa.com



Those red plastic things are just for show, but the Frio has substance.

Gaming Keyboard Kerfuffle

We push the buttons on three hot new planks

It's the holiday season again, and you know what that means—it's a time for giving, family, love, and for every computer peripheral company under the sun to refresh their lineups. We can't review every mouse, keyboard, and headset that comes out over the next few months, but we're going to try. To get the ball rolling, here are three of the hottest new gaming keyboards out this season. —ALEX CASTLE

With the basic faceplate attached, you can barely tell that the Shift is an interchangeable keyboard.

STEELSERIES SHIFT

It's tough to set yourself apart as a keyboard—when you get right down to it, most of them are fundamentally the same. The SteelSeries Shift, however, manages to set itself apart in two big ways.

First off—do you remember the Zboard? With the interchangeable keysets for different games? Yeah, the Shift is one of those.

No, don't stop reading yet. Although the original Zboard had a reputation for being a little on the janky side, SteelSeries has brought its trademark rock-solid construction to the Shift, resulting in a keyboard that's sturdy and good-looking enough (with the default keyset) that it would take most people a few minutes to realize there's something out of the ordinary.

The second thing that sets the Shift apart is its startlingly robust feature set. Forgetting for a second all the replaceable-faceplate gimmickry, the Shift brings a lot to the table, including 11 hotkey buttons (eight macro buttons times three profile buttons for 24 on-the-fly recordable hotkeys). These buttons are flush with the surface of the keyboard, and have a different feel than the regular keys, making them easier to distinguish—a nice touch. Additionally, every key on the board can be bound to whatever you want using the built-in software, and the board includes two additional function-shifting keys (labeled "bar" and "pad") that can be combined with all the other keys to produce a simply dizzying number of custom keybinds/macros.

The software includes support for plenty of custom layouts, and comes preloaded with a bunch of game-specific configurations. In one of the more unique features of the Shift, the software also comes with some monitoring functionality, which can provide you with a "heat map"–style map of your key-usage frequency. SteelSeries says it plans to expand this feature with more analytics in the future, but even now it can provide some interesting insight into how you use your keyboard.

The problem with the Shift is simple: The swappable keysets are a gimmick. The game-specific keysets are rarely helpful, and if you want game-specific key bindings you're better off just getting a high-quality gaming keyboard that lets you customize the keys. The interchangeable nature of the keyboard creates a couple of other problems, like a split-in-two spacebar and less-satisfying dome-style keys, which—while not terrible—aren't the best. We love the Shift's features, but there are better-constructed boards for the same price.

VERDICT **8**

STEELSERIES SHIFT
$90, www.steelseries.com

RAZER BLACKWIDOW ULTIMATE

Razer, long known for its high-end gaming mice, has had sort of a slow start when it comes to gaming keyboards. Its offerings haven't been bad, but the company hasn't had a must-have product yet. The BlackWidow is Razer's first.

The BlackWidow Ultimate's is a mechanical keyboard, like the SteelSeries 7G, but the keys have a little less travel and a very noticeable click when fully depressed, making them feel more like an old Model M keyboard. Whether you like your mechanical keyboard with or without a click is a matter of personal preference, but we happen to like ours with a click, and the Razer BlackWidow Ultimate feels great, especially for extended typing. However, beware: This sucker is loud! It shouldn't be a problem if you're used to the TACK-TACK-TACK sounds of a mechanical keyboard, but we wouldn't recommend using it in an office environment if you've got touchy coworkers.

The physical construction of the board is sturdy. It's not going to beat the SteelSeries models in a bullet-stopping competition, but it's still heavy and durable enough that it feels completely solid under your hands. Unfortunately, Razer opted to use a glossy black finish that picks up fingerprints at an alarming rate, and was starting to get grimy even in the week we used the keyboard for this review. It looks great clean, but it'll take some effort to keep it that way.

