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4000 Shoreline Court, Suite 400, South San Francisco, CA 94080
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Gordon
Mah Ung

UNIVERSAL GRAPHICS FOR ALL

AMERICAN'S, I'VE BEEN TOLD, don't care about discrete graphics anymore.

No, not you. If you're thumbing through *Maximum PC* magazine, you know the value of a good graphics card or two. The problem is, the average consumer in North America apparently feels little need for the GPU.

This isn't just anecdotal evidence, either. Research analysts who look at the ebb and flow of chip sales across the world have told me this, and I've also heard it from system builders, graphics card vendors, and various other plugged-in PC people over the years: Yankees just don't care about the discrete GPU. I've seen it with my own eyes as I browse the configurations of many PCs at the big-box stores: The vast majority use integrated graphics, with only a handful offering a discrete card.

Even more disturbing are the trends I'm being told about: While Americans don't care about graphics, in European and Asian countries, PC buyers have elevated the discrete GPU to a must-have item in new PC purchases.

So why aren't Americans choosing discrete GPUs when we buy a new PC? Some believe Americans have moved onto consoles as the primary gaming platform, so we give the PC short shrift. Others think that the PC's role in the physically smaller homes of Europe and Asia give it more prominence as a TV, productivity tool, and game machine.

Well, I'm here to tell you that Americans should care about graphics performance, even on their low-end machines—at least as much as they care about the typical three specs of CPU clock speed, RAM allotment, and hard drive capacity.

The PC gaming resurgence that we've seen lately tells us that we need to care about graphics performance. Certainly not every new PC buyer is going to want to play Battlefield 3 on Ultra, but even "casual games" will board the feature-creep train and start to require more and more graphics firepower. That doesn't even take into account the increasing reliance on the GPU for highly parallel workloads.

I'd be concerned that this was a lost cause if not for the fact that AMD and Intel are making the right moves in integrated graphics performance. AMD's Fusion chips are a step in the right direction. Instead of getting craptastic chipset-based integrated graphics with a fair quad-core, consumers now get $70-level discrete graphics and a quad-core chip, to boot.

With its larger market share, Intel's next-gen chip, code-named Ivy Bridge, will put another great big foot forward. Ivy Bridge's x86 functionality improvements are ho hum, but the company has made major advancements in the graphics side of the chip. More importantly, it's clear that Intel finally cares about graphics, so newer chips will just build upon the trend.

While I'm not certain we can ever convince our brothers-in-law or aunts to buy a PC with a discrete graphics card, all of us would be for the better if that PC just came with fairly decent graphics for free.

Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

THE NEWS

A Windows 8 slate is probably the most tablet-y thing you'll see from HP in 2012.

No Post-PC Era for HP

The computing giant caps a flip-floppy 2011 and looks forward to righting the ship

NOBODY NEEDS THE clean slate of a new year more than HP. After announcing a brave new vision for the company on August 18, 2011—a vision that included killing all WebOS hardware and possibly ditching its top-selling PC business—the company quickly discovered that, well, no one but CEO Léo Apotheker could see a future without the HP name on computers. Amid fierce consumer, enterprise, and investor backlash, HP's board of directors gave Apotheker the boot and named former eBay boss and failed California gubernatorial candidate Meg Whitman the new CEO. Whitman quickly established that (surprise!) HP does plan on keeping its PC line.

A Change of Heart

Why the sudden shift in direction? A number of factors probably influenced the decision—including HP's plummeting stock value and widespread jeers from virtually all corners—but supply chain issues were definitely part of it. As the largest PC manufacturer around, HP has extensive leverage with component and logistic providers, leverage that would disappear and hurt other HP divisions if the consumer business was spun off. Whitman admitted that was "one element of (the decision)" in an interview with AllThingsD.com (dthin.gs/ue0r4W).

Look for HP to slim down some of its bloated product lines with simpler offerings, including Ultrabooks.

Stopping the Bleeding in 2012

"(HP) will be working hard to put the strange year that was 2011 behind them," says Crawford Del Prete, chief research officer at International Data Corporation. So how will the company go about winning back the hearts and minds of skittish end users? By getting thinner and trimmer. Del Prete expects HP to entice customers with lightweight, sub-$1,000 Ultrabooks that feature "leading-edge technology and forward-thinking design" and are ready for use in the workplace as part of the "consumerization of IT" trend.

Rob Enderle, the owner and principal analyst of the Enderle Group, predicts HP will slim down in yet another way, citing Whitman's disapproval of HP's vast number of offerings. "I'd expect fewer products that are both more richly configured and more aggressively priced, as new, simpler lines replace the old, complex ones."

What about Tablets?

Del Prete notes that HP sank a ton of money into WebOS, so he expects the company to continue to license the software to other manufacturers until it figures out a way to actually see some return on its investment. Enderle isn't quite as optimistic. The recent departure of WebOS's lead supporter at HP leads him to believe that "unless it is sold quickly, WebOS is history." As this issue went to press, the latest word was that HP is in fact looking to sell WebOS, with Amazon, RIM, Oracle, and others interested.

WebOS hardware may be done, but HP won't let the mobile money-train pass it by. "I expect HP will now put the efforts they would have put into the WebOS tablet into their coming Windows 8 tablets instead," Enderle writes, a comment echoed by Del Prete. Look for both ARM- and traditional x86-based HP tablets for Windows 8.

No More Drama

Experts agree: Expect HP to be much more focused on execution—and much less focused on drama—under Meg Whitman in 2012. Don't make the mistake of ruling the company out, either; Lenovo may be making strides, but HP is still top dog in the PC world.

–BRAD CHACOS

Thai Floods Lead to Massive HDD Shortages

This autumn, heavy rain in Thailand caused flooding that led to massive property damage, as well as more than 500 deaths. The flooding forced the shutdown of many of the world's hard drive factories, including those of Seagate and Western Digital—up to 40 percent of the world's hard drive manufacturing capacity. This in turn will lead to massive drive shortages as retailers and system integrators run through existing inventories. Hard drive prices had already doubled as early as November 2011, with shortages expected to last through the first quarter of 2012.

The hard drive shortage could have a chilling effect on the entire PC industry; motherboard vendors reported slower-than-expected fourth-quarter sales, while PC sales could drop by nearly a quarter in the early part of next year, according to IDC, the tech research group.

It's not just consumers who'll feel the pinch. Nick Bilton at the *New York Times* (nyti.ms/w3Kvtu) warns that cloud-computing companies, which rely on ever-increasing storage pools, could run into problems—or even run out of space.

The drive shortage will lead to lean times for just about everyone in the PC component business, though SSD manufacturers could see sales soar. After all, with hard drive prices rising, their once absolute price advantage over solid-state drives may start to disappear, and if SSD manufacturers can keep up with demand, they could wind up sitting pretty. Some manufacturers, like OCZ, have already announced lower-cost SSD models to try to capture some of the market. **–NE**

Skype Founders Hit Play on Vdio

Video may have killed the radio star, but Vdio, the online video equivalent of Rdio, will do battle with Netflix for streaming supremacy. Skype creators Niklas Zennström and Janus Friis head up a team of heavy hitters with experience at Napster, Microsoft, TV Guide, and Apache.

Like Netflix, Vdio lets you instantly watch TV and movies. It's a privately funded project currently in closed beta. Vdio will debut in the UK, but it's a safe bet that it'll land in the U.S.

The Vdio team isn't backing down from inevitable comparisons to Netflix. Their answer to how Vdio is different from Netflix is, "We think people will love using Vdio." This should be fun. **–PL**

LSI Scoops up SandForce for $322 Million

In a bit of a shocker, LSI signed a definitive agreement to acquire SandForce, maker of popular high-speed SSD controllers in the performance category. In recent years, LSI has focused most of its attention on enterprise networking and storage. Many assumed a company like Intel or Corsair would pocket SandForce, just as OCZ did with Indilinx.

Yet LSI agreed to pay approximately $322 million in cash and assume around $48 million of unvested stock options and restricted shares held by SandForce employees. The acquisition should close in Q1 2012, and LSI envisions becoming an industry leader in the high-volume flash storage processor market space for Ultrabook, notebook, and enterprise SSD and flash solutions. **–PL**

Tom Halfhill
Fast Forward

ARM EMBRACES 64 BITS

IT WAS THE best-known secret of the year: ARM was prepping its first 64-bit CPU architecture to bash head-on with Intel in the low-power server market. ARM's official announcement finally came in October, and AppliedMicro revealed bold plans for the first 64-bit processor based on the new architecture.

With Microsoft readying its first ARM-compatible version of desktop/server Windows, PCs may flirt with ARM, too, although notebooks are more likely candidates than desktops. It's the first serious challenge from a non-x86 architecture that Intel has faced in 20 years.

These days, the desperate quest for power efficiency is driving the industry in new directions. Not all those roads lead to Intel. ARM's existing 32-bit CPU architecture rules the cell phone market and is popular in numerous other devices, such as Apple's iPad. Although ARM-based processors can't yet match the performance of Intel's best chips, they are powerful enough for many purposes and are more power efficient.

System vendors want to try building large servers using boatloads of low-power ARM chips, but the critical missing piece was a 64-bit ARM architecture. Every other server-processor architecture (x86, Itanium, POWER, SPARC) has been 64-bit for years.

Unlike Intel, however, ARM doesn't actually make microprocessors. It licenses its architecture and CPU cores to other companies, which design the chips and outsource manufacturing to independent foundries. Hence the importance of AppliedMicro's announcement: a future 32-core server processor called X-Gene. Someone has to go first.

Intel retains awesome advantages in CPU performance, fabrication technology, engineering resources, and market position. Frankly, I give ARM only a 50/50 chance of succeeding outside its traditional mobile scope. But the battle will be good drama, and the fresh competition will push Intel to design lower-power x86 processors, so almost any outcome is a win for the rest of us.

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

Thomas McDonald
Game Theory

RAGING MEDIOCRITY

I REMEMBER 1994 well. OJ Simpson debuted a new kind of TV show running 24/7 on every network. Ace of Base proved that Swedish musical artistry didn't die with ABBA. And Id Software released its last game that didn't disappoint me.

I'm not saying that Doom II was Id's last game of any value, but that it was its last game that met expectations. Everything since then has marked Id's gradual slide into game design mediocrity—a slide that reaches its nadir with Rage.

Since Doom II, Id's game design sensibility has hardly progressed at all. The Quake games added almost nothing to the basic Doom formula, while Doom III milked every cliché in the design book, from monster closets to a tedious obsession with sudden darkness.

I'm not talking about the technology. A new Id game is a chance to see technology tools that push PCs to do wonderful things. But if you're writing a review of an Id game, and you're lingering over the wonders of curved surfaces, volumetric fog/lighting, or nice, smooth shadow maps, you're not reviewing the game, *you're reviewing the engine*. Each new Id release is the greatest tech demo ever, but as games, they just don't offer much.

With Rage, the Id formula finally comes completely undone. It's as though the developers studied other games with more depth and innovation (namely Fallout 3 and Borderlands), and then attempted to squeegee a thin film of those gameplay elements over their old formula. They didn't even nail their two strongest areas: The tech is impressive but glitchy, and the multiplayer is weak. Oddly, Rage's visual design is the most aesthetically unappealing Id has ever done. It's hard to recall a more lovingly detailed, ugly environment.

Something good will come of this. Quake III gave us Call of Duty; Doom III gave us Prey; and something worthwhile will come from Rage. It just won't come from Id.

You can follow Thomas McDonald on Twitter @StateOfPlayBlog.

Ubuntu 14.04 to Run on Tablets, Smartphones, and TVs

At the Ubuntu Developer Summit in November, Canonical described a new strategy: "By 14.04 LTS, Ubuntu will power tablets, phones, TVs, and smart screens... and connect those devices seamlessly to the desktop, the server, and the cloud," wrote Canonical founder Mark Shuttleworth in a blog post.

Key to the strategy is Unity, the oft-maligned interface that became the default GUI of Ubuntu 11.04. In his blog, Shuttleworth noted that Unity was designed for its core elements to scale to any form factor, and he underlined the importance of partnerships with major silicon vendors. Canonical recently rolled out support for chips based on ARM's architecture inside Ubuntu 11.10. –**PC**

Go Ubuntu Unity is a great theme for the Go Launcher Ex Android app.

It's Official: Mobile Flash Sucks

There's one thing we've long agreed with Steve Jobs on: Adobe Flash sucks.

It appears that Adobe finally agrees, too—at least regarding the mobile version of Flash. Adobe announced it will stop developing its Flash mobile plugin, as well as TV support for it, in favor of HTML5.

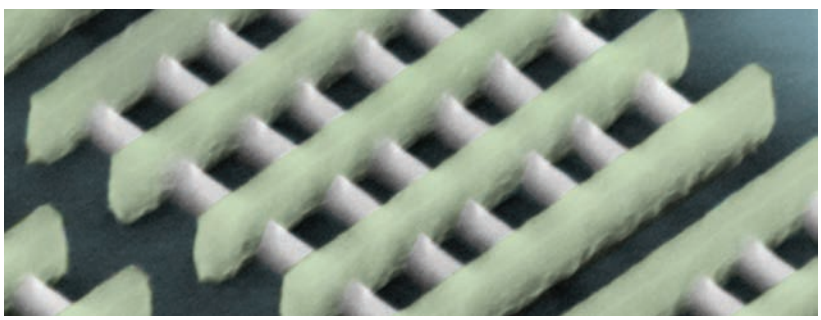
Adobe made the abrupt about-face after years of trying to squeeze Adobe Flash onto low-powered mobile devices and television sets. That's no easy feat considering that, at times, Flash would cripple even more powerful desktop PCs. Flash's fate on mobile was likely sealed when Steve Jobs declared a fatwa on the plugin for the iPad and iPhone. Adobe says that going forward, it will concentrate on HTML5 as well as AIR applications for mobile devices.

While Adobe is committed to Flash for desktops and laptops, many question how long that will last, as consumers turn more and more to tablets and phones for general browsing. –**GU**

Expect Ivy Bridge No Earlier than March

The doomsday clock is already ticking on Intel's spiffy Sandy Bridge processors. Ivy Bridge, the slimmer, trimmer 22nm next-generation processors, are barreling down so fast that you can already pick up motherboards that accommodate Ivy Bridge's PCIe 3.0 support. Intel only says "early 2012" for Ivy availability, but one source claims to know more.

DigiTimes (and its as-always anonymous sources) reports that Ivy Bridge will hit the streets no earlier than March. The same sources claim that quad-core Ivy Bridge processors will use just 45W, 65W, and 77W of thermal design power, thanks to Intel's energy-efficient tri-gate transistors (pictured below); dual-core processors will run at 35W and 55W. –**BC**



Quinn Norton
Byte Rights

THE CRAPPY HOUSE REMIX

EVERY TIME a terrible bill like COICA or PIPA gets exposed for what it would actually do to the Internet, large rights holders reinvent it slightly, lay some bad dubstep over it, and call it something you can dance to.

This time it's the Stopping Online Piracy Act—SOPA for short. SOPA is a bill coming out of the House that is a compliment to the Senate's PROTECT-IP abomination. It's entirely unlike PROTECT-IP, in that while it does all the same things and worse, it phrases them differently... so you won't notice.

SOPA has done away with PROTECT-IP's "blacklist," after realizing Americans don't really like blacklist censorship. Instead, SOPA allows the attorney general to cut off sites from the Internet by prohibiting them in some sort of non-list document. Since that's not a blacklist, it doesn't need any judicial review. Prohibited sites would be arranged in a tag cloud of some sort, and DNS providers would be required to not show them to you.

SOPA goes on to ban advertisers and credit card processors from doing business with sites dedicated to copyright infringement. Whether a site is dedicated to infringement is helpfully determined by what the guy filing the legal nastygram thinks looks like a site dedicated to infringement, without any law enforcement getting into the act, much less judges. The law calls this the "market-based approach." This provision could not possibly be abused as much as the infamous DMCA take-down notice, a provision used more to hobble competition and speech than protect copyright, according to a Google study, because I heard recently that all the bad people left the Internet.

This bill may let corporations and government break the Internet, but don't worry, because they've put out press releases promising they would never do anything like that.

Quinn Norton writes about copyright for Wired News and other publications.

Flexible Screens Come to Samsung's 2012 Gadgets

Samsung has announced that its 2012 lineup of mobile gadgets will include flexible screens—initially hitting phones, and eventually tablets. Though this is an exciting prospect, Samsung had little more information to give; we don't know which phones will include the technology first, or whether or not the screens will be able to stand up to Samsung's touted AMOLED screens used in phones like the Galaxy Nexus.

Samsung's interest in the screen innovation probably stems from its purchase of Liquivista, a screen developer that focuses on making flexible screens that are bright and consume little power. For now, only time will tell whether or not flex-screens are the next step in the ever-developing world of smartphones. **–AF**

Brits Build Biological Logic Gates

After a team at Imperial College London demonstrated logic gates made from harmless bacteria and chemicals in October, science took one step closer to presenting humanity with Kurzweilian living computers that could keep our bodies healthy from the inside.

Researchers modified the DNA of E. Coli bacteria and reprogrammed it to perform "on" and "off" switching when stimulated by chemicals, mimicking an electronic AND gate. A different experiment resulted in a NOT gate, and the scientists combined both gates into a NAND gate. These biological gates perform more like electronic gates than previously demonstrated, and their modularity bodes well for making more complex biological processors in the future.

While still a long way off, microscopic biological computers could include sensors that detect cancer cells, toxins, harmful plaque in the bloodstream, etc., and then neutralize those dangerous elements. **–MR**

Windows 8 Watch

Windows 8 Accepted by IT Pros and Gadget Makers

With Windows 8 expected to show up on machines in time for the back-to-school season of 2012, we're keeping a close eye on the industry anticipation for the OS. For example, a recent InformationWeek survey of 973 IT professionals found that 52 percent of their employers already had definite plans to adopt Windows 8.

While Windows 8 PCs are a given, one of the leading Android tablet developers, Asus, is planning two Windows 8 tablets to hit in Q3 of 2012, according to a presentation at the Asus 2011 Investor Conference. No further details were given.

Though ITG is not a PC giant like Asus, the obscure Taiwanese component maker nonetheless has announced its xpPhone 2, a 4.3-inch smartphone that will initially run Windows 7 when it launches in 2012 but will also support Windows 8 when that operating system arrives. The xpPhone 2 sheds bulk while improving on the battery life of its predecessor and has a 1.6GHz Intel Atom Z530, 2GB RAM, and 112GB of solid-state storage. **–MR**

THE LIST

8 GREAT WEBCOMICS FOR GEEKS

8 PENNY ARCADE

This geek favorite started as a video game comic but has become so much more.
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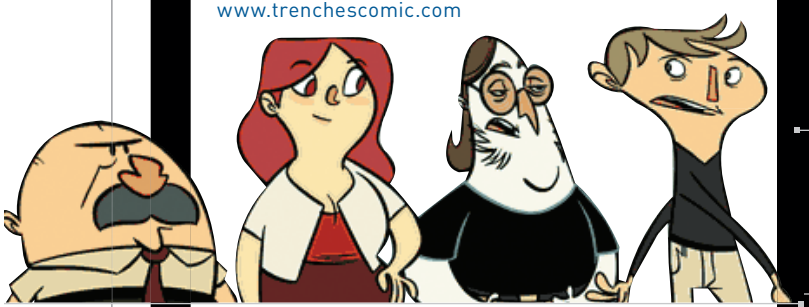

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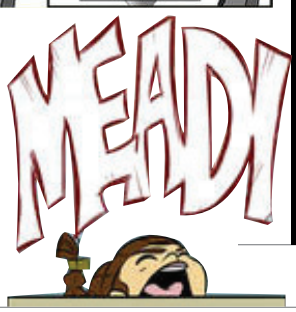

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HEAD TO

BY BRAD CHACOS

Amazon Prime vs. Netflix

Remember when Netflix and streaming video were virtually synonymous? Yeah, those were the days. Then, in the course of three disastrous months, Netflix jacked up prices by 60 percent, announced it was splitting off the DVD business, and then announced that, no, actually, it was going to keep DVDs in house after all. The wacky moves sent investors fleeing like rats and confused customers looking for alternatives—alternatives like Amazon Prime Instant Video. The service offers unlimited streaming, and Amazon has signed several new content deals since Prime Instant Video's launch last March. But is it a Netflix killer? Let's find out.

Round 1: Catalog

When it comes down to it, it's all about the content. Who has more of what you want? It's not really much of a contest at this point, unfortunately. Although Amazon offers a massive 100,000 programs for download à la carte at $2 to $4 a pop, only around 10,000 of those are available for unlimited free streaming via Amazon Prime. Netflix plays coy with the exact number of its streaming offerings, but we've found estimates ranging from 30,000 to 45,000 titles. Most titles available on Amazon are also available on Netflix, but not vice versa.

Winner: Netflix

Round 2: Pricing

Neither Netflix nor Amazon Prime breaks the bank. As everyone probably knows from the price-hike outrage of a few months ago, a streaming subscription to Netflix costs $8/month for all the video you can watch. Amazon Prime Instant Video costs even less on a monthly basis—about $6.66 (ooh, spooky!) a month—but that's kind of deceptive; you'll have to pay a flat $80 up front to purchase a year's subscription to Amazon Prime. But that $80 also includes free two-day shipping on many Amazon purchases, as well as access to Amazon's new e-book lending library for Kindle devices. Both services offer a free one-month trial.

Winner: Amazon Prime

Round 3: Image Quality

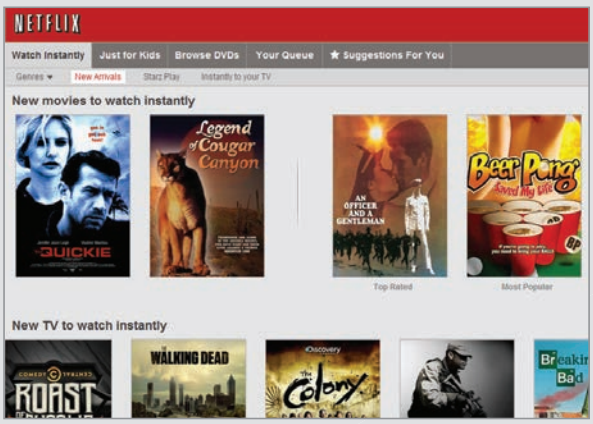
It's kind of hard to make a call on image quality because the speed of your Internet connection makes such a drastic difference. Netflix offers more HD content in general. In a head-to-head viewing test of "Broken Bow" from Season 1 of *Star Trek: Enterprise* in HD, Netflix' image quality looked slightly better overall and ran much more smoothly. We ran into repeated issues with Amazon Prime constantly bouncing our connection speed from the minimum to the maximum rating and back again, which resulted in stuttering playback and reduced image quality. Netflix (and Speedtest.net) didn't suffer from the same problem.

Winner: Netflix

Round 4: Device Compatibility

Amazon Instant Video (which Amazon Prime utilizes) certainly works on plenty of devices, including more than 200 Internet-enabled HDTVs, tons of Blu-ray players, the Roku, the Logitech Revue, and—soon—the $200 Kindle Fire tablet. Even still, that's just a fraction of the devices supported by Netflix. In addition to HDTV and Blu-ray device support, Netflix ups the ante by streaming to home theater systems; Android, iOS, and Windows Phone 7 smartphones and tablets; tons of set-top boxes (like the Boxee Box and Apple TV); and all the major video game consoles—including Nintendo's 3DS handheld.

Winner: Netflix



Netflix' recent PR missteps have consumers contemplating their streaming options.

Amazon Prime offers unlimited streaming (and free two-day shipping with Amazon purchases!) for $79 a year.

Round 5: Future Prospects

Let's get the bad part out of the way first: In February 2012, all Sony and Disney movies will disappear from Netflix. Since the news broke, however, Netflix has inked deals with DreamWorks, the CW, and AMC and says it plans to expand its TV programming. Amazon has deep pockets and recently signed contracts with Fox, CBS, and NBC to bring more content to its service. It's looking like TV content providers might be more willing to dance with digital media than movie companies are, at least in the short term.

Winner: Tie

And the Winner Is...

Don't get us wrong, Amazon Prime Instant Video brings plenty of stuff to the table: Its catalog and device support are nothing to sneeze at, and it's technically cheaper than Netflix over the course of a year. Unfortunately for Amazon CEO Jeff Bezos, though, everything that Amazon Prime Instant Video does, Netflix does, too—and Netflix does it better. (Amazon's lack of a play queue doesn't help things, either.) Amazon Prime is doing great things for a streaming service that's less than a year old, but **Netflix** is still king of the hill.

NETFLIX

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

>Overclocking Basics
>How Cool is Cool?
>The Throughput Myth

Manual Overclocking

I just upgraded my AMD Phenom 2 965 BE CPU to a Phenom 2 1100T CPU. I'm having a few problems trying to manually overclock it in the BIOS of my MSI 890FXA-GD70 motherboard. How do I change the various voltages if the only setting in the BIOS is Auto? Also, I just want to overclock the CPU, not the RAM. Which voltages should I change? Should they be higher or lower?

—Keith Brooks

THE DOCTOR RESPONDS: It's been a while since the Doc had an 890FXA-GD70 up and running, but changing the voltage should be fairly simple. Go to the VDD field that's set to Auto and use the plus and minus keys to change the voltage. You should also be running the latest BIOS, if you haven't already updated it. You will probably want to increase the setting for either "Adjust CPU FSB Frequency" or "Adjust CPU Ratio." Tweaking the CPU FSB should increase the DRAM clocks, while the CPU Ratio should leave the DRAM alone. If you want to keep your DRAM within spec while doing a front-side-bus overclock, simply change the "FSB/DRAM Ratio" until the frequency is at the desired clock.

If you decide you want to set it back to auto, simply go to that field and type "auto." Generally, adding voltage, not lowering voltage, is the key to achieving higher overclocks. Be advised: Overclocking can be hazardous to equipment on occasion. The hazard potential increases as you add voltage to the chip, so don't add tons of voltage without knowing the risks.

Arctic is Cool Enough

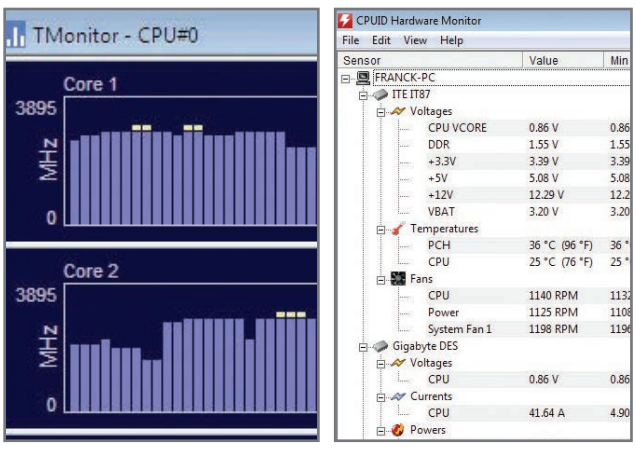
I need help selecting the right cooler upgrade for my CPU and have a question regarding thermal values for CPU coolers. I have been shopping around for a CPU cooler for my Core i7-960. When I built the computer, I used the stock cooler that came with my boxed processor, but I don't think it's good enough anymore. I understand that the CPU gives off heat, but I don't really understand how heat ratings of processors are figured out. Not many cooler manufacturers advertise the cooling capacity of their products. I could only find the Arctic Cooling Freezer 13 Pro's cooling capacity listed at 300 watts. How much heat will my processor give off when using the overclock features, and how do I know what is effective cooling capacity for my Socket 1366 processor? I want to use the higher CPU boost features of my Gigabyte EX58-DS4 when I'm playing games or running my Cubase music program.

Right now my clock cycles seem to slow down when running the processor beyond 50 percent using Hyper-Threading with my stock cooler. Because of limited space in an HTPC case, I have everything in a 4U server chassis, and it has five fans: one 12cm high-velocity fan in front, two 8cm on top for intake, and two 8cm exhaust at the back. I don't think airflow is affecting it, but I'm really not sure.

—Christopher Leach

THE DOCTOR RESPONDS: You can find out the total design power (TDP) of your CPU from the manufacturer's website. Your processor, at stock voltages, has a TDP rating of 130W, so the Freezer 13 Pro is more than capable of cooling it.

The stock cooler for your processor should be more than enough, even when using Turbo Boost, provided that it's seated correctly and the thermal paste is still there. You say your CPU seems to be throttling under load; the best way to determine that is to download TMonitor and HWMonitor



CPUID TMonitor displays clock speeds for each core of the Intel Core 2, Core i3/i5/i7, or AMD K10 processors, while HWMonitor tracks key hardware indicators such as voltages, temperatures, and fan speeds.

↘ submit your questions to: doctor@maximumpc.com

from www.cpuid.com and run them both while you're using your computer. TMonitor tracks your clock speeds, and HWMonitor tracks your temperatures. This way you can see if your CPU is throttling under load, and if so, how hot it's getting. Most Core i7 CPUs will clock themselves down if they get higher than 90 C to prevent damaging the CPU.

If you find your processor is throttling, check to see if the case is getting enough airflow. Even though it has plenty of fans, you might not be getting enough air in there. They could also be clogged with dust or pet hair. You should also try removing your CPU cooler, cleaning off the heat exchanger, applying new thermal paste, and reseating the cooler. It's not a bad idea to do that every few years. The Doctor suggests Arctic Silver 5 thermal paste.

As far as new coolers go, we always recommend Cooler Master's Hyper 212 Plus. It costs just $30 and can handle decent overclocks. It's also far superior to the stock cooler at stock speeds.

Second Drive on XP

I have built a new system based on the MSI 890FXA-GD65. I am currently rocking XP but will be going to Windows 7 and a new hard drive when my budget allows. My question is: After I install Windows 7, can I still run my current hard drive with XP as a secondary drive?

—RJ Lang

THE DOCTOR RESPONDS: Yes, you can certainly access the files from your Windows XP drive (so long as they're not encrypted) by running it as a secondary drive. Windows 7 may ask you to change permissions, which you should approve.

Through with this Throughput

I just bought the Netgear WNDR3700 router, and I'm getting really low transfer speeds. I bought a new PCIe Wireless N card and one USB Wireless N dongle. Both are rated at 300Mb/s up/down on the 2.4GHz wireless-N band. At best, from PC to PC, I'm getting no more than 2.8Mb/s (on a good day). If I transfer to the hard drive connected to the router, I can get 30Mb/s. If I transfer to my WD TV Live Plus that's connected by Ethernet, I get 17Mb/s at best. I've updated all drivers for the card and dongle, updated router firmware, and changed to a channel that has less interference. I even went through all the router settings and compared them to what is recommended on the forums. Please save me from having to go to power-line networking!

—Tom Jenkins

THE DOCTOR RESPONDS: The 300Mb/s ratings that router and client adapter manufacturers love to tout is a theoretical maximum that cannot be achieved in reality. When we're testing routers, we're impressed if we can get TCP throughput that's half that fast, and that's when the client and router are in the same room. It's difficult to tell if the performance you're seeing is reasonable or not because you haven't told us how much distance separates the router from the client and how many obstacles (walls, appliances, and so on) separate the client from the router, what materials your home is made from (sheetrock, brick, etc.), or if the router and client are on different floors.

The transfer speeds you're reporting for storage attached to the router and to the WD TV Live Plus do sound reasonable, since these devices use USB 2.0 interfaces. If, as you say, you've tried all the typical wireless networking optimizations, and you're still not satisfied with your PC-to-PC file transfers, and you don't want to string Ethernet (the absolute best solution), then why not give power-line networking a shot? The technology has improved by leaps and bounds over the past few years.

> THE DOC'S GUT FEELING IS THAT THE PSU IS THE PROBLEM

Epic Fail

I have a BIOStar TA890GXB HD motherboard with an AMD Athlon II X4 640, two 2GB G.Skill DDR3/1600 RAM, an MSI GTS 450 GPU, a 1TB Samsung HDD, and a 585W PSU that came with the case.

I built this system last year, and had problems with Driver IRQL BSODs, but then a local maintenance shop fixed the loose connectors. For around three months, the system ran beautifully with games like Modern Warfare and Borderlands. Then the problems came back, starting with video freezing and sound being garbled and repeated during extended use. The problem then turned into auto resets when under a system load. Then BSODs came back, first under heavy system loads, and later at anytime. The PC didn't respond to any fixes. Around that time, I bought another 1TB hard drive, and reinstalled Windows 7 and Ubuntu on two of three partitions created using the GParted Live tool. I saw no problems for around a week, but then the BSODs started again, and not just under a system load. I reinstalled Windows, and the problem persisted. So I started going into Linux because with it, I wouldn't need to worry about driver incompatibility.

Then the Linux problem started: a hard video freeze, audio looping, and other issues. The only way to get out of it was to reset. I have tried drivers from the CDs, websites, and older versions; flashed the BIOS to previous stable versions; ran Memtest 86+; moved around RAM, removed the GPU; used different CPU coolers; changed timings and speeds; used a desk fan blowing into the case, another PSU, different monitors with different outputs, and nothing solves it.

DeBugIt tested the hardware and told me it all passed, but it couldn't say anything about the PSU. All four of my PSUs had the same results on Dell PSU tester. My main PSU is 585W, and the others are all around 300W. Antec's PSU calculator said I needed a minimum of 289W with my GPU installed. BIOStar tested the mobo and said it ran fine for 24 hours and passed all its tests.

—Joshua Walton

THE DOCTOR RESPONDS: It sounds like cooling is not an issue, but you definitely have a hardware problem. The Doc's gut feeling is that the PSU is the problem. It's a "free" PSU, which means it might be a sticker PSU—that is, it's 585W on the sticker only. The guts are probably a good bit lower. However, you have swapped out the unit for another and still had problems. You also seem to have ruled out the RAM as the problem. In this case, you should consider running the RAM at a lower clock speed—say, 1,333MHz—until you can pinpoint your problem. Also, BIOStar isn't a top-notch kit, but the company has already "tested" it without issue, so that really just leaves the CPU.

As rare as it is for a chip to fail, it does happen, and way, way back, the Doc had an AMD 486 chip with bad cache, of all things. So it can happen. You may want to consider contacting AMD for a warranty claim on the CPU. Have your original AMD heatsink fan handy, as the CPU's serial number is on there.


CORSAIR

HOW TO SET UP A NEW PC —THE RIGHT WAY

BY MAXIMUM PC STAFF

WHETHER YOU JUST BUILT OR BOUGHT A NEW PC, IT PAYS TO **OPTIMIZE YOUR SETUP** FROM THE START

NOTHING HOLDS MORE promise than a brand-new PC. The hardware is fresh and full of potential, the OS is clean and clutter-free, and you have nothing but pure, unadulterated storage space awaiting your precious data. It's an exciting time, indeed. But before you start dumping old files onto your new rig willy-nilly, and downloading every shiny bauble of an app that catches your eye, take some time to consider a more measured approach to moving in. After all, you only have this opportunity once.

The way you set up your new PC now will have a lasting impact on your experience over time. Do it haphazardly, and your experience will be plagued by disorder and regret. Do it thoughtfully, though, by following the course of action we prescribe on the following pages, and you will have a machine that's primed and ready to meet your every need from the start.

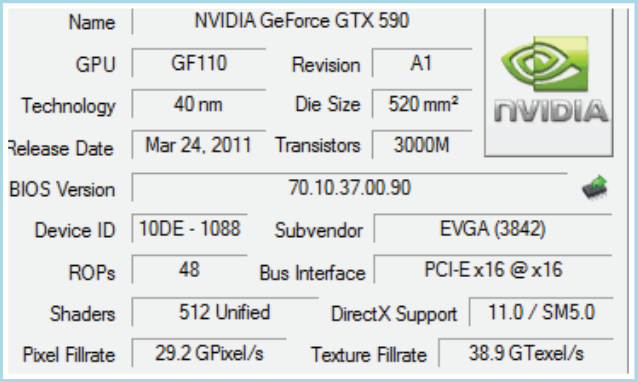
CHECK YOUR SPECS

If you've just built your rig or unboxed a sparkling-new PC, it's always a good idea to verify the hardware specs to make sure all parts are actually performing as they should be. We've seen simple BIOS misconfigurations downclock chips by hundreds of megahertz.

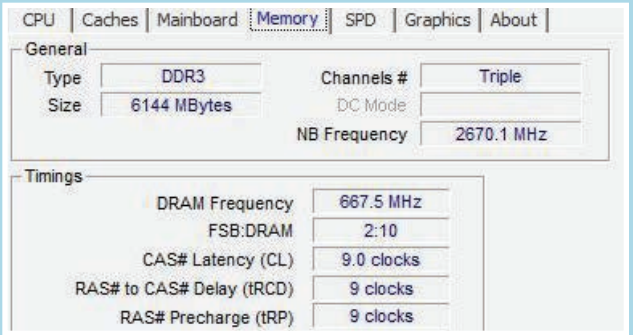
First download CPU-Z (www.cpuid.com). This excellent free utility will query your CPU and report the model number, cache size, and clock speed of the chip in real-time. To test your CPU's speed, put a load on it using, say, Prime95 (www.mersenne.org/freesoft) and run a stress test. CPU-Z should report the correct clock speed for your chip. While you're here, pull up Task Manager by hitting Ctrl+Alt+Del. Select the Performance tab and make sure that each of your cores, virtual or real, is represented. Believe it or not, we've seen Hyper-Threading turned off occasionally on some systems.

Turn off Prime95, but keep CPU-Z open. Click the Memory tab. You should see the memory frequency reported under DRAM Frequency. This is the base clock, so you should double it to get the frequency of the RAM. For example, if your DDR3/1600 is reporting as 667, your RAM is actually running at DDR3/1333 speed.

CPU-Z will also report graphics speed, but we prefer GPU-Z for more detailed info. Download it at www.techpowerup.com/gpuz. GPU-Z will generate a CPU-Z-like interface. Pay particular attention to the default clock speed and memory speeds for your GPU. If you paid for an overclocked GPU, check that it is running at the speeds you paid for. GPU-Z will also tell you if SLI or CrossFireX is enabled or not and also at what speed the PCIe slot is running. Yes, it's possible that a new machine will have the GPU running in a slower slot, which may impact performance.



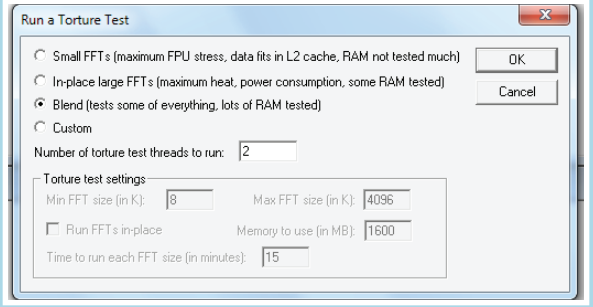
TechPowerUp's GPU-Z will tell you what speed the PCIe is running at.



Inspect CPU-Z's memory tab to see if your RAM is configured correctly for double- or triple-channel, and that the frequency is set to the level you paid for.

STRESS IT OUT

If a component is going to fail, you want it to fail while it's under warranty. For CPU stress tests, we prefer the free Prime95 (www.mersenne.org/freesoft). Just download it and run the in-place stress test. A properly configured and cooled stock-clocked system should have no problem running Prime95 for hours on end. For GPU stress testing, FurMark (www.ozone3d.net/benchmarks/fur) is still quite popular, or you can run Unigine's Heaven benchmark (www.unigine.com) in a loop for a few hours. Keep in mind that stressing the GPU will also stress your PSU and cooling, so any shortcomings may crop up there, as well.



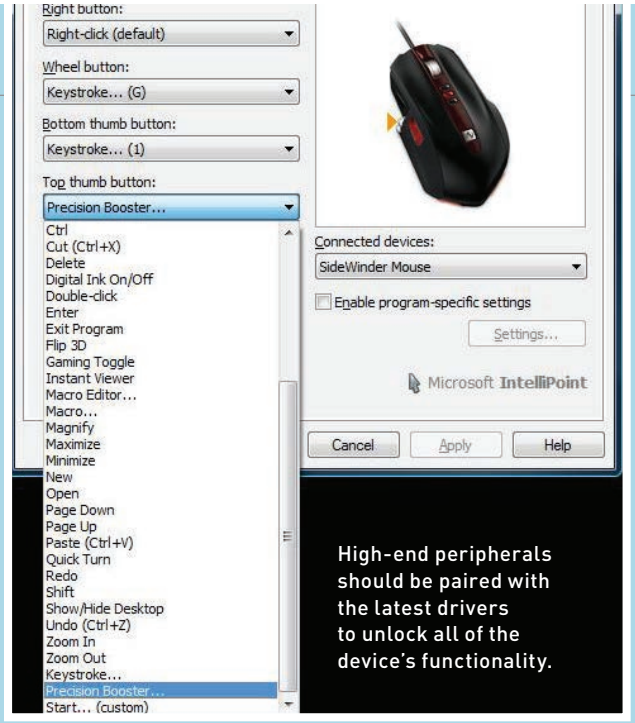
Any new PC should be able to run Prime95 for at least a few hours without issues.

RTFM

Did you know your motherboard has a special USB port that allows you to make BIOS updates without a CPU being installed? No? Well it's right there in the frakking manual. One of the first things you should do with your new machine is to read the documentation, particularly the motherboard manual, that came with it.

STORE YOUR EXTRA PARTS

Once you're done building a new PC, collect the extra modular power cables, drive rails, special sound-dampening drive screws, and put them in one place. You could even store the extra parts in your case, as long as there's room to spare and it won't block airflow. You won't thank us now, but you will in three years.



High-end peripherals should be paired with the latest drivers to unlock all of the device's functionality.

GET DRIVERS IN ORDER

If you installed the drivers from the disc that came with your motherboard, your drivers are already way out of date. Any new PC should be paired with the freshest drivers available for the platform, as updates can add performance, enhance compatibility, and fix the wonkiness that usually occurs with the first drivers to ship. The freshest drivers are usually available directly from the manufacturer of the component, so the best source for updated drivers for an AMD motherboard is AMD. If you're running a fancy gaming mouse or keyboard, you'll also want to install the matching drivers for them. These drivers unlock the full functionality of the mouse or peripheral beyond the built-in Windows 7 HID drivers.

Thanks to AVG's free AV app, even cheapskates can be safe from malware.

SET UP YOUR SECURITY

There's no point in taking the time and care to set up a new PC just right if you don't also make security one of your first priorities. Otherwise, it's just a matter of time before some form of malware gets in your system and mucks up the works, possibly even requiring a reinstall. Our Holiday issue antivirus roundup found Norton Internet Security 2012 ($70, www.norton.com) to be the best AV suite for purchase, while AVG Anti-Virus Free 2012 (www.avg.com) proved to be a very capable free solution. Before you do anything else, do this.

PREPARE FOR DISASTER

With Windows 7, everything you need for data backup and system repair is right there in the OS. Combine that with a large hard drive, and you have no excuse not to establish a full-fledged data recovery plan. With a secondary drive in place (either internal or external), head over to Control Panel, then System and Security, then Backup and Restore. Choose Backup Your Computer, then Set up Backup. Select the drive that backups will be saved to, choose the files to be saved, and set a schedule. Next, choose the option to Create a System Image, an exact copy of your drive—OS, system settings, program files, etc.—to use in the event your drive fails or your system stops working. Finally, opt to Create a System Repair Disc. This disc will save your bacon should your machine not start, allowing you to boot your computer from the optical drive and then retrieve the system image and backups you've dutifully created.

DECRAPIFY YOUR PC

When you build a new PC, you have full control over the software that gets installed. Not so when you buy a system, which is practically guaranteed to host a number of apps you have little use for, or that slow your PC's performance, or that constantly pester you with pop-ups. Get rid of that crap with PC Decrapifier (www.pcdecrapifier.com). The free tool walks you through the process of removing unnecessary programs, startup items, and icons.

TRANSFER YOUR FILES, EASILY

It's time to sully that pristine PC with craploads of junk from your old PC. Power users normally go manual by popping the old PC's drive into a spare SATA port on the new rig. This lets you pick and choose what's really worth moving. If you'd rather just do it on autopilot, check out Microsoft's free Easy Transfer utility. It's meant for newbies, but it can make the move to a new machine fairly painless. Run Windows Easy Transfer on your new PC (Start > All Programs > Accessories > System Tools), and it will give you options for the move: USB hard drive, the network, or an optional USB cable. The utility will ask you to insert a USB key where an executable will be installed. Run this executable on your old box, and it will package up all of the files into a single file that will be stored on an HDD or moved across the network to your new PC, where everything is unloaded into its proper place.