Beyond the key and build quality, the BlackWidow Ultimate hits the "just right" zone between feature drought and board-embiggening excess. It features on-the-fly

The BlackWidow Ultimate's individually backlit keys look great, but come with a hefty price tag.

recordable macros that can be bound to one of four special macro keys, or to any other regular key on the board. Using the driver software, you can define different profiles, which can either switch automatically when you load a game or by manually using the keyboard's function key and the number keys. The BlackWidow Ultimate also features blue individual-key backlighting, with five intensity settings.

Speaking of that backlighting, Razer also sells a basic version of the BlackWidow, which is essentially the same keyboard minus the backlighting, for $50 less. We haven't officially reviewed the basic-model BlackWidow, so we can't give it an unqualified recommendation, but it might be worth looking into if you want to save a few bucks. Otherwise, the BlackWidow Ultimate's excellent build quality and nicely sized feature set more than make up for its few shortcomings. This one's a winner.

KICK ASS!

VERDICT **9**

RAZER BLACKWIDOW ULTIMATE
$130, www.razerzone.com

STEELSERIES 6GV2

If the SteelSeries 6Gv2 looks familiar to you, it's probably because you're already familiar with the 7G, SteelSeries' flagship mechanical-key keyboard. SteelSeries didn't update the 7G this year, and it's still the company's top-of-the-line model. The 6Gv2 is essentially a more aggressively priced (around $100, versus around $150) version of the same keyboard with a few features stripped out.

The reason that the 6Gv2 looks nearly identical to the 7G is that it keeps all of the physical features that make its big brother a monster gaming keyboard. The keys use gold-plated mechanical switches with huge travel and no click. You don't have to press a key all the way down for it to register though, so you can either press the keys lightly and quickly, or slam them down, depending on your gaming style and/or current K/D ratio. We've always loved the 7G for gaming, although we've found that the no-click mechanical switches make the keyboard hard to do a lot of fast typing on.

Also intact is the 7G's amazing build quality. Made with metal-infused plastic and built on a solid-metal plate, the 6Gv2 could serve double-duty as a battering ram. Also, the keys are easy to remove, wash, and put back into place. In other words, you won't have to replace it any time soon.

So, all that good stuff is still the same. What do you give up? Two things. First, the 6Gv2 doesn't have a USB or audio pass-through. We can live with that. Second, for some reason, the 6Gv2 is missing about 50 percent of a right shift key. It's about the size of your standard control key, and is flush with the right side of the enter key. This means that trying to type a capital Y with your right hand alone lies somewhere between a difficult act of contortion and a physical impossibility, depending on your hand size. Who knows the motivation behind this decision—but it's obnoxious and very difficult to adapt to. On the plus side, the 6Gv2 now has a full-sized backspace key.

Otherwise, our only beef with the 6Gv2 is the same as with the 7G—owing to its super-austere design, it doesn't have some of the features you'd like in a gaming keyboard. Sure, we don't really need a billion macro keys, or a dedicated media controller, but it is useful to have access to at least a few recordable buttons.

VERDICT **7**

STEELSERIES 6GV2
$100, www.steelseries.com

Visually, the 6Gv2 is almost identical to the older 7G model.

HP 2310e

This LCD impresses across the board

One of HP's most recent display offerings, the 2310e, takes a number of current trends—super-slim size, LED backlighting, environmentally conscious materials—and wraps them up into one impressive package.

Physically, the 2310e is sleek, sophisticated, and incredibly shiny. Between the piano-black finish on the frame and the glossy TN active-matrix panel, this 23-inch, 1080p display can pick up a ton of smudges and fingerprints, so get those soft cloths ready. The rear of the display has standard DVI and HDMI inputs as well as a bonus input—DisplayPort. Ironically enough, the 2310e lacks a VESA mount on the rear, instead opting for a CD-size HP logo that lights up enough to illuminate your surroundings in low light. If this annoys you, you can turn it off.