TIPS FOR TRICKIER FILE TRANSFERS

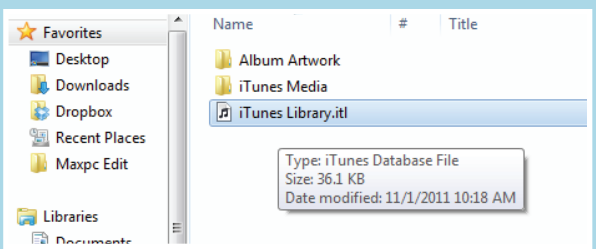
Moving documents from one computer to another is usually just a matter of copying-and-pasting onto an external hard drive and then to your new PC. That's fine for office docs and photos, but what about apps that build media libraries, like iTunes and Steam, or saved games, which go wherever the publisher feels like putting them?

iTUNES

If you're using an iDevice, you might be stuck with iTunes as a media manager. Here's how to move your music and other media (and keep your ratings, playlists, etc.) without having to rebuild your library.

First, open iTunes and go to File > Library > Organize Library > Consolidate Files. This will ensure that all your music is in one place. Once done, exit iTunes. Copy your iTunes folder, which should be under My Music (unless you've moved it) to your external drive. If you're decommissioning your old PC, be sure to deauthorize that computer from your iTunes account. Open iTunes again and go to Store > Deauthorize This Computer. Enter your Apple ID and password.

Install iTunes on your new computer, and then copy the iTunes folder from your external drive to the Music folder of your new computer. Next time you open iTunes, hold down Shift while you double-click the launcher. You'll be prompted to choose an iTunes library; look for iTunes Library.itl in the folder you just copied to your PC. You should now have your library, with ratings and playlists intact, on your new PC.



Hold Shift while launching iTunes to manually select your library file.

STEAM GAMES

On your old PC, go to your Steam folder (C:\Program Files\Steam, by default) and copy the steamapps folder and its contents to your external drive. On your new computer, install Steam and launch it once, then exit it. Go to the Steam folder and delete *everything* in it except for steam.exe. Now copy the steamapps folder from your old PC into the Steam folder on your new PC, and launch steam.exe again. After a brief self-update, Steam should show your games as installed. You'll have to do a quick file-verify as you launch each game for the first time, but that's a lot faster than downloading them all over again.

GAME SAVES

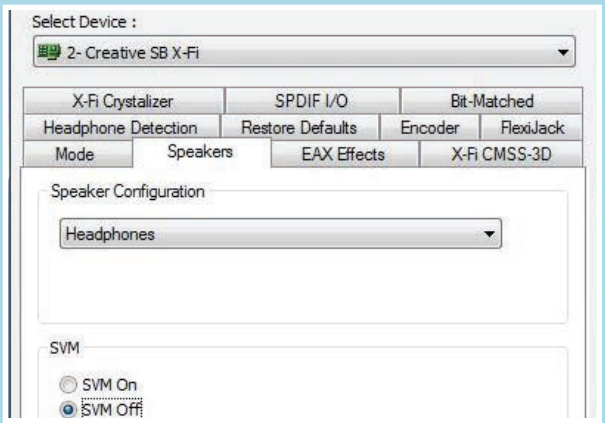
Not all your games come from Steam, and not all that do have Steam Cloud to manage their saves. And it seems every publisher has a different method of storing saved games. That's where GameSave Manager (free, www.gamesave-manager.com) comes in.

Run GameSave Manager on your old computer, and it will auto-detect the games you have installed, find out where the game saves are, and back them up, all via the Backup Gamesave(s) menu. Once you have a backup archive (a .gsba file), you can move it to your new computer and use GameSave Manager to automatically restore all your saves.

GameSave Manager hunts down all those weird game save directories and lets you back them up easily.

CONFIGURE AUDIO

By default, most motherboards and soundcards come configured for stereo speaker output. By default, most gamers today play with headphones. The problem is that most advanced audio cards feature algorithms tuned for the output mode. Cool features such as head-related transfer functions (HRTFs) and other filters that greatly enhance sound for headphones don't get used unless you set the driver accordingly. To do this, just dig into your soundcard's control panel and set the default to Headphones for the best experience.

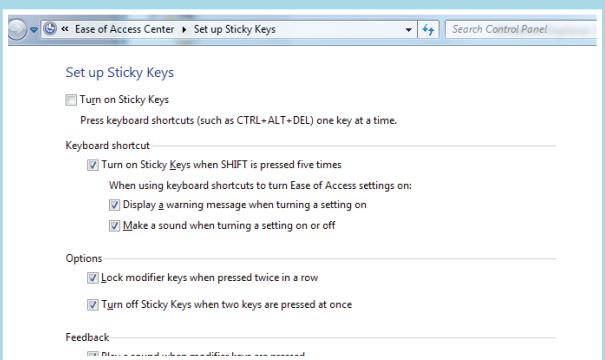


DISABLE ACCESSIBILITY SHORTCUTS

Windows comes with a host of accessibility features that can be a great help for people with disabilities or other difficulties using computer hardware. There are keyboard shortcuts for some of these options, but the shortcuts are easy to perform accidentally, and can pop up unwanted dialogue boxes. These shortcuts are:

> Press shift five times: StickyKeys
> Hold right-shift for eight seconds: FilterKeys
> Hold num lock for five seconds: ToggleKeys

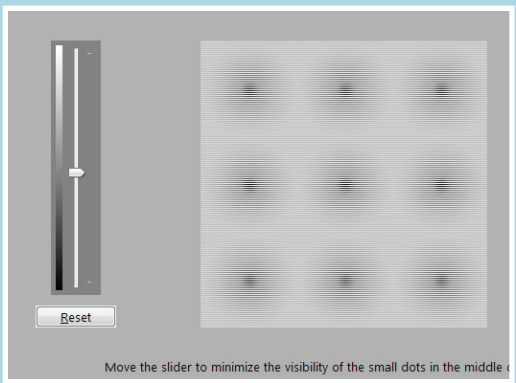
You can disable each shortcut individually by performing it, then choosing to turn off the shortcut, or you can disable them all in one fell swoop in Control Panel > Ease of Access Center > Make the keyboard easier to use.



CALIBRATE YOUR MONITOR

If you got a new display with your new PC (or if you've never taken the time to adjust your old monitor), it might be badly calibrated, degrading the image quality you see. For a quick-and-dirty fix, you can run the calibration software built in to Windows by clicking the Start button, then entering DCCW into the search bar. The program will run you through several simple calibration exercises, and adjust your monitor appropriately.

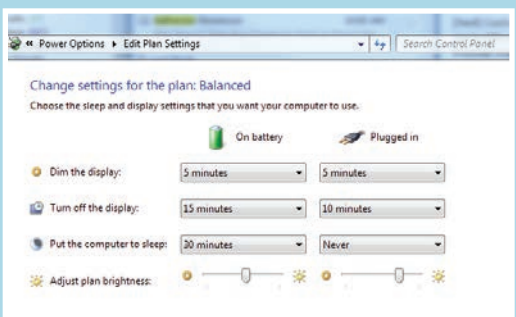
For a more thorough calibration, we recommend that you use high-quality calibration test images, such as those found at www.lagom.nl/lcd-test/.



ADJUST YOUR POWER SETTINGS

Whether you're looking to save the environment, or just your battery life, you should pay a visit to your new PC's power options. If you open the Control Panel, then select Hardware and Sound, and then Power Options, you'll see the available power profiles. You can select one of the available profiles, or change your screen's brightness from this menu, but if you want more control, you'll need to select a profile and click the link that says "Change plan settings."

A new menu will pop up, where you can change how long the computer waits before it dims the display, turns off the display, or goes to sleep. Even more options can be found by clicking the advanced power settings button.



SHARE FILES ON A NETWORK

If your new PC will be sharing a network with other computers running a version of Windows 7, you can create a Homegroup so they can all share files and devices (such as a printer). Be aware, however, that computers running Windows 7 Starter or Windows 7 Home Basic can join an existing Homegroup, but they can't create one.

To create a new Homegroup, click the Windows menu, choose Computer, and then click Homegroup in the left-hand column. Now click the button labeled "Create a homegroup" (you'll find it in the main window to the right). This will open a new window in which you can choose which types of files you'd like to share within the Homegroup (photos, music, video, etc.), and whether or not you'd like to share a printer. Click Next when you've made your decisions. After a few moments, a new window will appear with a 10-character, case-sensitive Homegroup password. Write this password down or print it.

To add your new PC to an existing Homegroup, obtain the password from any other computer in the Homegroup, click the Start menu, choose Control Panel, then Network and Internet, and then Homegroup. Windows will inform you of the existing Homegroup on the network and ask if you would like to join it. Click Join Now, choose the types of files you wish to share, and click Next. Enter the Homegroup password and click Next. You'll see a message indicating that you've joined the Homegroup, and when you click Network on either computer, you should see each of the other computers in the Homegroup and be able to move files between them.

If you'd like to share other folders within the Homegroup, right-click them, choose Share With from the pop-up menu, and then select either Homegroup (Read) or Homegroup (Read/Write).

CREATE A GUEST ACCOUNT

Say a friend wants to borrow your new computer to "check their email." You can limit the degree of access they'll gain (and damage they can cause) by turning on the Windows Guest account. Sign in using your administrator credentials, click the Start menu, and click the large icon at the top of menu. Click Manage Another Account, then Guest, and then click the Turn On button.

To switch to the Guest account, click the Start menu, then click the arrow next to the Shut Down button, and choose either Log-off or Switch User. Click the Guest button to log in as a guest. Guest users can launch programs and access the Internet, but they can't make Control Panel changes (including uninstalling software) or other changes to the computer's settings. They also can't access any files or folders protected by a password, and they can't access other computers on the network, even those within a Homegroup.

Activating your computer's Guest account is one of the easiest ways to grant someone limited access to your PC.

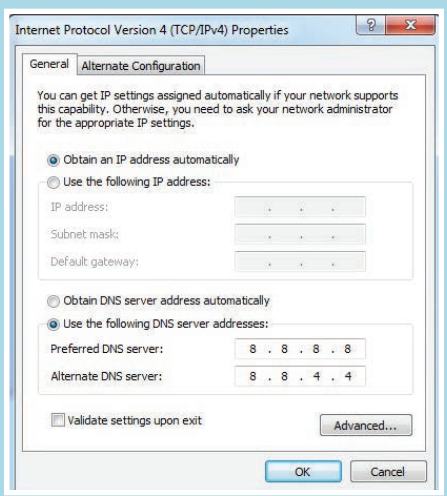
USE AN ALTERNATIVE DNS

Each time you type a hostname (such as www.maximumpc.com) into your browser and hit Enter, your computer initiates a DNS (Domain Name System) lookup. DNS is akin to a phonebook for the Internet: It converts that user-friendly name into the appropriate IP address. If you haven't configured your computer differently, you're probably relying on your ISP to perform these DNS lookups.

You might be able to speed up your web-browsing experience, as well as improve your online security, by switching to an alternative DNS resolution service, such as OpenDNS or Google Public DNS. We'll show you how to configure your Ethernet adapter to use the latter.

Sign on as an Administrator and click Control Panel, Network and Internet, Network and Sharing Center, and then choose Change Adapter Settings. Select which network connection you wish to change, right-click it, and choose Properties from the pop-out menu. On the Networking tab, choose Internet Protocol Version 4 and then click the Properties button. Choose the General tab and then Advanced. Click the DNS tab. If there are any DNS server addresses already in place here, write them down before erasing them and then click OK.

You should now be back on the General tab in the TCP/IPv4 Properties window. Click the radio button next to "Use the Following DNS Server Addresses" and type 8.8.8.8 in the Preferred DNS Server window and 8.8.4.4 in the Alternate DNS Server window. Click OK and close the Network Connections Properties window. Restart the network connection by right-clicking it and choosing Disable from the pop-out menu, and then right-click it a second time and choose Enable from the pop-out menu. This should restart your connection using the new DNS settings. To ensure your new settings are working, enter a hostname into your browser: www.maximumpc.com, for instance. If it resolves correctly, bookmark it, then click the bookmark. If it doesn't, roll back the changes you've just made and retest.



Many people find that switching to Google Public DNS delivers a faster web-browsing experience.

TIDY UP YOUR INSIDES

Your computer has a lot of cables inside, from front-panel connectors to SATA and power cables. If your case doesn't have a window, it might be tempting to just leave a rat's nest of wiring inside, but there are substantial benefits to an uncluttered chassis—better cooling and less dust, for example.

If you bought your PC from a boutique builder, it should have come with a decent wiring job, but if you built your own or bought an off-the-shelf system, there's likely room for improvement.

Many modern cases have cable-routing cutouts in the motherboard tray, and room behind it to route cables. You should route as many wires as you can behind the motherboard tray—usually your motherboard power cables, at least, can go back here. Route as many power cables from your PSU behind the motherboard and bring them back out near where they need to plug in; you can dramatically reduce clutter in your case this way.

If you don't have any cutouts in your motherboard tray, you can still use zip ties to keep your cables organized and out of the way. You can also buy stick-on organizing clips to keep your cables attached to your motherboard tray, not hanging out in the middle of your case.

If you have a modular power supply, disconnect (and keep in a safe place) any cables you're not using. If you don't, use zip ties to bundle unused cables together, and try to keep them out of the way of your fans' airflow.

Sloppy wiring can create pockets of hot air and dust in your case.

Routing cables behind the motherboard tray (if possible) can lead to a much cleaner and cooler build.

MUST-HAVE APPS AND UTILITIES

NO PC IS COMPLETE WITHOUT THESE KEY PROGRAMS

GOOGLE CHROME Google Chrome remains the single-fastest web browser out there. Couple that with exclusive apps and a fully customizable web interface, and you've got a browser that no PC should be without.
www.google.com/chrome

SECUNIA PSI Installing updates for all your software can be a tedious chore, which is why Secunia Personal Software Inspector is essential. Watch as it automatically updates programs in need, with no effort on your end.
www.secunia.com

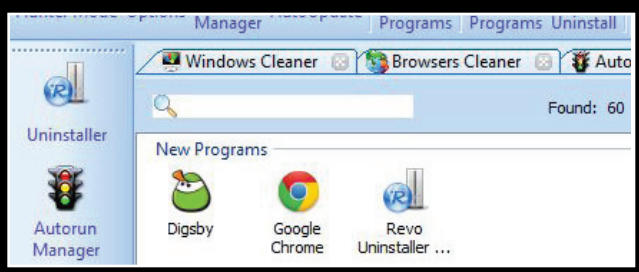
DROPBOX If you find yourself using more than one computing device daily, Dropbox makes it easy to share documents across all those devices, including smartphones.
www.dropbox.com

KEEPASS Using top-of-the-line encryption algorithms AES and Twofish, KeePass acts as a password manager, allowing you to store all your passwords (e.g., email, Facebook, online banking) in a single and secure database that can only be accessed by you.
www.keepass.info

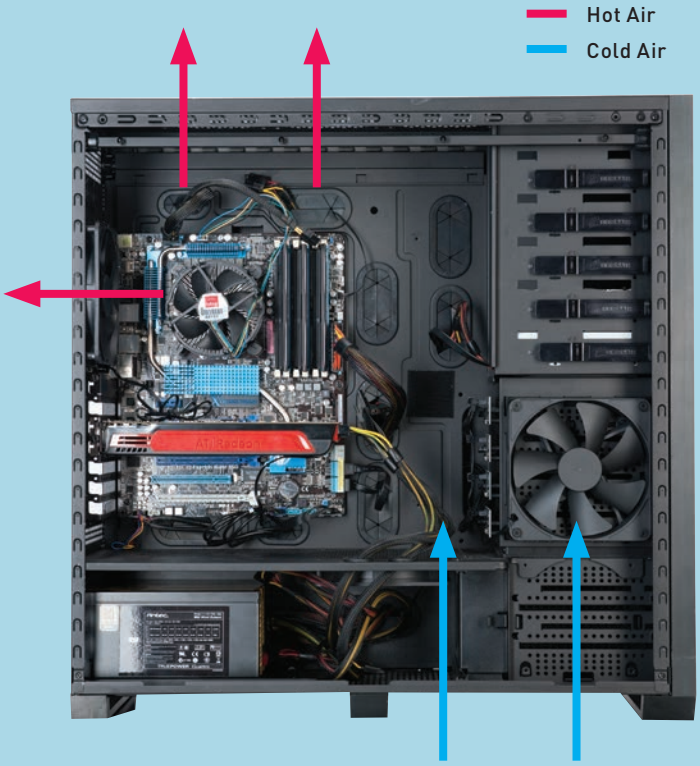
REVO UNINSTALLER These days, it's simply not enough to use Windows to uninstall your programs, as harmful remnants can be left behind. Enter Revo Uninstaller, a free app that not only uninstalls software, but allows you to manually remove additional data left behind.
www.revouninstaller.com

SKYPE Installing Skype allows you to talk face to face with anyone, anywhere, so long as they have the software and a webcam. Skype also allows you to set video conference calls, call mobile devices, and make international calls for additional fees.
www.skype.com

SUMATRA PDF Sumatra PDF is a free PDF creator and viewer



Revo Uninstaller



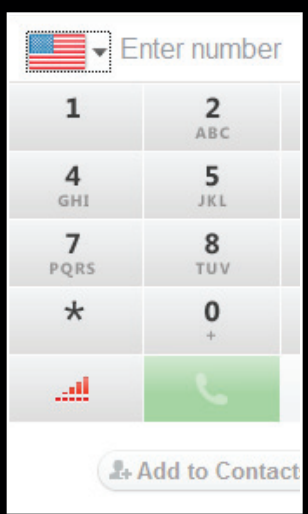
Provide a consistent airflow pattern for your case. Here, cool air enters at the bottom and exits through the top and rear.

OPTIMIZE YOUR FAN SETUP

Your components will last longer if they run at lower temperatures. They will run at lower temperatures if they have sufficient airflow. That's science.

Your case should have both intake and exhaust fans. You'll need at least one front intake fan and one rear exhaust fan. Many cases have additional intake fans on the front or left side, and additional exhaust fans at the top of the case. This helps keep hot air moving up and out of your case. You should have roughly the same number of exhaust fans as intake fans, and you should make sure they're in places that make sense, to create obvious paths for the air. Don't create dead zones where hot air can stay trapped. If your case has filters for its intake fans, clean them regularly. If not, dust inside your case regularly with canned air.

Many motherboards offer fan control in their BIOS settings; you can set your fans to ramp up when your system gets hot and ramp down when it's cool, or you can wire your fans to a fan controller and set their levels yourself. Most motherboard manufacturers also offer a desktop fan-control utility for use with their boards. Simple fan controllers just offer speed control; others, like NZXT's Sentry series, also include temperature sensors, which you can use to automatically control fan speeds based on the temperature of various parts of your system.



Skype

for Windows. It's a relatively small file, starts up extremely quickly, and is tremendously easy to use. It can also read XPS, DjVu, CBZ, and CBR files.
bit.ly/aHICnC

7-ZIP 7-Zip is a fast, free file archiver that can pack and unpack a huge range of files, from ZIP to TAR files. It features an extremely easy-to-use interface that presents users with all facets of the unzipped file, automatically organized by folders.
www.7-zip.org

FILEZILLA If you need to connect to an FTP server, FileZilla is the best way to go. It's easy to use and highly customizable—you can even configure your own transfer-speed limits and transfer up to 4GB of files.
www.filezilla-project.org

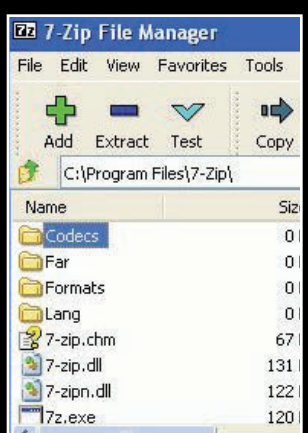
DIGSBY With Digsby you can consolidate all of your instant messaging accounts into one centralized hub, supporting AIM,

Digsby

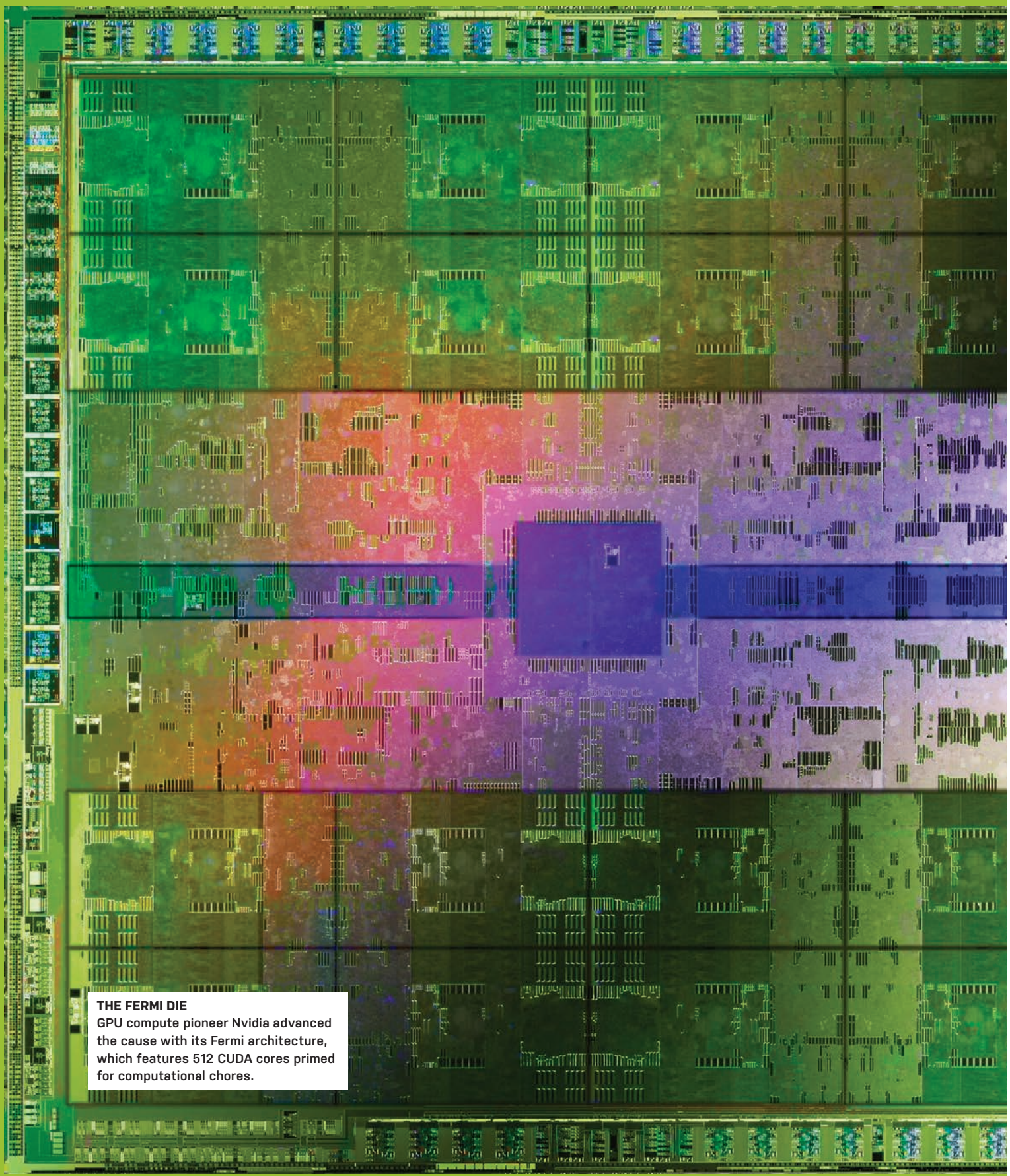
MSN, Yahoo, ICQ, and Google Talk. It's also a handy notification tool for personal email.
www.digsby.com

Malwarebytes Anti-Malware

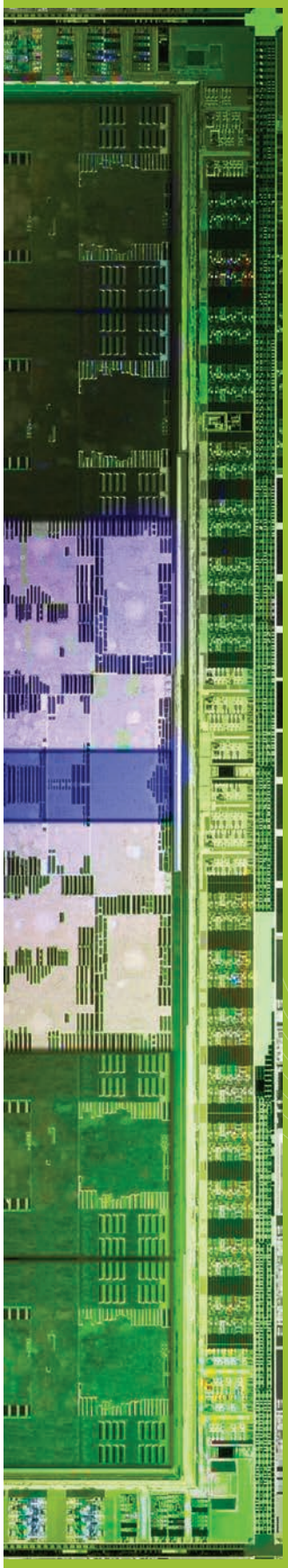
MALWAREBYTES' ANTI-MALWARE Yes, you already have an AV program (right?), but it never hurts to have a second opinion or line of defense. For us, that's Malwarebytes' Anti-Malware Free. It doesn't run auto scans, so it won't conflict with your other AV solution.
www.malwarebytes.org



SUPERANTISPYWARE You could say that SuperAntiSpyware is the third prong in our three-prong approach to PC security. Like Malwarebytes', it provides yet another line of defense. And it's free, so why not avail your PC of this extra layer of protection?
www.superantispyware.com



THE FERMI DIE
GPU compute pioneer Nvidia advanced the cause with its Fermi architecture, which features 512 CUDA cores primed for computational chores.



THE STATE OF GPU COMPUTING

By Loyd Case

MASSIVELY **PARALLEL COMPUTING** ENGINES INSIDE GPUS MAKE THEM IDEAL FOR A WIDE **RANGE OF TASKS** IN ADDITION TO GRAPHICS. BUT WHERE ARE THE APPLICATIONS?

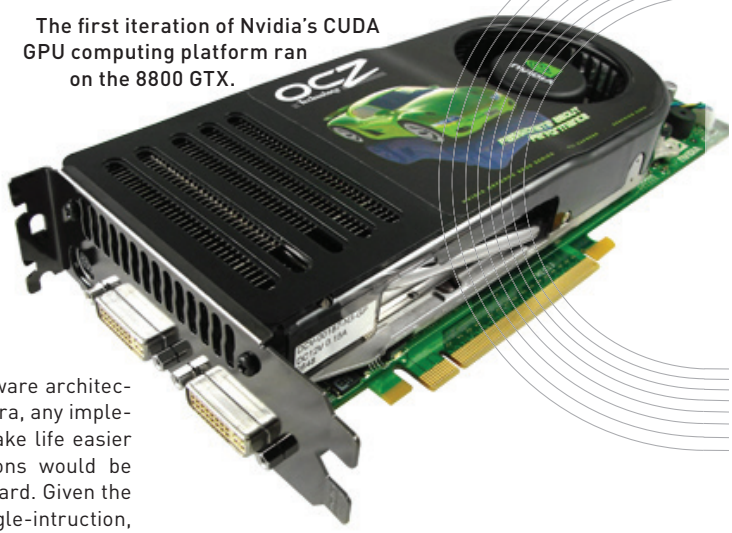
IN THE DARK AGES of PC gaming, the CPU took care of most of the graphics chores. The graphics chip did just the basics: some raster operations, dedicated text modes, and such seemingly quaint tasks as dithering colors down to 256 or 16 colors. As Windows took hold, the graphics equation began to shift a bit, with some Windows bitmap operations handled by "Windows accelerators." Then along came hardware like the 3dfx Voodoo and the Rendition V1000, and accelerated 3D graphics on the PC took off.

Now it's coming full circle. Today's GPUs are fully capable of running massively parallel, double-precision floating-point calculations. GPU computing allows the 3D graphics chip inside your PC to take on other chores. The GPU isn't just for graphics anymore.

GPU computing has its roots in an academic movement known as GPGPU, short for "general purpose computing on graphics processing units." Early GPGPU efforts were limited due to the difficulty of trying to get pre-DirectX 9 GPUs to work effectively with floating-point calculations. In the DirectX 11 era, GPU architectures have evolved, taking on some of the characteristics of traditional CPUs, like loops and branches, dynamic linking, and large addressable memory space, among others.

The new age of GPU compute is also more open. DirectCompute built into DirectX 11 supports all the major DirectX 11-capable hardware. OpenCL supports multiple operating system platforms, including mobile. We'll look at each of the major hardware manufacturers and APIs for GPU computing, as well as some applications that utilize the technology.

STATE OF THE HARDWARE



The first iteration of Nvidia's CUDA GPU computing platform ran on the 8800 GTX.

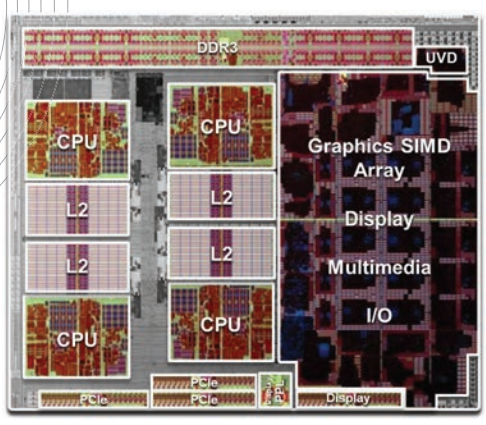
If we stick with GPU hardware, there are currently just two developers shipping GPU compute-enabled hardware: AMD and Nvidia. They'll soon be joined by Intel, however, with the integrated GPU in the upcoming Ivy Bridge CPU. Let's take a look at each of them in turn.

NVIDIA: TESLA AND CUDA

The first attempts at GPGPU used Nvidia GPUs. There were some early experiments with machine-vision applications that actually ran on very early GeForce 256-series cards, which didn't even have programmable shaders. However, efforts began to blossom when DirectX 9's more flexible programmable-shader architecture arrived.

Nvidia took note of these early efforts, and realized that GPUs were potentially very powerful tools, particularly for scientific and high-performance computing (HPC) tasks. So the company's architects began to think about how to make the GPU more useful to general purpose programming. Until then, GPUs were great for graphics, but trying to write applications that were more general was difficult. There were no loops or returns, for example, and shader programs severely restricted the number of lines of code permitted.

Part of the issue, of course, was the lock DirectX 9 had on GPU hardware architecture. Back in the DirectX 9 era, any implementation of features to make life easier for non-graphics applications would be outside of the DirectX standard. Given the raw floating-point and single-intruction, multiple-data (SIMD) performance, however, graphics processors looked like good candidates for certain classes of supercomputing tasks.



AMD is taking GPU computing mainstream by building in Radeon-class shader cores into the CPU die, as seen in this Fusion die shot.

In order to further the GPGPU movement, Nvidia created a more compute-friendly software development framework. CUDA 1.0, as Nvidia dubbed the architecture, was the first version of Nvidia's CUDA (Compute Unified Device Architecture) software platform. Programmers could now use standard C, plus Nvidia extensions, to develop applications, rather than have to work through the more cumbersome shader language process. In other words, general purpose apps didn't have to be written like graphics code. CUDA worked with 8800 GTX and related GPUs. That generation of graphics processors spawned the first products dedicated to GPU compute, the Tesla 870 line.

Since the early days of the 8800, Nvidia continued to build in architectural features to make the GPU a better general purpose programming tool. The goal isn't to make the GPU a replacement for the CPU. CPUs still excel at linear or small-scale multithreaded applications. However, GPUs are potentially excellent at large-scale parallel programming applications involving hundreds of threads operating on large volumes of separate but similar data. That programming model is ideal for a certain class of scientific and high-performance applications, including financial analysis.

It's significant that Nvidia positioned its latest Fermi architecture as a GPU compute platform before launching it as a graphics processor. The Fermi architecture brought substantial hardware enhancements to make it a better general purpose processor. These include fast atomic memory operations (which means a single memory location won't be corrupted by accesses from different functions), a unified memory architecture, better context switching, and more. Since Fermi's launch, Nvidia has also updated its CUDA software platform several times, which we'll discuss shortly.

Nvidia didn't just see GPU compute as something for oil exploration and academic computing. Nvidia acquired PhysX several years ago, discarding the dedicated hardware but keeping the broadly used physics API, so the GPU can accelerate physics calculations. The company has also worked with game developers to incorporate GPU compute into games, for water simulation, optical lens effects, and other compute-intensive tasks. Finally, it has worked with a number of mainstream companies like ArcSoft, Adobe, and CyberLink to enable GPU-accelerated video transcoding in both high-end and consumer-level video applications.

All the work of Fermi as a compute platform has paid off, as Nvidia's Tesla compute hardware sales topped $100M last year. Fermi doesn't get the attention that the desktop graphics or mobile processor divisions have been getting, but its existence has enabled Nvidia to remain at the top of the heap for GPU compute. Still, competitors are nipping at its heels.

AMD: THE MAINSTREAMING OF GPU COMPUTE

AMD was a little late to the GPU compute party, but it has been working feverishly to catch up. ATI Stream was the company's equivalent to Nvidia's CUDA. The first AMD FireStream cards for dedicated GPU compute were the model 580s, built on the Radeon X1900 GPU, which saw

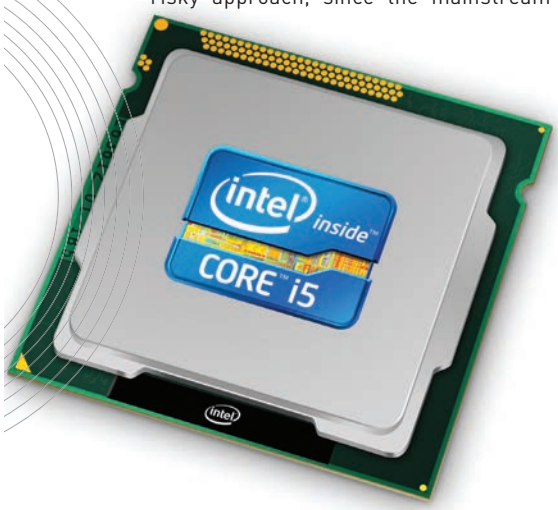
> INTEL'S UPCOMING IVY BRIDGE MAY CHANGE THE BALANCE

fairly limited pickup. It wasn't until the Radeon HD 4000 series shipped that AMD really had competitive hardware for GPU compute. The HD 5000 improved on that substantially. The latest Radeon 6000 series has significant enhancements specifically geared for general purpose parallel programming.

Philosophically, though, AMD has taken a slightly different road. At first, the company tried to mimic Nvidia's CUDA efforts, but eventually discarded that approach and fully embraced open standards like OpenCL and DirectCompute. (We'll discuss the software platforms in more detail next.)

Recently, AMD has shifted its GPU compute focus more to the mainstream. While AMD ships dedicated compute accelerators under the moniker FireStream, the company is trying to capitalize on its efforts to integrate Radeon graphics technology into mainstream CPUs. The Fusion APUs (accelerated processing units) are available in either mobile or desktop flavors. Even the high-end A3800, sporting a quad-core x86 CPU and 400 Radeon-class programmable shaders, costs less than $150.

AMD calls its approach to mainstream GPU compute App Acceleration. It's a risky approach, since the mainstream applications ecosystem isn't exactly rich with products that take advantage of GPU compute. The few applications that exist can run much faster on the GPU side of the APU, but the modest performance of the x86 side of the equation makes it difficult to compete with Intel's x86 performance dominance. AMD is betting that more software developers will take advantage of GPU compute, shifting the performance equation for the APUs.



The GPU in Sandy Bridge is fairly mediocre—except for the fixed-function video engine, which is purely awesome.

INTEL: BRIDGES TO GPU COMPUTE

Intel has been watching the GPU compute movement with some understandable concern. The company tried to get into discrete graphics with Larrabee, but that project died on the vine. The technology behind Larrabee is now relegated to limited use in some high-performance parallel compute applications, but you can't go out and buy a Larrabee board.

On the other hand, Intel has made waves with the integrated graphics built into its current Sandy Bridge CPUs. The Intel HD Graphics GPU is pretty average for Intel graphics, but the fixed-function video block is startlingly good. Video decode and transcode are very fast—even faster than most GPU-accelerated transcode. Of course, it's a fixed-function unit, so it isn't useful with non-standard codecs. But since a big part of the consumer GPU compute efforts from Nvidia and AMD focus on video encode and transcode, Sandy Bridge graphics stole a little thunder from the traditional graphics companies.

Intel's upcoming 22nm CPU, codenamed Ivy Bridge, may actually change the balance. The x86 CPU itself will offer modest enhancements to Sandy Bridge, but the GPU is being re-architected to be fully DirectX 11 compliant. When asked if GPU compute code could run entirely on the Ivy Bridge graphics core, the lead architect for Intel said it would. Performance is unknown at this point, but if Intel can couple a GPU core that's equal to the AMD GPU inside Fusion APUs with its raw x86 CPU capabilities, then it may signal a sunset on the era of entry-level discrete graphics cards.

THE API STORY

If you can't write software to take advantage of great hardware, you essentially have really expensive paperweights. Early attempts to turn GPUs into general purpose parallel processors were bootstrapping efforts, requiring programmers to figure out how to write a graphics shader program that would do something other than graphics.

As the hardware evolved, a strong need for standard programming interfaces became critical. What happened is a recapitulation of graphics history: proprietary technology first, then a steady shift to more open standards.

CUDA

Nvidia's CUDA platform was one of the first attempts to build a standard programming interface for GPU compute. Nvidia has always maintained that CUDA isn't really "Nvidia-only," but neither AMD nor Intel has really taken up the company's offer to accept it as a standard. Some of Nvidia's third-party partners, however, have chipped in, enabling support for Intel CPUs as fallback for some CUDA-based middleware.

CUDA started out small, consisting of libraries and a C compiler to write parallel-processing code for the GPU. Over the years, CUDA has evolved into an ecosystem of Nvidia and third-party compilers, debugging tools, and full integration with Microsoft Visual Studio.

CUDA has seen most of its success in the HPC and academic supercomputing market, but CUDA has a broader reach than just deskside supercomputers. Adobe used CUDA in Adobe Premiere Pro CS4, and later to accelerate high-definition video transcode and some transitions. MotionDSP uses CUDA to help reduce the shaky-cam effect in home videos. We'll highlight a few GPU-accelerated apps later in this article.

ATI STREAM

We'll just mention AMD's Stream software platform briefly, since AMD is no longer pushing it, choosing to focus instead on OpenCL and DirectCompute.

Stream was AMD's attempt to compete with CUDA, but the company obviously feels that the greater accessibility offered by standards-based platforms is more appealing.

DIRECTCOMPUTE

DirectCompute shipped with Microsoft's DirectX 11 API framework, so is available only on Windows Vista and Windows 7. It will also be available on Windows 8 when that OS ships. That means there's no support for DirectCompute on non-Microsoft operating systems. DirectCompute won't run on Windows XP, either, nor on Windows Phone 7 or the Xbox 360.

DirectCompute works across all GPUs capable of supporting DirectX 11. Today, that means only Nvidia GTX 400 series or later and AMD Radeon HD 5000 series or later. Intel will support DirectX 11 compute shaders when Ivy Bridge ships in 2012.

DirectCompute's key advantage is that it uses an enhanced version of the same shader language, HLSL, for GPU compute programming as it does for graphics programming. This makes it substantially easier for the large numbers of programmers already facile in Direct3D to write GPU compute code. It also runs across graphics processors from both AMD and Nvidia, giving it broad graphics hardware support.

On the downside, DirectCompute has no CPU fallback. So code specifically written for DirectCompute simply fails if a DirectX 11-capable GPU isn't available. That means programmers need a separate code path if they want to replicate the results of the DirectCompute code on a system running an older GPU.

OPENCL

Early on, OpenCL was developed by Apple, who turned over the framework to an open standards committee called Khronos Group. Apple retained the name as a trademark, but granted free rights to use it.

OpenCL runs on just about any hardware platform available, including traditional PC CPUs and GPUs inside mobile devices like smartphones and tablets. Care must be taken with code designed for multiplatform use, as a cell-phone GPU may not be able to handle the same number of threads as gracefully as an Nvidia GTX 580. In fact, Intel has even released an OpenCL interface for the current Sandy Bridge-integrated GPU.

Support for OpenCL has been quite strong. AMD is so enamored of OpenCL that it dropped its ATI Stream SDK in favor of a new Accelerated Parallel Processing SDK, which exclusively supports OpenCL. OpenCL has also come to the web. A variant of OpenCL, called WebCL, is in the prototype stage for web browsers, which allows JavaScript to call OpenCL code. This means you may one day run GPU compute code inside your browser.

On the other hand, OpenCL is still in its infancy. Supporting tools and middleware are still emerging, and for the time being developers may need to create their own custom libraries, instead of relying on commercially available or free middleware to ease programming chores. There's no integration yet with popular dev tools like Microsoft's Visual Studio.

THE API WARS

The GPU compute API situation today resembles the consumer 3D graphics API wars of the late 1990s. The leading development platform is CUDA. Despite Nvidia's protestations to the contrary, CUDA remains a proprietary platform. It has a rich ecosystem of developers and applications at this stage, but history hasn't been kind to single-platform standards over the long haul.

You could argue that DirectCompute is also proprietary, since it's Windows-only—and even lacks support on pre-Vista versions of Windows. However, Windows is by far the leading PC operating system, and DirectCompute supports all existing DirectX 11–capable hardware. That's where the support ends, however, since there's no version for mobile hardware, though we may see that change with Windows 8.

OpenCL offers the most promise in the long run, with its support for multiple operating systems, a wide array of hardware platforms, and strong industry support. OpenCL is the native GPU compute API for Mac OS X, which is gaining ground in the PC space, particularly on laptops. But OpenCL is still pretty immature at this stage of the game. There's a strong need for integration with popular development platforms, more powerful debugging tools and more robust third-party middleware.

CUDA	OpenCL	DirectCompute
Nvidia proprietary	Developed by a consortium led by Khronos Group	Developed by Microsoft
Oldest GPU compute platform software	Strong implementation on Mac OS X	Part of DirectX 11
Lots of support in high-performance computing	Available on most OS platforms	Graphics-like API
Available on multiple OS platforms	Runs on Nvidia, AMD, Intel (CPU). Intel GPU support in Ivy Bridge	Strong performance on Windows Vista, 7, 8
Mostly Nvidia H/W with CPU fallback		Runs on GPUs; no CPU fallback

This chart sums up the state of the GPU compute APIs in a nutshell.

THE APPLICATIONS STORY

To see what kind of strides GPU compute has made, we're going to focus on consumer applications, not scientific or highly vertical applications. GPUs should do well in applications where the code and data are highly parallel. Examples include some photography apps, video transcoding, and certain tasks in games (that aren't just graphical in nature.)

Musemage is the first photo editing application to be fully GPU accelerated.

MUSEMAGE

Musemage (www.musemage.com) is a complete photo editing application available from Chinese developer Paraken. When running on systems with Nvidia GPUs, Musemage is fully GPU accelerated. Musemage uses the CUDA software layer to accelerate the full range of photographic operations.

Musemage lacks a lot of the automated functions built into more mature tools like Photoshop, but if you're willing to manually tweak your images, most of the filters and tools act almost instantly, even on very large raw files—provided you've got Nvidia hardware.

ADOBE PREMIERE PRO CS5/5.5

Adobe's Premiere Pro (www.adobe.com) is a professional-level video editing tool. One of the tasks necessary for any video editor is previewing projects as you assemble clips, titles, transitions and filters into a coherent whole. Adobe's Mercury playback engine uses CUDA to accelerate the preview. This is incredibly useful as projects grow in size—you're able to scrub back and forth on the timeline in real time, even after making changes.
In addition, a number of effects and filters are GPU accelerated, including color correction, various blurs, and more. A complete list can be found at the Adobe website (adobe.ly/9iiZ4o).

Adobe is investigating porting the Mercury engine and other GPU-accelerated portions of Premiere Pro to OpenCL, but we haven't heard whether a final decision has been made. Given the relative immaturity of the tool sets and drivers, OpenCL may need a little more time before major software companies like Adobe commit to the new standard.

Interestingly, Intel has recently delivered a plugin for Premiere Pro CS5.5 that can speed up HD encoding if you use Adobe Encoder. It does require an H67 or Z68 chipset. With a Z68 system, you can use an Nvidia-based GPU to accelerate the Mercury playback engine and QuickSync to perform the final render.

VIDEO CONVERSION

A number of video transcoding apps exist that are GPU accelerated. One of the first was CyberLink's Media Espresso, which first used Nvidia's CUDA framework, then OpenCL. The latest version of Media Espresso takes advantage of Intel's QuickSync. Transcoding with QuickSync can be faster than using a GPU, but only if you use a QuickSync-supported codec.

Higher-end tools, like MainConcept, also use GPU encode. MainConcept offers separate H.264/AVC encoders for Nvidia, running on CUDA, and AMD, which uses OpenCL.

GAMES

When we think of games and GPUs, it's natural to think about graphics. But games are increasingly using the GPU for elements that aren't purely graphical. Physics is the first thing that comes to mind. Usually when we think of physics, we think of collisions and rigid body dynamics.

But physics isn't just about stuff bouncing off other stuff. Film effects like motion blur and lens effects like bokeh and volumetric smoke are handled via GPU compute techniques rather than run on the CPU. GPU compute also handles cloth simulations, better-looking water, and even some audio processing. In the future, we might see some of the AI calculations offloaded to the GPU; AMD already demonstrated GPU-controlled AI in an RTS-like setting.

As more GPU compute capability is integrated into the CPU die, it's possible for the on-die GPU to handle some of these compute tasks while the discrete graphics card takes care of graphics chores. The ability for the on-die GPU and CPU to share data more quickly—without having to move data over the PCI Express bus—may make up for the fewer shader cores available on-die.

PARALLELISM IS THE FUTURE

CPUs will never go out of fashion. There will always be a need for linear computation, and some applications don't lend themselves to parallel computation. However, the future of the Internet and PCs is a highly visual one. Digital video, photography, and games may be the initial drivers for this, but the visual Internet, through standards like WebCL and HTML5 Canvas, will create more immersive experiences over the web. And much of the underlying programming for creating these experiences will be parallel in nature. GPUs, whether discrete or integrated on the CPU die, are naturals for this highly visual, parallel future. GPU computing is still in its infancy.

BY PAUL LILLY

IN SEARCH OF THE MEDIA SUITE SPOT

WE TEST THREE **'DO-EVERYTHING'** PACKAGES FOR **MEDIA CREATION** AND MANAGEMENT TO FIND THE ONE THAT STRIKES THE PERFECT BALANCE OF **FEATURES, PERFORMANCE,** AND **EASE-OF-USE**

WHEN FRIENDS OR FAMILY MEMBERS you haven't seen in years suddenly show up at your front door, the proper thing to do is invite them in, find out whom they're married to these days, and then reminisce about old times over a tall glass of Guinness. What you don't do is drag out a two-ton box full of photo albums and Super-8 tapes and bore your company to tears, like you might have done before the digital era drop-kicked that kind of coma-inducing behavior into obsolescence. That might still work for your computer-illiterate parents, but this is a different time, and you're much more likely to have your memories and adventures preserved as digital bits scattered all over your hard drive. In the back of your mind, you keep meaning to organize your digital photos, home movies, and even your epic music collection, and wouldn't it be rad to mash them together? After all, a home-brewed DVD with a custom soundtrack and visual effects would dazzle your friends and relatives in ways a simple photo album and unorganized video can't.

This is where fully fledged media suites come into play. They not only help you organize and spice up your digital collection, they're also capable of converting music and videos into formats better suited for portable devices, like your handheld game player, smartphone, or tablet. Today's media suites are all about managing and manipulating your content so you can view it whenever, wherever, and however you want, and not simply burning to disc like you did in the 1990s.

To help you choose the right one, we rounded up three of the biggest, most popular media suites around: CyberLink Media Suite 9 Ultra, Nero 11 Platinum, and Roxio Creator 2012 Pro. Each one brings a barrelful of tricks to the digital party, so we narrowed our focus to the tasks you're most likely to use over and over again. Specifically, we're testing for Blu-ray/DVD/3D playback, DVD/Blu-ray burning, basic video and photo editing chores, and transcoding. Is there a suite that stands head and shoulders above the others? Let's find out!

MEDIA SUITES COMPARED

Comparing media suites isn't easy. Each of the three suites in this roundup comes with a laundry list of features and bullet points, and it really starts to get overwhelming when you consider that each of the individual programs included within each suite has its own list of selling points. This chart compares the three on a macro level, skipping over most of the features that apply to all three suites—like making DVD backups, for example—and focusing instead on differentiating features that actually matter to the end user. Are you rocking a touch screen? Roxio is the only one with a mode specifically for touch screens. Is overburning important to you? Nero does it; the others don't. This isn't by any stretch an all-inclusive list of features, but it does reveal some key differences that could play a part in your decision to drop a wad of cash on one suite over the other.

	Nero 11 Platinum	CyberLink Media Suite 9	Roxio Creator 2012 Pro
Blu-ray Playback/Burning	Y	Y	Y
3D Support	N	Y	Y
System Backups	Y	Y	Y
Overburning	Y	N	N
Photo Tags	N	Y	N
Social Media Integration	Y	Y	Y
Touch-screen Option	N	N	Y

NERO 11 PLATINUM

Heavy-footed, clumsy, and slow

TO SAY NERO'S BEEN around the block a time or two is like saying Brett Favre's played in a few football games: both are gross understatements. If you've been building computers for any length of time, or have ever purchased an optical recorder, then you've probably come across Nero in some shape or form. It's been around since 1997, back when Bill Clinton was still president, the Internet was an infant, and Windows 95 ruled the roost. Back then, there wasn't a need for media suites, and you would use Nero Burning ROM for burning copies of audio CDs, backing up data to optical discs, copying games, and, well, not much else. Computers and technology have changed significantly since then, and so has Nero, which is now a multifaceted suite of media tools with a price tag to match its robust feature-set.

Nero 11 Platinum is Nero AG's (formerly Ahead Software) top-of-the-line software suite that retails for $110. It includes 10 individual programs of various utility, each of which fires up independently of the others. You would think that wielding so many individual programs would turn into an organizational nightmare, but Nero does a good job of wrangling them into a Welcome menu that lists each one in a sidebar. Navigating within each program is another story entirely.

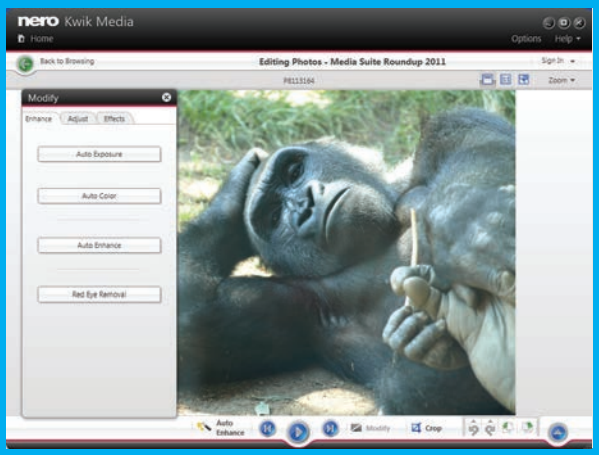
Our biggest gripe with Nero is the steep learning curve, at least compared to the other suites in this roundup. That's too bad, because underneath the clunky controls, there's a lot you can do with Nero. We got our first taste of sour grapes when trying to edit movies with Nero Video. This brings up a Welcome screen with six tiles: Capture, Edit & Import, Create & Export, Projects, Tools, and Product Info. Logic dictates that we should start with the Edit & Import tile, but your only options are to Make Movie or Slide Show, Import from AVCHD Camera, Import AVCHD from Disc, and Import AVCHD from Hard Drive. That's fine if your video is AVCHD, but what if it isn't? If you choose one of the AVCHD import options, Nero freaks out and tells you it can't recognize your video because it's the wrong format. The video editor loads anyway, and once you dismiss the error message, you're free to drag-and-drop your non-AVCHD video into the editor and begin manipulating it. Alternately, you can choose the unintuitive option of Make Movie or Slide Show to edit your flicks. Yet another way to get to the same place

Kwik Media is Nero's new media organizer for photos, videos, and music. It's also available as a free download (www.kwikmedia.nero.com).

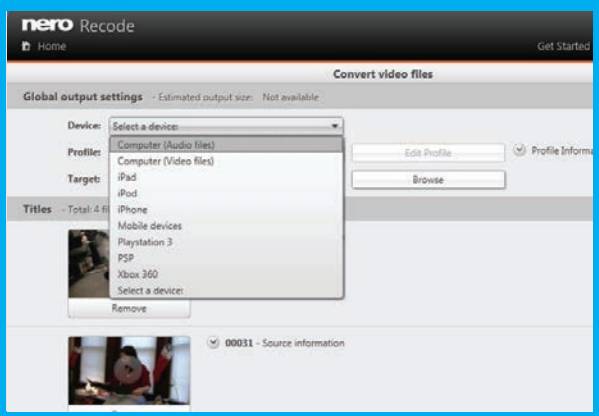
is through the Create & Export tile, which brings up a window to import and then edit your videos. It's all very redundant and bound to confuse your mom and dad, who just want to add some pizazz to their vacation videos.

Once you've stumbled through the front door and are finally able to edit home movies, Nero provides an assortment of tools to spruce up your clips, all of which are organized within a fairly feature-rich dashboard. New to Nero 11 is an Express Editing configuration that lets you sprinkle in video effects, clipart, text, speech bubbles, picture-in-picture effects, and add other snazzy doodads by dropping them into a storyboard format. You're given a generous amount to play with, such as 50 transition effects alone, made even more robust by being able to tweak each one's properties. Even with the Express Editing feature, it's still a bit more complicated than it needs to be, but if you take the time to learn the interface, it's possible to produce a prosumer-grade video.

Nero Recode offers a far easier UI to work with, and it's a piece of pie to convert your HD videos into mobile-friendly formats for viewing on the go. If you want to port video shot from your Flip camera over to your smartphone, for example, all you need to do is drag and plop the video into the indicated box and select the device you want to watch it on. There are preconfigured profiles for most major gadgets, including the iPad, iPod, iPhone, PlayStation 3, PSP, and Xbox 360, as well as a catch-all category simply called Mobile devices. It's curious Nero opted not to include profiles for some of the more popular Android devices, like the Xoom tablet and Galaxy smartphone, and it's even more quirky that you can't create your own profiles, though you can edit any of the existing ones and adjust the audio and video settings to suit your specific gear. More savvy video buffs will appreciate additional fine-grain control in the form of being able to choose the specific resizing method and deinterlace mode.



Simple photo editing controls in Nero feel more like an afterthought than a bona fide feature addition.



Nero's drag-and-drop interface makes it incredibly easy to transcode videos—we just wish there were more model-specific profiles to choose from.

While Nero doesn't make it obvious, it does support overburning, a sometimes buggy technology that allows for recording audio and data beyond a disc's rated capacity by filling in the lead-in area of a CD or DVD. Blu-ray playback and burning are also supported, but not 3D.

Some basic photo editing tools are included in Nero, with an emphasis on basic. Serious photographers will want to steer clear, but for things like cropping and removing freaky red eyes, it gets the job done. There are also a handful of effects to play with, for the 1 percent out there who actually use these gimmicks. Nero placed a much greater emphasis on organizing and sharing photos (and other media) than it did on manipulating them, and it appears to have been bitten by the app store bug. Nero Kwik Media is Nero's new front-end for rounding up all your photos, videos, music, playlists, slide shows, photo albums, and more. It's sort of a hyper version of Windows 7's Library feature, and you can add functionality by downloading plugins through Nero's Market. Most of the plugins are already included with the Platinum suite, but you'll want to grab Nero Kwik Faces so you can tag your pictures and later search through your photo library by friends and family.

With a little more TLC to the UI, this could be the media suite to beat. As it stands, it's the one that gets beat.

VERDICT **6**

Nero 11 Platinum

$110, www.nero.com

CYBERLINK MEDIA SUITE 9 ULTRA

This all-in-one suite gets very little wrong and nearly everything right

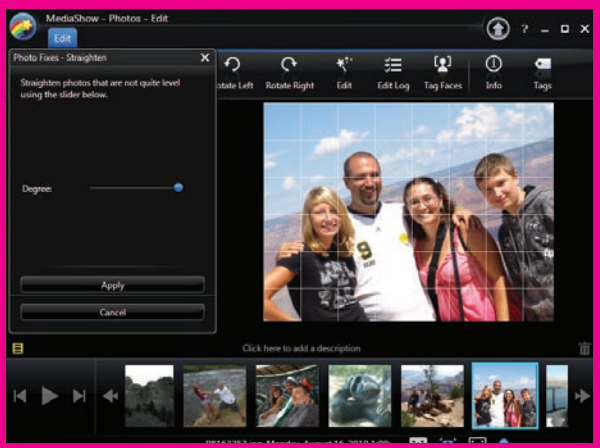
CYBERLINK MEDIA SUITE 9 is available in three different flavors and subsequent price points: Centra ($70), Pro ($100), and Ultra ($130). Ultra is the only version that supports Blu-ray playback, which seems like a hefty premium, especially over the Centra package, but if watching Blu-ray discs is all you're after, CyberLink's PowerDVD 11 Ultra software sells for a more reasonable $100. PowerDVD 10 BD Express is included in CyberLink's flagship media suite reviewed here, in addition to tools for Blu-ray and DVD authoring, transcoding, photo and video editing, and data burning to a variety of formats and media, including BDXL discs.

Like Nero, CyberLink shoehorns nearly a dozen different programs into a single media suite, only CyberLink does a far superior job of organizing them within a front-end that creates the illusion it's all just one piece of software. CyberLink sometimes ruins the illusion by requiring individual updates for each program and making attempts to upsell many of them (lame!), but otherwise it offers a dexterous UI that bounces you from program to program without a hint of clumsiness. The main menu contains a row of labeled icons along the bottom: Movie, Video, Photo, Music, Data & Backup, Device, and Utilities. Clicking any of them instantly brings up a list of related tasks at your disposal. If you want to rip an audio CD, you'll find that option by clicking—you guessed it—Music, with additional links to Play Music, Make an Audio CD, Make an MP3 Disc, Make a WMA Disc, and Edit Audio. We found we couldn't rip directly to MP3, but had no problem converting to that format. Each option fires up the appropriate program and discards the main menu you were just in, and when you're finished fiddling around and exit a program, CyberLink shuttles you back to the main window. It's all very slick, and smooth to boot, which is surprising when you consider how big and heavy this media suite is (around 2.4GB).

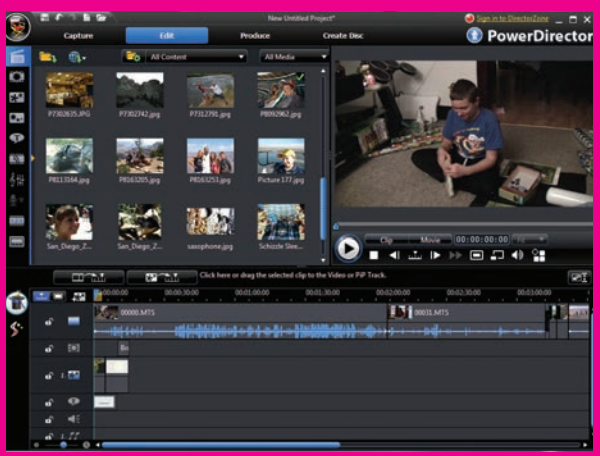
We were really awestruck by how insanely easy it is to convert videos to play on a plethora of portable devices and media players. CyberLink's MediaEspresso software is billed as an "ultra-fast universal media converter," and it's one of the cogs included in this wonderful machine. A MediaEspresso Windows gadget sits at the bottom-right of the desktop in the shape of a coffee cup and changes shape depending on what portable device you plug into your PC. Attach an iPhone 4S, for example, and the coffee cup turns into an iPhone. More than just eye candy, MediaEspresso works behind the scenes, loading the appropriate profile for your gear—when you drag and drop a video you shot with your pocket camera into the widget, it immediately starts transcoding it into a format that works with your iPhone, Galaxy S II, Zune, or whatever. There are preconfigured profiles for more than 90 devices, as well as catch-all profiles in case your specific model isn't in MediaEspresso's database. It's a crapshoot when you start getting into the latest hardware: MediaEspresso has profiles for Asus's Transformer tablet and the HTC Flyer, but not Motorola's Droid X2 smartphone. Of course, you can always edit any of these profiles, or even create your own.

CyberLink's video transcoding is not only super simple, it's also fast—and capable of cleaning up your media. There are a few video quality enhancements you can enable to improve the overall lighting, remove noise, and improve sharpness. In many cases, these optional enhancements result in better-looking videos, though they can sometimes add significantly to the time it takes to transcode a video. And while CyberLink supports GPU acceleration, there are some notable omissions, like AMD's 5700 and 5800 series graphics cards.

Should you want to watch movies instead of transcode them, CyberLink's PowerDVD software is another capable tool. It supports Blu-ray, 3D, and HD video files, and comes with an assort-



CyberLink's straighten tool plops a grid on top of your photo, making it easy to fix crooked images or intentionally tilt them for a cool perspective shot.

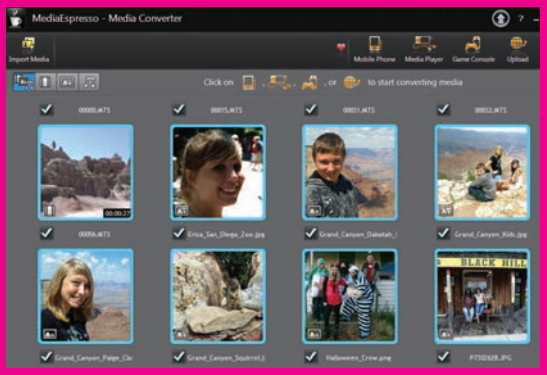


When you're finished editing a movie in CyberLink, you can output your masterpiece to a variety of file formats or upload it directly to YouTube or Facebook.

ment of gadgets for videophiles who like to spend as much time tinkering as they do consuming. You can play with the lighting, aspect ratio, and audio, and can upconvert movies or convert them to 3D on the fly. In 3D mode, you can adjust the 3D scene depth with a slider to reduce (or induce) eye fatigue, and there are options for both stereoscopic and anaglyph (red and cyan glasses) 3D modes. Very cool.

We weren't quite as impressed with the process of editing and touching up photos. This is one of the few areas where CyberLink feels a little bit clunky, and before you can edit your snapshots, you first have to import them. Doing so brings up a new window and requires a few mouse clicks, and then you have to hit the Back button to see your imported photos. Right-clicking your photos gives you the option of editing them, and as is common with a jack-of-all-trades suite such as this one, CyberLink leaves a lot to be desired. You'll find only basic enhancement options like crop, red-eye removal, and some color-fixing dials, along with a handful of special effects, if for some reason you really want to make your photo appear old and yellow (CyberLink calls it "Antique"). You can also touch up videos with similarly basic controls, as well as remove camera shake.

For editing movies, CyberLink includes the complete retail edition of PowerDirector 8 Ultra, which is both a blessing and a curse. There's a learning curve associated with full-featured editors, and this one is no exception, though it's nowhere near as complicated as something like Sony Vegas. Spend some time learning the interface, and it won't be long before you're dazzling friends and family with B-movie conversions of your home videos.



Are your videos too dark? Try enabling CyberLink's TrueTheater AutoLight option in the Settings menu to lighten things up.

What's left is mostly standard fare, things like burning disc images, creating disc labels, and backing up data. But these things, along with everything else, are generally better than the competition, and everything is extremely well organized.

CyberLink is fast, flexible, and easy to use; just the way we like it.

VERDICT **9**

CyberLink Media Suite 9 Ultra

$130, www.cyberlink.com

ROXIO CREATOR 2012 PRO

Proof that a bundled photo editor doesn't have to suck

THE WAY WE SEE IT, $130 is a big investment for software, even a fully loaded media suite. So once we resign ourselves to spending a jester's ransom for a chunk of computer code, the very last thing we want to see is a banner ad on the main screen proposing we drop another 40 bucks into the till, yet that's the first thing Roxio does as it tries to hawk a USB capture device for converting video from VHS, Hi8, and V8 to DVD. But hey, you'll save $10 off the list price, so there's that. With a little digging, we discovered you can remove this and other solicitations by heading to Tools > Preferences and unchecking the box that offers to "Display relevant production information and offers from Roxio."

First impression out of the way, Roxio quickly gets to work atoning for its money-grubbing introduction. The main menu isn't as sleek or slick as CyberLink's, but it's just as straightforward and easy to navigate. A total of seven frequent tasks appear on the home screen so you can jump right in and copy a disc, burn an audio CD, or edit video, among other things. On the left side of the menu are five additional tabs to choose from—Data/Copy, Video/Movies, Music/Audio, Photo, and Learning Center—and each one brings up a new set of options.

Roxio is the only media suite in this roundup to give any serious consideration to photo editing. It's not nearly as robust as Photoshop, GIMP, or even lower-level consumer editors like Photoshop Elements, but where CyberLink and Nero offer only a bare-bones editor, the one built into Roxio offers quite the expansive toolset. The basics are there, like red-eye removal and color enhancements, but so is an advanced tool that's slightly similar to Photoshop's awesome spot healing brush for removing blemishes from photos. There's a wrinkle removal tool to help you stay one step ahead of father time, and another one for touching up scratches, although both of these are little more than glorified blur brushes. A second tab introduces more editing utensils, including a cloning tool we didn't expect to find. One of the most useful items is a customizable touch-up brush with nearly a dozen different uses. You can stroke parts of your photo to turn it black and white or apply certain effects like lighten, darken, sharpen, soften, desaturate, and more. You're able to fine-tune each brush, as well, adjusting the size, edge fading, and transparency level. On top of it all, Roxio provides a plethora

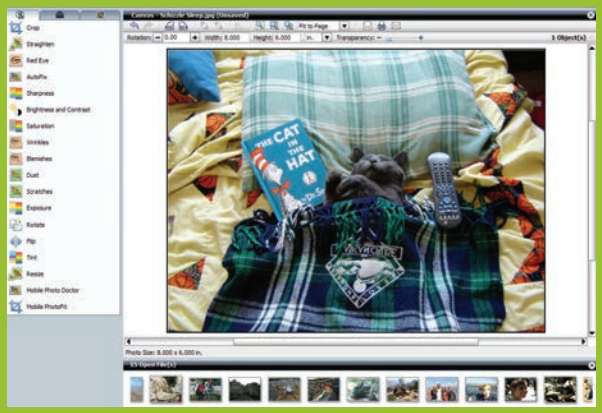
Roxio commits the cardinal sin of trying to upsell customers, who have already spent $130 for the flagship suite, on more media related products. Thankfully, you can turn off the annoying banner ad.

of special effects, clip art, frames, and other items so you can tap into your inner Rembrandt (or Picasso, as it were).

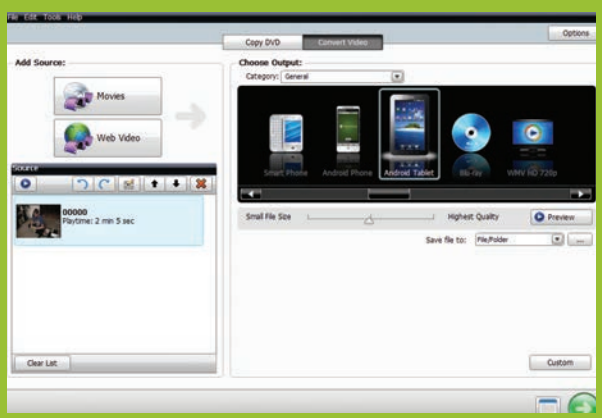
You can also convert 2D images into 3D in a variety of formats, including anaglyph (old-school blue-and-cyan glasses) and both side-by-side (Nvidia 3D Vision) and top/bottom stereoscopic configurations. What's more, Roxio affords a bit of fine-grain control over how the final image will look. Don't fret, tweaking a 3D image isn't as complicated as it sounds, at least not in Roxio. You start by opening a 2D image in Roxio's 3D Photo Creator. The photo you select is automatically converted to 3D, but before you save it, you can adjust its 3D effect using a graphical dial in the edit window. There's also a grayscale button, in case you find it easier to work your 3D mojo without color (this is just for editing—it won't save your photo in grayscale), and a crop tool. When you feel you've leveled up your 3D editing skills and are ready for a bigger challenge, Roxio provides a second method for creating 3D photos by letting you select independent images for both the left and right eye. In other words, it won't be long before you start driving your family nuts by insisting they hold a pose while you take multiple shots from different angles. Stay still, Bobby!

Creating a DVD movie is just as easy, albeit harder to find because the option is not clearly labeled on the main menu. Whereas there's an option to "Create 3D Photos" on the Photo tab, there's no "Create 3D DVDs/Movies" under the Video/Movies tab. To get to it, you click "Create DVDs" and then you can select either 2D or 3D. There are two options for 3D movies, standard definition (DVD) and high definition (AVCHD Blu-ray). Both support anaglyph and a wide range of stereoscopic formats.

Whether you're editing a 2D or 3D movie, the process is fairly straightforward and easy. Roxio uses a storyboard format in which you drag videos, photos, and music to wherever you want them to appear in your timeline. There's an option to stabilize



It's not Photoshop, but you can do much more with your photos in Roxio than you can with CyberLink or Nero.



Roxio makes it incredibly easy to fetch a video from YouTube and convert it to your Android tablet, or just about any other mobile device.

video, and a whole bunch of special effects and transitions to spice things up. If you want to take the lazy route, another option is to have Roxio automatically edit your videos by choosing from a set of themes, but the results are often hokey.

Many of Roxio's abilities come with an advanced option, and that includes ripping music. Clicking Rip is the fastest way to get the job done, but selecting Rip-Advanced gives you access to higher bitrates. Roxio supports a medley of audio codecs, including AAC, AC3, FLAC, MP3, MP3 VBR, OGG, WAV, and WMA.

Transcoding video is equally versatile and virtually dummy-proof. It's not quite as streamlined as CyberLink's program, but there are a plethora of device profiles to choose from, both by type (tablet, smartphone, etc.) and brand. Unfortunately, while you can edit any of these profiles, you can't save the changes or create custom ones. You can, however, pull source video from online sites like DailyMotion, YouTube, and, ahem, other types of Tube and convert them to your specific device.

Roxio isn't as slick as CyberLink, and it lacks features like face tagging and overburning. But it's easy to use and is the only media suite of the bunch to include a photo editor that doesn't feel like an amped-up version of MSPaint.

VERDICT

8

Roxio Creator 2012 Pro

$130, www.roxio.com

ROLL YOUR OWN

How to create a media suite from free apps

Our DIY mentality doesn't just apply to hardware and building PCs, it's applicable in the world of software, too. Each one of these full-fledged media suites will set you back a Benjamin or more, and one thing they all have in common is that each is really just a collection of individual programs served on a pricey platter—some more elegantly organized than others. If you're willing to give up certain premium features and don't mind managing multiple applications on your own, it's entirely possible to put together a low- or no-cost home-brewed media suite of your own. Consider this your penny-pinching cheat sheet.

OVERCOMING THE BLU-RAY BLUES Getting a Blu-ray movie to play on your PC for free is tricky, though not impossible. There just aren't many free players out there, and if you find one, be careful—it might be a rebadged (and unauthorized) version of a paid program (i.e., pirated). In most cases, your Blu-ray drive or BD-equipped PC should have shipped with a lightweight player. If it didn't, or if you bought your system used, you can either pay a small premium for a dedicated player app, or rip your Blu-ray and view it on VLC (free, www.videolan.org) or any media player that supports MKV (Matroska) file formats. MakeMKV (free, www.makemkv.com) is a popular program that decrypts and rips Blu-ray discs to MKV, though you're technically circumventing copy protection here. As long as it's for fair-use backups, we don't have a problem with that.

BURN, BABY, BURN! Again, your optical drive should have shipped with at least an OEM version of Nero or some other disc burning software, but if not, there are plenty of free alternatives to do the trick. And if you're using Windows 7, you can burn CDs, DVDs, and BDs without any third-party software, including ISO and IMG files. Alternately, both CDBurnerXP (free, www.cdburnerxp.se) and ImgBurn (free, www.imgburn.com) work well.

PHOTO FINISH Whether you're looking to touch up a photo by adjusting the brightness and removing those evil-looking red eyes, or you want to go crazy with layers and an advanced toolbox filled with virtual utensils, there's a free photo editor out there tailor-made just for you. For the former, Google's Picasa 3 (free, www.picasa.google.com) is a no-cost editor nearly identical to the one built into CyberLink's Media Suite 9 Ultra. It's great for making quick edits and even shows a histogram and camera information. Another option is Photoshop. No, not the über-expensive photo editor, but the online version (free, www.photoshop.com), where you can store, edit, and share photos at no cost.

For professional-level editing, GIMP (free, www.gimp.org), is a free, open-source alternative to the mega-version of Photoshop. It's arguably just as powerful and fleshed out, and you can do some amazing things in GIMP, once you've learned the interface.

Picasa isn't as powerful as GIMP, but it's nowhere near as complicated, either. For quick-and-dirty edits, Picasa is hard to beat.

Forget Windows Media Player, VideoLAN's VLC player will play just about any media file you throw at it, including MKV files.

LIGHTS, CAMERA, ACTION! If you're rocking a copy of Windows 7, Microsoft's Windows Live Movie Maker (free, www.microsoft.com) is sufficient for basic video editing with transitions and other effects, but it's not a high-level editor by any means. Alternately, Avidemux (free, www.avidemux.org) and VirtualDub (free, www.virtualdub.org) are both general-purpose editors with a wider range of codec support, but they're a bit intimidating for less savvy users. There isn't much middle ground here, and this is one of the areas you sacrifice by rolling your own media suite.

RIP IT AND ROCK OUT! Ripping your gnarly collection of audio CDs to MP3 format so you can listen to those old-school Beastie Boys beats on your media player is easy. But ripping archival-quality MP3s from CDs? That takes a little more work than those one-click solutions you'll find in Windows Media Player and iTunes. If that's something you want to do, you'll need an audio grabber—Exact Audio Copy (free, www.exactaudiocopy.de)—and the LAME MP3 encoder (free, www.lame.sourceforge.net). Once you've gone and grabbed those, point your browser to our online guide to ripping high-quality MP3s at bit.ly/7oQZQl.

WHITE PAP

BY BILL O'BRIEN

4G Cellular Wireless Technology

4G, or not 4G? That is the question

Cellular wireless communications technology is now in its fourth generation. Or is it? You've no doubt heard a great deal of marketing about 4G phones and services, but what does the term actually mean?

First-generation technology of the early 1980s—1G—was based on analog transmissions. The industry switched to digital spread spectrum about 10 years later, ushering in the age of 2G cellular networks. In 2001, 3G technology enabled these networks to carry multimedia as well as voice and data traffic—at the leisurely pace of about 200Kb/s. Now we're seeing the first deployments of products that are being marketed as 4G technologies, but is that what they really are?

According to the ITU (International Telecommunications Union, a standards body established at the United Nations), any product that claims to be a 4G telecommunications device must meet *all* the requirements spelled out in its IMT-Advanced (International Mobile Telecommunications Standard-Advanced) specification. Such devices will operate on an IP-based packet-switching network that delivers nominal throughput of 100Mb/s for mobile communications (client devices in planes, trains, and cars), and speeds of 1Gb/s for relatively stationary clients. While that all sounds neat, clean, and wrapped with a bow, what anyone will tell you about "standards," even those produced by the ITU, is that they are often subject to interpretation. And that puts the devil in the details, because none of the services on the market today truly meet the ITU's definition of 4G, even though some utilize what are widely considered to be 4G technologies.

3G UNDER THE HOOD

A 3G cell-phone system depends on code division multiple access (CDMA) and spread spectrum radio technology, which allows many users to share both time and frequencies. If eight units of bandwidth are available, for instance, each user can transmit all of the time over all of the frequencies, but will be limited to using only one of the eight available orthogonal codes (non-overlapping communication channels for each active link) to avoid interference with anyone using the other seven units of bandwidth.

That's great, as far as it goes, but those specifications are for just one cell within an entire network. Activity on adjacent cells can cause crosstalk and noise if those other cells are using the same orthogonal codes. A CDMA network will try to circumvent this problem by using as much bandwidth as possible; but wireless data networks have become robust in their own right, which limits the effectiveness of this approach.

4G UNDER THE HOOD

Next-generation cell-phone technology relies on orthogonal frequency division multiple access (OFDMA) and other frequency-domain equalization schemes. Multiple input/multiple output (MIMO) antenna schemes with dynamic channel allocation and channel-dependent scheduling are also important components. OFDMA differs from CDMA by combining dynamically assigned subcarriers within time slots. It's essentially a hybrid of FDMA (frequency division multiple access) and TDMA (time division multiple access) systems that takes the substantial multipath suppression and frequency diversity that single-user OFDM (orthogonal frequency division multiplexing) has to offer, and adds multi-access controls that can accommodate a wider range of content and quality-of-service needs.

OFDMA's multiple access is regulated within the digital domain (before the Fast Fourier Transform operation is performed), which allows for more dynamic and efficient bandwidth allocation. The end result is improved integration of time and frequency algorithms, which should—in theory, at least—deliver a better experience to the end user. OFDMA is also more power efficient, especially in terms of peak-to-peak power ratios. Rather than blast one signal across the entire frequency band, this scheme splits the available bandwidth among the total number of users within each cell. Since each user affects only a subset of the available subcarriers, they leave a smaller footprint, and their devices consume less power than if they were tapping all the available bandwidth.

THE 4G FORK

The fork in the road to 4G comes when service providers and device manufacturers decide to follow either the IEEE 802.16 standard (aka Mobile WiMAX—the acronym is for Worldwide Interoperability for Microwave Access), or to deploy LTE (Long Term Evolution) technology. Marketing claims to the contrary, none of the current services described as 4G (WiMax, which Sprint Nextel promotes;

ER

> PERHAPS TODAY'S STATE-OF-THE-ART CELL PHONES SHOULD BE CALLED 3G+

LTE, offered by both Verizon and AT&T; and HSPA+, also known as Evolved High-Speed Packet Access, pushed by T-Mobile and AT&T) actually adhere to every aspect of the ITU's IMT-Advanced spec. In fact, the ITU has accepted only the next versions of LTE and WiMax (LTE-Advanced and WiMax Release 2, aka WirelessMAN Advanced, with the MAN acronym standing for Municipal Area Network), as legitimate 4G candidates. Sprint Nextel adopted WiMAX early on, but is now also working on an LTE-Advanced network. AT&T and Verizon are doing the same. T-Mobile—in acquisition talks with AT&T—has said it would stick with HSPA+ for now, and that it would need a spectrum partner to deploy an LTE network.

The WiMAX standard, as with most communications standards, is not a rigid, top-to-bottom design specification; it's a set of guidelines designed to ensure maximum interoperability between various manufacturers' devices. The standard defines the goals, but manufacturers can choose various paths to reach those goals. A base station, for instance, must determine which subcarrier frequency to use, how power is to be allocated, and then relay this information to the user devices on the network. The process is dynamic and handled in the background so as not to interrupt service. This can be accomplished based on traffic density, communication priority, or even a fairness approach that equalizes conditions for all users either proportionally or more generally. While every manufacturer could adopt its own approach, there's no reason why a consortium of manufacturers couldn't agree on a single approach.

The LTE spec was originally focused on 3G systems, but it was soon expanded to include enhancement opportunities for other systems, as well. LTE and HSPA+, however, are both wrapped around GSM (Global System for Mobile Communication) cores. GSM is a circuit-switched network standard originally developed for 2G telecommunications, and it didn't support packet data transport until GPRS (General Packet Radio Service) and then EDGE (Enhanced Data rates for GSM Evolution) were added. Handling packetized data isn't as natural a progression for LTE as it is for WiMAX.

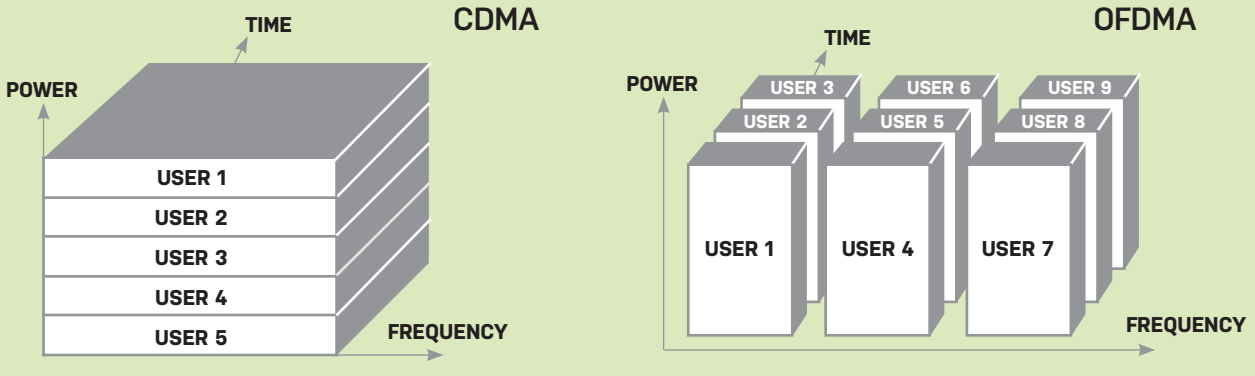
The problem isn't a flaw in the LTE specification; rather, it's the flexibility built into spec. Verizon's network runs in the 746–787MHz frequency range while AT&T, for example, operates from 704–746MHz. They're both in the 700MHz band, but the actual frequencies have only one small point of overlap at 746MHz. Given the possibilities, if push came to shove, it would be entirely possible for one manufacturer to effectively lock out all the others. The days of the simple SIM card swap to change carriers would be just a fond memory as we descended into the realm of proprietary devices once again.

THE CRYSTAL BALL

It wasn't long ago that the availability of 3G networks was at best spotty, so perhaps we shouldn't be surprised by the paucity of 4G coverage today. Carriers can't, after all, make the transition without at least temporarily inconveniencing a large chunk of their existing 3G customer base. As for what's next, we predict LTE networks will continue to prevail for now, and that LTE-Advanced will dominate the true 4G market in the years ahead. Bear in mind, however, that "evolution" means change and "long term" doesn't necessarily mean years.

CDMA vs. OFDMA

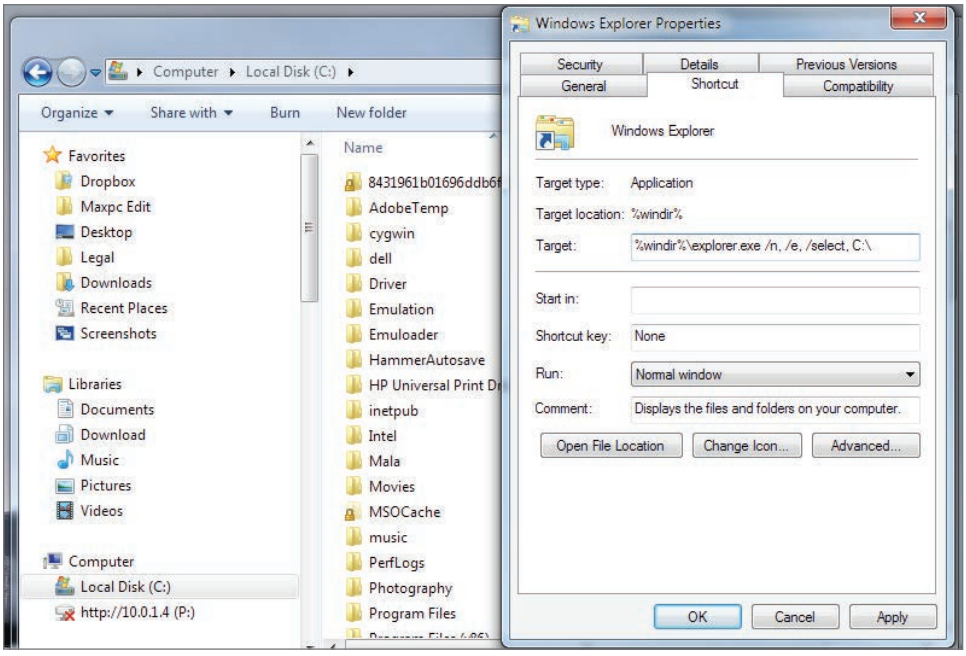
CDMA allows many users to use the same frequencies at the same time. OFDMA does the same, but it delivers more bandwidth by dynamically assigning each user a subcarrier within each time slot.



HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

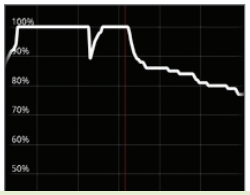
WINDOWS TIP OF THE MONTH



CHANGE WINDOWS EXPLORER'S DEFAULT START LOCATION

If you want Explorer to point somewhere other than Libraries by default, follow these steps: **1)** Copy the complete path of the folder you want to start in. **2)** Right-click the Explorer icon in the task bar, then right-click Windows Explorer, and select Properties. **3)** In the target box, enter **%windir%\explorer.exe /n, /e, /select, [the folder path you copied]**.

MAKE - USE - CREATE



ALEX CASTLE
ONLINE MANAGING EDITOR

PERSONAL WEBSITE, MADE SIMPLE

IN ONE OF THE how-to articles this month, we show you how to make a QR code for your business card, which can make a great impression on a potential customer or employer. But first, you've got to have something to link to.

A good personal website can make all the difference. Here are three free services that make it easy to set up a great-looking site to show yourself off.

About.me: After you create a free About.me profile, you'll be walked through a 15-minute set-up process that leaves you with a simple, stylish profile that links out to everywhere else you are on the web.

Central.ly: Very similar to About.me, Central.ly is aimed at small businesses. If you run your own business, this site's a great way to save money on a web designer.

LinkedIn: You're already familiar with LinkedIn, but it's worth mentioning that linking directly to your LinkedIn profile can be an easy, workable alternative to setting up a personal site.

↘ submit your How To project idea to: comments@maximumpc.com

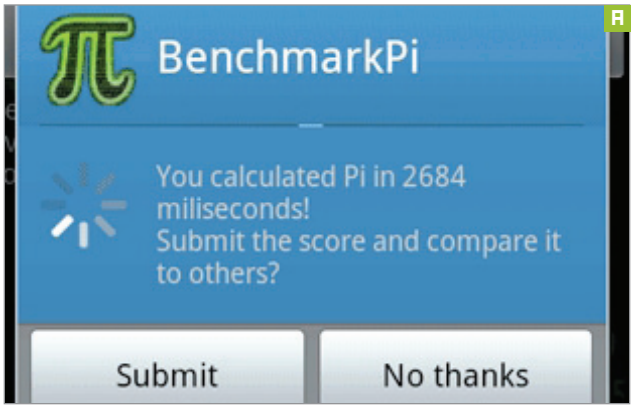
Benchmark Your Android Phone for Free

–Seamus Bellamy

CAR NUTS RACE their rides to see whose machine is the fastest. Fitness fanatics run marathons to test their physical limitations and endurance against that of their fellows. Geeks and gearheads? Our battles are fought and won on the basis of how capable our hardware is. While our desktops and laptops might be a thing of wonder to behold, carrying them around with us for the sake of collecting the accolades we deserve isn't always convenient. Carrying around a smartphone or tablet, however, is.

Benchmarking quantifies your device's capabilities; it also provides the added benefit of telling you how well your phone manages the current version of your handset's operating system and apps, as well as whether future OS upgrades will slow all that zippy mobile computing hotness to a bag of sluggish hardware fail. If you're the owner of an Android handset, there are a lot of options out there for measuring its performance. Here are three of our favorite free benchmarking tools, and why we think you should use them.

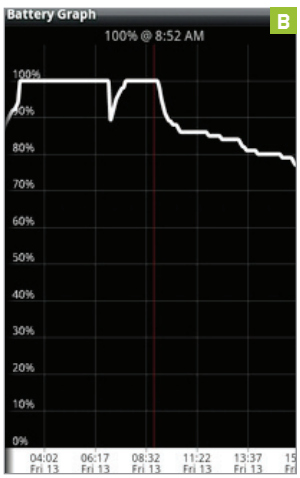
1 BENCHMARKPI BenchmarkPi (bit.ly/t7JJkP) gauges processor efficiency so well it'd make a grown man cry **(image A)**. The genius of BenchmarkPi is its simplicity: By measuring how quickly your handset is able to calculate Pi to a particular number of decimal places, BenchmarkPi can ascertain how powerful your processor is. Additionally, the app is great at being able to tell whether or not your device is burdened by other programs running in the background, making it easy to troubleshoot problem apps. If you're feeling competitive, you're in luck: BenchmarkPi also maintains a constantly updated list of the top 300 Android phones out there, ranking them by their processing power.