The bottom of the frame holds five capacitive touch buttons that light up when pressed; the onscreen display menus are nicely organized and easy to navigate. The 2310e maintains the trend of increasingly slim displays—it's only about one inch thick— but gives up some features in exchange: mainly built-in speakers, which isn't that big a loss in our book, as they're usually not that great.

The 2310e features HP's BrightView technology, which is supposed to increase sharpness, reduce glare, and offer a 70 percent color gamut. LED backlighting seems to have come of age with the 2310e as well, and makes it a more environmentally conscious product since mercury is eliminated; the display uses BFR/PVC-free plastics, arsenic-free display glass, and recyclable plastics on the rear cover, base, and packaging.

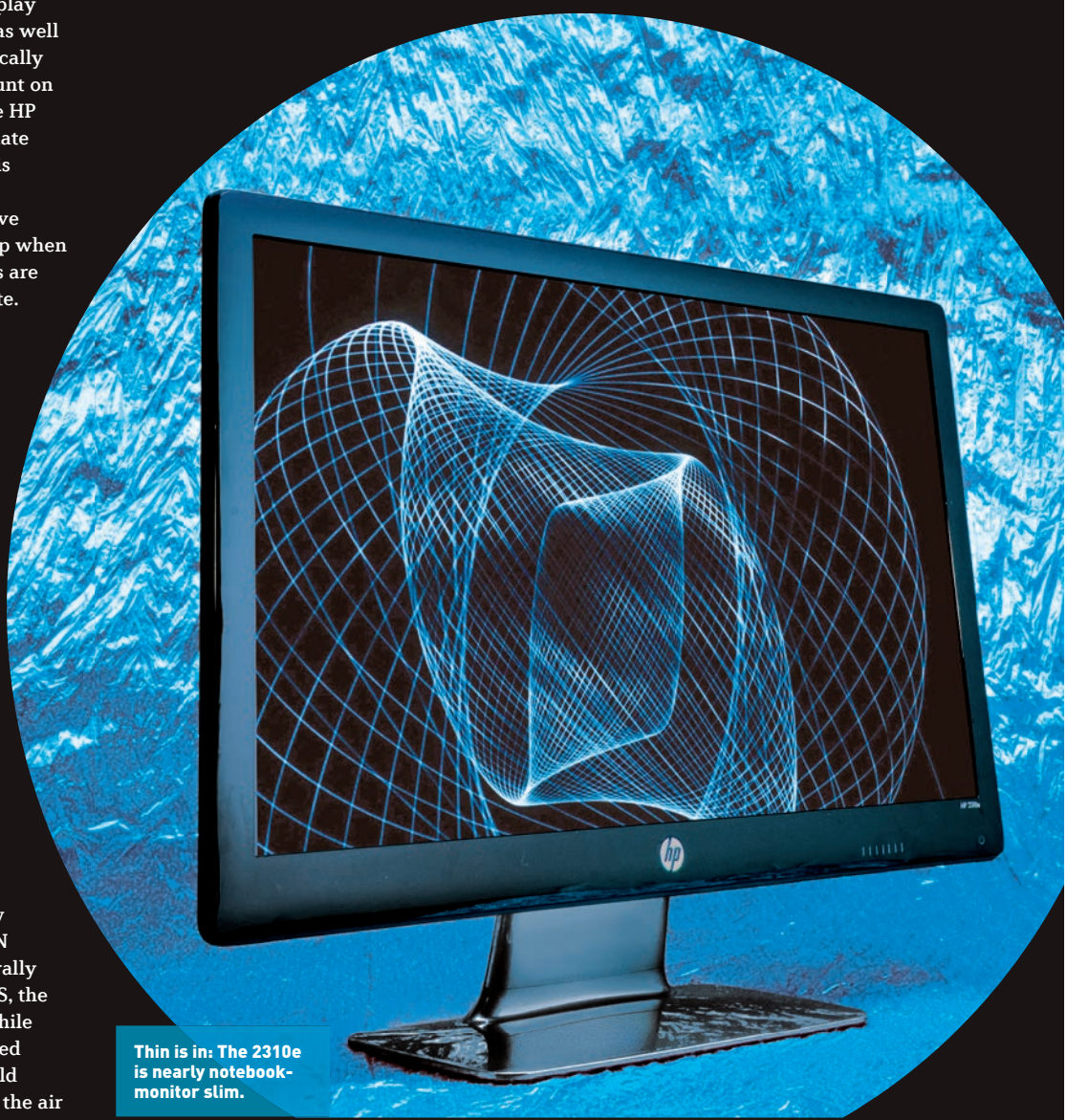
That's all well and good, but how does it perform? Beautifully, for a TN panel. Although TN panels are generally considered inferior technology to IPS, the 2301e excelled in our video tests. While watching *V for Vendetta*, it reproduced exceptional levels of details (we could literally see specs of dust floating in the air in some scenes) and incredible black-level detail even in dark or shadowed scenes. Likewise, while playing the game Arkham Asylum, we were impressed by the crisp, clean feel of the game. It did suffer some white-level saturation in our DisplayMate tests, but excelled in the color-tracking, gray-scale, color-purity, and multiple intensity tests. Overall, an admirable display if you can handle a reflective screen and don't require speakers. **—AMBER BOUMAN**