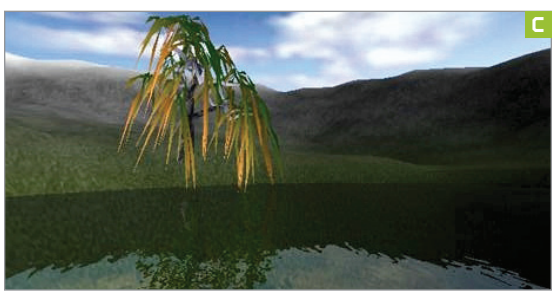
2 BATTERY GRAPH The harder your smartphone has to chug in order to crunch the numbers necessary to do important work (and by work we mean running a session of Minecraft Pocket Edition), the less juice your battery will have left for lower-priority tasks, such as calling your loved ones to assure them you're still alive and well despite the Creeper's best efforts.

» Battery Graph (bit.ly/see2TK) is designed to run in the background on your handset while you go about your business **(image B)**. Start it up when you turn on your phone, and check it out at the end of the day. While you're busy texting, finding your way with Google Maps, or having a jaw-wag with a co-worker via Skype, Battery Graph will quietly collect data on how each hoop you force your phone to jump through effects its power reserves. To snag a balanced benchmark of your battery's performance, drain its battery all the way down and then charge it completely before starting.

» In order to paint a true picture of your battery's performance, run Battery Graph over several days under normal operating conditions. Doing so will let you discover what applications and times of day take the biggest bite out of your battery's life, as well as show you how long your battery lasts during an average day.



3 NENAMARK 1 & 2 Available in two different flavors—one for high-end Android phones and the other for handsets wielded by mere mortals—NenaMark (www.nena.se) is one of the easiest ways to benchmark your phone's GPU performance for free. By measuring the number of frames per second your smartphone can crank out in the face of parametric surfaces, varying light models, particles, and reflections **(image C)**, NenaMark is able to ascertain whether your phone takes graphical hits like a champ or a glass-jawed featherweight. Your handset's results can then be measured against those of other makes and models to see how your phone ranks.



Create a Personalized QR Code

–Alex Castle

IF YOU'VE BEEN in a public space in the last year or two, you've probably seen a QR code—a small, square two-dimensional barcode that looks a bit like a miniature crossword puzzle. They've been around for more than 15 years, but they've recently exploded in popularity, thanks to smartphones, which are perfect QR-scanners.

Unlike traditional supermarket-style barcodes—which codify an identification number—QR codes are binary representations of numbers or letters, and can be many different sizes. A tiny QR code can represent just 30 numbers, and a giant one can represent thousands of letters, numbers, and punctuation marks. With that much flexibility, everyone can find a use for QR codes. In this article, we'll show you how to make a distinctive, personalized QR code to put on your business card, or anything else.

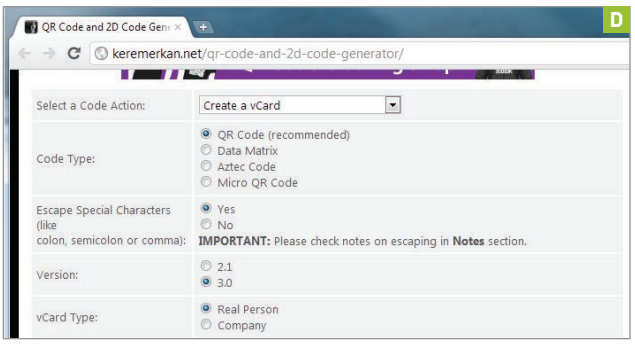
1 GET YOUR VCARD We're going to avoid the obvious joke here and let you know that vCard is a standard for digitally transmitting contact information. You might have encountered a vCard attached to an email message in the past, but they work great in QR codes, too—most QR reader apps are designed to detect vCards and automatically enter the data into the phone's contact list.

» There are plenty of sites that will create a vCard QR code for you automatically (just a Google search away), but we recommend the web app at bit.ly/dziTfO.

» There, you simply click the Select a Code Action drop-down box, and select Create a vCard. Then, enter your personal information into the boxes below **(image D)**, and hit Generate Code. Note that QR code size is dependent on the number of characters encoded, so you might find yourself dealing with a giant, unwieldy code that will be hard to fit on a business card. To get it down to size, we recommend using only vital information, like your name, phone number, and email address.

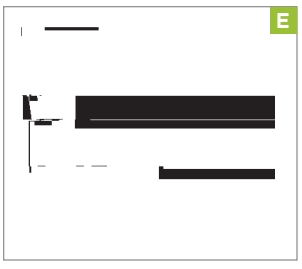
» Another way to get around having a huge QR code is to have a personal website with your contact info (perhaps in a downloadable vCard) and to embed a link to that in a QR code. You can use a link shortener to make the URL and QR code as small as possible, which you will want for the next section

D

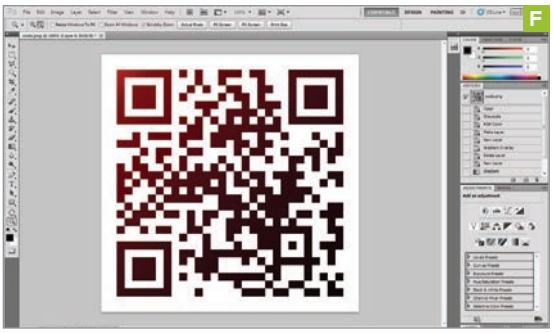


2 PERSONALIZE YOUR CODE One downside to QR codes is that by default they look a little impersonal **(image E)**. If you want to give your business card some visual appeal, there are a couple of simple things you can do. For one, you can give it a more interesting color scheme. The

E



F



QR code generator we recommended defaults to black-on-white, but you can tell it to use any color for the foreground or the background. Make sure the background is lighter than the foreground, and that there's decent contrast between the two. Otherwise, reader apps may have a hard time with it.

» An even neater-looking trick, and one that's still easy to pull off is to use a subtle color gradient. To do this, just open your image editor of choice (Photoshop and the free GIMP both work great), create a color gradient, and then use your QR code as a mask for that layer **(image F)**.

» If you want to go a step further by introducing a logo into your QR code, that's entirely possible, as well. Just make sure to use the highest error correction setting (this can be set in the web app we recommended earlier) when you generate your QR code. This will make the code larger, but will allow it to be read even if up to 30 percent of the code is erased and written over. For best results, don't place your graphic or logo over the tracking boxes in the corners of the code. With some trial and error, you should be able to find out what scans and what doesn't **(image G)**.

G

BUILD IT

NATHAN EDWARDS **SENIOR EDITOR**

Time to Break in Sandy Bridge-E

Intel's new enthusiast platform is here. I'm going to put it through its paces with a quiet riot of a gaming rig

LENGTH OF TIME: **2 HOURS**

LEVEL OF DIFFICULTY: **INTERMEDIATE**

THE MISSION Intel has just released its new Sandy Bridge-E platform. With six- and eight-core processors, eight DIMM slots, and multiple PCIe 3.0 slots, it's Nehalem's true heir and the answer to complaints that Sandy Bridge, while awesome, just isn't enthusiast enough. The i7-2600K is a great part, but it's only a quad-core, and there hasn't been a six-core enthusiast CPU from Intel since the i7-990X, which is on a dead platform.

I've gotten my hands on the Sandy Bridge-E flagship CPU: the Core i7-3960X, a $1,000, six-core beast at 3.3GHz. Oh, and a motherboard and cooler to go with it. I've rustled up a passel of RAM, a titanic GPU, a quiet case, and a speedy SSD. I'm going to see whether X79 has what it takes to wrest the enthusiast crown from X58, and whether it can do so quietly.

INGREDIENTS

PART/URL	PRICE
Case Antec P280 www.antec.com	$140
PSU Thermaltake Toughpower Grand 850W www.thermaltakeusa.com	$195
Mobo Asus P9X79 Deluxe www.asus.com	$400
CPU Core i7-3960X www.intel.com	$100
Cooler Intel RTS2011LC www.intel.com	$100
GPU Asus ROG Matrix GTX580 www.asus.com	$530
RAM 32GB Corsair Vengeance DDR3/1600 (8x4GB) www.corsair.com	$190
Optical Drive Plextor PX-B320SA Blu-ray combo drive www.plextor.com	$110
SSD 256GB Samsung 830 Series www.samsung.com	$420
Hard Drive 3TB Hitachi Deskstar 7K3000 www.hitachigst.com	$360
OS Windows 7 Professional 64-bit (OEM) www.microsoft.com	$99
TOTAL	$3,544

BUILDING FROM THE CPU OUT

WHY A $1,000 CPU? Well, it's the only Sandy Bridge-E chip we could get our hands on, but it's also multiplier unlocked, so in a matter of moments that 3.3GHz hexa-core becomes a 4.3GHz without even trying, thanks in part to the desktop overclocking software included with Asus's P9X79 Deluxe motherboard. Intel's RTS2011LC cooler is Asetek-made, and should enable nice overclocks without causing much noise.

The mobo's eight memory slots and the low cost of 4GB DDR3 DIMMs make the RAM choice easy—two 16GB Corsair Vengeance DDR3/1600 kits cost less than $200. A 256GB Samsung 830 SSD will hold my OS and games, with a 3TB Deskstar for storage.

Asus's ROG Matrix GTX 580 is one of the quietest full-powered videocards we've ever tested, and its massive fans mean it stays quiet even when overclocked and overvolted. Speaking of quiet: Antec's P280 combines the quiet competence of the P180 series with modern niceties like cable-routing cutouts and USB 3.0 front-panel connectors. Thermaltake's Toughpower Grand 850W provides the juice for my build while promoting good cable management with its modular design. Add in a Blu-ray combo drive, and I've got all the ingredients for a fantastic, overclockable, quiet gaming rig. With 32GB of RAM. Still not tired of that.

ASSEMBLING THE HARDWARE

1 PREP THE BOARD

UNLIKE PREVIOUS Intel LGA sockets, Sandy Bridge-E's LGA2011 socket requires the use of two levers to secure the CPU, not just one. When installing the CPU, make sure the first arm is secure over the socket top's lip **(image A)**, then secure it. Afterwards, secure the bottom arm **(image B)**.

Because LGA2011 comes with its own universal backplate, you don't need to install a separate one for the cooler. Instead you'll just follow the instructions on the cooler to prep the retention mount for LGA2011 install.

I'm using all eight DIMM slots on the X79 board, so I don't need to worry about which slots to populate first. If you are only using four, however, install your DIMMs in the blue (outer) sets of slots, not the black ones.

2 PREP THE CASE

I'M USING Intel's RTS2011LC cooler, which usurps the rear exhaust fan mount, so the first thing to do is remove the 12cm exhaust fan (don't forget to detach its speed toggle from the rear panel). The P280 doesn't ship with any intake fans by default, though it provides mounts for two 12cm fans fore and aft of the hard drive tray. The fan's power cable won't reach the motherboard from the front intake mounts, so either mount it on the inside of the hard drive cage **(image C)** or invest in an extension cable.

Install the motherboard's I/O shield, then the motherboard itself.

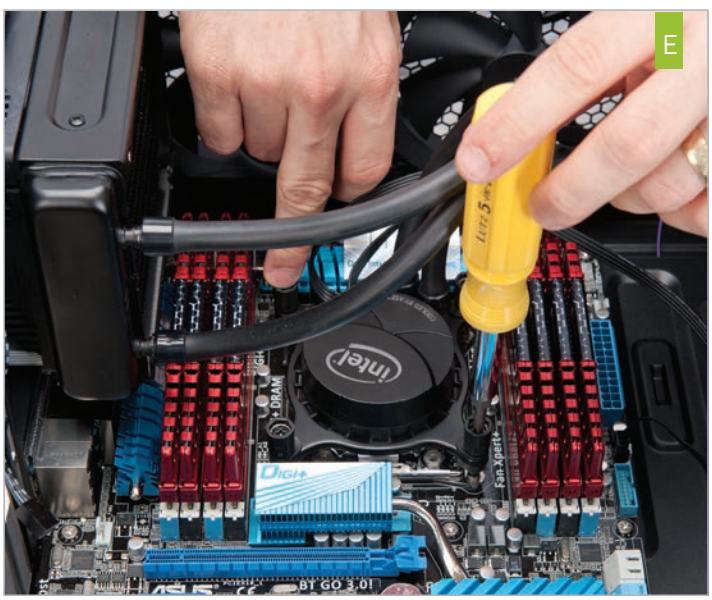

C


D

3 INSTALL THE CPU COOLER

HERE'S WHERE it gets tricky. The P280's rear-panel fan-control switch won't allow us to install the radiator directly against the rear panel; we have to put the fan in first. The fan that comes with Intel's RST2011LC, though, only has mounting holes on one side of its housing. In order to mount the fan as intake (rather than exhaust), we'll need to use the four aluminum spacers Intel ships with the cooler. Install as shown **(image D)**.

Once the radiator and fan are installed, apply a dollop of thermal paste half the size of a pea to the CPU's heat spreader, and attach the CPU retention clamp to the backplate by using the shorter of the two sets of mounting screws included with the cooler. Seat the cooler on the CPU, then align the ledges on the cooler with the barbs on the mounting plate, and tighten the screws, opposite corners first, like changing a car tire **(image E)**. Connect the fan's power cable to the header on the pump, then connect the pump's power cable to the CPU_FAN header.


E

4 INSTALL DRIVES

REMOVE THE top-most optical drive bezel and slide the Blu-ray drive into the slot; the toolless mechanism will engage when the drive is in all the way. Secure the drive with screws if you'd like, then connect a SATA cable from the optical drive to one of the blue SATA ports on the motherboard.

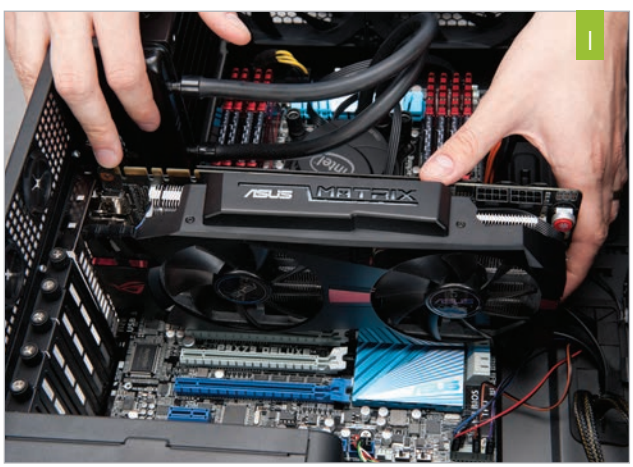
The P280, like previous Antec cases, is all about silence, and its hard drive trays bear that out. Rather than attaching to the sides of the hard drive, like most trays, the P280's trays attach to the bottom of the drive through thick silicone grommets **(image F)**. These dampen vibration and prevent noise.

Since SSDs don't produce vibration, they just mount to the middle of the drive tray. Install both drives, slide the trays back into place, and attach each drive to the top gray 6Gb/s SATA ports on the motherboard with the black-and-white 6Gb/s SATA cables that come with the motherboard.


F

6 INSTALL THE VIDEOCARD

FROM AN installation perspective, the only unusual aspect of the Asus Matrix GTX 580 we're using is its tremendous size—it uses three expansion slots instead of the usual two. Install it in the case's second through fourth expansion slots, which correspond to the top PCIe x16 slot on the motherboard **(image I)**. Attach the two 8-pin power connectors. Double-check to make sure everything is connected and powered, and you're all set!



I

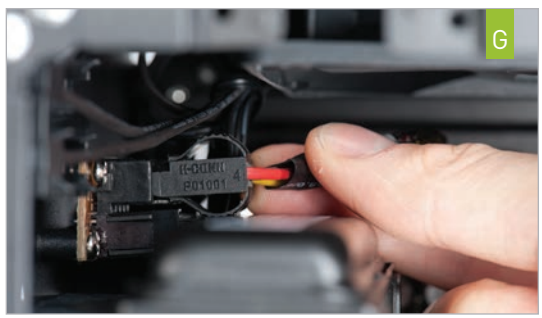
5 INSTALL PSU, ROUTE WIRES

CONNECT THE front-panel connectors to the motherboard, then install the PSU in the bottom of the case with the fan pointing down. Use the four extra-long screws that come with the PSU. Route the 24-pin and 8-pin ATX power cables behind the motherboard, as well as one Molex power connector, which you should bring behind the motherboard tray with the 8-pin ATX power cable, to plug into the fan controller at the top rear of the case **(image G)**.

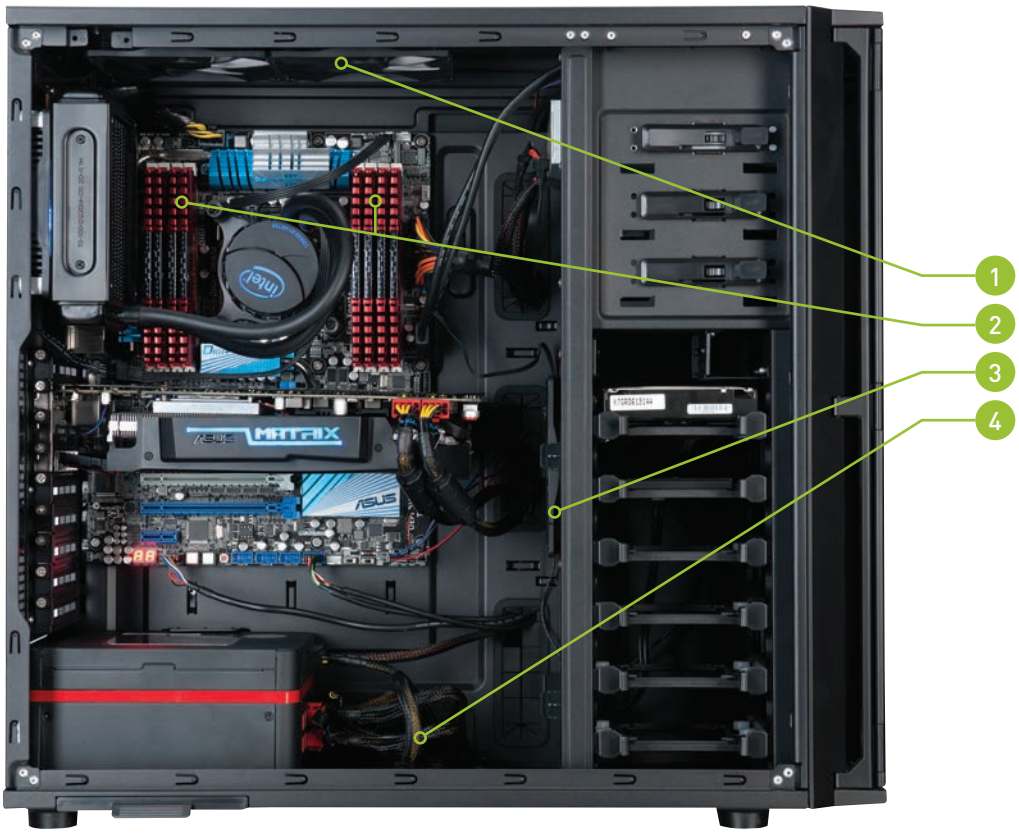
You should be able to power the optical drive and both storage drives with a single SATA power strand; I found it helps to bring the cable through the bottom cutout, back out through the top, and use the first SATA power port on the optical drive, then bring the rest of the strand back through the cutout and down to the hard drive and SSD.

Don't forget to attach two 8-pin PCIe power cables (the ones with the red connectors) to your PSU and run them up to where the videocard will be. When completed, the right side of my case looked like **image H**.

If you haven't already, take the time to plug in the front-panel connectors: the USB 2.0, HD Audio, and front-panel controls go to the bottom of the motherboard, and the USB 3.0 internal header attaches at center right.


G


H



1. Antec's two-speed fans are near-silent on low, and I didn't have to switch 'em up to high, even with GPU and CPU overclocked.

2. 32GB of RAM is probably overkill, but with DDR3 so cheap and slots so plentiful, how could we resist?

3. The fan we moved from the rear exhaust draws cool air from the front of the case over the hard drive, then straight to the GPU.

4. The Antec P280 case doesn't have quite as many behind-the-motherboard cable-routing options as other cases, but it's still easy to do a neat wiring job

IT'S A QUIET RIOT, ALL RIGHT

EVEN BEFORE I overclocked the machine, its results were impressive, but once I got the CPU up to 4.4GHz and the GPU up to 930MHz (from its 816MHz default), it blew our zero-point out of the water. Thanks to those six overclocked cores and 32GB of RAM, the Sandy Bridge-E rig was a whopping 60 percent faster than the zero-point in our Vegas Pro 9 test, 45 percent faster in Lightroom, 40 percent faster in ProShow, and 54 percent faster in MainConcept Reference. The overclocked GTX 580 even outperformed the dual-GPU Radeon HD 5970 from our zero-point.

In CPU- and RAM-dependent tests, my X79 also trounced Dream Machine 2011's overclocked 2600K, though the single GTX 580 in my rig, overclocked as it was, couldn't match the three GTX 580s in the Dream Machine, producing just 51.6fps in our Stalker benchmark to the Dream Machine's 125.9fps. It fared a bit better in our Far Cry 2 benchmark, at 124.5fps, but the tri-SLI Dream Machine pushed over 203fps to our 2650x1600 panel. Still, with a few more GPUs, the Sandy Bridge-E machine would trounce our Dream Machine.

One thing I didn't get to try was building out a RAM disk—yet. With 32GB to play with, I could make a 20GB RAM disk with read speeds in the 4,000MB/s range and still have 12GB of RAM for day-to-day tasks. I also probably could have clocked the CPU up a bit more, but I ran out of time. Still, 4.4GHz is quite nice. I'm also really impressed with how easily the Matrix GTX 580 overclocked with Asus's GPU Tweak software, and how quietly it ran even at a 13 percent overclock.

Another nice surprise was Antec's P280 chassis. This was my first build into that case, and frankly, I expected to have to add more fans. While it's not the easiest build I've ever done, the P280's guts are miles ahead of Antec's older designs, and the darn thing is quiet.

It did feel weird to pay just $200 for 32GB of RAM, yet more than $350 for a 3TB hard drive. The flooding in Thailand had just started to affect hard drive supplies at the time I was building, and I was startled to see prices on existing stock double nearly overnight.

After this build, I'm definitely excited for Sandy Bridge-E. The platform's sheer power and ease-of-overclocking breathe new life into enthusiast computing. Most people will find that Socket 1155 Sandy Bridge machines are still a better buy from a cost/performance standpoint, but those who need power by the bucketful will find it here.

BENCHMARKS

	ZERO POINT	
Vegas Pro (sec)	3,049	1,905
Lightroom 2.6 (sec)	356	245
ProShow 4 (sec)	1,112	795
MainConcept 1.6 (sec)	2,113	1,379
STALKER: CoP (fps)	42.0	51.6
Far Cry 2 (fps)	114.4	124.5

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

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

INSIDE

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Falcon Northwest Mach V Icon 2

It's more a work of art than a PC

Sometimes, it's the outside *and* the inside that matters.

YOU CAN'T TRULY appreciate the paint job on Falcon Northwest's Mach V unless you can fondle it. We mean it—you just can't comprehend how damn smooth the paint is without lovingly stroking your hand on the side of this beauty as if you were a presidential candidate.

Inside the Mach V, you'll find a pedigree of hardware to match its stunning exterior. Intel's top gun—the 3.3GHz Core i7-3960X—gets top billing, of course. This hexa-core chip simply makes all other chips before it—quad- or hexa-core—seem downright weak. Falcon mates the chip with a top-end Asus Rampage IV Extreme board. In addition to sporting the very cool ability to update the BIOS from a USB key without a CPU or RAM installed, the Rampage IV caters to extreme overclockers with such over-the-top tricks as an "overclocking key." The overclocking key is an external video dongle that lets you display an overlay of any of the CPU's temps and various voltages on a single-link monitor in real time.

Why would anyone ever want to do this? Believe it or not, extreme overclockers need the information in real time during their liquid-nitrogen escapades, and this feature can save them the price of buying a very expensive Fluke meter.

The Mach V, of course, doesn't run on liquid helium or liquid nitrogen; it uses a Cool-It Eco II ALC cooler, which enables the CPU to go from a stock 3.3GHz all the way to 4.4GHz. Falcon takes full advantage of the Intel X79 chipset's support for eight DIMM slots, too, fully populating the board with 32GB of DDR3/1600 RAM. We know 32GB is overkill, but there's some appeal to it: We're talking RAM disk, baby! Sure, an SSD can post read speeds of 500MB/s, but a RAM disk can post a staggering 4,000MB/s! It's a small RAM disk, but it delivers phenomenal disk I/O. For graphics, Falcon outfits the Mach V with a pair of EVGA GeForce GTX 580 Classified cards. These aren't just overclocked cards, mind you, they also pack massive 3GB frame buffers—double the size of a standard GTX 580 card.

So how does the Falcon stack up? It's wicked fast and handily pounds the crap out of our elderly zero-point system, as well as the majority of the Core i7-990X boxes we've tested in the last year. But how does it stack up against the Digital Storm HailStorm we reviewed in the Holiday 2011 issue? There's the rub: Digital Storm clocked its Core i7-3960X part even higher, to 4.7GHz. That 7 percent edge gives DStorm's system a boost in just about everything that's processor bound. Digital Storm also takes the lead in gaming performance, thanks to its tri-SLI GTX 580 configuration. That design choice endows the DStorm with a 20 percent boost in most high-res games. Yeah, we know, a pair of GTX 580s is crazy fast for every game out today; but three of a kind trumps a pair, no matter how you cut the benchmarks.

We have to note, however, that the Digital Storm rig costs about $400 more than this Falcon. Still, when each price tag is pushing $7,000, it's hard to snivel over a few hundred bucks. The Falcon Mach V is the sexier beast, though; and make no mistake: She's fast enough for you, old man; she's just not the fastest machine we've tested. —GORDON MAH UNG

BENCHMARKS

	ZERO POINT	
Vegas Pro (sec)	3,049	1,853
Lightroom 2.6 (sec)	356	240
ProShow 4 (sec)	1,112	790
MainConcept (sec)	2,113	1,303
STALKER: CoP (fps)	42.0	94.3 (+213%)
Far Cry 2 (fps)	114.4	200.0

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 1,750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and the 64-bit version of Windows 7 Ultimate.

VERDICT 9

Falcon Northwest Mach V Icon 2

+ HAL 2000 The smoothest paint job we've seen in a long time; damned fast.

– ED 209 Expensive; an SLI rig will never beat a tri-SLI config.

$6,993, www.falcon-nw.com

SPECIFICATIONS

Processor	Intel 3.3GHz Core i7-3960X OC'd to 4.4GHz
Mobo	Asus Rampage IV Extreme using Intel X79 chipset
RAM	32GB Kingston DDR3/1600
Videocard	EVGA Classified GeForce GTX 580 (3GB) in SLI
Soundcard	Onboard
Storage	256GB Crucial M4, 2TB WD HDD (7,200rpm)
Optical	LG Blu-ray UH12LS28K
Case/PSU	Mach V Icon 2 Case/ Silverstone Strider Gold 1,200 Watt

Asus P9X79 Deluxe

A deluxe board with an enthusiast price tag

LET'S BE FRANK: If you're even thinking about buying into Intel's deliciously fast LGA2011 platform this early, you are an enthusiast—Enthusiast with a capital-freaking-E, since you can't even look at LGA2011 without buying a $550 chip.

So if you're jumping in, you might as well use both feet. Asus's P9X79 Deluxe certainly fits that bill, delivering cool features and a stout price tag: This X79-based board will set you back a cool $400.

"Deluxe" features on board include digital VRMs, Asus's trademark UEFI, and built-in Wi-Fi and Bluetooth, with a bundled smartphone app that enables you to remotely overclock and monitor your system. This board also has an all-new feature that lets you use a particular USB port to update its BIOS without a processor installed.

The P9X79 is an eight-DIMM-slot board, not one of the weaker four-slot boards that limit your upgrade path. The eight-DIMM design will let you build a 32GB PC for less than $200 in memory cost. Doing that on any four-slot board will set you back more than $1,000. What do you do with 32GB? You set up a RAM drive, of course! We set up a RAM drive on this board using eight 4GB sticks of Corsair Vengeance RAM and saw read speeds of 4GB/s. Take that, SSDs!

But what you get in RAM, you lose in storage. The PCH in the X79 has the circuitry to support many more SAS and SATA 6Gb/s ports, but compatibility concerns caused board makers to "de-feature" it at the last minute. So instead of a board bristling with 10 SATA 6Gb/s ports, we get the standard Z68 layout of two SATA 6Gb/s and four SATA 3Gb/s. Asus tries to beef up the board's six standard ports (four 3Gb/s and two 6Gb/s) with a Marvell 6Gb/s controller that also does SSD caching. Few of us could afford to install that many HDDs given today's prices, of course, but that doesn't render the lack of native support any less of a letdown—this is a $400 motherboard, after all.

We fired up Intel's new DX79SI mobo to compare its performance to that of the P9X79. While we don't normally expect to see big performance deltas between boards based on the same chipsets, the Asus board generally produced better benchmark numbers, with one significant exception: Intel's board delivered much faster SATA 6Gb/s write speeds. We normally use OCZ's Enyo external drive to test USB 3.0 performance, but the P9X79's USB controller uses the new and speedier UASP protocol, so we also used an OWC SATA 6Gb/s drive inside a new Asus enclosure. With UASP, we saw USB 3.0 speeds climb to a nice 225MB/s read and 217MB/write. We would have liked to compare this to a USB 3.0 enclosure that doesn't support UASP, but our generic USB 3.0 enclosures don't seem to like any SATA 6Gb/s drives.

In the end, The P9X79 Deluxe gives you just about everything an enthusiast would truly want: SLI, tri-SLI, CrossFire X, PCIe 3.0, tons of overclocking features, lots of USB 3.0 ports, and truly fast performance (albeit it only in comparison to the limited number of X79 boards we've seen so far). Now if only it had more SATA 6Gb/s ports and the price wasn't so painful. —**GORDON MAH UNG**

BENCHMARKS

	Asus P9X79	Intel DX79
PCMark 7 overall	**3,662**	3,489
Valve Particle (fps)	**299**	260
SiSoft Sandra (GB/s)	39.9	38.9
SATA 6Gb/s read (MB/s)	**508**	499.9
SATA 6Gb/s write (MB/s)	224	**252.2**
USB 3.0 read (MB/s)	198	202.3
USB 3.0 write (MB/s)	**175**	168.5
SLI compliance	Yes	Yes
32GB compliance	Yes	Yes

We tested both boards with a 3.3GHz Core i7-3960X, 16GB of DDR3/1600, a 150GB Western Digital Raptor, a GeForce GTX 580, and 64-bit Windows 7 Professional SP1. Performance scores for the SATA 6Gb/s and USB 3.0 were attained using CrystalDiskMark 3 run against an OCZ Enyo USB 3.0 drive and an OWC Mercury Extreme Pro SSD.

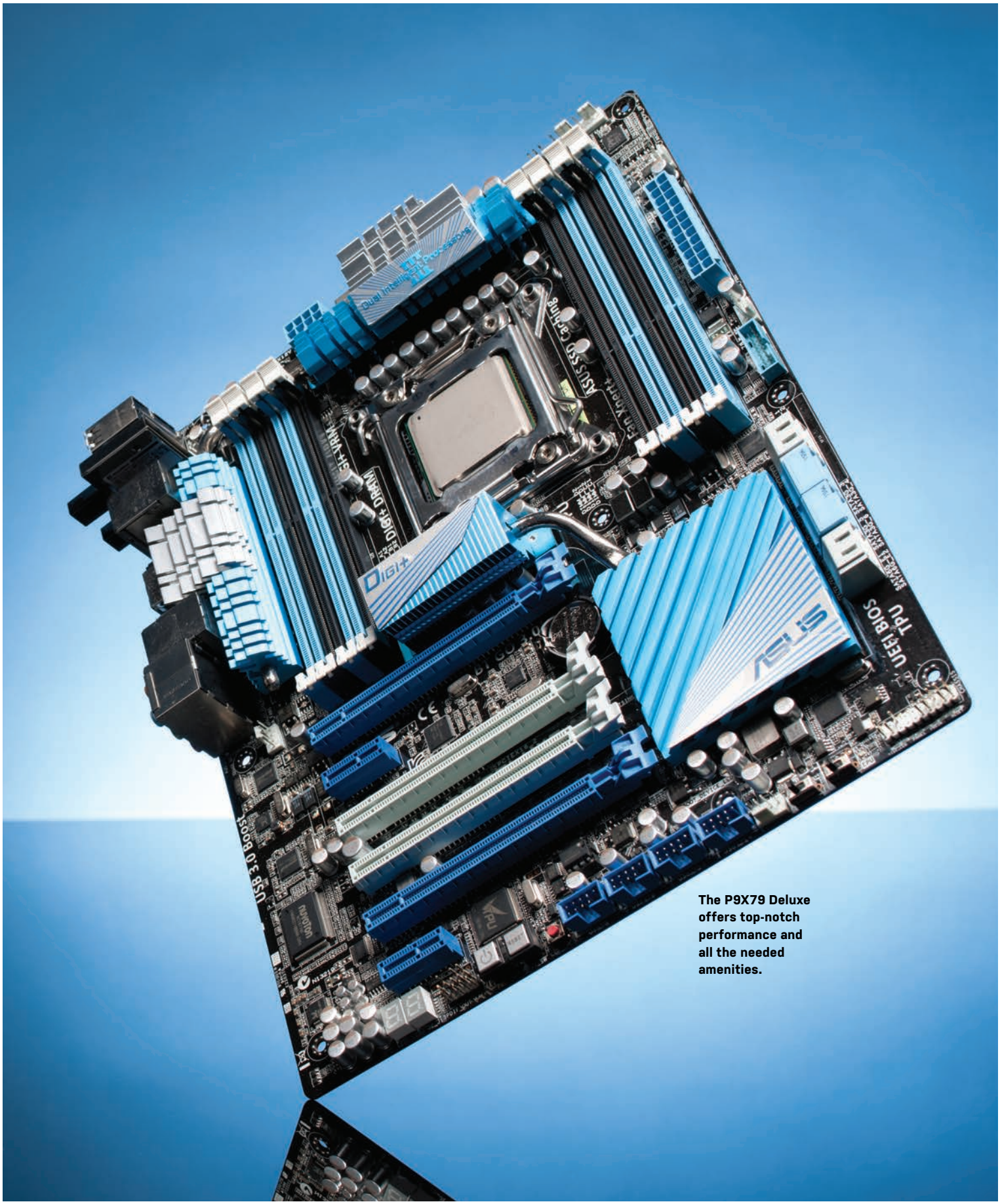
VERDICT **9**

ASUS P9X79 DELUXE

+ MCLEAN DELUXE Tons of USB 3.0 ports; well laid out; fast.

– MCHOTDOG Painful pricing; needs more SATA 6Gb/s ports.

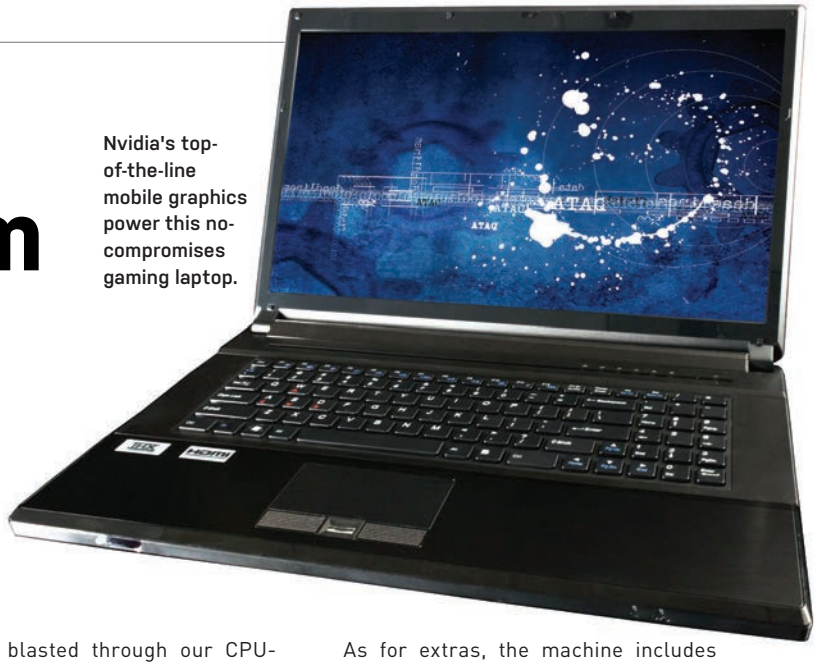
$400, www.asus.com



The P9X79 Deluxe offers top-notch performance and all the needed amenities.

Digital Storm x17 Laptop

Fast performance and no frills



Nvidia's top-of-the-line mobile graphics power this no-compromises gaming laptop.

WE GET TO TEST a lot of unusual laptops—overclocked, oversize, over-dimensional, and just altogether overdone. Digital Storm's x17, from first impression to Lab testing to real-world evaluation, is just a normal 17-inch laptop. It has high-end components that make it an extremely fast 17-inch laptop, but we're not sure that's enough to justify its high price.

The centerpiece of this system is Nvidia's GeForce GTX 580M graphics card with 2GB of memory. As the current top-of-the-line of Nvidia's mobile offerings, it delivered unflinchingly fast performance in all of our benchmarks. For example, it rendered 86fps in our Far Cry 2 benchmark and 115fps in Call of Duty 4. That's almost twice the speed of our reference system, leaving plenty of headroom for more demanding games to come in the future. That's the advantage of shelling out extra money for a top-of-the-line gaming laptop—you stave off obsolescence just a bit.

The quad-core Intel Core i7-2820QM chip running at 2.3GHz, with Turbo Mode to 3.4GHz, was also essential to the laptop's good showing in our tests. Digital Storm's x17 blasted through our CPU-intensive tasks, with special help from its 120GB SSD (SATA 6Gb/s) in the video rendering. We're happy to see that solid-state drives have become almost standard in high-end laptops; they make perfect sense in terms of durability, energy use, and, of course, speed. Digital Storm also included a 750GB 7,200rpm mechanical drive for storing your prized collection of kitten videos.

Though we can't complain about the guts of the system, we do have some quibbles with some of the design choices. For one thing, the laptop has HDMI and DVI ports for video output, but no old-fashioned VGA port. That's nothing that a $3 adapter can't fix, but for a laptop, which you might want to plug into random projectors and monitors, we'd prefer a VGA port always at the ready. The glossy surface of the 17.3-inch LED-backlit display is a bit too glossy for our taste; glossy means reflective, and we prefer not to look at ourselves while we sit in front of a laptop. We also prefer touchpad buttons that give a more definite click when you press them.

As for extras, the machine includes a fingerprint reader integrated into the touchpad as well as excellent speakers with THX audio. Many of the laptops we test have speakers that just aren't loud enough, and the x17 offered both full-blast volume and a comparatively rich sound through its five speakers and built-in subwoofer.

Digital Storm's x17 is about as fast a gaming laptop as you are going to find, short of an SLI configuration. In fact, it's fast in anything you might want to do. The only real drawbacks are the price and its decidedly unexceptional appearance.

—KEN FEINSTEIN

VERDICT 9

Digital Storm x17 Laptop

+ BANANA SPLIT Extremely fast gaming performance; booming audio.

– PLAIN VANILLA Humdrum, uninspired design; pricey.

$2,890, www.digitalstormonline.com

BENCHMARKS

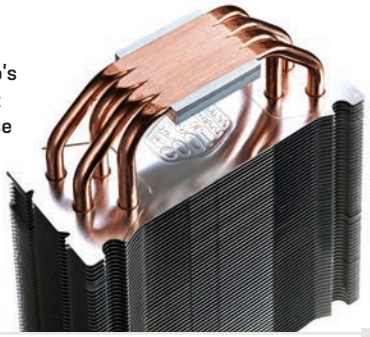
	ZERO POINT	
Premiere Pro CS3 (sec)	899	480
Photoshop CS3 (sec)	131	74
ProShow Producer (sec)	876	541
MainConcept (sec)	1,782	1,074
Far Cry 2 (fps)	48.5	86.4
Call of Duty 4 (fps)	62.2	115
Battery life (min)	96	130

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

Our zero-point notebook is an Asus G73Jw-A1 with a 1.73GHz Intel Core i7-740QM, 8GB DDR3/1066, two 500GB Seagate 7,200rpm hard drives, a GeForce GTX 460M, and Windows 7 Home Premium 64-bit. Far Cry 2 tested at 1680x1050 with 4x AA; Call of Duty tested at 1680x1050 with 4x AA and 4x anisotropic filtering.

SPECIFICATIONS

CPU	2.3GHz Intel Core i7-2820QM (Turbo Mode to 3.4GHz)
GPU	Nvidia GeForce GTX 580M 2GB
RAM	8GB DDR3
Chipset	Mobile Intel HM67 Express
Drives	120GB SSD, 750GB 7,200rpm SATA Hard Drive
Optical	Blu-ray combo drive
Connectivity	HDMI out, DVI out, Ethernet, two USB 3.0, two USB 2.0, Wi-Fi, FireWire, eSATA, headphone, mic, line-in, S/PDIF output, media reader, webcam
Lap/Carry	8 lbs, 9.6 oz / 11 lbs



The Hyper 212 Evo's flat direct-contact heat pipes increase the surface area that comes into contact with the CPU's heat spreader.

Besides the heat pipes, the Evo's translucent PWM fan is the only difference between this and previous iterations of the Hyper 212 CPU cooler.

Cooler Master Hyper 212 Evo

The low-cost champion, evolved

FREQUENT MAXIMUM PC readers will have noticed our love affair with Cooler Master's Hyper 212 Plus CPU cooler. The 212 Plus came out of nowhere and captured our hearts—and a spot on our Best of the Best list—with its excellent cooling power and rock-bottom $30 price tag way back in 2009. It's not the best CPU cooler we've tested, but we've installed it in virtually every stock-clocked PC we've built since, thanks to its unbeatable price/performance ratio. Cooler Master's all-new Hyper 212 Evo costs five dollars more than the Plus. But is it five dollars better?

Like its predecessor, the Evo is a skyscraper-style heatsink with four direct-contact heat pipes rising through a stack of aluminum cooling fins. It's 6.3 inches tall from the contact plate to the top of the heat pipes, 2 inches deep (3.13 inches after adding one 12cm fan), and 4.7 inches wide. Cooler Master provides a universal mounting bracket that will fit AMD and Intel LGA775, 1155/1156, and 1366 sockets, and a separate one for Socket LGA2011. Four standoff pegs bolt through the motherboard and onto the backplate, and an X-shaped bracket holds the contact plate to the CPU with four spring screws attached to the standoffs. Plastic clips secure the 12cm fan to the heat exchanger in a fashion similar to the most recent 212 Plus coolers we've used (the original Hyper used wire clips).

In short, the Evo is identical to its predecessor in every aspect but one: Where the 212 Plus's heat pipes meet the cooler's contact plate, small gaps reduce the surface area that is in direct contact with the CPU's own heat spreader. The bottoms of the Evo's heat pipes are so flat that these gaps are entirely eliminated.

At our i7-930 test bed's stock speed of 2.8GHz, it was hard to tell the difference between the two coolers: The Evo ran just over a degree Celsius hotter than the Plus at idle, and just under a degree warmer at 100 percent CPU burn. Both coolers far outperformed our stock cooler, by 4-5 C at idle and by a whopping 14 C at full burn.

We didn't notice a meaningful difference until we cranked up the test bed to our overclocking-challenge speed of 3.9GHz. At full burn, the Evo kept our CPU fully 9 C cooler than its predecessor could manage. Neither part came close to besting our air-cooling champion, Prolimatech's Armageddon, with this stress test, however; and the stock Intel cooler lasted just 20 seconds before the CPU began to throttle itself.

If you're already using a Hyper 212 Plus, we don't see a reason to switch to the Evo unless you'd like to crank your clock speeds a little higher. If you're building a new rig, or looking to upgrade from a stock cooler, on the other hand, the Evo is a worthy successor to the 212 Plus. Five dollars for a cooler that can keep an overclocked proc 9 C cooler? We'll take it.

We could wish for an easier mounting bracket, but honestly, the Hyper 212 Evo is a damn-good deal at $35.

—NATHAN EDWARDS

BENCHMARKS

	Cooler Master Hyper 212 Evo	Cooler Master Hyper 212 Plus	Prolimatech Armageddon	Stock Intel Cooler
Ambient (C)	25	25	25.3	24.6
2.8GHz idle (C)	38.75	37.5	**36.25**	42.5
2.8GHz 100% burn (C)	57	56.25	**51.25**	71.5
3.9GHz idle (C)	45	46.25	**42.5**	55.25
3.9GHz 100% burn (C)	84.25	93.25	**73**	WNR

Best scores are bolded. Ambient represents ambient air temperature in the Lab at time of testing. All coolers tested with a Core i7-930 at both stock 2.8GHz and overclocked to 3.9GHz on an Asus P6X58D Premium motherboard in a Corsair 800D chassis with stock fans, 6GB DDR3 RAM, and Radeon HD 5850 GPU. Clock frequencies measured with TMonitor; temps with HWMonitor. Stress tests performed with Intel's internal testing utility running at 70 percent load.

VERDICT 9 KICK ASS!

Cooler Master Hyper 212 Evo

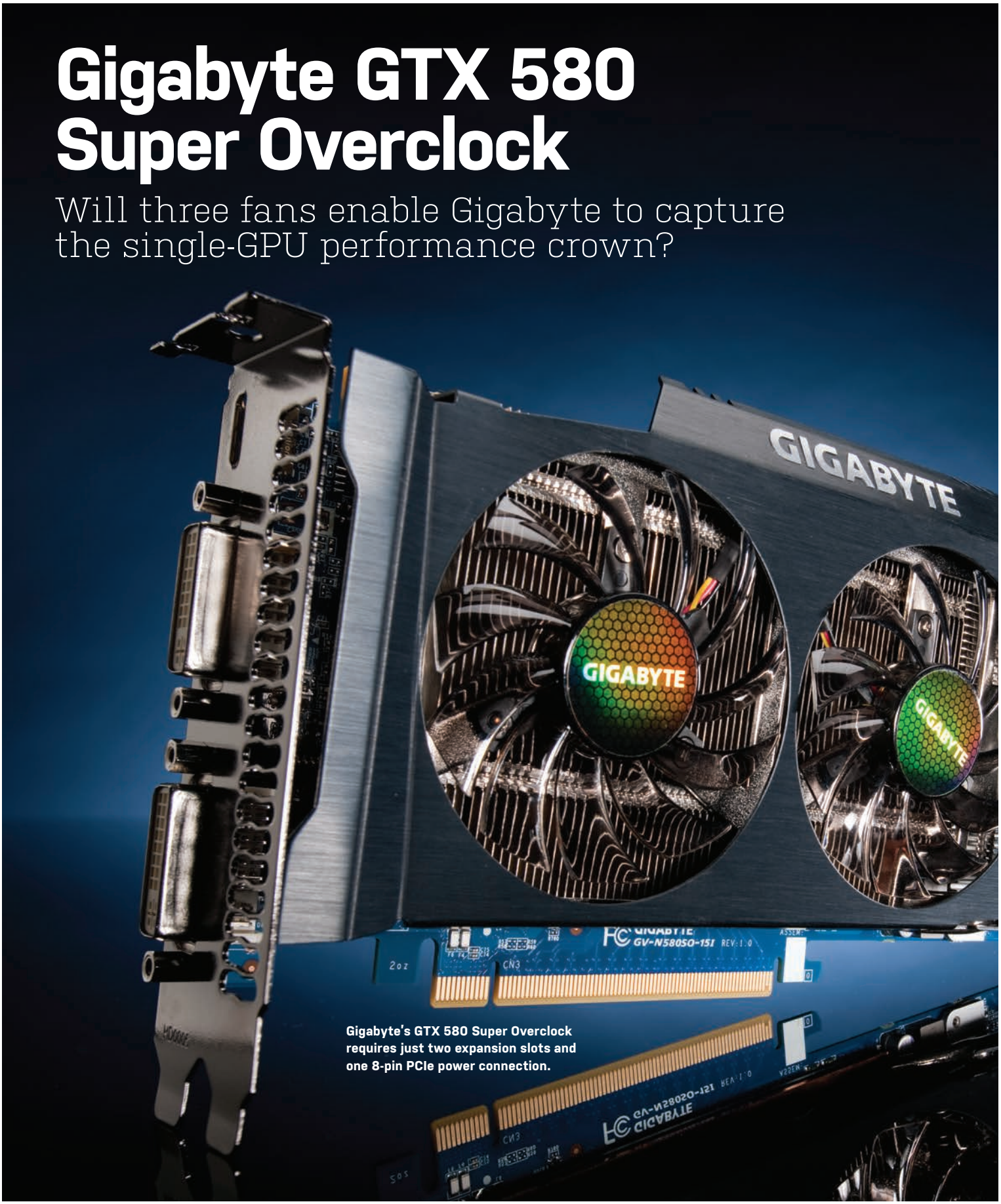
+ EVO Nearly identical to the Plus; excellent value for the money; better performance on overclocked chips

– PLUS Nearly identical to the Plus; mounting bracket is getting old.

$35, www.coolermaster.com

Gigabyte GTX 580 Super Overclock

Will three fans enable Gigabyte to capture the single-GPU performance crown?



Gigabyte's GTX 580 Super Overclock requires just two expansion slots and one 8-pin PCIe power connection.

WE FOUND THE Asus Matrix GTX 580 Platinum that we reviewed in the November 2011 issue to be pretty badass: It's a solid, factory-overclocked card that's impressively easy to push even harder. But it's also three slots wide and requires two 8-pin PCIe power connectors. Gigabyte's GTX 580 Super Overclock (model GV-N580SO-15L) takes Nvidia's GPU even further, pumping the core from a stock 772MHz all the way to 855MHz, and the card's 1.5GB of GDDR5 memory from a stock 1,002MHz to 1,025MHz (the Matrix GTX 580 comes out of the box with its GPU running at 816MHz and its memory at 1,002MHz). And the Gigabyte takes up only two slots and uses just a single 8-pin power connector.

Gigabyte, like Asus, provides software to help you overclock the card even more, but Gigabyte's card lacks the other engineering amenities that Asus provides, including voltage control, insta-max fan speed, and reset-to-factory-settings buttons. This renders Gigabyte's offering less forgiving when it comes to pushing the envelope. The Super OC ships with three cooling fans, which must be better than the two on the Matrix, right? Well, the card remained cool enough during our benchmarks, but we also found it to be noisier under load than the Matrix card.

With those thoughts in mind, let's discuss performance: Gigabyte's card edged out Asus's, but it was by no means a clean sweep: the Asus Matrix card won several benchmark categories, with Unigine Heaven being the most notable. Several other results—including Just Cause 2 and Metro 2033—were essentially ties. So the Gigabyte's performance is pretty good, but it's not quite as over-the-top as we had expected. Also, take a look at the difference in power consumption. This is where Asus's careful binning of GTX 580 GPUs comes in: The Matrix consumes much less juice than the Super Overclock, which likely will leave you more headroom for overclocking.

All these factors are reflected in the card's street price, which is $10 less than the Asus (and Gigabyte was offering a $20 rebate at press time). So the Super Overclock delivers fewer features and a little less performance and headroom, but also a lower price tag. You'll need to decide which factors are most important to you. **—LOYD CASE**

VERDICT

8

Gigabyte GTX 580 Super Overclock

+ CAPTAIN AMERICA Good performance at base clocks; requires only one 8-pin PCIe power connector.

– CAPTAIN UNDERPANTS Consumes more power; somewhat noisier; likely offers less room for overclocking beyond the factory's numbers.

$520, www.gigabyte.com

BENCHMARKS

	Gigabyte GTX 580 Super OC	EVGA GTX 580 SC	Asus Matrix GTX 580	XFX Radeon HD 6970
3DMark 2011	**6,885**	6,105	6,677	5,314
3DMark Vantage Perf	**24,762**	23,888	24,212	20,443
Unigine Heaven 2.1 (fps)	34	36	**38**	27
BattleForge DX11 (fps)	**82**	78	78	47
Far Cry 2 / Long (fps)	123	122	**124**	94
HAWX 2 DX11 (fps)	**167**	158	164	81
STALKER: CoP DX11 (fps)	**61**	58	59	53
Just Cause 2 (fps)	55	52	**56**	41
Aliens vs. Predator (fps)	42	44	**45**	40
F1 2010 (fps)	**76**	72	74	65
Dirt3 (fps)	65	74	**75**	52
Metro 2033 (fps)	26	26	**27**	22
System power @ idle (W)	157	141	**132**	139
System power @ full throttle (W)	397	395	369	**331**

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

3TB Seagate Barracuda

Three platters, three terabytes

Although this is a 7,200rpm drive, Seagate hasn't given it the "XT" branding; it's just a Barracuda.

SINCE TIME BEGAN, man has looked at four- and five-platter 3TB hard drives and dared to say, "That's cool, but when will we get hard drives with one terabyte per platter?" Man is impossible to please. Nevertheless, drive makers have cracked the 1TB-per-platter limit, and this year we'll see 4- and 5TB drives, and even one-platter 1TB drives. The first 1TB/platter drive to cross our bench, though, is Seagate's new 3TB Barracuda.

This is the first from Seagate's simplified 3.5-inch-consumer drive lineup. The LP and XT designations, for "green" and "enthusiast," respectively, are gone. In fact, Seagate has entirely phased out 5,400rpm and "green" drives. The Barracuda lineup now consists exclusively of 7,200rpm drives with 6Gb/s SATA controllers. The 2- and 3TB models use three platters, the 1.5TB version uses two, and the 1TB and lesser-capacity drives all use one. Increased areal density allows for faster read and write speeds, which should mean a faster drive. Does it?

It does. On our Sandy Bridge test bed, the 3TB Barracuda had average sequential read speeds higher than 155MB/s, with max sequential read speeds of 200MB/s. Average sequential write speeds were higher than 150MB/s. The two 7,200rpm 3TB drives we reviewed in July 2011—Seagate's Barracuda XT and Hitachi's Deskstar 7K3000—were both slower, by around 30MB/s. Random-access times for the three-platter drives were less than 15ms—speedy for a mechanical drive, although nowhere near the 0.1ms random-access times an SSD will post.

In our Premiere Pro encoding benchmark, the three-platter Barracuda lagged slightly behind the five-platter Deskstar, and both five-platter drives bested the three-platter model in PCMark Vantage.

As with all drives higher than 2.2TB, you'll need a motherboard with UEFI, the ability to make GPT partitions, and a 64-bit operating system in order to create a bootable 3TB partition on your drive. If you don't meet those criteria, you can use Seagate's included DiscWizard software to help create multiple partitions. Or you can use Disk Management in the control panel, as the gods intended. Most *Maximum PC* users will opt to use their 3TB drives as storage volumes, anyway, and you don't need UEFI to create 3TB non-booting partitions in Windows.

If you can find it at its MSRP of $180, the three-platter 3TB drive is a steal, combining sustained speeds of over 150MB/s with, well, three terabytes of storage. But given the hard drive shortages forecast due to this autumn's flooding in Thailand, supplies could be tight and street prices much higher. —NATHAN EDWARDS

BENCHMARKS

	Seagate Barracuda 3TB	Hitachi Deskstar 7K3000 3TB	Seagate Barracuda XT 3TB	WD Caviar Green 3TB
HDTune 4.01				
Avg read (MB/s)	**155.8**	119.5	124	101.5
Random-access read (ms)	**14.9**	15.7	17.2	15.7
Avg write (MB/s)	**150.7**	118.5	122	96.9
Random-access write (ms)	14.9	15.7	17.3	**15.6**
Burst write (MB/s)	**335.5**	315.6	284.8	183.1
Premiere Pro Encode (sec)	455	**435**	447	530
PCMark Vantage	6,910	**7,663**	6,975	4,910

Best scores are bolded. All drives tested on our hard drive test bench: a stock-clocked Intel Core i3-2100 CPU on an Asus P8P67 Pro (Rev 3.1) motherboard with 4GB DDR3, running Windows 7 Professional 64-bit. All tests performed using native Intel 6Gb/s SATA chipset with IRST version 10.1 drivers.

VERDICT 9

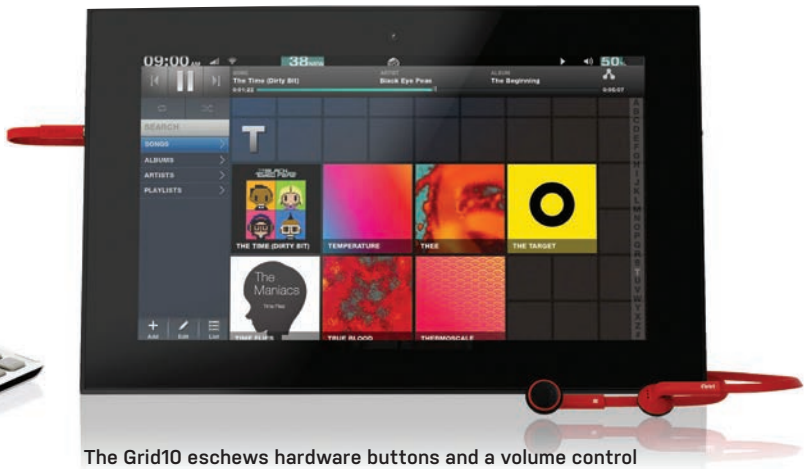
Seagate 3TB Barracuda (ST3000DM001)

+ BREAKING BAD Blazing-fast sequential reads and writes; fast access times (for mechanical storage).

– BREAKING DAWN Encoding and Vantage scores lag slightly behind.

$180 www.seagate.com

Take your pick of an Asus Slider in either Mocha or White, and with 16 or 32GB of onboard storage.



The Grid10 eschews hardware buttons and a volume control in favor of onscreen gestures and controls. A proprietary combo connector for charging, USB, and HDMI replaces standard ports.

Not Your Average Androids

Three unique tablets bring something new to the market

We've previously decried the deluge of 10-inch Android tablets as an attack of the clones; very little distinguished one from the other besides the brand name and color on the back panel. Each entry in this new crop of Android oddities, however, is unique in its own endearing—and sometimes frustrating—way. While it can no longer be said that tablet developers aren't trying anything new, we sheepishly admit that the clones are all right. —**MARKKUS ROVITO**

ASUS EEE PAD SLIDER SL101-A1

It's easy to believe that a new tablet's sole purpose is to model the latest fall fashions. Much ado is made of how thin and light each latest entrant is. Well, the Slider is more whale than waif. This is a product with a specific focus: to provide an Android (Honeycomb) tablet alternative to a cheap laptop. In that regard, the Slider manages to seem downright svelte.

A follow-up to the Asus Eee Pad Transformer, the Slider converts to a propped-up tablet with a full keyboard much more elegantly than the clamshell Transformer did. Simply pull up on the lip above the Slider's webcam and the display slides up and out to a perfect angle, revealing a keyboard that also improves on the usability of the Transformer's plank. While you don't get as many function keys, and there's still some annoying spacing problems with the Shift and Arrow keys, the Slider has a far better typing keyboard.

The Slider is a chunky slab that doesn't cotton to single-handed use because its display doesn't detach like the Transformer's. You also don't get the extra battery that the Transformer dock provided, and the Slider's battery life suffers for it. You might be able to put in a full eight-hour day on a single charge if you're just hacking away at a doc using the included Polaris Office suite; but if you're vegging out to some Hulu, expect the laziness to last closer to five hours.

While rocking the same (some would say "aging") Tegra 2 CPU that is standard on so many tablets today, the Slider exhibits exquisite performance in terms of smooth app switching, web browsing, and gaming. That, along with the beautiful colors and crisp detail of its display, comprises the highlights of the Slider experience. We also appreciate the full-size USB 2.0 port for adding a mouse or connecting an external drive, while the MicroSD slot provides a convenient means of expanding the 16GB of storage (32GB in the pricier SL101-B1).

Don't even think about the Slider if you're not serious about using it as a laptop replacement. But if this curious form factor appeals to you, step right up. Its excellent display and performance, reasonable keyboard, and extra features, such as Asus cloud storage, make the Slider go down easily.

VERDICT **8**

Asus Eee Pad Slider SL101-A1

$480, www.asus.com

FUSION GARAGE GRID10

If you believe beauty for its own sake needs no justification, you may have something in common with Fusion Garage. The boutique manufacturer out of Singapore wrote GridOS on top of the Android 2.2 kernel for the purpose of, we assume, looking really cool. The OS, which aside from the Settings screen bears little resemblance to Android, looks great; but the Garage needs a lot of tinkering in terms of performance to be more than a pretty face.

GridOS opens on a home screen where named clusters of apps are arranged on a rectangular grid that you can organize to your liking. Inward finger swipes from the top, bottom, and right of the bezel act in lieu of the typical Android home, menu, and back buttons, while the left-to-right swipe takes you to the GridOS Heartbeat,

The 8-inch VTAB1008 adds about 30 percent more screen real estate than a 7-inch tablet, but its weight makes it less appealing for one-handed e-book reading.

an innovative hub that shows all your email, social media, calendar, and app notifications. Other Grid apps, such as Calendar, Contacts, and Messages, as well as the video, music, and photo galleries, also run with the grid theme, presenting content in a compelling and clear manner.

All of that would be great if it weren't for inconsistent performance (especially with touch-screen responsiveness for gestures and web page scrolling), poor battery life (about four hours doing little more than web browsing and email), and the Google disconnect. Grid10 goes the non-Google route, confining you to the anemic Amazon Appstore and depriving you of Google apps and integration (although sideloading is possible). Sure, Fusion Garage provides capable Calendar and Contacts apps; but without Google integration, you must GridLink the tablet to Twitter or Facebook to import contacts, a process that in our opinion entails offensive privacy intrusions.

GridOS is visually stunning, and the Grid10 delivers some high-end hardware (including the highest-resolution display on a 10-inch tablet) for a reasonable price—even when you factor in the optional USB and HDMI cables at $29 and $39, respectively. But in the end, there's little to no extra functionality to justify the extra headaches.

VERDICT 6

Fusion Garage Grid10

$300, fusiongarage.com

SPECIFICATIONS

	Asus Eee Pad Slider	Fusion Garage Grid 10	Vizio VTAB1008
CPU	Nvidia Tegra 2 1GHz dual-core	Nvidia Tegra 2 1GHz dual-core	Marvell Armada 600 1GHz single-core
RAM	1GB	512MB	512MB
OS	Android 3.2	Grid OS (built on top of the Android 2.2 kernel)	Android 2.3.2
Display	10.1 inch, 1280x800, LED-backlit LCD	10.1 inch, 1366x768 TFT LCD	8 inch,1024x768, LED-backlit LCD
Storage	16GB (SL101-A1)/32GB (SL101-B1)	16GB	4GB
Camera	1.2MP front; 5MP rear	1.3MP front	VGA front
Connectivity	USB 2.0, Mini HDMI, MicroSD, headphone/mic, Bluetooth 2.1, 802.11b/g/n	Docking port (power and optional USB and HDMI) MicroSD, headphone/mic, Bluetooth 2.1, 802.11b/g/n	Micro USB, Micro HDMI 1.4, MicroSD, headphone/mic, Bluetooth, 802.11b/g/n
Dimensions (WxHxD inches)	10.7x7.1x0.68	10.8x6.8x0.55	6.6x8.1x0.48
Weight	2.1 lbs	1.7 lbs	1.5 lbs

VIZIO VTAB1008

As the Amazon Kindle Fire extends the expectations for low-cost tablets, models such as the VTAB1008 are already selling for less than $200. While Vizio can't match Amazon's content delivery or cloud storage, it does have a feature no other tablet offers: a built-in IR blaster and Remote Control app with a comprehensive device database. This renders the VTAB1008 a handy universal remote control (Vizio is best known for manufacturing big-screen HDTVs, after all).

We successfully controlled an entire home entertainment system with this tablet, which has a custom user interface running on top of Android 2.3.2 (although we think the transition from controlling one device to another was a trifle awkward). Common tasks such as jumping to the home screen, opening apps, and zooming in and out of pages felt sluggish. Touch-screen responsiveness seemed a bit off, as well, but we're not sure if this was due to the 1GHz single-core processor not being able to keep up with us.

The screen's 1024x768 resolution certainly didn't blow us away, but it did exhibit natural color and good contrast. While it seems as though every display in the world is widescreen these days, the VTAB1008's 4:3 aspect ratio is well suited to standard-definition movies and TV shows, and Vizio provides buyers with extended free trials for Netflix (30 days) and Hulu Plus (90 days). Connect the tablet's HDMI output to a higher-resolution display, and it will produce video at the native resolution of the stream (up to 1080p). Three strategically placed speakers, meanwhile, ensure stereo sound in either portrait or landscape mode.

Vizio sells this tablet primarily as a TV accessory—touting its universal remote control features and its ability to browse the web and use email while watching television; something we know multitasking tablet users love to do. In other words, it's not aimed at power users. Vizio nonetheless does plan to offer a Honeycomb update; and the VTAB1008 can access the Android Market, unlike the Kindle Fire (which we'll review next issue). If you're interested in a budget tablet with strong battery life that can double as a universal remote, this could be the device you're looking for.

VERDICT 7

Vizio VTAB1008

$330, www.vizio.com

Cubitek XL Tank

An all-aluminum chassis from a newcomer

The customizable aluminum GPU-support column is perfect for folks who drag their machines around to LAN parties.

Is Lian Li-esque a word?

CUBITEK CALLS this chassis the XL Tank, although we're not sure what the XL stands for. At 19.3 inches tall by 9.1 inches wide by 20.7 inches long, the XL Tank could be a large midtower, or a small full-tower case—but it's not extra-large by any means.

The XL Tank is a spiffy-looking case, featuring full aluminum construction and a slick, black brushed exterior with sharp, defined angles that remind us of more expensive Lian Li chassis. The interior panels are unpainted glossy aluminum, which we like—unpainted aluminum looks much better than unpainted steel.

The XL Tank can accommodate XL-ATX, CEB, ATX, microATX, and Mini-ITX motherboard configurations. The motherboard tray includes a large CPU backplane cutout, as well as 14 cutouts for cable management. None of the cutouts feature grommets or padding of any kind, although the edges have been deburred.

The inside of the chassis offers slightly more building space than your average full-tower, and while the hard drive cage can be removed to gain space, we were able to cram a 12-inch videocard inside without moving anything.

The XL Tank also sports several unique features, including an aluminum videocard-support column; washers and screws enable you to place varying degrees of pressure on the top of your card to secure it in place. Rigging your hard drives into one of the six available drive bays involves attaching wheels to the sides of the drives, rolling them into place, and then locking them down with a hex bolt. Even the case's plastic feet can be removed using a screwdriver. A toolless case this ain't; in fact, the eight PCIe mounting brackets are the only components that use thumbscrews.

The XL Tank comes with four fans: two 14cm top fans, one 23cm front fan, and one 14cm exhaust fan. The chassis also features two rear cutouts for water cooling. The front panel is relatively spartan, with two USB 3.0 ports (using pass-through cables), two USB 2.0 ports, and a single eSATA port. There are four optical drive bays—one of which harbors a 3.5-inch adapter—that require small screws to secure the drives.

This is a very quiet enclosure when powered up, but you needn't worry that it won't keep your gear cool. CPU temps on our thermal testing setup hovered around 55.7 degrees Celsius while under full load, and 35.7 C at idle.

The XL Tank provides for a straightforward build experience, it stays cool under load, and we dig its understated style. Cubitek, for whatever reason, provides a profusion of extra bolts and screws—easily twice as many as is typical—but each bag is clearly labeled, and we had no trouble figuring out which ones we needed. Steer clear of this case if you're looking for a quick-and-easy, toolless build, but the XL Tank will provide ample rewards to those willing to invest a little extra time and patience. —ALAN FACKLER

VERDICT 8

Cubitek XL Tank

+ TANK Retro styling and minimalist approach; cool idling temp with stock fans; GPU support column is a nice touch; lots of cable routing cutouts.

– STANK Too many screws and bolts; no toolless enclosures; some screws need an Allen wrench (provided); no padding on cutouts.

$170, www.cubitek.com

The third-generation WD TV Live is thinner and more capable than previous models, and the remote is significantly better.

Plenty of device support here, with both analog and digital audio and video outputs.

Madcap Media Streamers

One of these things is not like the other

Media streamers like the Western Digital WD TV Live and Netgear NeoTV make just a little less sense than they did a couple of years ago. In those days, they were the perfect alternative to stuffing a home theater PC into your entertainment center. These days, you can get nearly all the same functionality from a new Blu-ray player or a Smart TV.

On the other hand, the latest incarnations of these two products cost less than a new Blu-ray player, and they're several orders of magnitude cheaper than a new HDTV (or a home theater PC, for that matter). And while they do have some features in common, the NeoTV delivers far fewer features than the WD TV Live and is priced accordingly, so we're not making a direct a head-to-head comparison between the two here. —MICHAEL BROWN

WESTERN DIGITAL WD TV LIVE

For a company whose primary business is manufacturing hard drives, Western Digital sure knows a lot about digital media and how to stream it over a network. Each succeeding generation of the company's WD TV Live product has led the market in terms of features, price, and performance, and this one is no different.

With this incarnation, WD adds several new services (including Hulu Plus and Spotify), a collection of simple online games, an integrated Wi-Fi adapter, and even the ability to decode Dolby TrueHD. Unlike the pricier WD TV Live Hub, which remains in Western Digital's lineup, this product does not include any local storage. But it is equipped with two USB 2.0 ports, so you can easily connect a portable drive. You can also connect a USB keyboard, which makes initial setup (entering Wi-Fi and network user IDs and passwords, for instance) considerably easier than hunting and pecking using the remote and the onscreen keyboard.

Most people will connect the WD TV Live to their entertainment system using the HDMI 1.4 port (you'll need to provide your own cable), but the device will happily accommodate older equipment with its analog A/V and digital S/PDIF outputs. There's also an Ethernet port in the back panel, but the integrated 802.11b/g/n wireless client adapter proved plenty fast for streaming video at 720p—an impressive achievement, considering that we tested the box in a room-within-a-room home theater at Maximum PC Lab North. We needed a hardwired connection to stream video at 1080p. Image quality was excellent.

The remote is easily the best that WD has come up with so far, with a molded grip that feels very natural in either hand. We needed to bend our thumb to reach the alpha-numeric keypad on the bottom half the device, but we seldom use those buttons, anyway. We used the home, arrow, mute, and transport (play/pause, stop, fast forward/rewind, and skip forward/back) buttons far more frequently, and those are all within easy reach. The remote also has four shortcut buttons—labeled A, B, C, and D—that can be custom programmed.

Western Digital offers a strong collection of online movie and music services in addition to the new ones mentioned earlier. You'll find all the old standbys here, including Netflix, YouTube, and Pandora; but you'll also get CinemaNow, Blockbuster on Demand, Live365, and several others. Unfortunately, you won't be able to tap what we consider to be the best online, on-demand movie service of them all:

Anyone considering buying one of Roku's streaming boxes should take a long look at what Netgear has to offer with the NeoTV NTV200.

Netgear's app lets you use your smartphone as a remote.

Vudu. Western Digital does deserve praise for its broad media file and container file support, which includes the video standards AVI, MKV, MPEG-1/2/4, h.264, VOB, and M2TS (the container for Blu-ray movies); the audio formats AAC, FLAC, OGG, and MP3 (including 24-bit/48kHz FLAC); and the digital photo formats BMP, JPEG, and PNG. The device supports playlists and subtitles, too.

The WD TV Live is the best full-featured media streamer you can buy today, but we'd like it even more if it included Vudu.

VERDICT 9 KICK ASS!

Western Digital WD TV Live

$120 street, www.wdc.com

NETGEAR NEOTV NTV200

Craving a spot at the commercial online media buffet, but not at all interested in ripping your own media? Netgear has just the right dish. The NeoTV taps your broadband connection to serve up Netflix, Vudu, Pandora, YouTube, Picasa, and plenty of other online services; but it can't tap media stored on your own network, and it doesn't have any USB ports to access local storage.

We initially considered this to be a major disappointment: If you own a late-model Blu-ray player or a Smart TV, the NeoTV has very little to offer. But plenty of us haven't made such investments, and if online entertainment is all you're looking for, Netgear's device costs $40 less than Western Digital's. You're not getting as many features, but you're also not being forced to pay for features you won't utilize.

The NeoTV's built-in 802.11b/g/n Wi-Fi adapter performed just as well as the one inside the WD TV Live—we had no problem streaming Netflix and Vudu movies without wires (although we were once again limited to 720p resolution; we needed to plug in a CAT5 cable to enjoy Vudu movies at 1080p). The only other connectivity features on the box are HDMI and S/PDIF—there's no support for analog audio or video devices at all.

Netgear provides a very basic remote control with the NeoTV. We have no complaint with the button layout, and we like the clicky, tactile feel it provides much better than the mushy buttons on Western Digital's controller; but there's no alpha-numeric keypad for typing search queries (you must use the arrow buttons to navigate an onscreen keyboard), and there's no mute button. But Netgear redeems itself with a free app that will turn your iPhone or Android phone into a compatible remote. That's sure to come in handy when the regular remote's two coin batteries crap out late one evening.

There's also a very good collection of streaming media services on tap. While Western Digital scores a big win with its support for Spotify, Netgear can deliver movies in HD and in surround sound on demand via Vudu. And if you're a Napster subscriber, you can listen to your tunes on the NeoTV, but not on the WD TV Live. There's a long list of other less interesting services, including a host of video podcasts (does anyone actually watch those?) and some very basic online games (the same ones that Western Digital offers, including Black Jack Royale, Kaboom, Sudoku, and Texas Hold 'Em).

Enthusiasts will want more than what the NeoTV delivers, but this is a good product to recommend to friends and family who just want an easy way to stream media from the Internet to their entertainment center.

VERDICT 8

Netgear NeoTV NTV200

$80, www.netgear.com

iHome iW1 Wireless Speaker

A good wireless speaker tied to a middling networked audio ecosystem

The iHome iW1 is as attractive as B&W's iconic Zeppelin—albeit in a much more understated fashion.

THE AIRPLAY-CAPABLE iW1 wireless speaker is by far the iHome's most advanced product, but its $300 price tag pits it against some tough competition, including the Sonos Play:3. The Sonos sounds just slightly better, and the Sonos Wireless HiFi system remains the best inexpensive multiroom audio system we've tested (iHome recommends limiting an AirPlay network to just three iW1s), but the iW1 is eminently portable and can operate on battery power.

Most people will stream music to the iW1 over their Wi-Fi network using Apple's AirPlay technology or by docking an iOS device using the provided USB cable. But you can connect any audio source to the speaker using a 1/8-inch cable. The iW1's battery charger sits beneath the unit and is completely hidden while charging. The balance of the iW1's industrial design is equally elegant. Touch-sensitive controls for volume and iPod/iTunes control are located on the top of the device, along with a collection of status LEDs.

A 13-watt-per-channel Class D amplifier drives two, 3-inch, long-excursion polypropylene woofers and two, 1-inch silk dome tweeters. The amp is strong enough to fill an average bedroom with sound, and it's fine for providing background music in larger rooms, but we wouldn't rely on it for a lively party. We've said the same about the Sonos Play:3.

Like Bowers and Wilkins' pricier Zeppelin Air ($600), the iW1 takes the digital output of a docked iOS device, bypassing the digital-to-analog converter on the device. But where B&W uses a dedicated, high-end DAC for this task (an Analog Devices AD1936 that delivers a signal-to-noise ratio of 106dB), and first upsamples the bit stream to 24-bit resolution and a 96kHz sampling rate (using an Analog Devices ADAU1445 sample-rate converter), iHome uses a lower-precision multifunction codec (an Analog Devices ADAU1761 that delivers a signal-to-noise ratio of 98dB). The ADAU1761 combines a DSP, DAC, ADC, mic input, and more—it's the type of chip that you might find on a smartphone or digital camera as readily as a bookshelf audio system.

As with other AirPlay devices we've tested, iHome uses BridgeCo's DM870 networked media processor to handle wireless media streaming. The DM870 also runs the Bongiovi Acoustics Digital Power Station software, which will restore life to music that's been encoded using lossy codecs such as MP3 and AAC. The Bongiovi DPS (sorry, we can't help but pronounce this "bong-jovee") does make compressed tracks sound better; but if you're using iTunes and an iOS device, you really should encode your music using the Apple Lossless codec.

We used a number of such tracks to evaluate the iW1's audio chops, including Cara Dillon's rendition of the Irish folk song "The Parting Glass," from *Live at the Grand Opera House*. This track consists of nothing more than Dillon's delicate voice accompanied by grand piano, and it gave us a good opportunity to evaluate the speaker's performance with both streaming and hardwired audio. The Zeppelin Air, as expected, wiped the floor with the iW1; but the comparably priced Sonos Play:3 also delivered a slightly better performance than the iHome. Dillon's voice sounded crisper, and the piano notes decayed just a little more naturally.

If you can't afford a Zeppelin, and portability ranks higher than assembling a multiroom audio system, iHome's iW1 is a very attractive system. —MICHAEL BROWN

VERDICT 7

iHome iW1 Wireless Speaker

+ AIRPLAY Rechargeable battery; elegant industrial design; solid sound.

– PAY TO PLAY Ties you to iTunes; AirPlay is inferior to Sonos network; lacks a hardwired Ethernet port.

$300, www.ihomeaudio.com

Corsair Vengeance 1500 USB Gaming Headset

A pretty impressive second act, literally, figuratively, and audibly

WE AWARDED CORSAIR'S HS1 USB headset a 9 verdict last year, remarking that its huge 50mm drivers, solid and comfortable construction, and $100 price tag added up to a surprisingly good value for a freshman effort. The one element that denied the HS1 a Kick Ass award was its uninspired—nay, downright ugly—industrial design.

Corsair's new flagship USB headset, the Vengeance 1500, retains all the strengths of the HS1 and eliminates nearly all its weaknesses. The Vengeance 1500 packs the same gigantic drivers as its predecessor, providing top-notch sound quality for this price range. The circumaural design and thick, squishy padding make for a tight seal around your ears that isolates you from the pollution of ambient noise. While it doesn't deliver the level of quality that some higher-end products provide—Sennheiser's PC 333D G4ME, for example—the Vengeance 1500 does provide respectable dynamic range and bass response that's perfectly suitable for both games and movies. And while nothing can compare to an actual surround-sound setup, Corsair does deliver Dolby Headphone. This software algorithm upmixes stereo and 5.1-channel sources to simulate a 7.1-channel speaker system wrapped around your head, delivering better positional awareness than stereo phones are capable of providing.

Build quality as compared to the HS1 has also improved significantly. The struts connecting the ear cups to the headband feature an attractive brushed-aluminum finish, and the cups themselves swivel to lay flat against your chest when the headset is resting on your neck. They might feel odd if you're transitioning from an on-ear headset, but after many extended gaming sessions, we've found the Vengeance 1500 to be one of the most comfortable headsets we've tested. They are quite large, however, so they might not be the right choice if your head is particularly small.

Corsair's HS1 is a solid headset; the only reason we wouldn't recommend it today is that the Vengeance 1500 is even better. If you're looking for a serious gaming headset and can afford to spend 100 bones, you won't go wrong with this one. —**ALEX CASTLE**

The Vengeance 1500 sounds every bit as good as Corsair's earlier HS1 USB headset, and it looks a whole lot better.

VERDICT 9 KICK ASS!

Corsair Vengeance 1500 USB Gaming Headset

+ VENGEANCE High construction quality; good sound; comfortable; good value.

– PENANCE Too large for folks with wee heads.

$100, www.corsair.com

Battlefield 3

Behold the Chimera!

THERE IS A CREATURE in Greek mythology known as the Chimera. The Chimera was an unholy patchwork of a beast, a combination of lion, snake, and goat. Battlefield 3 is the software equivalent of a Chimera—a beast of a game stitched together from disparate parts.

Battlefield 3's single-player campaign is undoubtedly the goat. The game resorts to every dirty funneling trick to keep you on its chosen path, ranging from invisible walls to flat-out killing you and forcing a reload if you wander. You'll spend much of the game running a high-speed conga line with your AI squad mates, dashing from one checkpoint to the next.

The action remains maddeningly scripted when you reach those checkpoints. Ever-present mortar, grenade, and rocket explosions, combined with seemingly random enemy spawns, leave you waiting behind cover while the game essentially plays itself. Make your presence felt and your AI squad mates will do their best to get you killed by bumping into you, shoving you out of "their" cover, and getting in the way of your shots, all while the enemy seems to target you exclusively.

And if ever there was a game you didn't want to play staring at teammates' backs, it's Battlefield 3. This game boasts the most photorealistic graphics we've ever seen, with crisp textures, smooth animation, and almost no texture pop-in, a feat made all the more impressive by the game's high fidelity and remarkable draw distance. The Frostbite 2 engine's hyper-realistic volumetric effects add to the visual wow factor: Black smoke belches from burned-out tanks, sand blows across desert wastelands, and every explosion ejects chunks of dirt and plumes of dust skyward.

EA's digital-distribution and DRM system, Origin, plays the part of the snake, slithering into your Battlefield 3 experience whether you want it or not. While we suffered no technical or stability problems with Origin, the client is wholly unremarkable. It gets the job done, but it pales in comparison to Valve's well-established and feature-rich Steam. EA's Battlelog, the web-based launcher that serves as BF3's main menu, is equally unimpressive: Managing and communicating with friends is cumbersome, voice chat is absent, and trying to set up a game with a large group is nigh impossible.

Battlefield 3 offers an expansive battlespace that can go from desolate to crowded in a heartbeat on 64-player maps.

The Frostbite 2 engine delivers unparalleled lighting effects and stunning, near-photorealistic environments.

Thankfully, Battlefield 3 roars where it matters most: Multiplayer is nothing short of sublime. Classes are extremely well balanced, weapons are varied, and the leveling and unlock trees entice you to keep playing without overwhelming new players. The game features five competitive modes: squad deathmatch, team deathmatch, rush, squad rush, and conquest. In typical Battlefield fashion, vehicles play a big role, especially in the larger maps. The spectacle of 32 or 64 players firing devastating tank rounds, crashing helicopters, and shooting down jets leads to jaw-dropping "wow" moments of emergent, chaotic goodness.

So, is the Chimera that is Battlefield 3 held back by its worthless goat element and its sneaky snake component? Yes, but not all that much. Battlefield 3's unparalleled immersion factor and fantastic online modes render it the go-to multiplayer FPS well into the foreseeable future. —**DAN SCHARFF**

VERDICT 9

Battlefield 3

+ ROARING LION Refined, well-balanced, multiplayer classes; giant, chaotic, detailed maps; jaw-dropping pyrotechnic, lighting, and particle effects

– BLEATING GOAT Unfulfilling single-player campaign; Battlelog is a pain to deal with.

$60, www.battlefield.com/battlefield3, ESRB: M

LAB NOTES

NATHAN EDWARDS **SENIOR EDITOR**

Overclocking Sandy Bridge-E

Auto-overclocking provides a good starting point, with room to grow

LIKE SANDY BRIDGE'S "K" parts, some Sandy Bridge-E CPUs will have unlocked core multipliers to make overclocking easy. The Core i7-3960X is one such fully unlocked CPU, and it's easy as pie to overclock. I did it by slightly increasing the Bclock and upping the core ratio on my Asus P9X79 Deluxe's BIOS, but Asus's AI Tweak, which ships on the driver CD, lets you do the same thing with an easy-to-use GUI from within the OS. Open the TurboV Evo utility, and you'll be able to fiddle with every setting easily.

If you want a quick jumping-off point, though, you can just hit the Auto Tuning button. The utility will start stepping up the Bclock and core ratios automatically while stress-testing your CPU. Once it hits an unstable point, it'll reboot to a stable configuration, which you can stick with or—if you're adventurous—use as a baseline for more ambitious clocks.

Michael Brown
Reviews Editor

The more battery-powered streaming-audio speakers I review, including the iHome iW1 in this issue, the more I realize the glaring opportunity that Sonos has failed to seize. The company has the best affordable multiroom audio system, bar none, but it doesn't offer any battery-powered speakers. A portable outdoor model would be even better!

Alex Castle
Online Managing Editor

I've got a new gadget to add to my "scoffs-at-but-secretly-wants" list: the Sony HMZ-T1 Personal 3D Viewer. I haven't gotten to try it myself, but I've always secretly loved the idea of an immersive, head-mounted display. By all accounts the thing works pretty well—maybe I should get one for the office. For productivity only, of course.

Amber Bouman
Online Features Editor

I'm pretty thrilled to (finally) be starting a new build with my BitFenix Survivor case, Duke Nukem GTX 560 GPU, Asus P7P55D-E motherboard with an Intel Core i5-760 processor, and CoolerMaster V6 GT cooler. Now, if I can just track down a hard drive.

Markkus Rovito
Senior Editor

For a recent backpacking trip, I bought a Kinesis K3 USB charger, so my phone could serve as my video/photo camera, reading material, audio recorder, and notebook over seven grid-free days. The K3 has a 4,000 mAh battery that you can fill up via AC adapter and then replenish via solar and wind power. Pure ass-kickery.

Alan Fackler
Associate Editor

I know I'm going to catch some flack for this, but now that I've sat down with both Call of Duty: Modern Warfare 3 and Battlefield 3, I find that my loyalties lie with Modern War 3. The scope is scaled way down by comparison, but that addictive arena experience of just running and firing like crazy keeps me coming back. Now if only they'd update the damn graphics engine.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Windows 7 Tablets
> Digital Editions
> Best of the Best

Slated for Disapproval

I received my December issue of *Maximum PC* thinking that a good tablet article had finally been written. A 12-page article and not a single mention of the one tablet that actually deserved to be reviewed in *Maximum PC*?! Have you forgotten that there are Windows 7 tablets? Some actually make Androids and iPads look like the media delivery toys that they really are.

The one that should be at the top of your list is the Asus EP121, a Windows 7 tablet that is powered by an i5 CPU. Yes, a tablet with an i5 processor, 4GB of DDR3 RAM, an SSD hard drive, Cintiq-type graphics performance, and much more. I sold my year-old laptop after getting this amazing machine. Imagine that, a tablet that can actually do real work: MS Office, Coral Painter, Photoshop, etc.

–Randy Myers

SENIOR EDITOR MARKKUS ROVITO RESPONDS: Of course, we know about Windows 7 tablets, and in our experience with them, their battery life and performance speeds were appalling enough to politely decline their affections until they mature a bit. We do see your point, however, and there is a definite distinction between the Android and iPad couch buddies that are normally called tablets and the $1,000-plus workhorse slate PCs such as the EP121. There is a place for slate PCs in our pages and in our readers' lives, and we expect 2012 to be a real breakthrough year for those devices, especially once Windows 8 is ready for prime time.

Tablets in the Stream

I am shopping for an Android tablet and am in a dilemma. My main purpose for the tablet is entertainment—primarily, streaming videos at 720p. I have searched many forums and reviews for the best tablet for 720p streaming. Some have mentioned that Tegra 2 is really bad for streaming HD-quality videos. Some also mentioned that there are specific video streaming apps that work, and some that don't.

Can someone at *Maximum PC* recommend a tablet and app that work well for streaming 720p videos?

–Gio

SENIOR EDITOR MARKKUS ROVITO RESPONDS: When it comes to streaming 720p video to a tablet, we can't pin any problems specifically to the Tegra 2. Streaming video to a tablet is a sophisticated process that will have varying results depending on many factors besides the processor, including network connection quality or network interference, the source device of the video file, the number of tasks running in the background of the tablet, etc. You can't trust every Internet denizen to have it all sorted.

That said, more power doesn't hurt, so that's our recommendation. The Asus Transformer Prime just came out in December, and its quad-core Tegra 3 chip is supposedly five times faster than the Tegra 2, with improved power and only 61 percent of the power consumption. We'll be reviewing it soon, but the early hands-on reports confirm the speedier performance and sumptuous graphics. At $500/600 (32/64GB), the Transformer Prime is not cheap, but we suspect it will be a good value for what you get, and the boosted specs should only help with streaming video.