HP 2310E

VERDICT 9

+ HOUDINI	- CHRIS ANGEL
Impressive and crisp detail; good performance in black levels; pristine colors.	No speakers; picks up fingerprints and smudges very easily.

$260, www.hp.com



Thin is in: The 2310e is nearly notebook-monitor slim.

Sid Meier's Civilization V

A leaner, meaner version of the classic series

It may not move games in Modern Warfare numbers, but Civilization is the definition of a venerable gaming franchise. Spanning nearly two decades, the series has seen five full games, a half-dozen expansion packs, and a handful of spin-offs. But this isn't Call of Duty—there's not going to be another core Civ game every year, or even every couple of years, so every version has to satisfy the fan base for at least three or four years.

So, is Civilization V good?

Yes.

That's not terribly surprising, so let's get at the stuff you want to know: How does Civilization V change up the time-tested Civ formula? Basically, by keeping the best elements intact, while streamlining, polishing, and upgrading the rest.

Civilization V's new hex-based grid makes for much more natural-looking terrain.

Perhaps more than anything, combat in Civilization V has undergone a huge improvement. In one of the biggest changes the series has ever seen, you can no longer stack multiple military units on a single tile. That means no more 40-tank-strong unstoppable "stacks of doom" crashing through your territory. Additionally, the cost and upkeep on military units has been increased, putting the emphasis on smaller armies, smartly composed and commanded. All in all, the combat feels much more strategic—like a game of chess played across Civilization V's hexagonal grid.

The game looks great, and that new hex-grid allows for more natural-looking, beautifully rendered landscapes to conquer and cultivate. Unit models are more detailed than ever, and the combat and movement animations are greatly improved. Civilization V forces you to make more strategic decisions about what to build in your empire. In previous games, you'd end up trying to build almost every building in every city, and carpeting your entire territory with roads. In Civ V, roads and most buildings have upkeep costs, forcing you to consider what each city really needs, and which routes are worth building roads on.

Many of the game's systems have been streamlined, while others have been removed altogether. Religion is completely gone, as are espionage and corporations. Culture counts toward the new civics system, which does away with the all-or-nothing civics from Civilization IV, and replaces them with a "talent-tree" system that allows you to gradually unlock different bonuses for your civilization.

The importance of commerce in the game is increased, as money can now be used to buy land tiles on the map. Additionally, money is used to win the favor of City States—another major new presence in Civilization V. City States are single-city civilizations sprinkled liberally around the map. They're easy to take over, but they provide even more valuable bonuses if you befriend them—through monetary donations or by completing small "quests"—instead.