As for the app, we've had success with Qualcomm's Skifta, which was recently our Android App of Week online (bit.ly/v0iQsW). It turns your Android device into a DLNA Digital Media Controller, letting you stream media to or from it.

Digital Editions

I am in the process of switching my considerably large number of magazine subscriptions from paper to digital format. I am currently using one of two formats: Kindle or Zinio. Both of these offer the option of reading on my desktop or tablet. The Zinio edition has proven to be far superior to Kindle with most (if not all) of my magazines as an exact replica of the print version, whereas the Kindle removes many of the photos and illustrations. Kindle also removes the advertise-

> HAVE YOU FORGOTTEN THAT THERE ARE WINDOWS 7 TABLETS?

↘ submit your questions to: comments@maximumpc.com

ments, but frankly, I prefer to see the advertisements in *Maximum PC*.

My question is about the availability of *Maximum PC* in digital format. I thought I had seen mention that you would start offering that this fall and I have put off renewing my print subscription. But I have not seen any further mention.

—Bruce Noren

EDITOR-IN-CHIEF KATHERINE STEVENSON RESPONDS: Digital editions of *Maximum PC* are currently available for the Barnes & Noble Nook and Apple iPhone/iPad (through their respective newsstand apps). In both cases, the digital version is an exact copy of the print version, with ads and all. And in both cases, a single issue costs $7.99 while a subscription costs $.99 per issue.

Expect to see a digital version of *Maximum PC* for Amazon's Kindle Fire, as well.

Best of the Best Headset?

I was wondering why you do not have a headset in your Best of the Best section. Headsets are a necessity for gaming these days (with VoIP chat) and there are many different options out there. I am in the market right now for a new headset and I was wondering what *Maximum PC* recommends.

—Ryan Calvert

ONLINE MANAGING EDITOR ALEX CASTLE RESPONDS: You're absolutely right, Ryan, a headset is an important part of any gamer's kit—both because it lets you use voice chat in multiplayer games, and because it's a great way to play games after everyone else in your household has gone to sleep. Not featuring a Best of the Best headset is an oversight, and we're fixing it right now. You can see the extended list of Best of the Best products (now including headsets!) at MaximumPC.com.

As for what we'd recommend, see our review on page 90. The Corsair Vengeance 1500 is a great-sounding headset with a solid, comfortable build. At $100, it's not the cheapest on the market, but once you try it out, you'll see it's worth every cent.

Your Best of the Best is Bugged

I can no longer idly sit by while you continue to praise the Vertex 3 SSD. I have tried integrating these SSD drives several times on several different systems only to find that there are compatibility lockups. First you might think it's because of the SATA controller, but when several different controllers suffer from lockups and blue screens, and other competing SSDs such as the Intel 510 work flawlessly on the same system, it has to be a problem with the SSD. If you don't believe me, please look at the overwhelmingly high amount of negative feedback on various online web sales sites (Newegg, etc.). I demand your due diligence on the topic by investigating and revoking the drive's Kick Ass award.

—Joe

SENIOR EDITOR NATHAN EDWARDS RESPONDS: We never ran into the BSOD issue when we were testing or deploying the Vertex 3 in any of our systems, but we know that other users have. In October, SandForce finally tracked down the bug in its firmware that was causing the BSODs, and OCZ issued a firmware update, 2.15, that should fix the issue.

Regardless, the Vertex 3 is no longer our Best of the Best recommendation; it was replaced in the Holiday issue by Samsung's 830 Series SSD, which is as fast or faster in nearly every metric, and uses Samsung's controller, not SandForce's—and thus is not affected by the BSOD bug.

[NOW ONLINE]

THE F2P REVOLUTION: 25 ONLINE GAMES YOU CAN PLAY FOR FREE

One of the biggest trends in gaming over the last half-decade has been the rise of the Free to Play (F2P) online business model. You might have heard it called "freemium," or the pejorative "pay to win," but whatever you call it, it's here to stay.

We've rounded up 25 high-quality, big budget online games that you can play for free. For each one, we tell you what you get for free, and what will cost you. (bit.ly/sCgU32)

[NEXT MONTH]

COMING IN MAXIMUM PC's OCCUPY WINTER FEBRUARY ISSUE

Make Your Own Smart TV

There are multiple ways to bring the Internet to your TV, and stream the content from your TV to other devices. We're going to examine a slew of solutions for making your TV smarter.

Ultrabooks

You've been hearing about them for a while. Next month we'll put four Ultrabooks to the test.

Build a Bulldozer Box

We'll walk you through the process of building a PC using AMD's new eight-core processor.

HARDWARE

ROUTER

Netgear WNDR4500

Netgear's WNDR4500 is the first router we've been excited about since, well, Netgear's WNDR3700. It supports three 150Mb/s spatial streams on both the 2.4- and 5GHz frequency bands, so its wireless throughput is screamin' fast; it boasts two USB 3.0 ports, to support both NAS and a multifunction printer; and you can operate a guest network on both frequency bands. Netgear has also completely redesigned its browser-based user interface and come up with a user-friendly client app, so you can enthusiastically recommend this router to friends and family without worrying that they'll ask you to set it up for them. www. netgear.com

THE REST OF THE BEST

High-End Processor
Intel 3.3GHz Core i7-3960X
www.intel.com

Midrange Processor
Intel 3.5GHz Core i7-2700K
www.intel.com

Budget Processor
Intel 3.3GHz Core i5-2500K
www.intel.com

LGA1155 Motherboard
Asus P8Z68-V Pro
www.asus.com

AM3 Motherboard
Asus M5A99X Evo
www.asus.com

Price-No-Object GPU
Asus GeForce GTX 590
www.asus.com

Performance GPU
XFX Radeon HD 6970
www.xfxforce.com

Midrange GPU
MSI NGTX560 Ti Twin Frozr OC
www.msi.com

Budget GPU
XFX Radeon HD 6870
www.xfxforce.com

Performance Hard Drive
Samsung 830 Series SSD 256GB
www.samsung.com

Capacity Hard Drive
Hitachi Deskstar 7K3000 3TB
www.hitachigst.com

Air Cooling
Cooler Master Hyper 212 Evo
www.coolermaster.com

High-End Cooler
Prolimatech Armageddon
www.prolimatech.com

Blu-ray Drive
Plextor B940SA
www.plextor.com

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

Mid-Tower Case
Corsair White Graphite Series 600T
www.corsair.com

Midrange Display
LG E2370v
www.lg.com

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

GAMES WE ARE PLAYING

Battlefield 3
www.battlefield.com

Deus Ex: Human Revolution
www.deusex.com

Team Fortress 2
www.teamfortress.com

Magic: The Gathering: Online
www.wizards.com/magiconline

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FUTURE US, INC.
4000 Shoreline Court, Suite 400, South San Francisco, CA 94080
Tel: 650-872-1642, www.futureus.com

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Gordon
Mah Ung

UNIVERSAL GRAPHICS FOR ALL

AMERICAN'S, I'VE BEEN TOLD, don't care about discrete graphics anymore.

No, not you. If you're thumbing through *Maximum PC* magazine, you know the value of a good graphics card or two. The problem is, the average consumer in North America apparently feels little need for the GPU.

This isn't just anecdotal evidence, either. Research analysts who look at the ebb and flow of chip sales across the world have told me this, and I've also heard it from system builders, graphics card vendors, and various other plugged-in PC people over the years: Yankees just don't care about the discrete GPU. I've seen it with my own eyes as I browse the configurations of many PCs at the big-box stores: The vast majority use integrated graphics, with only a handful offering a discrete card.

Even more disturbing are the trends I'm being told about: While Americans don't care about graphics, in European and Asian countries, PC buyers have elevated the discrete GPU to a must-have item in new PC purchases.

So why aren't Americans choosing discrete GPUs when we buy a new PC? Some believe Americans have moved onto consoles as the primary gaming platform, so we give the PC short shrift. Others think that the PC's role in the physically smaller homes of Europe and Asia give it more prominence as a TV, productivity tool, and game machine.

Well, I'm here to tell you that Americans should care about graphics performance, even on their low-end machines—at least as much as they care about the typical three specs of CPU clock speed, RAM allotment, and hard drive capacity.

The PC gaming resurgence that we've seen lately tells us that we need to care about graphics performance. Certainly not every new PC buyer is going to want to play Battlefield 3 on Ultra, but even "casual games" will board the feature-creep train and start to require more and more graphics firepower. That doesn't even take into account the increasing reliance on the GPU for highly parallel workloads.

I'd be concerned that this was a lost cause if not for the fact that AMD and Intel are making the right moves in integrated graphics performance. AMD's Fusion chips are a step in the right direction. Instead of getting craptastic chipset-based integrated graphics with a fair quad-core, consumers now get $70-level discrete graphics and a quad-core chip, to boot.

With its larger market share, Intel's next-gen chip, code-named Ivy Bridge, will put another great big foot forward. Ivy Bridge's x86 functionality improvements are ho hum, but the company has made major advancements in the graphics side of the chip. More importantly, it's clear that Intel finally cares about graphics, so newer chips will just build upon the trend.

While I'm not certain we can ever convince our brothers-in-law or aunts to buy a PC with a discrete graphics card, all of us would be for the better if that PC just came with fairly decent graphics for free.

Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

THE NEWS

A Windows 8 slate is probably the most tablet-y thing you'll see from HP in 2012.

No Post-PC Era for HP

The computing giant caps a flip-floppy 2011 and looks forward to righting the ship

NOBODY NEEDS THE clean slate of a new year more than HP. After announcing a brave new vision for the company on August 18, 2011—a vision that included killing all WebOS hardware and possibly ditching its top-selling PC business—the company quickly discovered that, well, no one but CEO Léo Apotheker could see a future without the HP name on computers. Amid fierce consumer, enterprise, and investor backlash, HP's board of directors gave Apotheker the boot and named former eBay boss and failed California gubernatorial candidate Meg Whitman the new CEO. Whitman quickly established that (surprise!) HP does plan on keeping its PC line.

A Change of Heart

Why the sudden shift in direction? A number of factors probably influenced the decision—including HP's plummeting stock value and widespread jeers from virtually all corners—but supply chain issues were definitely part of it. As the largest PC manufacturer around, HP has extensive leverage with component and logistic providers, leverage that would disappear and hurt other HP divisions if the consumer business was spun off. Whitman admitted that was "one element of (the decision)" in an interview with AllThingsD.com (dthin.gs/ue0r4W).

Look for HP to slim down some of its bloated product lines with simpler offerings, including Ultrabooks.

Stopping the Bleeding in 2012

"(HP) will be working hard to put the strange year that was 2011 behind them," says Crawford Del Prete, chief research officer at International Data Corporation. So how will the company go about winning back the hearts and minds of skittish end users? By getting thinner and trimmer. Del Prete expects HP to entice customers with lightweight, sub-$1,000 Ultrabooks that feature "leading-edge technology and forward-thinking design" and are ready for use in the workplace as part of the "consumerization of IT" trend.

Rob Enderle, the owner and principal analyst of the Enderle Group, predicts HP will slim down in yet another way, citing Whitman's disapproval of HP's vast number of offerings. "I'd expect fewer products that are both more richly configured and more aggressively priced, as new, simpler lines replace the old, complex ones."

What about Tablets?

Del Prete notes that HP sank a ton of money into WebOS, so he expects the company to continue to license the software to other manufacturers until it figures out a way to actually see some return on its investment. Enderle isn't quite as optimistic. The recent departure of WebOS's lead supporter at HP leads him to believe that "unless it is sold quickly, WebOS is history." As this issue went to press, the latest word was that HP is in fact looking to sell WebOS, with Amazon, RIM, Oracle, and others interested.

WebOS hardware may be done, but HP won't let the mobile money-train pass it by. "I expect HP will now put the efforts they would have put into the WebOS tablet into their coming Windows 8 tablets instead," Enderle writes, a comment echoed by Del Prete. Look for both ARM- and traditional x86-based HP tablets for Windows 8.

No More Drama

Experts agree: Expect HP to be much more focused on execution—and much less focused on drama—under Meg Whitman in 2012. Don't make the mistake of ruling the company out, either; Lenovo may be making strides, but HP is still top dog in the PC world.

–BRAD CHACOS

Thai Floods Lead to Massive HDD Shortages

This autumn, heavy rain in Thailand caused flooding that led to massive property damage, as well as more than 500 deaths. The flooding forced the shutdown of many of the world's hard drive factories, including those of Seagate and Western Digital—up to 40 percent of the world's hard drive manufacturing capacity. This in turn will lead to massive drive shortages as retailers and system integrators run through existing inventories. Hard drive prices had already doubled as early as November 2011, with shortages expected to last through the first quarter of 2012.

The hard drive shortage could have a chilling effect on the entire PC industry; motherboard vendors reported slower-than-expected fourth-quarter sales, while PC sales could drop by nearly a quarter in the early part of next year, according to IDC, the tech research group.

It's not just consumers who'll feel the pinch. Nick Bilton at the *New York Times* (nyti.ms/w3Kvtu) warns that cloud-computing companies, which rely on ever-increasing storage pools, could run into problems—or even run out of space.

The drive shortage will lead to lean times for just about everyone in the PC component business, though SSD manufacturers could see sales soar. After all, with hard drive prices rising, their once absolute price advantage over solid-state drives may start to disappear, and if SSD manufacturers can keep up with demand, they could wind up sitting pretty. Some manufacturers, like OCZ, have already announced lower-cost SSD models to try to capture some of the market. **–NE**

Skype Founders Hit Play on Vdio

Video may have killed the radio star, but Vdio, the online video equivalent of Rdio, will do battle with Netflix for streaming supremacy. Skype creators Niklas Zennström and Janus Friis head up a team of heavy hitters with experience at Napster, Microsoft, TV Guide, and Apache.

Like Netflix, Vdio lets you instantly watch TV and movies. It's a privately funded project currently in closed beta. Vdio will debut in the UK, but it's a safe bet that it'll land in the U.S.

The Vdio team isn't backing down from inevitable comparisons to Netflix. Their answer to how Vdio is different from Netflix is, "We think people will love using Vdio." This should be fun. **–PL**

LSI Scoops up SandForce for $322 Million

In a bit of a shocker, LSI signed a definitive agreement to acquire SandForce, maker of popular high-speed SSD controllers in the performance category. In recent years, LSI has focused most of its attention on enterprise networking and storage. Many assumed a company like Intel or Corsair would pocket SandForce, just as OCZ did with Indilinx.

Yet LSI agreed to pay approximately $322 million in cash and assume around $48 million of unvested stock options and restricted shares held by SandForce employees. The acquisition should close in Q1 2012, and LSI envisions becoming an industry leader in the high-volume flash storage processor market space for Ultrabook, notebook, and enterprise SSD and flash solutions. **–PL**

Tom Halfhill
Fast Forward

ARM EMBRACES 64 BITS

IT WAS THE best-known secret of the year: ARM was prepping its first 64-bit CPU architecture to bash head-on with Intel in the low-power server market. ARM's official announcement finally came in October, and AppliedMicro revealed bold plans for the first 64-bit processor based on the new architecture.

With Microsoft readying its first ARM-compatible version of desktop/server Windows, PCs may flirt with ARM, too, although notebooks are more likely candidates than desktops. It's the first serious challenge from a non-x86 architecture that Intel has faced in 20 years.

These days, the desperate quest for power efficiency is driving the industry in new directions. Not all those roads lead to Intel. ARM's existing 32-bit CPU architecture rules the cell phone market and is popular in numerous other devices, such as Apple's iPad. Although ARM-based processors can't yet match the performance of Intel's best chips, they are powerful enough for many purposes and are more power efficient.

System vendors want to try building large servers using boatloads of low-power ARM chips, but the critical missing piece was a 64-bit ARM architecture. Every other server-processor architecture (x86, Itanium, POWER, SPARC) has been 64-bit for years.

Unlike Intel, however, ARM doesn't actually make microprocessors. It licenses its architecture and CPU cores to other companies, which design the chips and outsource manufacturing to independent foundries. Hence the importance of AppliedMicro's announcement: a future 32-core server processor called X-Gene. Someone has to go first.

Intel retains awesome advantages in CPU performance, fabrication technology, engineering resources, and market position. Frankly, I give ARM only a 50/50 chance of succeeding outside its traditional mobile scope. But the battle will be good drama, and the fresh competition will push Intel to design lower-power x86 processors, so almost any outcome is a win for the rest of us.

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

Thomas McDonald
Game Theory

RAGING MEDIOCRITY

I REMEMBER 1994 well. OJ Simpson debuted a new kind of TV show running 24/7 on every network. Ace of Base proved that Swedish musical artistry didn't die with ABBA. And Id Software released its last game that didn't disappoint me.

I'm not saying that Doom II was Id's last game of any value, but that it was its last game that met expectations. Everything since then has marked Id's gradual slide into game design mediocrity—a slide that reaches its nadir with Rage.

Since Doom II, Id's game design sensibility has hardly progressed at all. The Quake games added almost nothing to the basic Doom formula, while Doom III milked every cliché in the design book, from monster closets to a tedious obsession with sudden darkness.

I'm not talking about the technology. A new Id game is a chance to see technology tools that push PCs to do wonderful things. But if you're writing a review of an Id game, and you're lingering over the wonders of curved surfaces, volumetric fog/lighting, or nice, smooth shadow maps, you're not reviewing the game, *you're reviewing the engine.* Each new Id release is the greatest tech demo ever, but as games, they just don't offer much.

With Rage, the Id formula finally comes completely undone. It's as though the developers studied other games with more depth and innovation (namely Fallout 3 and Borderlands), and then attempted to squeegee a thin film of those gameplay elements over their old formula. They didn't even nail their two strongest areas: The tech is impressive but glitchy, and the multiplayer is weak. Oddly, Rage's visual design is the most aesthetically unappealing Id has ever done. It's hard to recall a more lovingly detailed, ugly environment.

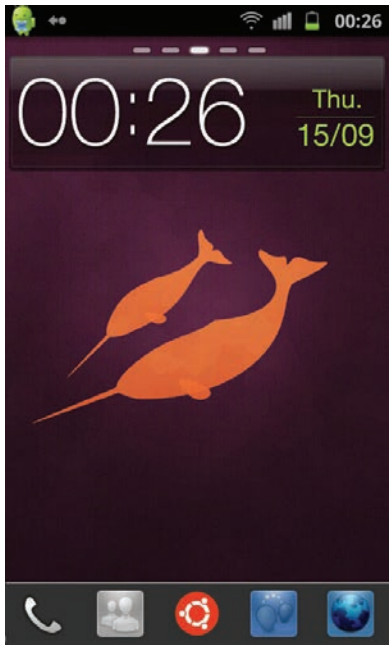
Something good will come of this. Quake III gave us Call of Duty; Doom III gave us Prey; and something worthwhile will come from Rage. It just won't come from Id.

You can follow Thomas McDonald on Twitter @StateOfPlayBlog.

Ubuntu 14.04 to Run on Tablets, Smartphones, and TVs

At the Ubuntu Developer Summit in November, Canonical described a new strategy: "By 14.04 LTS, Ubuntu will power tablets, phones, TVs, and smart screens... and connect those devices seamlessly to the desktop, the server, and the cloud," wrote Canonical founder Mark Shuttleworth in a blog post.

Key to the strategy is Unity, the oft-maligned interface that became the default GUI of Ubuntu 11.04. In his blog, Shuttleworth noted that Unity was designed for its core elements to scale to any form factor, and he underlined the importance of partnerships with major silicon vendors. Canonical recently rolled out support for chips based on ARM's architecture inside Ubuntu 11.10. –**PC**



Go Ubuntu Unity is a great theme for the Go Launcher Ex Android app.

It's Official: Mobile Flash Sucks

There's one thing we've long agreed with Steve Jobs on: Adobe Flash sucks.

It appears that Adobe finally agrees, too—at least regarding the mobile version of Flash. Adobe announced it will stop developing its Flash mobile plugin, as well as TV support for it, in favor of HTML5.

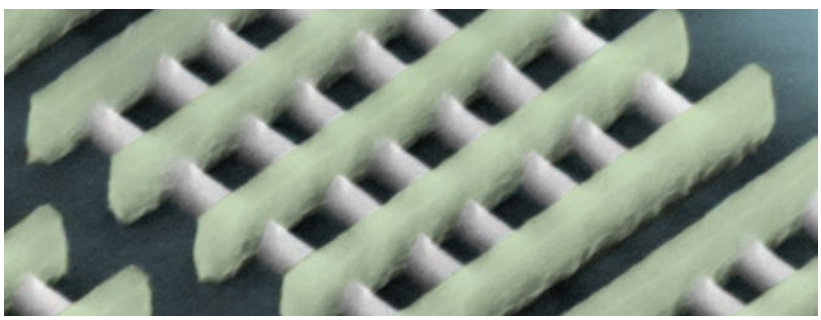
Adobe made the abrupt about-face after years of trying to squeeze Adobe Flash onto low-powered mobile devices and television sets. That's no easy feat considering that, at times, Flash would cripple even more powerful desktop PCs. Flash's fate on mobile was likely sealed when Steve Jobs declared a fatwa on the plugin for the iPad and iPhone. Adobe says that going forward, it will concentrate on HTML5 as well as AIR applications for mobile devices.

While Adobe is committed to Flash for desktops and laptops, many question how long that will last, as consumers turn more and more to tablets and phones for general browsing. –**GU**

Expect Ivy Bridge No Earlier than March

The doomsday clock is already ticking on Intel's spiffy Sandy Bridge processors. Ivy Bridge, the slimmer, trimmer 22nm next-generation processors, are barreling down so fast that you can already pick up motherboards that accommodate Ivy Bridge's PCIe 3.0 support. Intel only says "early 2012" for Ivy availability, but one source claims to know more.

DigiTimes (and its as-always anonymous sources) reports that Ivy Bridge will hit the streets no earlier than March. The same sources claim that quad-core Ivy Bridge processors will use just 45W, 65W, and 77W of thermal design power, thanks to Intel's energy-efficient tri-gate transistors (pictured below); dual-core processors will run at 35W and 55W. –**BC**



Quinn Norton
Byte Rights

THE CRAPPY HOUSE REMIX

EVERY TIME a terrible bill like COICA or PIPA gets exposed for what it would actually do to the Internet, large rights holders reinvent it slightly, lay some bad dubstep over it, and call it something you can dance to.

This time it's the Stopping Online Piracy Act—SOPA for short. SOPA is a bill coming out of the House that is a compliment to the Senate's PROTECT-IP abomination. It's entirely unlike PROTECT-IP, in that while it does all the same things and worse, it phrases them differently... so you won't notice.

SOPA has done away with PROTECT-IP's "blacklist," after realizing Americans don't really like blacklist censorship. Instead, SOPA allows the attorney general to cut off sites from the Internet by prohibiting them in some sort of non-list document. Since that's not a blacklist, it doesn't need any judicial review. Prohibited sites would be arranged in a tag cloud of some sort, and DNS providers would be required to not show them to you.

SOPA goes on to ban advertisers and credit card processors from doing business with sites dedicated to copyright infringement. Whether a site is dedicated to infringement is helpfully determined by what the guy filing the legal nastygram thinks looks like a site dedicated to infringement, without any law enforcement getting into the act, much less judges. The law calls this the "market-based approach." This provision could not possibly be abused as much as the infamous DMCA take-down notice, a provision used more to hobble competition and speech than protect copyright, according to a Google study, because I heard recently that all the bad people left the Internet.

This bill may let corporations and government break the Internet, but don't worry, because they've put out press releases promising they would never do anything like that.

Quinn Norton writes about copyright for Wired News and other publications.

Flexible Screens Come to Samsung's 2012 Gadgets

Samsung has announced that its 2012 lineup of mobile gadgets will include flexible screens—initially hitting phones, and eventually tablets. Though this is an exciting prospect, Samsung had little more information to give; we don't know which phones will include the technology first, or whether or not the screens will be able to stand up to Samsung's touted AMOLED screens used in phones like the Galaxy Nexus.

Samsung's interest in the screen innovation probably stems from its purchase of Liquivista, a screen developer that focuses on making flexible screens that are bright and consume little power. For now, only time will tell whether or not flex-screens are the next step in the ever-developing world of smartphones. **–AF**

Brits Build Biological Logic Gates

After a team at Imperial College London demonstrated logic gates made from harmless bacteria and chemicals in October, science took one step closer to presenting humanity with Kurzweilian living computers that could keep our bodies healthy from the inside.

Researchers modified the DNA of E. Coli bacteria and reprogrammed it to perform "on" and "off" switching when stimulated by chemicals, mimicking an electronic AND gate. A different experiment resulted in a NOT gate, and the scientists combined both gates into a NAND gate. These biological gates perform more like electronic gates than previously demonstrated, and their modularity bodes well for making more complex biological processors in the future.

While still a long way off, microscopic biological computers could include sensors that detect cancer cells, toxins, harmful plaque in the bloodstream, etc., and then neutralize those dangerous elements. **–MR**

Windows 8 Watch

Windows 8 Accepted by IT Pros and Gadget Makers

With Windows 8 expected to show up on machines in time for the back-to-school season of 2012, we're keeping a close eye on the industry anticipation for the OS. For example, a recent InformationWeek survey of 973 IT professionals found that 52 percent of their employers already had definite plans to adopt Windows 8.

While Windows 8 PCs are a given, one of the leading Android tablet developers, Asus, is planning two Windows 8 tablets to hit in Q3 of 2012, according to a presentation at the Asus 2011 Investor Conference. No further details were given.

Though ITG is not a PC giant like Asus, the obscure Taiwanese component maker nonetheless has announced its xpPhone 2, a 4.3-inch smartphone that will initially run Windows 7 when it launches in 2012 but will also support Windows 8 when that operating system arrives. The xpPhone 2 sheds bulk while improving on the battery life of its predecessor and has a 1.6GHz Intel Atom Z530, 2GB RAM, and 112GB of solid-state storage. **–MR**

THE LIST

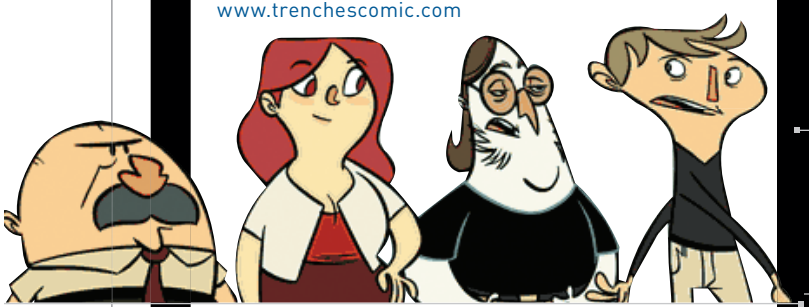
8 GREAT WEBCOMICS FOR GEEKS

8 PENNY ARCADE

This geek favorite started as a video game comic but has become so much more.
www.penny-arcade.com

7 THE TRENCHES

From the makers of Penny Arcade and PvP, The Trenches focuses on the trials and tribulations of video game testers.
www.trenchescomic.com

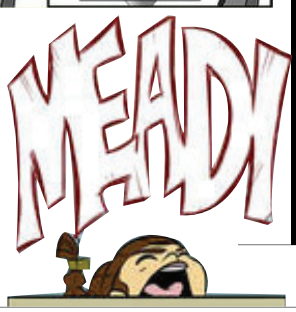


6 USER FRIENDLY

Centered on the staff of a fictional Internet provider, UF is classic IT guy humor.
www.userfriendly.org

5 PVP ONLINE

One of the first webcomics, PvP follows the office antics of a group of game magazine employees.
www.pvponline.com



4 DRESDEN CODAK

Amazing artwork and high-minded philosophical and tech content make this comic a double-yes.
www.dresdencodak.com

3 SEQUENTIAL ART

Human and anthropomorphic characters talk games and fanboyism.
bit.ly/99Xd16

2 MS PAINT ADVENTURES

This user-driven, text-based adventure comic is pure geek awesomeness.
www.mspaintadventures.com

1 DUELING ANALOGS

Consistently hilarious, DA pokes fun at games and gamers.
www.duelinganalogs.com

HEAD TO

BY BRAD CHACOS

Amazon Prime vs. Netflix

Remember when Netflix and streaming video were virtually synonymous? Yeah, those were the days. Then, in the course of three disastrous months, Netflix jacked up prices by 60 percent, announced it was splitting off the DVD business, and then announced that, no, actually, it was going to keep DVDs in house after all. The wacky moves sent investors fleeing like rats and confused customers looking for alternatives—alternatives like Amazon Prime Instant Video. The service offers unlimited streaming, and Amazon has signed several new content deals since Prime Instant Video's launch last March. But is it a Netflix killer? Let's find out.

Round 1: Catalog

When it comes down to it, it's all about the content. Who has more of what you want? It's not really much of a contest at this point, unfortunately. Although Amazon offers a massive 100,000 programs for download à la carte at $2 to $4 a pop, only around 10,000 of those are available for unlimited free streaming via Amazon Prime. Netflix plays coy with the exact number of its streaming offerings, but we've found estimates ranging from 30,000 to 45,000 titles. Most titles available on Amazon are also available on Netflix, but not vice versa.

Winner: Netflix

Round 2: Pricing

Neither Netflix nor Amazon Prime breaks the bank. As everyone probably knows from the price-hike outrage of a few months ago, a streaming subscription to Netflix costs $8/month for all the video you can watch. Amazon Prime Instant Video costs even less on a monthly basis—about $6.66 (ooh, spooky!) a month—but that's kind of deceptive; you'll have to pay a flat $80 up front to purchase a year's subscription to Amazon Prime. But that $80 also includes free two-day shipping on many Amazon purchases, as well as access to Amazon's new e-book lending library for Kindle devices. Both services offer a free one-month trial.

Winner: Amazon Prime

Round 3: Image Quality

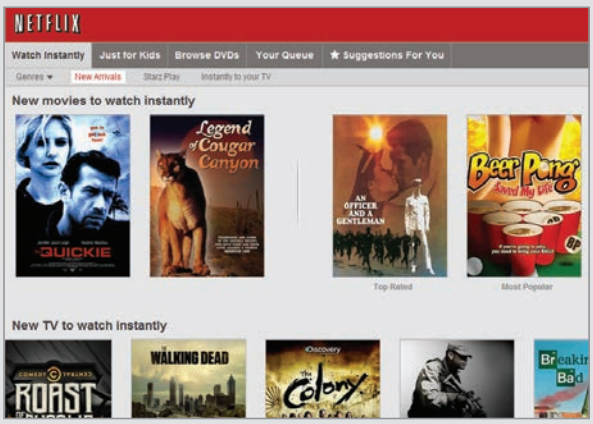
It's kind of hard to make a call on image quality because the speed of your Internet connection makes such a drastic difference. Netflix offers more HD content in general. In a head-to-head viewing test of "Broken Bow" from Season 1 of *Star Trek: Enterprise* in HD, Netflix' image quality looked slightly better overall and ran much more smoothly. We ran into repeated issues with Amazon Prime constantly bouncing our connection speed from the minimum to the maximum rating and back again, which resulted in stuttering playback and reduced image quality. Netflix (and Speedtest.net) didn't suffer from the same problem.

Winner: Netflix

Round 4: Device Compatibility

Amazon Instant Video (which Amazon Prime utilizes) certainly works on plenty of devices, including more than 200 Internet-enabled HDTVs, tons of Blu-ray players, the Roku, the Logitech Revue, and—soon—the $200 Kindle Fire tablet. Even still, that's just a fraction of the devices supported by Netflix. In addition to HDTV and Blu-ray device support, Netflix ups the ante by streaming to home theater systems; Android, iOS, and Windows Phone 7 smartphones and tablets; tons of set-top boxes (like the Boxee Box and Apple TV); and all the major video game consoles—including Nintendo's 3DS handheld.

Winner: Netflix



Netflix' recent PR missteps have consumers contemplating their streaming options.

Amazon Prime offers unlimited streaming (and free two-day shipping with Amazon purchases!) for $79 a year.

Round 5: Future Prospects

Let's get the bad part out of the way first: In February 2012, all Sony and Disney movies will disappear from Netflix. Since the news broke, however, Netflix has inked deals with DreamWorks, the CW, and AMC and says it plans to expand its TV programming. Amazon has deep pockets and recently signed contracts with Fox, CBS, and NBC to bring more content to its service. It's looking like TV content providers might be more willing to dance with digital media than movie companies are, at least in the short term.

Winner: Tie

And the Winner Is...

Don't get us wrong, Amazon Prime Instant Video brings plenty of stuff to the table: Its catalog and device support are nothing to sneeze at, and it's technically cheaper than Netflix over the course of a year. Unfortunately for Amazon CEO Jeff Bezos, though, everything that Amazon Prime Instant Video does, Netflix does, too—and Netflix does it better. (Amazon's lack of a play queue doesn't help things, either.) Amazon Prime is doing great things for a streaming service that's less than a year old, but **Netflix** is still king of the hill.

NETFLIX

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

>Overclocking Basics
>How Cool is Cool?
>The Throughput Myth

Manual Overclocking

I just upgraded my AMD Phenom 2 965 BE CPU to a Phenom 2 1100T CPU. I'm having a few problems trying to manually overclock it in the BIOS of my MSI 890FXA-GD70 motherboard. How do I change the various voltages if the only setting in the BIOS is Auto? Also, I just want to overclock the CPU, not the RAM. Which voltages should I change? Should they be higher or lower?

—Keith Brooks

THE DOCTOR RESPONDS: It's been a while since the Doc had an 890FXA-GD70 up and running, but changing the voltage should be fairly simple. Go to the VDD field that's set to Auto and use the plus and minus keys to change the voltage. You should also be running the latest BIOS, if you haven't already updated it. You will probably want to increase the setting for either "Adjust CPU FSB Frequency" or "Adjust CPU Ratio." Tweaking the CPU FSB should increase the DRAM clocks, while the CPU Ratio should leave the DRAM alone. If you want to keep your DRAM within spec while doing a front-side-bus overclock, simply change the "FSB/DRAM Ratio" until the frequency is at the desired clock.

If you decide you want to set it back to auto, simply go to that field and type "auto." Generally, adding voltage, not lowering voltage, is the key to achieving higher overclocks. Be advised: Overclocking can be hazardous to equipment on occasion. The hazard potential increases as you add voltage to the chip, so don't add tons of voltage without knowing the risks.

Arctic is Cool Enough

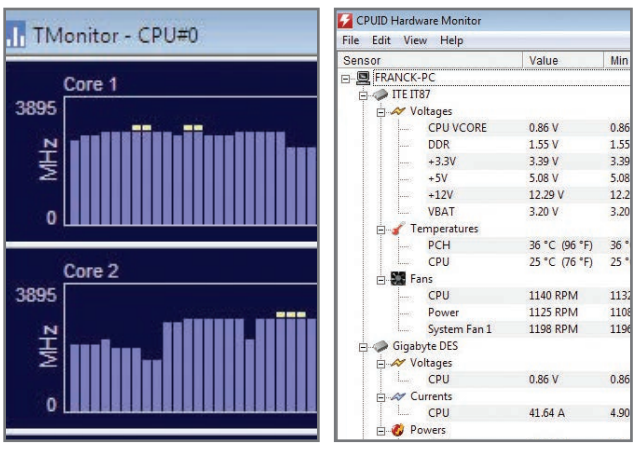
I need help selecting the right cooler upgrade for my CPU and have a question regarding thermal values for CPU coolers. I have been shopping around for a CPU cooler for my Core i7-960. When I built the computer, I used the stock cooler that came with my boxed processor, but I don't think it's good enough anymore. I understand that the CPU gives off heat, but I don't really understand how heat ratings of processors are figured out. Not many cooler manufacturers advertise the cooling capacity of their products. I could only find the Arctic Cooling Freezer 13 Pro's cooling capacity listed at 300 watts. How much heat will my processor give off when using the overclock features, and how do I know what is effective cooling capacity for my Socket 1366 processor? I want to use the higher CPU boost features of my Gigabyte EX58-DS4 when I'm playing games or running my Cubase music program.

Right now my clock cycles seem to slow down when running the processor beyond 50 percent using Hyper-Threading with my stock cooler. Because of limited space in an HTPC case, I have everything in a 4U server chassis, and it has five fans: one 12cm high-velocity fan in front, two 8cm on top for intake, and two 8cm exhaust at the back. I don't think airflow is affecting it, but I'm really not sure.

—Christopher Leach

THE DOCTOR RESPONDS: You can find out the total design power (TDP) of your CPU from the manufacturer's website. Your processor, at stock voltages, has a TDP rating of 130W, so the Freezer 13 Pro is more than capable of cooling it.

The stock cooler for your processor should be more than enough, even when using Turbo Boost, provided that it's seated correctly and the thermal paste is still there. You say your CPU seems to be throttling under load; the best way to determine that is to download TMonitor and HWMonitor



CPUID TMonitor displays clock speeds for each core of the Intel Core 2, Core i3/i5/i7, or AMD K10 processors, while HWMonitor tracks key hardware indicators such as voltages, temperatures, and fan speeds.

↘ submit your questions to: doctor@maximumpc.com

from www.cpuid.com and run them both while you're using your computer. TMonitor tracks your clock speeds, and HWMonitor tracks your temperatures. This way you can see if your CPU is throttling under load, and if so, how hot it's getting. Most Core i7 CPUs will clock themselves down if they get higher than 90 C to prevent damaging the CPU.

If you find your processor is throttling, check to see if the case is getting enough airflow. Even though it has plenty of fans, you might not be getting enough air in there. They could also be clogged with dust or pet hair. You should also try removing your CPU cooler, cleaning off the heat exchanger, applying new thermal paste, and reseating the cooler. It's not a bad idea to do that every few years. The Doctor suggests Arctic Silver 5 thermal paste.

As far as new coolers go, we always recommend Cooler Master's Hyper 212 Plus. It costs just $30 and can handle decent overclocks. It's also far superior to the stock cooler at stock speeds.

Second Drive on XP

I have built a new system based on the MSI 890FXA-GD65. I am currently rocking XP but will be going to Windows 7 and a new hard drive when my budget allows. My question is: After I install Windows 7, can I still run my current hard drive with XP as a secondary drive?

—RJ Lang

THE DOCTOR RESPONDS: Yes, you can certainly access the files from your Windows XP drive (so long as they're not encrypted) by running it as a secondary drive. Windows 7 may ask you to change permissions, which you should approve.

Through with this Throughput

I just bought the Netgear WNDR3700 router, and I'm getting really low transfer speeds. I bought a new PCIe Wireless N card and one USB Wireless N dongle. Both are rated at 300Mb/s up/down on the 2.4GHz wireless-N band. At best, from PC to PC, I'm getting no more than 2.8Mb/s (on a good day). If I transfer to the hard drive connected to the router, I can get 30Mb/s. If I transfer to my WD TV Live Plus that's connected by Ethernet, I get 17Mb/s at best. I've updated all drivers for the card and dongle, updated router firmware, and changed to a channel that has less interference. I even went through all the router settings and compared them to what is recommended on the forums. Please save me from having to go to power-line networking!

—Tom Jenkins

THE DOCTOR RESPONDS: The 300Mb/s ratings that router and client adapter manufacturers love to tout is a theoretical maximum that cannot be achieved in reality. When we're testing routers, we're impressed if we can get TCP throughput that's half that fast, and that's when the client and router are in the same room. It's difficult to tell if the performance you're seeing is reasonable or not because you haven't told us how much distance separates the router from the client and how many obstacles (walls, appliances, and so on) separate the client from the router, what materials your home is made from (sheetrock, brick, etc.), or if the router and client are on different floors.

The transfer speeds you're reporting for storage attached to the router and to the WD TV Live Plus do sound reasonable, since these devices use USB 2.0 interfaces. If, as you say, you've tried all the typical wireless networking optimizations, and you're still not satisfied with your PC-to-PC file transfers, and you don't want to string Ethernet (the absolute best solution), then why not give power-line networking a shot? The technology has improved by leaps and bounds over the past few years.

> THE DOC'S GUT FEELING IS THAT THE PSU IS THE PROBLEM

Epic Fail

I have a BIOStar TA890GXB HD motherboard with an AMD Athlon II X4 640, two 2GB G.Skill DDR3/1600 RAM, an MSI GTS 450 GPU, a 1TB Samsung HDD, and a 585W PSU that came with the case.

I built this system last year, and had problems with Driver IRQL BSODs, but then a local maintenance shop fixed the loose connectors. For around three months, the system ran beautifully with games like Modern Warfare and Borderlands. Then the problems came back, starting with video freezing and sound being garbled and repeated during extended use. The problem then turned into auto resets when under a system load. Then BSODs came back, first under heavy system loads, and later at anytime. The PC didn't respond to any fixes. Around that time, I bought another 1TB hard drive, and reinstalled Windows 7 and Ubuntu on two of three partitions created using the GParted Live tool. I saw no problems for around a week, but then the BSODs started again, and not just under a system load. I reinstalled Windows, and the problem persisted. So I started going into Linux because with it, I wouldn't need to worry about driver incompatibility.

Then the Linux problem started: a hard video freeze, audio looping, and other issues. The only way to get out of it was to reset. I have tried drivers from the CDs, websites, and older versions; flashed the BIOS to previous stable versions; ran Memtest 86+; moved around RAM, removed the GPU; used different CPU coolers; changed timings and speeds; used a desk fan blowing into the case, another PSU, different monitors with different outputs, and nothing solves it.

DeBugIt tested the hardware and told me it all passed, but it couldn't say anything about the PSU. All four of my PSUs had the same results on Dell PSU tester. My main PSU is 585W, and the others are all around 300W. Antec's PSU calculator said I needed a minimum of 289W with my GPU installed. BIOStar tested the mobo and said it ran fine for 24 hours and passed all its tests.

—Joshua Walton

THE DOCTOR RESPONDS: It sounds like cooling is not an issue, but you definitely have a hardware problem. The Doc's gut feeling is that the PSU is the problem. It's a "free" PSU, which means it might be a sticker PSU—that is, it's 585W on the sticker only. The guts are probably a good bit lower. However, you have swapped out the unit for another and still had problems. You also seem to have ruled out the RAM as the problem. In this case, you should consider running the RAM at a lower clock speed—say, 1,333MHz—until you can pinpoint your problem. Also, BIOStar isn't a top-notch kit, but the company has already "tested" it without issue, so that really just leaves the CPU.

As rare as it is for a chip to fail, it does happen, and way, way back, the Doc had an AMD 486 chip with bad cache, of all things. So it can happen. You may want to consider contacting AMD for a warranty claim on the CPU. Have your original AMD heatsink fan handy, as the CPU's serial number is on there.


CORSAIR

HOW TO SET UP A NEW PC —THE RIGHT WAY

BY MAXIMUM PC STAFF

WHETHER YOU JUST BUILT OR BOUGHT A NEW PC, IT PAYS TO **OPTIMIZE YOUR SETUP** FROM THE START

NOTHING HOLDS MORE promise than a brand-new PC. The hardware is fresh and full of potential, the OS is clean and clutter-free, and you have nothing but pure, unadulterated storage space awaiting your precious data. It's an exciting time, indeed. But before you start dumping old files onto your new rig willy-nilly, and downloading every shiny bauble of an app that catches your eye, take some time to consider a more measured approach to moving in. After all, you only have this opportunity once.

The way you set up your new PC now will have a lasting impact on your experience over time. Do it haphazardly, and your experience will be plagued by disorder and regret. Do it thoughtfully, though, by following the course of action we prescribe on the following pages, and you will have a machine that's primed and ready to meet your every need from the start.

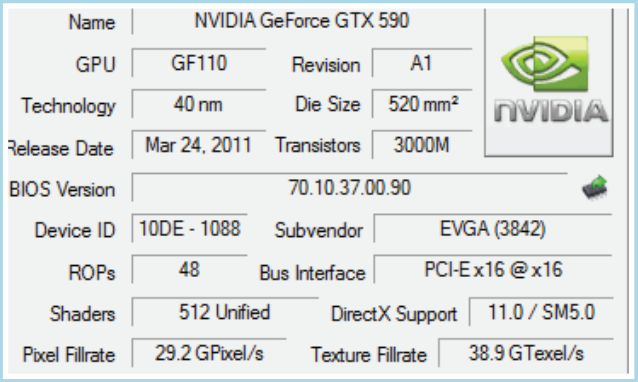
CHECK YOUR SPECS

If you've just built your rig or unboxed a sparkling-new PC, it's always a good idea to verify the hardware specs to make sure all parts are actually performing as they should be. We've seen simple BIOS misconfigurations downclock chips by hundreds of megahertz.