The game is not without its flaws. The AI is a little fishy—it provides a challenge at any of the game's many difficulty levels, but it doesn't play like a real person, especially in combat.

Multiplayer also is oddly incomplete—the game turns off *all* animations when playing multiplayer, so it becomes a bit more like a board game, and it's hard to keep track of your armies as they teleport from space to space. Additionally, multiplayer is missing the hotseat mode, which allows you to play with your friends on one computer.

The bottom line is that if you've ever been into a Civilization game, or you *could* see yourself getting into a deliberately paced, strategic game of epic proportions, Civilization V will grab hold of your attention and not let go. The multiplayer mode is marred by a couple of questionable design decisions, but the game is otherwise top-notch. **—ALEX CASTLE**

You'll visit your fellow world leaders in their fully rendered war rooms in Civilization V.

VERDICT 9

SID MEIER'S CIVILIZATION V

WONDERS	BLUNDERS
An excellent refinement of the classic Civ formula; beautiful graphics.	A few odd omissions from multiplayer; some AI issues.

$50, www.civilizaton.com, ESRB: E

LAB NOTES

Who Backups the Backup?

Our Seagate BlackArmor 440 NAS is not invulnerable

NATHAN EDWARDS
SENIOR ASSOCIATE EDITOR

There's a right time to back up your NAS, and it's *before* anything goes wrong. A few weeks before press time, one of the drives on our backup NAS failed. Since RAID 5 can tolerate one drive failure without losing data, and I didn't have a spare drive handy, I plugged a USB drive into one of the NAS box's ports and backed up the degraded (but not failed) RAID. Just in time, too—the next week, another drive went offline and we lost the array. After receiving two replacement drives, I rebuilt the RAID (which took nine hours) and tried to restore from USB, to no avail.

It's easy to *know* good backup practices, and hard to keep on top of them. Next time, I'll set up a regularly scheduled USB backup and keep a couple of spare drives on hand so I can repair a degraded array *before* it fails.

KATHERINE STEVENSON
DEPUTY EDITOR

Apropos of this month's Tech Preview, I can tell you that the trend in PC notebooks next year will be clickpads. In other words, vendors will stop incorporating distinct right and left "mouse" buttons, opting instead for a larger, single surface that will be more conducive to multitouch operations. Pressing down on the surface will initiate right- or left-click actions.

GORDON MAH UNG
SENIOR EDITOR

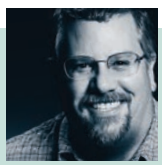
I've found a way to reduce my family tech-support hours—I convinced a relative to replace his family's ancient XP machines with new Dell boxes and an HP MediaSmart Server for network backups, and to pay for a three-PC Kaspersky 2011 license. With Win7 and restricted accounts for the teens, those 9 p.m. emergency calls should go away.

ALEX CASTLE
ONLINE MANAGING EDITOR

Computer peripherals are usually sort of a quiet beat, but in the last month I've been inundated with more products than I know what to do with. I get that all the companies want to get their stuff out in time for the holiday shopping season, but please—won't somebody think of the poor, poor reviewers?

ALAN FACKLER
ONLINE ASSISTANT EDITOR

I'll be blunt and honest. That's me on the cover, and that seemingly simple picture *wasn't freakin' easy to take*. I wasn't allowed to breathe when I had the mask on (or I'd fog the mask), so in both images you see me in, I'm in an airtight suit, sweating bullets, and *holding my breath*. You're welcome.

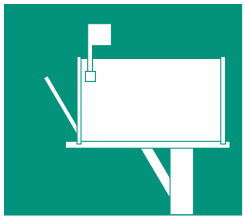


MICHAEL BROWN
REVIEWS EDITOR

After checking out early reference-design boards using AMD's new Radeon HD 6800 series GPUs, I must say I'm pretty impressed with the price/performance ratios. The company's branding strategy, on the other hand, is a mess: A lot of less-informed consumers will buy a 6850 or 6870 thinking it's a step up from the 5850 or 5870 they already own—and they'll be sorely disappointed.