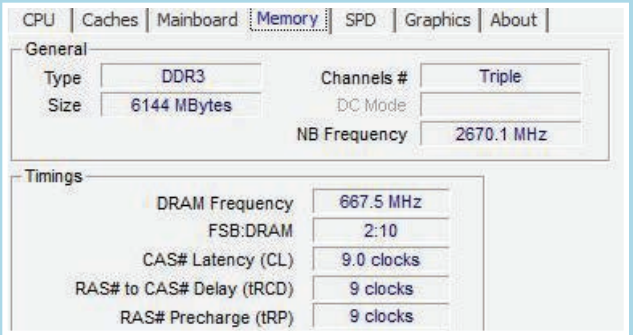
First download CPU-Z (www.cpuid.com). This excellent free utility will query your CPU and report the model number, cache size, and clock speed of the chip in real-time. To test your CPU's speed, put a load on it using, say, Prime95 (www.mersenne.org/freesoft) and run a stress test. CPU-Z should report the correct clock speed for your chip. While you're here, pull up Task Manager by hitting Ctrl+Alt+Del. Select the Performance tab and make sure that each of your cores, virtual or real, is represented. Believe it or not, we've seen Hyper-Threading turned off occasionally on some systems.

Turn off Prime95, but keep CPU-Z open. Click the Memory tab. You should see the memory frequency reported under DRAM Frequency. This is the base clock, so you should double it to get the frequency of the RAM. For example, if your DDR3/1600 is reporting as 667, your RAM is actually running at DDR3/1333 speed.

CPU-Z will also report graphics speed, but we prefer GPU-Z for more detailed info. Download it at www.techpowerup.com/gpuz. GPU-Z will generate a CPU-Z-like interface. Pay particular attention to the default clock speed and memory speeds for your GPU. If you paid for an overclocked GPU, check that it is running at the speeds you paid for. GPU-Z will also tell you if SLI or CrossFireX is enabled or not and also at what speed the PCIe slot is running. Yes, it's possible that a new machine will have the GPU running in a slower slot, which may impact performance.



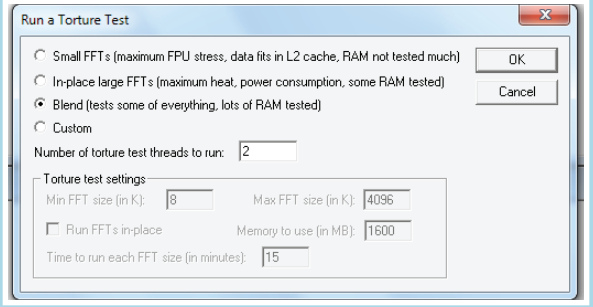
TechPowerUp's GPU-Z will tell you what speed the PCIe is running at.



Inspect CPU-Z's memory tab to see if your RAM is configured correctly for double- or triple-channel, and that the frequency is set to the level you paid for.

STRESS IT OUT

If a component is going to fail, you want it to fail while it's under warranty. For CPU stress tests, we prefer the free Prime95 (www.mersenne.org/freesoft). Just download it and run the in-place stress test. A properly configured and cooled stock-clocked system should have no problem running Prime95 for hours on end. For GPU stress testing, FurMark (www.ozone3d.net/benchmarks/fur) is still quite popular, or you can run Unigine's Heaven benchmark (www.unigine.com) in a loop for a few hours. Keep in mind that stressing the GPU will also stress your PSU and cooling, so any shortcomings may crop up there, as well.



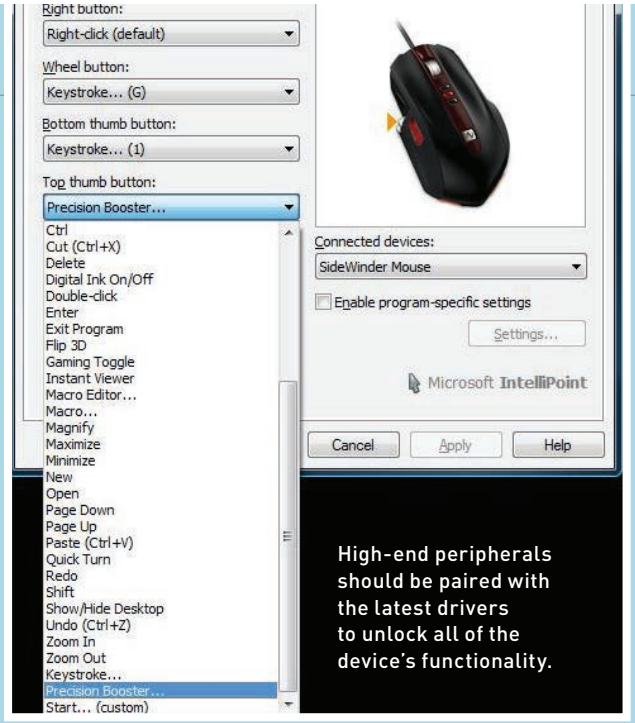
Any new PC should be able to run Prime95 for at least a few hours without issues.

RTFM

Did you know your motherboard has a special USB port that allows you to make BIOS updates without a CPU being installed? No? Well it's right there in the frakking manual. One of the first things you should do with your new machine is to read the documentation, particularly the motherboard manual, that came with it.

STORE YOUR EXTRA PARTS

Once you're done building a new PC, collect the extra modular power cables, drive rails, special sound-dampening drive screws, and put them in one place. You could even store the extra parts in your case, as long as there's room to spare and it won't block airflow. You won't thank us now, but you will in three years.



High-end peripherals should be paired with the latest drivers to unlock all of the device's functionality.

GET DRIVERS IN ORDER

If you installed the drivers from the disc that came with your motherboard, your drivers are already way out of date. Any new PC should be paired with the freshest drivers available for the platform, as updates can add performance, enhance compatibility, and fix the wonkiness that usually occurs with the first drivers to ship. The freshest drivers are usually available directly from the manufacturer of the component, so the best source for updated drivers for an AMD motherboard is AMD. If you're running a fancy gaming mouse or keyboard, you'll also want to install the matching drivers for them. These drivers unlock the full functionality of the mouse or peripheral beyond the built-in Windows 7 HID drivers.

Thanks to AVG's free AV app, even cheapskates can be safe from malware.

SET UP YOUR SECURITY

There's no point in taking the time and care to set up a new PC just right if you don't also make security one of your first priorities. Otherwise, it's just a matter of time before some form of malware gets in your system and mucks up the works, possibly even requiring a reinstall. Our Holiday issue antivirus roundup found Norton Internet Security 2012 ($70, www.norton.com) to be the best AV suite for purchase, while AVG Anti-Virus Free 2012 (www.avg.com) proved to be a very capable free solution. Before you do anything else, do this.

PREPARE FOR DISASTER

With Windows 7, everything you need for data backup and system repair is right there in the OS. Combine that with a large hard drive, and you have no excuse not to establish a full-fledged data recovery plan. With a secondary drive in place (either internal or external), head over to Control Panel, then System and Security, then Backup and Restore. Choose Backup Your Computer, then Set up Backup. Select the drive that backups will be saved to, choose the files to be saved, and set a schedule. Next, choose the option to Create a System Image, an exact copy of your drive—OS, system settings, program files, etc.—to use in the event your drive fails or your system stops working. Finally, opt to Create a System Repair Disc. This disc will save your bacon should your machine not start, allowing you to boot your computer from the optical drive and then retrieve the system image and backups you've dutifully created.

DECRAPIFY YOUR PC

When you build a new PC, you have full control over the software that gets installed. Not so when you buy a system, which is practically guaranteed to host a number of apps you have little use for, or that slow your PC's performance, or that constantly pester you with pop-ups. Get rid of that crap with PC Decrapifier (www.pcdecrapifier.com). The free tool walks you through the process of removing unnecessary programs, startup items, and icons.

TRANSFER YOUR FILES, EASILY

It's time to sully that pristine PC with craploads of junk from your old PC. Power users normally go manual by popping the old PC's drive into a spare SATA port on the new rig. This lets you pick and choose what's really worth moving. If you'd rather just do it on autopilot, check out Microsoft's free Easy Transfer utility. It's meant for newbies, but it can make the move to a new machine fairly painless. Run Windows Easy Transfer on your new PC (Start > All Programs > Accessories > System Tools), and it will give you options for the move: USB hard drive, the network, or an optional USB cable. The utility will ask you to insert a USB key where an executable will be installed. Run this executable on your old box, and it will package up all of the files into a single file that will be stored on an HDD or moved across the network to your new PC, where everything is unloaded into its proper place.

TIPS FOR TRICKIER FILE TRANSFERS

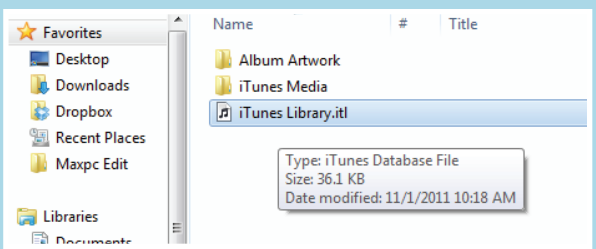
Moving documents from one computer to another is usually just a matter of copying-and-pasting onto an external hard drive and then to your new PC. That's fine for office docs and photos, but what about apps that build media libraries, like iTunes and Steam, or saved games, which go wherever the publisher feels like putting them?

iTUNES

If you're using an iDevice, you might be stuck with iTunes as a media manager. Here's how to move your music and other media (and keep your ratings, playlists, etc.) without having to rebuild your library.

First, open iTunes and go to File > Library > Organize Library > Consolidate Files. This will ensure that all your music is in one place. Once done, exit iTunes. Copy your iTunes folder, which should be under My Music (unless you've moved it) to your external drive. If you're decommissioning your old PC, be sure to deauthorize that computer from your iTunes account. Open iTunes again and go to Store > Deauthorize This Computer. Enter your Apple ID and password.

Install iTunes on your new computer, and then copy the iTunes folder from your external drive to the Music folder of your new computer. Next time you open iTunes, hold down Shift while you double-click the launcher. You'll be prompted to choose an iTunes library; look for iTunes Library.itl in the folder you just copied to your PC. You should now have your library, with ratings and playlists intact, on your new PC.



Hold Shift while launching iTunes to manually select your library file.

STEAM GAMES

On your old PC, go to your Steam folder (C:\Program Files\Steam, by default) and copy the steamapps folder and its contents to your external drive. On your new computer, install Steam and launch it once, then exit it. Go to the Steam folder and delete *everything* in it except for steam.exe. Now copy the steamapps folder from your old PC into the Steam folder on your new PC, and launch steam.exe again. After a brief self-update, Steam should show your games as installed. You'll have to do a quick file-verify as you launch each game for the first time, but that's a lot faster than downloading them all over again.

GAME SAVES

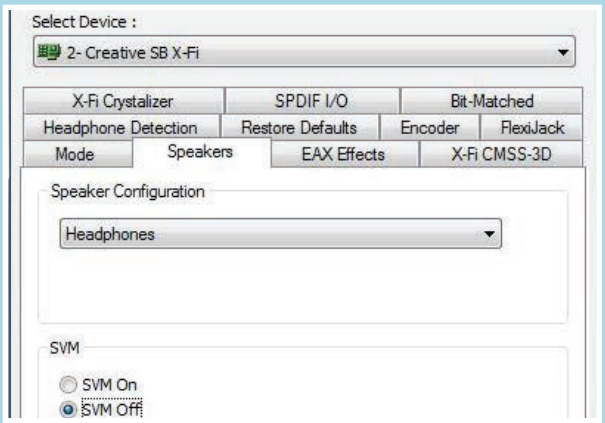
Not all your games come from Steam, and not all that do have Steam Cloud to manage their saves. And it seems every publisher has a different method of storing saved games. That's where GameSave Manager (free, www.gamesave-manager.com) comes in.

Run GameSave Manager on your old computer, and it will auto-detect the games you have installed, find out where the game saves are, and back them up, all via the Backup Gamesave(s) menu. Once you have a backup archive (a .gsba file), you can move it to your new computer and use GameSave Manager to automatically restore all your saves.

GameSave Manager hunts down all those weird game save directories and lets you back them up easily.

CONFIGURE AUDIO

By default, most motherboards and soundcards come configured for stereo speaker output. By default, most gamers today play with headphones. The problem is that most advanced audio cards feature algorithms tuned for the output mode. Cool features such as head-related transfer functions (HRTFs) and other filters that greatly enhance sound for headphones don't get used unless you set the driver accordingly. To do this, just dig into your soundcard's control panel and set the default to Headphones for the best experience.

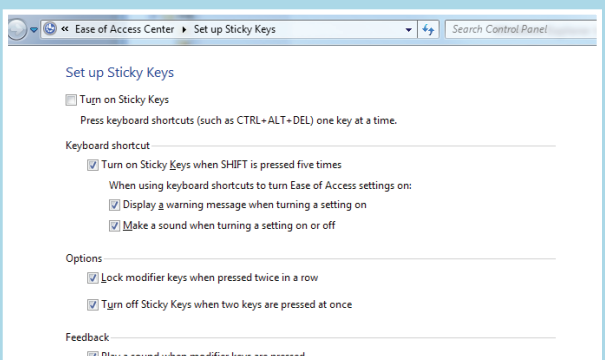


DISABLE ACCESSIBILITY SHORTCUTS

Windows comes with a host of accessibility features that can be a great help for people with disabilities or other difficulties using computer hardware. There are keyboard shortcuts for some of these options, but the shortcuts are easy to perform accidentally, and can pop up unwanted dialogue boxes. These shortcuts are:

> Press shift five times: StickyKeys
> Hold right-shift for eight seconds: FilterKeys
> Hold num lock for five seconds: ToggleKeys

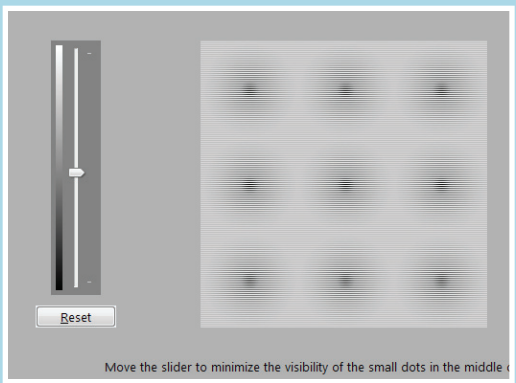
You can disable each shortcut individually by performing it, then choosing to turn off the shortcut, or you can disable them all in one fell swoop in Control Panel > Ease of Access Center > Make the keyboard easier to use.



CALIBRATE YOUR MONITOR

If you got a new display with your new PC (or if you've never taken the time to adjust your old monitor), it might be badly calibrated, degrading the image quality you see. For a quick-and-dirty fix, you can run the calibration software built in to Windows by clicking the Start button, then entering DCCW into the search bar. The program will run you through several simple calibration exercises, and adjust your monitor appropriately.

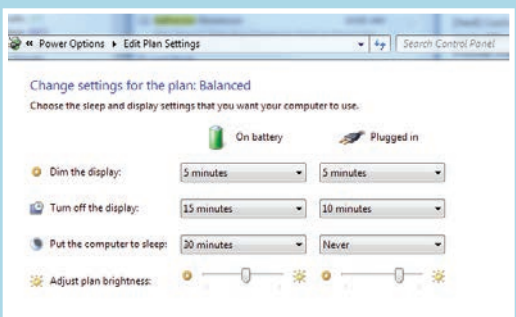
For a more thorough calibration, we recommend that you use high-quality calibration test images, such as those found at www.lagom.nl/lcd-test/.



ADJUST YOUR POWER SETTINGS

Whether you're looking to save the environment, or just your battery life, you should pay a visit to your new PC's power options. If you open the Control Panel, then select Hardware and Sound, and then Power Options, you'll see the available power profiles. You can select one of the available profiles, or change your screen's brightness from this menu, but if you want more control, you'll need to select a profile and click the link that says "Change plan settings."

A new menu will pop up, where you can change how long the computer waits before it dims the display, turns off the display, or goes to sleep. Even more options can be found by clicking the advanced power settings button.



SHARE FILES ON A NETWORK

If your new PC will be sharing a network with other computers running a version of Windows 7, you can create a Homegroup so they can all share files and devices (such as a printer). Be aware, however, that computers running Windows 7 Starter or Windows 7 Home Basic can join an existing Homegroup, but they can't create one.

To create a new Homegroup, click the Windows menu, choose Computer, and then click Homegroup in the left-hand column. Now click the button labeled "Create a homegroup" (you'll find it in the main window to the right). This will open a new window in which you can choose which types of files you'd like to share within the Homegroup (photos, music, video, etc.), and whether or not you'd like to share a printer. Click Next when you've made your decisions. After a few moments, a new window will appear with a 10-character, case-sensitive Homegroup password. Write this password down or print it.

To add your new PC to an existing Homegroup, obtain the password from any other computer in the Homegroup, click the Start menu, choose Control Panel, then Network and Internet, and then Homegroup. Windows will inform you of the existing Homegroup on the network and ask if you would like to join it. Click Join Now, choose the types of files you wish to share, and click Next. Enter the Homegroup password and click Next. You'll see a message indicating that you've joined the Homegroup, and when you click Network on either computer, you should see each of the other computers in the Homegroup and be able to move files between them.

If you'd like to share other folders within the Homegroup, right-click them, choose Share With from the pop-up menu, and then select either Homegroup (Read) or Homegroup (Read/Write).

CREATE A GUEST ACCOUNT

Say a friend wants to borrow your new computer to "check their email." You can limit the degree of access they'll gain (and damage they can cause) by turning on the Windows Guest account. Sign in using your administrator credentials, click the Start menu, and click the large icon at the top of menu. Click Manage Another Account, then Guest, and then click the Turn On button.

To switch to the Guest account, click the Start menu, then click the arrow next to the Shut Down button, and choose either Log-off or Switch User. Click the Guest button to log in as a guest. Guest users can launch programs and access the Internet, but they can't make Control Panel changes (including uninstalling software) or other changes to the computer's settings. They also can't access any files or folders protected by a password, and they can't access other computers on the network, even those within a Homegroup.

Activating your computer's Guest account is one of the easiest ways to grant someone limited access to your PC.

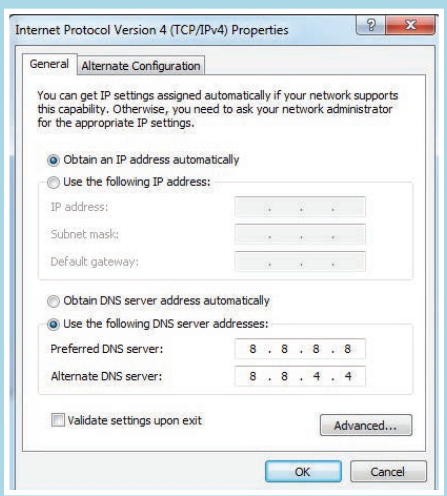
USE AN ALTERNATIVE DNS

Each time you type a hostname (such as www.maximumpc.com) into your browser and hit Enter, your computer initiates a DNS (Domain Name System) lookup. DNS is akin to a phonebook for the Internet: It converts that user-friendly name into the appropriate IP address. If you haven't configured your computer differently, you're probably relying on your ISP to perform these DNS lookups.

You might be able to speed up your web-browsing experience, as well as improve your online security, by switching to an alternative DNS resolution service, such as OpenDNS or Google Public DNS. We'll show you how to configure your Ethernet adapter to use the latter.

Sign on as an Administrator and click Control Panel, Network and Internet, Network and Sharing Center, and then choose Change Adapter Settings. Select which network connection you wish to change, right-click it, and choose Properties from the pop-out menu. On the Networking tab, choose Internet Protocol Version 4 and then click the Properties button. Choose the General tab and then Advanced. Click the DNS tab. If there are any DNS server addresses already in place here, write them down before erasing them and then click OK.

You should now be back on the General tab in the TCP/IPv4 Properties window. Click the radio button next to "Use the Following DNS Server Addresses" and type 8.8.8.8 in the Preferred DNS Server window and 8.8.4.4 in the Alternate DNS Server window. Click OK and close the Network Connections Properties window. Restart the network connection by right-clicking it and choosing Disable from the pop-out menu, and then right-click it a second time and choose Enable from the pop-out menu. This should restart your connection using the new DNS settings. To ensure your new settings are working, enter a hostname into your browser: www.maximumpc.com, for instance. If it resolves correctly, bookmark it, then click the bookmark. If it doesn't, roll back the changes you've just made and retest.



Many people find that switching to Google Public DNS delivers a faster web-browsing experience.

TIDY UP YOUR INSIDES

Your computer has a lot of cables inside, from front-panel connectors to SATA and power cables. If your case doesn't have a window, it might be tempting to just leave a rat's nest of wiring inside, but there are substantial benefits to an uncluttered chassis—better cooling and less dust, for example.

If you bought your PC from a boutique builder, it should have come with a decent wiring job, but if you built your own or bought an off-the-shelf system, there's likely room for improvement.

Many modern cases have cable-routing cutouts in the motherboard tray, and room behind it to route cables. You should route as many wires as you can behind the motherboard tray—usually your motherboard power cables, at least, can go back here. Route as many power cables from your PSU behind the motherboard and bring them back out near where they need to plug in; you can dramatically reduce clutter in your case this way.

If you don't have any cutouts in your motherboard tray, you can still use zip ties to keep your cables organized and out of the way. You can also buy stick-on organizing clips to keep your cables attached to your motherboard tray, not hanging out in the middle of your case.

If you have a modular power supply, disconnect (and keep in a safe place) any cables you're not using. If you don't, use zip ties to bundle unused cables together, and try to keep them out of the way of your fans' airflow.

Sloppy wiring can create pockets of hot air and dust in your case.

Routing cables behind the motherboard tray (if possible) can lead to a much cleaner and cooler build.

MUST-HAVE APPS AND UTILITIES

NO PC IS COMPLETE WITHOUT THESE KEY PROGRAMS

GOOGLE CHROME Google Chrome remains the single-fastest web browser out there. Couple that with exclusive apps and a fully customizable web interface, and you've got a browser that no PC should be without.
www.google.com/chrome

SECUNIA PSI Installing updates for all your software can be a tedious chore, which is why Secunia Personal Software Inspector is essential. Watch as it automatically updates programs in need, with no effort on your end.
www.secunia.com

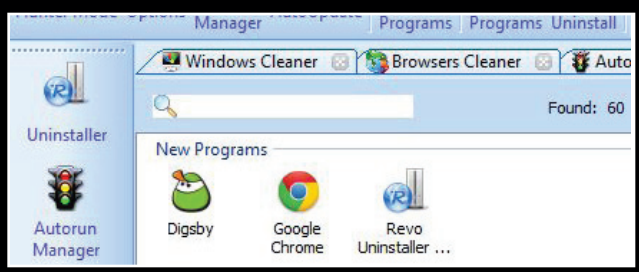
DROPBOX If you find yourself using more than one computing device daily, Dropbox makes it easy to share documents across all those devices, including smartphones.
www.dropbox.com

KEEPASS Using top-of-the-line encryption algorithms AES and Twofish, KeePass acts as a password manager, allowing you to store all your passwords (e.g., email, Facebook, online banking) in a single and secure database that can only be accessed by you.
www.keepass.info

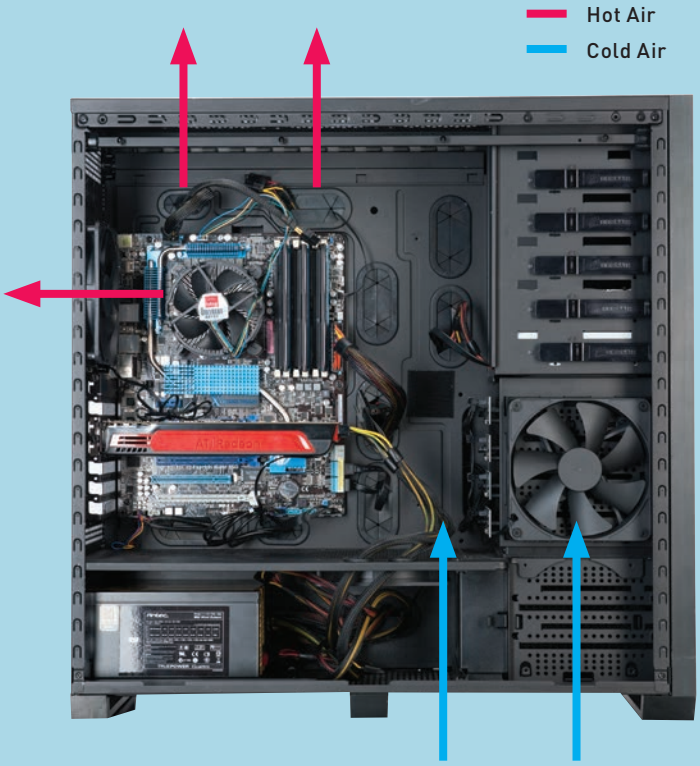
REVO UNINSTALLER These days, it's simply not enough to use Windows to uninstall your programs, as harmful remnants can be left behind. Enter Revo Uninstaller, a free app that not only uninstalls software, but allows you to manually remove additional data left behind.
www.revouninstaller.com

SKYPE Installing Skype allows you to talk face to face with anyone, anywhere, so long as they have the software and a webcam. Skype also allows you to set video conference calls, call mobile devices, and make international calls for additional fees.
www.skype.com

SUMATRA PDF Sumatra PDF is a free PDF creator and viewer



Revo Uninstaller



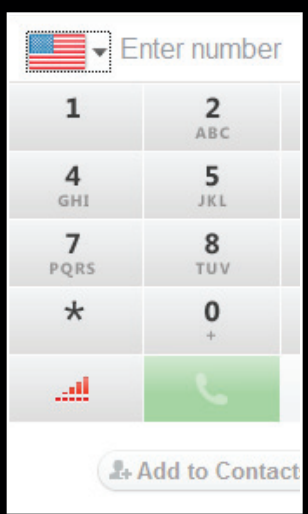
Provide a consistent airflow pattern for your case. Here, cool air enters at the bottom and exits through the top and rear.

OPTIMIZE YOUR FAN SETUP

Your components will last longer if they run at lower temperatures. They will run at lower temperatures if they have sufficient airflow. That's science.

Your case should have both intake and exhaust fans. You'll need at least one front intake fan and one rear exhaust fan. Many cases have additional intake fans on the front or left side, and additional exhaust fans at the top of the case. This helps keep hot air moving up and out of your case. You should have roughly the same number of exhaust fans as intake fans, and you should make sure they're in places that make sense, to create obvious paths for the air. Don't create dead zones where hot air can stay trapped. If your case has filters for its intake fans, clean them regularly. If not, dust inside your case regularly with canned air.

Many motherboards offer fan control in their BIOS settings; you can set your fans to ramp up when your system gets hot and ramp down when it's cool, or you can wire your fans to a fan controller and set their levels yourself. Most motherboard manufacturers also offer a desktop fan-control utility for use with their boards. Simple fan controllers just offer speed control; others, like NZXT's Sentry series, also include temperature sensors, which you can use to automatically control fan speeds based on the temperature of various parts of your system.



Skype

for Windows. It's a relatively small file, starts up extremely quickly, and is tremendously easy to use. It can also read XPS, DjVu, CBZ, and CBR files.
bit.ly/aHICnC

7-ZIP 7-Zip is a fast, free file archiver that can pack and unpack a huge range of files, from ZIP to TAR files. It features an extremely easy-to-use interface that presents users with all facets of the unzipped file, automatically organized by folders.
www.7-zip.org

FILEZILLA If you need to connect to an FTP server, FileZilla is the best way to go. It's easy to use and highly customizable—you can even configure your own transfer-speed limits and transfer up to 4GB of files.
www.filezilla-project.org

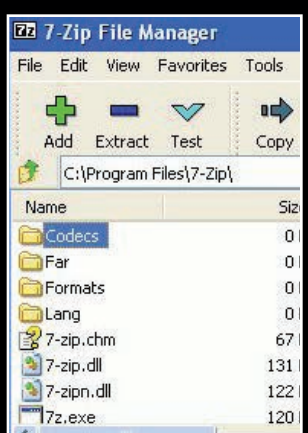
DIGSBY With Digsby you can consolidate all of your instant messaging accounts into one centralized hub, supporting AIM,

Digsby

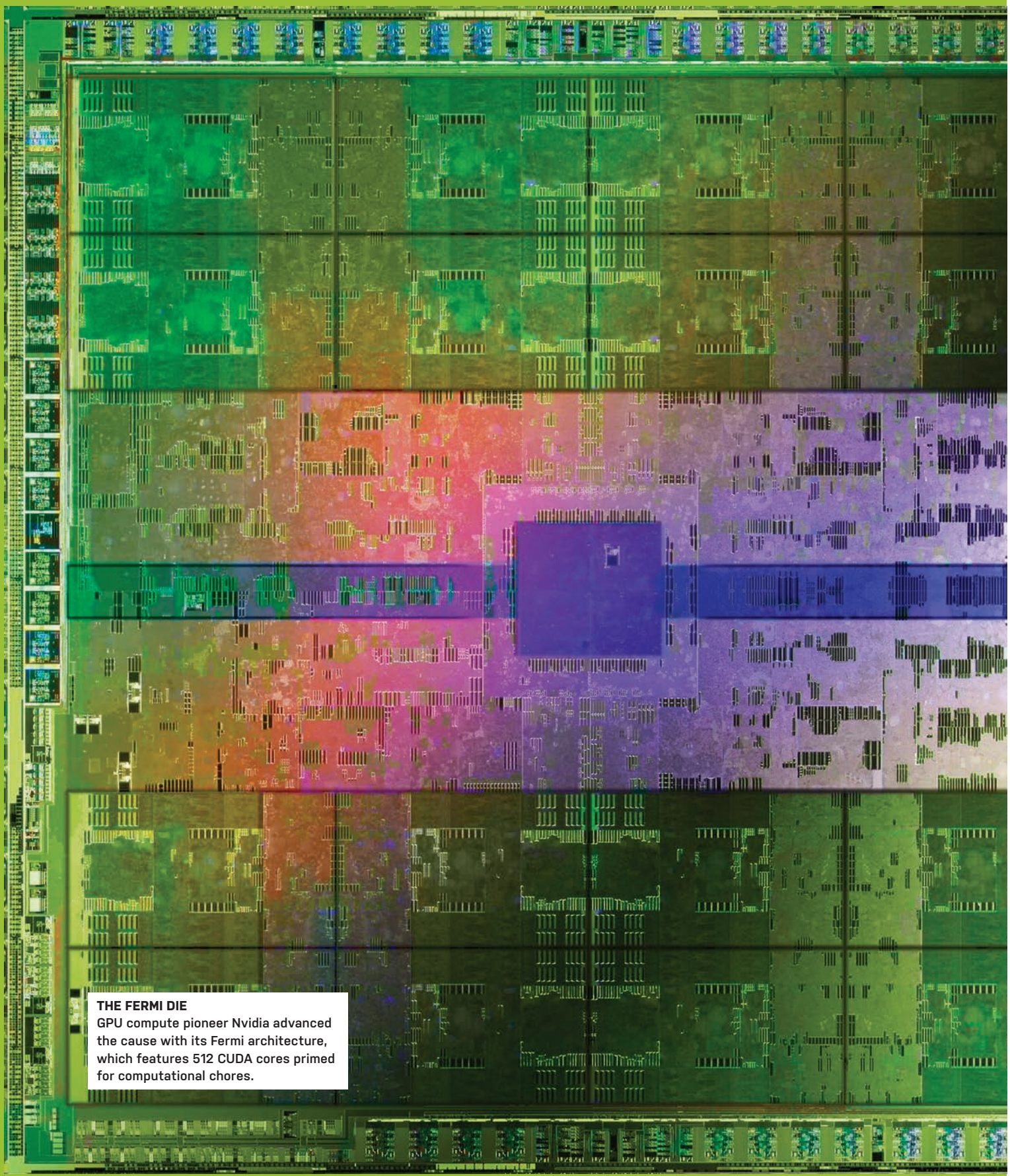
MSN, Yahoo, ICQ, and Google Talk. It's also a handy notification tool for personal email.
www.digsby.com

Malwarebytes Anti-Malware

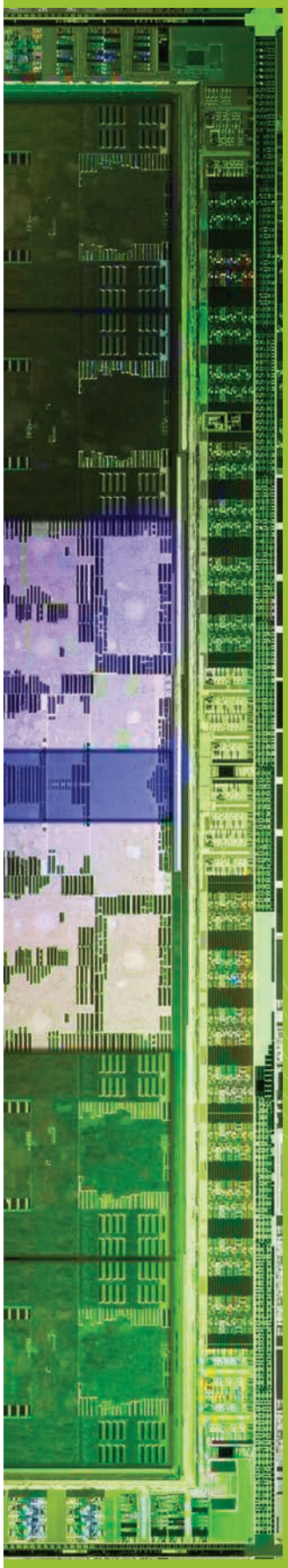
MALWAREBYTES' ANTI-MALWARE Yes, you already have an AV program (right?), but it never hurts to have a second opinion or line of defense. For us, that's Malwarebytes' Anti-Malware Free. It doesn't run auto scans, so it won't conflict with your other AV solution.
www.malwarebytes.org



SUPERANTISPYWARE You could say that SuperAntiSpyware is the third prong in our three-prong approach to PC security. Like Malwarebytes', it provides yet another line of defense. And it's free, so why not avail your PC of this extra layer of protection?
www.superantispyware.com



THE FERMI DIE
GPU compute pioneer Nvidia advanced the cause with its Fermi architecture, which features 512 CUDA cores primed for computational chores.



THE STATE OF GPU COMPUTING

By Loyd Case

MASSIVELY **PARALLEL COMPUTING** ENGINES INSIDE GPUS MAKE THEM IDEAL FOR A WIDE **RANGE OF TASKS** IN ADDITION TO GRAPHICS. BUT WHERE ARE THE APPLICATIONS?

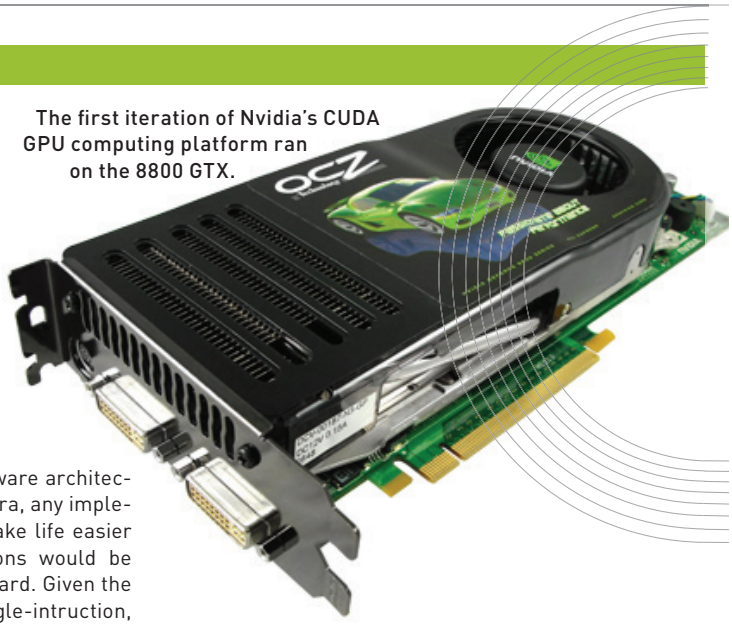
IN THE DARK AGES of PC gaming, the CPU took care of most of the graphics chores. The graphics chip did just the basics: some raster operations, dedicated text modes, and such seemingly quaint tasks as dithering colors down to 256 or 16 colors. As Windows took hold, the graphics equation began to shift a bit, with some Windows bitmap operations handled by "Windows accelerators." Then along came hardware like the 3dfx Voodoo and the Rendition V1000, and accelerated 3D graphics on the PC took off.

Now it's coming full circle. Today's GPUs are fully capable of running massively parallel, double-precision floating-point calculations. GPU computing allows the 3D graphics chip inside your PC to take on other chores. The GPU isn't just for graphics anymore.

GPU computing has its roots in an academic movement known as GPGPU, short for "general purpose computing on graphics processing units." Early GPGPU efforts were limited due to the difficulty of trying to get pre-DirectX 9 GPUs to work effectively with floating-point calculations. In the DirectX 11 era, GPU architectures have evolved, taking on some of the characteristics of traditional CPUs, like loops and branches, dynamic linking, and large addressable memory space, among others.

The new age of GPU compute is also more open. DirectCompute built into DirectX 11 supports all the major DirectX 11-capable hardware. OpenCL supports multiple operating system platforms, including mobile. We'll look at each of the major hardware manufacturers and APIs for GPU computing, as well as some applications that utilize the technology.

STATE OF THE HARDWARE



The first iteration of Nvidia's CUDA GPU computing platform ran on the 8800 GTX.

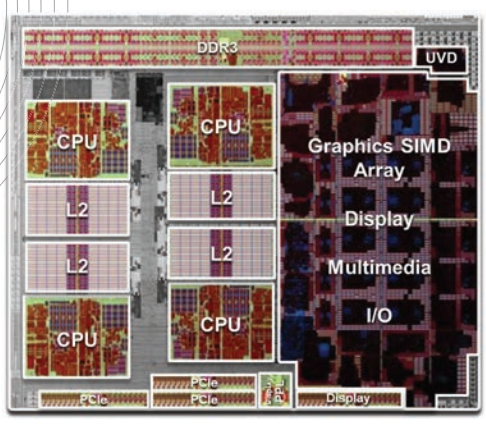
If we stick with GPU hardware, there are currently just two developers shipping GPU compute-enabled hardware: AMD and Nvidia. They'll soon be joined by Intel, however, with the integrated GPU in the upcoming Ivy Bridge CPU. Let's take a look at each of them in turn.

NVIDIA: TESLA AND CUDA

The first attempts at GPGPU used Nvidia GPUs. There were some early experiments with machine-vision applications that actually ran on very early GeForce 256-series cards, which didn't even have programmable shaders. However, efforts began to blossom when DirectX 9's more flexible programmable-shader architecture arrived.

Nvidia took note of these early efforts, and realized that GPUs were potentially very powerful tools, particularly for scientific and high-performance computing (HPC) tasks. So the company's architects began to think about how to make the GPU more useful to general purpose programming. Until then, GPUs were great for graphics, but trying to write applications that were more general was difficult. There were no loops or returns, for example, and shader programs severely restricted the number of lines of code permitted.

Part of the issue, of course, was the lock DirectX 9 had on GPU hardware architecture. Back in the DirectX 9 era, any implementation of features to make life easier for non-graphics applications would be outside of the DirectX standard. Given the raw floating-point and single-intruction, multiple-data (SIMD) performance, however, graphics processors looked like good candidates for certain classes of supercomputing tasks.



AMD is taking GPU computing mainstream by building in Radeon-class shader cores into the CPU die, as seen in this Fusion die shot.

In order to further the GPGPU movement, Nvidia created a more compute-friendly software development framework. CUDA 1.0, as Nvidia dubbed the architecture, was the first version of Nvidia's CUDA (Compute Unified Device Architecture) software platform. Programmers could now use standard C, plus Nvidia extensions, to develop applications, rather than have to work through the more cumbersome shader language process. In other words, general purpose apps didn't have to be written like graphics code. CUDA worked with 8800 GTX and related GPUs. That generation of graphics processors spawned the first products dedicated to GPU compute, the Tesla 870 line.

Since the early days of the 8800, Nvidia continued to build in architectural features to make the GPU a better general purpose programming tool. The goal isn't to make the GPU a replacement for the CPU. CPUs still excel at linear or small-scale multithreaded applications. However, GPUs are potentially excellent at large-scale parallel programming applications involving hundreds of threads operating on large volumes of separate but similar data. That programming model is ideal for a certain class of scientific and high-performance applications, including financial analysis.

It's significant that Nvidia positioned its latest Fermi architecture as a GPU compute platform before launching it as a graphics processor. The Fermi architecture brought substantial hardware enhancements to make it a better general purpose processor. These include fast atomic memory operations (which means a single memory location won't be corrupted by accesses from different functions), a unified memory architecture, better context switching, and more. Since Fermi's launch, Nvidia has also updated its CUDA software platform several times, which we'll discuss shortly.

Nvidia didn't just see GPU compute as something for oil exploration and academic computing. Nvidia acquired PhysX several years ago, discarding the dedicated hardware but keeping the broadly used physics API, so the GPU can accelerate physics calculations. The company has also worked with game developers to incorporate GPU compute into games, for water simulation, optical lens effects, and other compute-intensive tasks. Finally, it has worked with a number of mainstream companies like ArcSoft, Adobe, and CyberLink to enable GPU-accelerated video transcoding in both high-end and consumer-level video applications.

All the work of Fermi as a compute platform has paid off, as Nvidia's Tesla compute hardware sales topped $100M last year. Fermi doesn't get the attention that the desktop graphics or mobile processor divisions have been getting, but its existence has enabled Nvidia to remain at the top of the heap for GPU compute. Still, competitors are nipping at its heels.

AMD: THE MAINSTREAMING OF GPU COMPUTE

AMD was a little late to the GPU compute party, but it has been working feverishly to catch up. ATI Stream was the company's equivalent to Nvidia's CUDA. The first AMD FireStream cards for dedicated GPU compute were the model 580s, built on the Radeon X1900 GPU, which saw

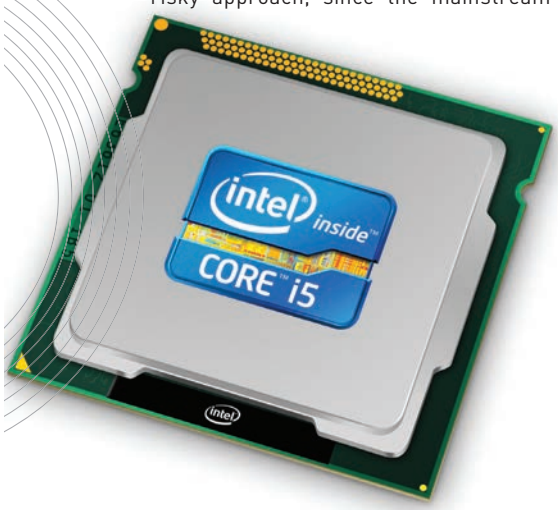
> INTEL'S UPCOMING IVY BRIDGE MAY CHANGE THE BALANCE

fairly limited pickup. It wasn't until the Radeon HD 4000 series shipped that AMD really had competitive hardware for GPU compute. The HD 5000 improved on that substantially. The latest Radeon 6000 series has significant enhancements specifically geared for general purpose parallel programming.

Philosophically, though, AMD has taken a slightly different road. At first, the company tried to mimic Nvidia's CUDA efforts, but eventually discarded that approach and fully embraced open standards like OpenCL and DirectCompute. (We'll discuss the software platforms in more detail next.)

Recently, AMD has shifted its GPU compute focus more to the mainstream. While AMD ships dedicated compute accelerators under the moniker FireStream, the company is trying to capitalize on its efforts to integrate Radeon graphics technology into mainstream CPUs. The Fusion APUs (accelerated processing units) are available in either mobile or desktop flavors. Even the high-end A3800, sporting a quad-core x86 CPU and 400 Radeon-class programmable shaders, costs less than $150.

AMD calls its approach to mainstream GPU compute App Acceleration. It's a risky approach, since the mainstream applications ecosystem isn't exactly rich with products that take advantage of GPU compute. The few applications that exist can run much faster on the GPU side of the APU, but the modest performance of the x86 side of the equation makes it difficult to compete with Intel's x86 performance dominance. AMD is betting that more software developers will take advantage of GPU compute, shifting the performance equation for the APUs.