We tackle tough reader questions on...

GPU Acceleration in CS5
Net Neutrality
Airflow Control



GPU Acceleration for Premiere?

Like most nerds, I'm a gamer and recently built a new PC with the Radeon 5870, but lately I've been dabbling with video editing. I recently switched to CS5 and keep hearing marketing hype about Nvidia's GPU acceleration for CS5 Premier Pro. Is there any truth to this? I have yet to see any real benchmarks that showcase the differences in performance between high-end ATI/AMD and Nvidia cards. Please cut through the BS!

—Jeff "JBaz" Basladynski

Contributing Writer Loyd Case Responds: Premiere Pro CS5 was rewritten from the ground up to take advantage of Nvidia's CUDA GPU compute framework. Where it's most visible is in previews. Let's say you have multiple clips you're compiling into multiple streams that overlap. They may be from different sources that were shot at different resolutions or bitrates. Prior to CS5, if you moved the timeline, it would take some time for the preview renders to catch up, and performance would get a little chunky. Plus, the previews were at reduced resolution. Now, the GPU renders previews, and it happens in nearly real time. It's all very smooth, even with quad HD content (e.g., shot with RED cameras.)

Also, all transitions and effects are now GPU-accelerated, as well. Adobe undertook this project before more standards-based APIs (OpenCL) were available. The company is looking into what it would take to move future versions to OpenCL, which would enable support for AMD GPUs. But nothing has been confirmed yet. Officially, CS5 only supports Nvidia Pro cards (Quadro) and the GTX 480 and GTX 470. There are hacks available on the net to enable support for other Nvidia GPUs.

Holier than Thou?

What's the deal with all the holes? Lately, I have noticed a big change in cases. If you look at your budget gaming rig (November 2010) and the tower in the ad on the back cover of the October issue, cases are now very open. I see lots of holes. What happened to good control of airflow? My momma said never leave the case open.

—Jeff Welch

Senior Associate Editor Nathan Edwards Responds: The cases you're referring to are the Cooler Master HAF 922 and Antec LanBoy Air. HAF stands for High Air Flow; both cases are designed to get a lot of air moving through the case. We're not case designers (too bad!) but cases just need more airflow than they used to. Heck, when I was a kid, CPUs didn't even need fans. Today's enthusiast parts put out a lot of heat, and the large amounts of mesh on both these cases correspond to lots of internal fans—or a few large high-volume fans. These case vendors aren't just slapping fans wherever they feel like it, though. Airflow is still controlled; there's just more of it. Adding more fans (and mesh panels) ain't the same as leaving the side off of your case, fortunately. More, in this case, really is more.

Budget Second Opinions

I have noticed that no matter what you or *PC Gamer* list as the best budget parts, you still manage to throw in an Intel proc and an Nvidia graphics card. I think the GeForce GTX 470 you recommended [in the "Builder's Creed" article, November 2010] was the wrong choice. As for the CPU, I thought a nice Phenom II would have made more sense due to the upgrade path that AMD lays out for budget-minded folks with its AM3 platform. I also disagree with the SSD choice. The 60GB wasn't worth the expense.

CUTCOPYPASTE

▶ An error appeared in the table in our router feature, "Routers that Go the Distance," in the December issue. The correct Trendnet model is TEW-673GRU.

NOW ONLINE

Fun with Video!

We've been experimenting with making some home movies here in the Maximum PC Lab, and the fruits of our labor are starting to show up online. Tune in for videos of first looks, reviews, and whatever other shenanigans are going on around the Lab.

You could have gone with a 30GB SSD and recommended disabling the page file and using it only as a system/boot drive. There is no reason for the budget-minded to use an SSD for storing games or video since they can't afford one that's of a size to even do this.

—Tony Dorsett

Senior Editor Gordon Mah Ung Responds: To quote Marko Ramius: "When he reached the New World, Cortez burned his ships." I've got news for you Tony. Come next year, neither AM3 nor LGA1156 are going to have much of a future once AM3+ and LGA1155 are introduced. Nevertheless, our November budget machine does have an upgrade path: a Core i7-870 chip, which adds Hyper-Threading. It's faster than AMD's fastest Phenom II X6 chips in most things, and even in heavily multithreaded apps, it's so close that it's not worth AMD fanboys crowing about.

Our 60GB SSD was $160 at the time we wrote our story and has since dropped to $145. The 30GB Kingston is about $93. I'm sorry, but I think the money for the extra capacity was well spent, because even 60GB is barely squeaking by. With a bone-stock Windows 7 install and our benchmarks copied to the drive, we were practically topped out. I cringe at the thought of dropping down to 30GB. As someone who has tried disabling the page file in Windows over the years, I'm not a fan of it. Invariably, you will run into something that breaks even if you have 24GB of RAM installed.

Finally, when *Maximum PC* reviewed the GeForce GTX 470 in the June issue, we gave it a 9/Kick Ass verdict and the benchmarks pegged it running fairly competitively with AMD's vaunted Radeon HD 5970. I think that getting that kind of performance for $290 is a great way to build a budget gaming machine.

IF WE DO NOTHING, WE ARE LOOKING AT A ROBBER BARON INTERNET

Net Neutrality for Whom?

Quinn Norton's column "Chaotic Neutrality" in the November 2010 issue got me thinking about our legislative process. Here is what really worries me about net neutrality legislation and regulation: Who are these laws and regulations written for? Who do they benefit? America is a plutocracy (has been for a while now, but we do not teach this to our kids in school!), and the legislation and regulations that have been passed for the last two decades have been exclusively for the benefit of corporations. Not individuals. In my mind, this automatically makes any net neutrality legislation and regulation suspect, as I know that this additional layer of oversight and control is not for my benefit. At one level or another (via tiered pricing, taxes, access fees, or reduction of capability/bandwidth), I, as the end user, will end up paying more for something I really did not need to begin with. All for the benefit of someone else.

—Lonnie R. West

Contributing Writer Quinn Norton Responds: Lonnie, I think the points you raise are largely valid, but the problem is even worse. A lack of legislation doesn't keep the net we have, it delivers it to the management of corporations just as much as any legislation could. In fact, the call for legislation only really began as a response to proposed and ongoing corporate abuse of the end-to-end principle. If we do legislate, we have to worry about special interest influence. If we get good laws despite special interests, we have to worry about regulatory capture in enforcement. And if we do nothing, we are looking at a robber baron Internet, where a few telecom and content companies get to control everything up to and including what we see and what we say. Left, right, or center, I fear it's hard days ahead.

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VIDEOCARD

Razer BlackWidow Ultimate

Our reigning Best of the Best gaming keyboard (the Logitech G19) has been king for so long that we almost forgot we even *have* a keyboard category. Well, we do, and it's about time a new keyboard took the crown. The Razer BlackWidow Ultimate steps up to the challenge, with a rock-solid build quality, a good feature set, excellent software support, and at $130, a price that's easier on the wallet than the $200 G19.
www.razerzone.com

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Blu-ray Drive
Plextor B940SA
www.plextor.com

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

30-Inch Display
HP ZR30w
www.hp.com

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

Gaming Mouse
Madcatz Cyborg R.A.T.7
www.cyborggaming.com

Games we are playing

Sid Meier's Civilization V
www.civilization5.com

StarCraft II: Wings of Liberty
www.starcraft2.com

Minecraft
www.minecraft.net

Darkwind
www.dark-wind.com

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

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