The GPU in Sandy Bridge is fairly mediocre—except for the fixed-function video engine, which is purely awesome.

INTEL: BRIDGES TO GPU COMPUTE

Intel has been watching the GPU compute movement with some understandable concern. The company tried to get into discrete graphics with Larrabee, but that project died on the vine. The technology behind Larrabee is now relegated to limited use in some high-performance parallel compute applications, but you can't go out and buy a Larrabee board.

On the other hand, Intel has made waves with the integrated graphics built into its current Sandy Bridge CPUs. The Intel HD Graphics GPU is pretty average for Intel graphics, but the fixed-function video block is startlingly good. Video decode and transcode are very fast—even faster than most GPU-accelerated transcode. Of course, it's a fixed-function unit, so it isn't useful with non-standard codecs. But since a big part of the consumer GPU compute efforts from Nvidia and AMD focus on video encode and transcode, Sandy Bridge graphics stole a little thunder from the traditional graphics companies.

Intel's upcoming 22nm CPU, codenamed Ivy Bridge, may actually change the balance. The x86 CPU itself will offer modest enhancements to Sandy Bridge, but the GPU is being re-architected to be fully DirectX 11 compliant. When asked if GPU compute code could run entirely on the Ivy Bridge graphics core, the lead architect for Intel said it would. Performance is unknown at this point, but if Intel can couple a GPU core that's equal to the AMD GPU inside Fusion APUs with its raw x86 CPU capabilities, then it may signal a sunset on the era of entry-level discrete graphics cards.

THE API STORY

If you can't write software to take advantage of great hardware, you essentially have really expensive paperweights. Early attempts to turn GPUs into general purpose parallel processors were bootstrapping efforts, requiring programmers to figure out how to write a graphics shader program that would do something other than graphics.

As the hardware evolved, a strong need for standard programming interfaces became critical. What happened is a recapitulation of graphics history: proprietary technology first, then a steady shift to more open standards.

CUDA

Nvidia's CUDA platform was one of the first attempts to build a standard programming interface for GPU compute. Nvidia has always maintained that CUDA isn't really "Nvidia-only," but neither AMD nor Intel has really taken up the company's offer to accept it as a standard. Some of Nvidia's third-party partners, however, have chipped in, enabling support for Intel CPUs as fallback for some CUDA-based middleware.

CUDA started out small, consisting of libraries and a C compiler to write parallel-processing code for the GPU. Over the years, CUDA has evolved into an ecosystem of Nvidia and third-party compilers, debugging tools, and full integration with Microsoft Visual Studio.

CUDA has seen most of its success in the HPC and academic supercomputing market, but CUDA has a broader reach than just deskside supercomputers. Adobe used CUDA in Adobe Premiere Pro CS4, and later to accelerate high-definition video transcode and some transitions. MotionDSP uses CUDA to help reduce the shaky-cam effect in home videos. We'll highlight a few GPU-accelerated apps later in this article.

ATI STREAM

We'll just mention AMD's Stream software platform briefly, since AMD is no longer pushing it, choosing to focus instead on OpenCL and DirectCompute.

Stream was AMD's attempt to compete with CUDA, but the company obviously feels that the greater accessibility offered by standards-based platforms is more appealing.

DIRECTCOMPUTE

DirectCompute shipped with Microsoft's DirectX 11 API framework, so is available only on Windows Vista and Windows 7. It will also be available on Windows 8 when that OS ships. That means there's no support for DirectCompute on non-Microsoft operating systems. DirectCompute won't run on Windows XP, either, nor on Windows Phone 7 or the Xbox 360.

DirectCompute works across all GPUs capable of supporting DirectX 11. Today, that means only Nvidia GTX 400 series or later and AMD Radeon HD 5000 series or later. Intel will support DirectX 11 compute shaders when Ivy Bridge ships in 2012.

DirectCompute's key advantage is that it uses an enhanced version of the same shader language, HLSL, for GPU compute programming as it does for graphics programming. This makes it substantially easier for the large numbers of programmers already facile in Direct3D to write GPU compute code. It also runs across graphics processors from both AMD and Nvidia, giving it broad graphics hardware support.

On the downside, DirectCompute has no CPU fallback. So code specifically written for DirectCompute simply fails if a DirectX 11-capable GPU isn't available. That means programmers need a separate code path if they want to replicate the results of the DirectCompute code on a system running an older GPU.

OPENCL

Early on, OpenCL was developed by Apple, who turned over the framework to an open standards committee called Khronos Group. Apple retained the name as a trademark, but granted free rights to use it.

OpenCL runs on just about any hardware platform available, including traditional PC CPUs and GPUs inside mobile devices like smartphones and tablets. Care must be taken with code designed for multiplatform use, as a cell-phone GPU may not be able to handle the same number of threads as gracefully as an Nvidia GTX 580. In fact, Intel has even released an OpenCL interface for the current Sandy Bridge-integrated GPU.

Support for OpenCL has been quite strong. AMD is so enamored of OpenCL that it dropped its ATI Stream SDK in favor of a new Accelerated Parallel Processing SDK, which exclusively supports OpenCL. OpenCL has also come to the web. A variant of OpenCL, called WebCL, is in the prototype stage for web browsers, which allows JavaScript to call OpenCL code. This means you may one day run GPU compute code inside your browser.

On the other hand, OpenCL is still in its infancy. Supporting tools and middleware are still emerging, and for the time being developers may need to create their own custom libraries, instead of relying on commercially available or free middleware to ease programming chores. There's no integration yet with popular dev tools like Microsoft's Visual Studio.

THE API WARS

The GPU compute API situation today resembles the consumer 3D graphics API wars of the late 1990s. The leading development platform is CUDA. Despite Nvidia's protestations to the contrary, CUDA remains a proprietary platform. It has a rich ecosystem of developers and applications at this stage, but history hasn't been kind to single-platform standards over the long haul.

You could argue that DirectCompute is also proprietary, since it's Windows-only—and even lacks support on pre-Vista versions of Windows. However, Windows is by far the leading PC operating system, and DirectCompute supports all existing DirectX 11–capable hardware. That's where the support ends, however, since there's no version for mobile hardware, though we may see that change with Windows 8.

OpenCL offers the most promise in the long run, with its support for multiple operating systems, a wide array of hardware platforms, and strong industry support. OpenCL is the native GPU compute API for Mac OS X, which is gaining ground in the PC space, particularly on laptops. But OpenCL is still pretty immature at this stage of the game. There's a strong need for integration with popular development platforms, more powerful debugging tools and more robust third-party middleware.

CUDA	OpenCL	DirectCompute
Nvidia proprietary	Developed by a consortium led by Khronos Group	Developed by Microsoft
Oldest GPU compute platform software	Strong implementation on Mac OS X	Part of DirectX 11
Lots of support in high-performance computing	Available on most OS platforms	Graphics-like API
Available on multiple OS platforms	Runs on Nvidia, AMD, Intel (CPU). Intel GPU support in Ivy Bridge	Strong performance on Windows Vista, 7, 8
Mostly Nvidia H/W with CPU fallback		Runs on GPUs; no CPU fallback

This chart sums up the state of the GPU compute APIs in a nutshell.

THE APPLICATIONS STORY

To see what kind of strides GPU compute has made, we're going to focus on consumer applications, not scientific or highly vertical applications. GPUs should do well in applications where the code and data are highly parallel. Examples include some photography apps, video transcoding, and certain tasks in games (that aren't just graphical in nature.)

Musemage is the first photo editing application to be fully GPU accelerated.

MUSEMAGE

Musemage (www.musemage.com) is a complete photo editing application available from Chinese developer Paraken. When running on systems with Nvidia GPUs, Musemage is fully GPU accelerated. Musemage uses the CUDA software layer to accelerate the full range of photographic operations.

Musemage lacks a lot of the automated functions built into more mature tools like Photoshop, but if you're willing to manually tweak your images, most of the filters and tools act almost instantly, even on very large raw files—provided you've got Nvidia hardware.

ADOBE PREMIERE PRO CS5/5.5

Adobe's Premiere Pro (www.adobe.com) is a professional-level video editing tool. One of the tasks necessary for any video editor is previewing projects as you assemble clips, titles, transitions and filters into a coherent whole. Adobe's Mercury playback engine uses CUDA to accelerate the preview. This is incredibly useful as projects grow in size—you're able to scrub back and forth on the timeline in real time, even after making changes.
In addition, a number of effects and filters are GPU accelerated, including color correction, various blurs, and more. A complete list can be found at the Adobe website (adobe.ly/9iiZ4o).

Adobe is investigating porting the Mercury engine and other GPU-accelerated portions of Premiere Pro to OpenCL, but we haven't heard whether a final decision has been made. Given the relative immaturity of the tool sets and drivers, OpenCL may need a little more time before major software companies like Adobe commit to the new standard.

Interestingly, Intel has recently delivered a plugin for Premiere Pro CS5.5 that can speed up HD encoding if you use Adobe Encoder. It does require an H67 or Z68 chipset. With a Z68 system, you can use an Nvidia-based GPU to accelerate the Mercury playback engine and QuickSync to perform the final render.

VIDEO CONVERSION

A number of video transcoding apps exist that are GPU accelerated. One of the first was CyberLink's Media Espresso, which first used Nvidia's CUDA framework, then OpenCL. The latest version of Media Espresso takes advantage of Intel's QuickSync. Transcoding with QuickSync can be faster than using a GPU, but only if you use a QuickSync-supported codec.

Higher-end tools, like MainConcept, also use GPU encode. MainConcept offers separate H.264/AVC encoders for Nvidia, running on CUDA, and AMD, which uses OpenCL.

GAMES

When we think of games and GPUs, it's natural to think about graphics. But games are increasingly using the GPU for elements that aren't purely graphical. Physics is the first thing that comes to mind. Usually when we think of physics, we think of collisions and rigid body dynamics.

But physics isn't just about stuff bouncing off other stuff. Film effects like motion blur and lens effects like bokeh and volumetric smoke are handled via GPU compute techniques rather than run on the CPU. GPU compute also handles cloth simulations, better-looking water, and even some audio processing. In the future, we might see some of the AI calculations offloaded to the GPU; AMD already demonstrated GPU-controlled AI in an RTS-like setting.

As more GPU compute capability is integrated into the CPU die, it's possible for the on-die GPU to handle some of these compute tasks while the discrete graphics card takes care of graphics chores. The ability for the on-die GPU and CPU to share data more quickly—without having to move data over the PCI Express bus—may make up for the fewer shader cores available on-die.

PARALLELISM IS THE FUTURE

CPUs will never go out of fashion. There will always be a need for linear computation, and some applications don't lend themselves to parallel computation. However, the future of the Internet and PCs is a highly visual one. Digital video, photography, and games may be the initial drivers for this, but the visual Internet, through standards like WebCL and HTML5 Canvas, will create more immersive experiences over the web. And much of the underlying programming for creating these experiences will be parallel in nature. GPUs, whether discrete or integrated on the CPU die, are naturals for this highly visual, parallel future. GPU computing is still in its infancy.

BY PAUL LILLY

IN SEARCH OF THE MEDIA SUITE SPOT

WE TEST THREE **'DO-EVERYTHING'** PACKAGES FOR **MEDIA CREATION** AND MANAGEMENT TO FIND THE ONE THAT STRIKES THE PERFECT BALANCE OF **FEATURES, PERFORMANCE,** AND **EASE-OF-USE**

WHEN FRIENDS OR FAMILY MEMBERS you haven't seen in years suddenly show up at your front door, the proper thing to do is invite them in, find out whom they're married to these days, and then reminisce about old times over a tall glass of Guinness. What you don't do is drag out a two-ton box full of photo albums and Super-8 tapes and bore your company to tears, like you might have done before the digital era drop-kicked that kind of coma-inducing behavior into obsolescence. That might still work for your computer-illiterate parents, but this is a different time, and you're much more likely to have your memories and adventures preserved as digital bits scattered all over your hard drive. In the back of your mind, you keep meaning to organize your digital photos, home movies, and even your epic music collection, and wouldn't it be rad to mash them together? After all, a home-brewed DVD with a custom soundtrack and visual effects would dazzle your friends and relatives in ways a simple photo album and unorganized video can't.

This is where fully fledged media suites come into play. They not only help you organize and spice up your digital collection, they're also capable of converting music and videos into formats better suited for portable devices, like your handheld game player, smartphone, or tablet. Today's media suites are all about managing and manipulating your content so you can view it whenever, wherever, and however you want, and not simply burning to disc like you did in the 1990s.

To help you choose the right one, we rounded up three of the biggest, most popular media suites around: CyberLink Media Suite 9 Ultra, Nero 11 Platinum, and Roxio Creator 2012 Pro. Each one brings a barrelful of tricks to the digital party, so we narrowed our focus to the tasks you're most likely to use over and over again. Specifically, we're testing for Blu-ray/DVD/3D playback, DVD/Blu-ray burning, basic video and photo editing chores, and transcoding. Is there a suite that stands head and shoulders above the others? Let's find out!

MEDIA SUITES COMPARED

Comparing media suites isn't easy. Each of the three suites in this roundup comes with a laundry list of features and bullet points, and it really starts to get overwhelming when you consider that each of the individual programs included within each suite has its own list of selling points. This chart compares the three on a macro level, skipping over most of the features that apply to all three suites—like making DVD backups, for example—and focusing instead on differentiating features that actually matter to the end user. Are you rocking a touch screen? Roxio is the only one with a mode specifically for touch screens. Is overburning important to you? Nero does it; the others don't. This isn't by any stretch an all-inclusive list of features, but it does reveal some key differences that could play a part in your decision to drop a wad of cash on one suite over the other.

	Nero 11 Platinum	CyberLink Media Suite 9	Roxio Creator 2012 Pro
Blu-ray Playback/Burning	Y	Y	Y
3D Support	N	Y	Y
System Backups	Y	Y	Y
Overburning	Y	N	N
Photo Tags	N	Y	N
Social Media Integration	Y	Y	Y
Touch-screen Option	N	N	Y

NERO 11 PLATINUM

Heavy-footed, clumsy, and slow

TO SAY NERO'S BEEN around the block a time or two is like saying Brett Favre's played in a few football games: both are gross understatements. If you've been building computers for any length of time, or have ever purchased an optical recorder, then you've probably come across Nero in some shape or form. It's been around since 1997, back when Bill Clinton was still president, the Internet was an infant, and Windows 95 ruled the roost. Back then, there wasn't a need for media suites, and you would use Nero Burning ROM for burning copies of audio CDs, backing up data to optical discs, copying games, and, well, not much else. Computers and technology have changed significantly since then, and so has Nero, which is now a multifaceted suite of media tools with a price tag to match its robust feature-set.

Nero 11 Platinum is Nero AG's (formerly Ahead Software) top-of-the-line software suite that retails for $110. It includes 10 individual programs of various utility, each of which fires up independently of the others. You would think that wielding so many individual programs would turn into an organizational nightmare, but Nero does a good job of wrangling them into a Welcome menu that lists each one in a sidebar. Navigating within each program is another story entirely.

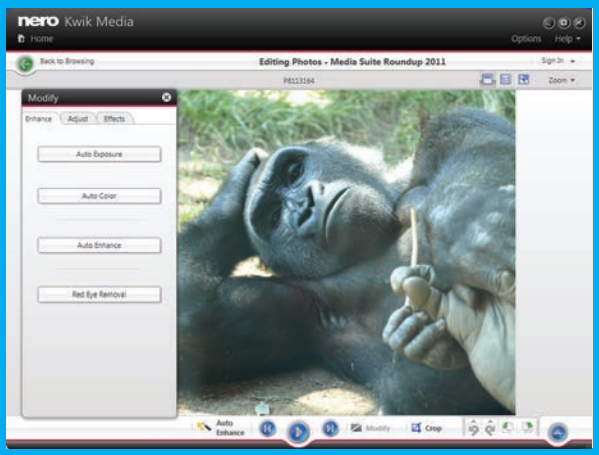
Our biggest gripe with Nero is the steep learning curve, at least compared to the other suites in this roundup. That's too bad, because underneath the clunky controls, there's a lot you can do with Nero. We got our first taste of sour grapes when trying to edit movies with Nero Video. This brings up a Welcome screen with six tiles: Capture, Edit & Import, Create & Export, Projects, Tools, and Product Info. Logic dictates that we should start with the Edit & Import tile, but your only options are to Make Movie or Slide Show, Import from AVCHD Camera, Import AVCHD from Disc, and Import AVCHD from Hard Drive. That's fine if your video is AVCHD, but what if it isn't? If you choose one of the AVCHD import options, Nero freaks out and tells you it can't recognize your video because it's the wrong format. The video editor loads anyway, and once you dismiss the error message, you're free to drag-and-drop your non-AVCHD video into the editor and begin manipulating it. Alternately, you can choose the unintuitive option of Make Movie or Slide Show to edit your flicks. Yet another way to get to the same place

Kwik Media is Nero's new media organizer for photos, videos, and music. It's also available as a free download (www.kwikmedia.nero.com).

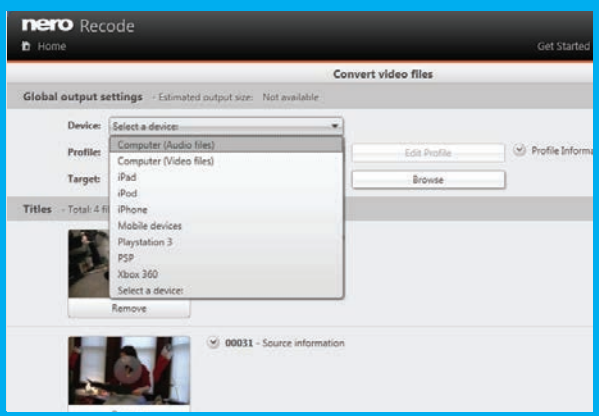
is through the Create & Export tile, which brings up a window to import and then edit your videos. It's all very redundant and bound to confuse your mom and dad, who just want to add some pizazz to their vacation videos.

Once you've stumbled through the front door and are finally able to edit home movies, Nero provides an assortment of tools to spruce up your clips, all of which are organized within a fairly feature-rich dashboard. New to Nero 11 is an Express Editing configuration that lets you sprinkle in video effects, clipart, text, speech bubbles, picture-in-picture effects, and add other snazzy doodads by dropping them into a storyboard format. You're given a generous amount to play with, such as 50 transition effects alone, made even more robust by being able to tweak each one's properties. Even with the Express Editing feature, it's still a bit more complicated than it needs to be, but if you take the time to learn the interface, it's possible to produce a prosumer-grade video.

Nero Recode offers a far easier UI to work with, and it's a piece of pie to convert your HD videos into mobile-friendly formats for viewing on the go. If you want to port video shot from your Flip camera over to your smartphone, for example, all you need to do is drag and plop the video into the indicated box and select the device you want to watch it on. There are preconfigured profiles for most major gadgets, including the iPad, iPod, iPhone, PlayStation 3, PSP, and Xbox 360, as well as a catch-all category simply called Mobile devices. It's curious Nero opted not to include profiles for some of the more popular Android devices, like the Xoom tablet and Galaxy smartphone, and it's even more quirky that you can't create your own profiles, though you can edit any of the existing ones and adjust the audio and video settings to suit your specific gear. More savvy video buffs will appreciate additional fine-grain control in the form of being able to choose the specific resizing method and deinterlace mode.



Simple photo editing controls in Nero feel more like an afterthought than a bona fide feature addition.



Nero's drag-and-drop interface makes it incredibly easy to transcode videos—we just wish there were more model-specific profiles to choose from.

While Nero doesn't make it obvious, it does support overburning, a sometimes buggy technology that allows for recording audio and data beyond a disc's rated capacity by filling in the lead-in area of a CD or DVD. Blu-ray playback and burning are also supported, but not 3D.

Some basic photo editing tools are included in Nero, with an emphasis on basic. Serious photographers will want to steer clear, but for things like cropping and removing freaky red eyes, it gets the job done. There are also a handful of effects to play with, for the 1 percent out there who actually use these gimmicks. Nero placed a much greater emphasis on organizing and sharing photos (and other media) than it did on manipulating them, and it appears to have been bitten by the app store bug. Nero Kwik Media is Nero's new front-end for rounding up all your photos, videos, music, playlists, slide shows, photo albums, and more. It's sort of a hyper version of Windows 7's Library feature, and you can add functionality by downloading plugins through Nero's Market. Most of the plugins are already included with the Platinum suite, but you'll want to grab Nero Kwik Faces so you can tag your pictures and later search through your photo library by friends and family.

With a little more TLC to the UI, this could be the media suite to beat. As it stands, it's the one that gets beat.

VERDICT **6**

Nero 11 Platinum

$110, www.nero.com

CYBERLINK MEDIA SUITE 9 ULTRA

This all-in-one suite gets very little wrong and nearly everything right

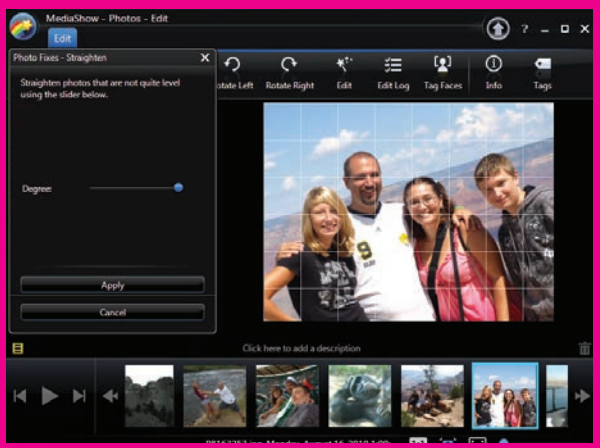
CYBERLINK MEDIA SUITE 9 is available in three different flavors and subsequent price points: Centra ($70), Pro ($100), and Ultra ($130). Ultra is the only version that supports Blu-ray playback, which seems like a hefty premium, especially over the Centra package, but if watching Blu-ray discs is all you're after, CyberLink's PowerDVD 11 Ultra software sells for a more reasonable $100. PowerDVD 10 BD Express is included in CyberLink's flagship media suite reviewed here, in addition to tools for Blu-ray and DVD authoring, transcoding, photo and video editing, and data burning to a variety of formats and media, including BDXL discs.

Like Nero, CyberLink shoehorns nearly a dozen different programs into a single media suite, only CyberLink does a far superior job of organizing them within a front-end that creates the illusion it's all just one piece of software. CyberLink sometimes ruins the illusion by requiring individual updates for each program and making attempts to upsell many of them (lame!), but otherwise it offers a dexterous UI that bounces you from program to program without a hint of clumsiness. The main menu contains a row of labeled icons along the bottom: Movie, Video, Photo, Music, Data & Backup, Device, and Utilities. Clicking any of them instantly brings up a list of related tasks at your disposal. If you want to rip an audio CD, you'll find that option by clicking—you guessed it—Music, with additional links to Play Music, Make an Audio CD, Make an MP3 Disc, Make a WMA Disc, and Edit Audio. We found we couldn't rip directly to MP3, but had no problem converting to that format. Each option fires up the appropriate program and discards the main menu you were just in, and when you're finished fiddling around and exit a program, CyberLink shuttles you back to the main window. It's all very slick, and smooth to boot, which is surprising when you consider how big and heavy this media suite is (around 2.4GB).

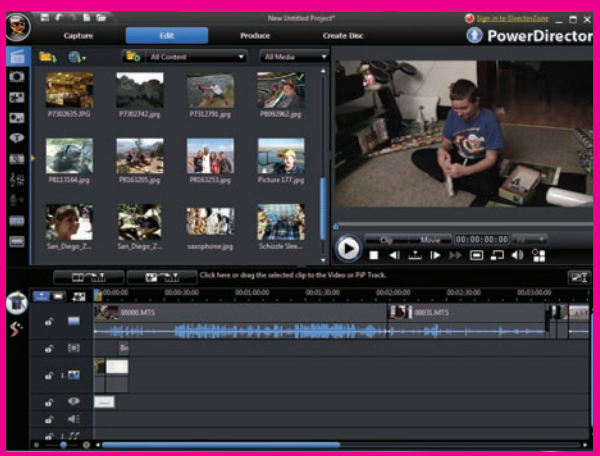
We were really awestruck by how insanely easy it is to convert videos to play on a plethora of portable devices and media players. CyberLink's MediaEspresso software is billed as an "ultra-fast universal media converter," and it's one of the cogs included in this wonderful machine. A MediaEspresso Windows gadget sits at the bottom-right of the desktop in the shape of a coffee cup and changes shape depending on what portable device you plug into your PC. Attach an iPhone 4S, for example, and the coffee cup turns into an iPhone. More than just eye candy, MediaEspresso works behind the scenes, loading the appropriate profile for your gear—when you drag and drop a video you shot with your pocket camera into the widget, it immediately starts transcoding it into a format that works with your iPhone, Galaxy S II, Zune, or whatever. There are preconfigured profiles for more than 90 devices, as well as catch-all profiles in case your specific model isn't in MediaEspresso's database. It's a crapshoot when you start getting into the latest hardware: MediaEspresso has profiles for Asus's Transformer tablet and the HTC Flyer, but not Motorola's Droid X2 smartphone. Of course, you can always edit any of these profiles, or even create your own.

CyberLink's video transcoding is not only super simple, it's also fast—and capable of cleaning up your media. There are a few video quality enhancements you can enable to improve the overall lighting, remove noise, and improve sharpness. In many cases, these optional enhancements result in better-looking videos, though they can sometimes add significantly to the time it takes to transcode a video. And while CyberLink supports GPU acceleration, there are some notable omissions, like AMD's 5700 and 5800 series graphics cards.

Should you want to watch movies instead of transcode them, CyberLink's PowerDVD software is another capable tool. It supports Blu-ray, 3D, and HD video files, and comes with an assort-



CyberLink's straighten tool plops a grid on top of your photo, making it easy to fix crooked images or intentionally tilt them for a cool perspective shot.

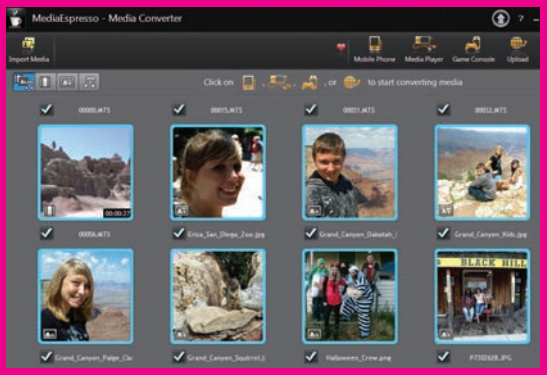


When you're finished editing a movie in CyberLink, you can output your masterpiece to a variety of file formats or upload it directly to YouTube or Facebook.

ment of gadgets for videophiles who like to spend as much time tinkering as they do consuming. You can play with the lighting, aspect ratio, and audio, and can upconvert movies or convert them to 3D on the fly. In 3D mode, you can adjust the 3D scene depth with a slider to reduce (or induce) eye fatigue, and there are options for both stereoscopic and anaglyph (red and cyan glasses) 3D modes. Very cool.

We weren't quite as impressed with the process of editing and touching up photos. This is one of the few areas where CyberLink feels a little bit clunky, and before you can edit your snapshots, you first have to import them. Doing so brings up a new window and requires a few mouse clicks, and then you have to hit the Back button to see your imported photos. Right-clicking your photos gives you the option of editing them, and as is common with a jack-of-all-trades suite such as this one, CyberLink leaves a lot to be desired. You'll find only basic enhancement options like crop, red-eye removal, and some color-fixing dials, along with a handful of special effects, if for some reason you really want to make your photo appear old and yellow (CyberLink calls it "Antique"). You can also touch up videos with similarly basic controls, as well as remove camera shake.

For editing movies, CyberLink includes the complete retail edition of PowerDirector 8 Ultra, which is both a blessing and a curse. There's a learning curve associated with full-featured editors, and this one is no exception, though it's nowhere near as complicated as something like Sony Vegas. Spend some time learning the interface, and it won't be long before you're dazzling friends and family with B-movie conversions of your home videos.



Are your videos too dark? Try enabling CyberLink's TrueTheater AutoLight option in the Settings menu to lighten things up.

What's left is mostly standard fare, things like burning disc images, creating disc labels, and backing up data. But these things, along with everything else, are generally better than the competition, and everything is extremely well organized.

CyberLink is fast, flexible, and easy to use; just the way we like it.

VERDICT **9**

CyberLink Media Suite 9 Ultra

$130, www.cyberlink.com

ROXIO CREATOR 2012 PRO

Proof that a bundled photo editor doesn't have to suck

THE WAY WE SEE IT, $130 is a big investment for software, even a fully loaded media suite. So once we resign ourselves to spending a jester's ransom for a chunk of computer code, the very last thing we want to see is a banner ad on the main screen proposing we drop another 40 bucks into the till, yet that's the first thing Roxio does as it tries to hawk a USB capture device for converting video from VHS, Hi8, and V8 to DVD. But hey, you'll save $10 off the list price, so there's that. With a little digging, we discovered you can remove this and other solicitations by heading to Tools > Preferences and unchecking the box that offers to "Display relevant production information and offers from Roxio."

First impression out of the way, Roxio quickly gets to work atoning for its money-grubbing introduction. The main menu isn't as sleek or slick as CyberLink's, but it's just as straightforward and easy to navigate. A total of seven frequent tasks appear on the home screen so you can jump right in and copy a disc, burn an audio CD, or edit video, among other things. On the left side of the menu are five additional tabs to choose from—Data/Copy, Video/Movies, Music/Audio, Photo, and Learning Center—and each one brings up a new set of options.

Roxio is the only media suite in this roundup to give any serious consideration to photo editing. It's not nearly as robust as Photoshop, GIMP, or even lower-level consumer editors like Photoshop Elements, but where CyberLink and Nero offer only a bare-bones editor, the one built into Roxio offers quite the expansive toolset. The basics are there, like red-eye removal and color enhancements, but so is an advanced tool that's slightly similar to Photoshop's awesome spot healing brush for removing blemishes from photos. There's a wrinkle removal tool to help you stay one step ahead of father time, and another one for touching up scratches, although both of these are little more than glorified blur brushes. A second tab introduces more editing utensils, including a cloning tool we didn't expect to find. One of the most useful items is a customizable touch-up brush with nearly a dozen different uses. You can stroke parts of your photo to turn it black and white or apply certain effects like lighten, darken, sharpen, soften, desaturate, and more. You're able to fine-tune each brush, as well, adjusting the size, edge fading, and transparency level. On top of it all, Roxio provides a plethora

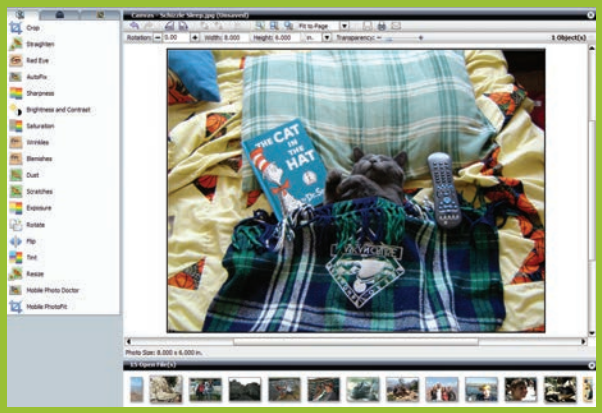
Roxio commits the cardinal sin of trying to upsell customers, who have already spent $130 for the flagship suite, on more media related products. Thankfully, you can turn off the annoying banner ad.

of special effects, clip art, frames, and other items so you can tap into your inner Rembrandt (or Picasso, as it were).

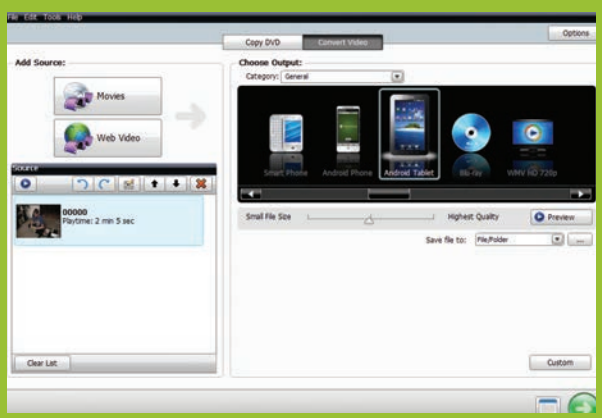
You can also convert 2D images into 3D in a variety of formats, including anaglyph (old-school blue-and-cyan glasses) and both side-by-side (Nvidia 3D Vision) and top/bottom stereoscopic configurations. What's more, Roxio affords a bit of fine-grain control over how the final image will look. Don't fret, tweaking a 3D image isn't as complicated as it sounds, at least not in Roxio. You start by opening a 2D image in Roxio's 3D Photo Creator. The photo you select is automatically converted to 3D, but before you save it, you can adjust its 3D effect using a graphical dial in the edit window. There's also a grayscale button, in case you find it easier to work your 3D mojo without color (this is just for editing—it won't save your photo in grayscale), and a crop tool. When you feel you've leveled up your 3D editing skills and are ready for a bigger challenge, Roxio provides a second method for creating 3D photos by letting you select independent images for both the left and right eye. In other words, it won't be long before you start driving your family nuts by insisting they hold a pose while you take multiple shots from different angles. Stay still, Bobby!

Creating a DVD movie is just as easy, albeit harder to find because the option is not clearly labeled on the main menu. Whereas there's an option to "Create 3D Photos" on the Photo tab, there's no "Create 3D DVDs/Movies" under the Video/Movies tab. To get to it, you click "Create DVDs" and then you can select either 2D or 3D. There are two options for 3D movies, standard definition (DVD) and high definition (AVCHD Blu-ray). Both support anaglyph and a wide range of stereoscopic formats.

Whether you're editing a 2D or 3D movie, the process is fairly straightforward and easy. Roxio uses a storyboard format in which you drag videos, photos, and music to wherever you want them to appear in your timeline. There's an option to stabilize



It's not Photoshop, but you can do much more with your photos in Roxio than you can with CyberLink or Nero.



Roxio makes it incredibly easy to fetch a video from YouTube and convert it to your Android tablet, or just about any other mobile device.

video, and a whole bunch of special effects and transitions to spice things up. If you want to take the lazy route, another option is to have Roxio automatically edit your videos by choosing from a set of themes, but the results are often hokey.

Many of Roxio's abilities come with an advanced option, and that includes ripping music. Clicking Rip is the fastest way to get the job done, but selecting Rip-Advanced gives you access to higher bitrates. Roxio supports a medley of audio codecs, including AAC, AC3, FLAC, MP3, MP3 VBR, OGG, WAV, and WMA.

Transcoding video is equally versatile and virtually dummy-proof. It's not quite as streamlined as CyberLink's program, but there are a plethora of device profiles to choose from, both by type (tablet, smartphone, etc.) and brand. Unfortunately, while you can edit any of these profiles, you can't save the changes or create custom ones. You can, however, pull source video from online sites like DailyMotion, YouTube, and, ahem, other types of Tube and convert them to your specific device.

Roxio isn't as slick as CyberLink, and it lacks features like face tagging and overburning. But it's easy to use and is the only media suite of the bunch to include a photo editor that doesn't feel like an amped-up version of MSPaint.

VERDICT

8

Roxio Creator 2012 Pro

$130, www.roxio.com

ROLL YOUR OWN

How to create a media suite from free apps

Our DIY mentality doesn't just apply to hardware and building PCs, it's applicable in the world of software, too. Each one of these full-fledged media suites will set you back a Benjamin or more, and one thing they all have in common is that each is really just a collection of individual programs served on a pricey platter—some more elegantly organized than others. If you're willing to give up certain premium features and don't mind managing multiple applications on your own, it's entirely possible to put together a low- or no-cost home-brewed media suite of your own. Consider this your penny-pinching cheat sheet.

OVERCOMING THE BLU-RAY BLUES Getting a Blu-ray movie to play on your PC for free is tricky, though not impossible. There just aren't many free players out there, and if you find one, be careful—it might be a rebadged (and unauthorized) version of a paid program (i.e., pirated). In most cases, your Blu-ray drive or BD-equipped PC should have shipped with a lightweight player. If it didn't, or if you bought your system used, you can either pay a small premium for a dedicated player app, or rip your Blu-ray and view it on VLC (free, www.videolan.org) or any media player that supports MKV (Matroska) file formats. MakeMKV (free, www.makemkv.com) is a popular program that decrypts and rips Blu-ray discs to MKV, though you're technically circumventing copy protection here. As long as it's for fair-use backups, we don't have a problem with that.

BURN, BABY, BURN! Again, your optical drive should have shipped with at least an OEM version of Nero or some other disc burning software, but if not, there are plenty of free alternatives to do the trick. And if you're using Windows 7, you can burn CDs, DVDs, and BDs without any third-party software, including ISO and IMG files. Alternately, both CDBurnerXP (free, www.cdburnerxp.se) and ImgBurn (free, www.imgburn.com) work well.

PHOTO FINISH Whether you're looking to touch up a photo by adjusting the brightness and removing those evil-looking red eyes, or you want to go crazy with layers and an advanced toolbox filled with virtual utensils, there's a free photo editor out there tailor-made just for you. For the former, Google's Picasa 3 (free, www.picasa.google.com) is a no-cost editor nearly identical to the one built into CyberLink's Media Suite 9 Ultra. It's great for making quick edits and even shows a histogram and camera information. Another option is Photoshop. No, not the über-expensive photo editor, but the online version (free, www.photoshop.com), where you can store, edit, and share photos at no cost.

For professional-level editing, GIMP (free, www.gimp.org), is a free, open-source alternative to the mega-version of Photoshop. It's arguably just as powerful and fleshed out, and you can do some amazing things in GIMP, once you've learned the interface.

Picasa isn't as powerful as GIMP, but it's nowhere near as complicated, either. For quick-and-dirty edits, Picasa is hard to beat.

Forget Windows Media Player, VideoLAN's VLC player will play just about any media file you throw at it, including MKV files.

LIGHTS, CAMERA, ACTION! If you're rocking a copy of Windows 7, Microsoft's Windows Live Movie Maker (free, www.microsoft.com) is sufficient for basic video editing with transitions and other effects, but it's not a high-level editor by any means. Alternately, Avidemux (free, www.avidemux.org) and VirtualDub (free, www.virtualdub.org) are both general-purpose editors with a wider range of codec support, but they're a bit intimidating for less savvy users. There isn't much middle ground here, and this is one of the areas you sacrifice by rolling your own media suite.

RIP IT AND ROCK OUT! Ripping your gnarly collection of audio CDs to MP3 format so you can listen to those old-school Beastie Boys beats on your media player is easy. But ripping archival-quality MP3s from CDs? That takes a little more work than those one-click solutions you'll find in Windows Media Player and iTunes. If that's something you want to do, you'll need an audio grabber—Exact Audio Copy (free, www.exactaudiocopy.de)—and the LAME MP3 encoder (free, www.lame.sourceforge.net). Once you've gone and grabbed those, point your browser to our online guide to ripping high-quality MP3s at bit.ly/7oQZQl.

WHITE PAP

BY BILL O'BRIEN

4G Cellular Wireless Technology

4G, or not 4G? That is the question

Cellular wireless communications technology is now in its fourth generation. Or is it? You've no doubt heard a great deal of marketing about 4G phones and services, but what does the term actually mean?

First-generation technology of the early 1980s—1G—was based on analog transmissions. The industry switched to digital spread spectrum about 10 years later, ushering in the age of 2G cellular networks. In 2001, 3G technology enabled these networks to carry multimedia as well as voice and data traffic—at the leisurely pace of about 200Kb/s. Now we're seeing the first deployments of products that are being marketed as 4G technologies, but is that what they really are?

According to the ITU (International Telecommunications Union, a standards body established at the United Nations), any product that claims to be a 4G telecommunications device must meet *all* the requirements spelled out in its IMT-Advanced (International Mobile Telecommunications Standard-Advanced) specification. Such devices will operate on an IP-based packet-switching network that delivers nominal throughput of 100Mb/s for mobile communications (client devices in planes, trains, and cars), and speeds of 1Gb/s for relatively stationary clients. While that all sounds neat, clean, and wrapped with a bow, what anyone will tell you about "standards," even those produced by the ITU, is that they are often subject to interpretation. And that puts the devil in the details, because none of the services on the market today truly meet the ITU's definition of 4G, even though some utilize what are widely considered to be 4G technologies.

3G UNDER THE HOOD

A 3G cell-phone system depends on code division multiple access (CDMA) and spread spectrum radio technology, which allows many users to share both time and frequencies. If eight units of bandwidth are available, for instance, each user can transmit all of the time over all of the frequencies, but will be limited to using only one of the eight available orthogonal codes (non-overlapping communication channels for each active link) to avoid interference with anyone using the other seven units of bandwidth.

That's great, as far as it goes, but those specifications are for just one cell within an entire network. Activity on adjacent cells can cause crosstalk and noise if those other cells are using the same orthogonal codes. A CDMA network will try to circumvent this problem by using as much bandwidth as possible; but wireless data networks have become robust in their own right, which limits the effectiveness of this approach.

4G UNDER THE HOOD

Next-generation cell-phone technology relies on orthogonal frequency division multiple access (OFDMA) and other frequency-domain equalization schemes. Multiple input/multiple output (MIMO) antenna schemes with dynamic channel allocation and channel-dependent scheduling are also important components. OFDMA differs from CDMA by combining dynamically assigned subcarriers within time slots. It's essentially a hybrid of FDMA (frequency division multiple access) and TDMA (time division multiple access) systems that takes the substantial multipath suppression and frequency diversity that single-user OFDM (orthogonal frequency division multiplexing) has to offer, and adds multi-access controls that can accommodate a wider range of content and quality-of-service needs.

OFDMA's multiple access is regulated within the digital domain (before the Fast Fourier Transform operation is performed), which allows for more dynamic and efficient bandwidth allocation. The end result is improved integration of time and frequency algorithms, which should—in theory, at least—deliver a better experience to the end user. OFDMA is also more power efficient, especially in terms of peak-to-peak power ratios. Rather than blast one signal across the entire frequency band, this scheme splits the available bandwidth among the total number of users within each cell. Since each user affects only a subset of the available subcarriers, they leave a smaller footprint, and their devices consume less power than if they were tapping all the available bandwidth.

THE 4G FORK

The fork in the road to 4G comes when service providers and device manufacturers decide to follow either the IEEE 802.16 standard (aka Mobile WiMAX—the acronym is for Worldwide Interoperability for Microwave Access), or to deploy LTE (Long Term Evolution) technology. Marketing claims to the contrary, none of the current services described as 4G (WiMax, which Sprint Nextel promotes;

ER

> PERHAPS TODAY'S STATE-OF-THE-ART CELL PHONES SHOULD BE CALLED 3G+

LTE, offered by both Verizon and AT&T; and HSPA+, also known as Evolved High-Speed Packet Access, pushed by T-Mobile and AT&T) actually adhere to every aspect of the ITU's IMT-Advanced spec. In fact, the ITU has accepted only the next versions of LTE and WiMax (LTE-Advanced and WiMax Release 2, aka WirelessMAN Advanced, with the MAN acronym standing for Municipal Area Network), as legitimate 4G candidates. Sprint Nextel adopted WiMAX early on, but is now also working on an LTE-Advanced network. AT&T and Verizon are doing the same. T-Mobile—in acquisition talks with AT&T—has said it would stick with HSPA+ for now, and that it would need a spectrum partner to deploy an LTE network.

The WiMAX standard, as with most communications standards, is not a rigid, top-to-bottom design specification; it's a set of guidelines designed to ensure maximum interoperability between various manufacturers' devices. The standard defines the goals, but manufacturers can choose various paths to reach those goals. A base station, for instance, must determine which subcarrier frequency to use, how power is to be allocated, and then relay this information to the user devices on the network. The process is dynamic and handled in the background so as not to interrupt service. This can be accomplished based on traffic density, communication priority, or even a fairness approach that equalizes conditions for all users either proportionally or more generally. While every manufacturer could adopt its own approach, there's no reason why a consortium of manufacturers couldn't agree on a single approach.

The LTE spec was originally focused on 3G systems, but it was soon expanded to include enhancement opportunities for other systems, as well. LTE and HSPA+, however, are both wrapped around GSM (Global System for Mobile Communication) cores. GSM is a circuit-switched network standard originally developed for 2G telecommunications, and it didn't support packet data transport until GPRS (General Packet Radio Service) and then EDGE (Enhanced Data rates for GSM Evolution) were added. Handling packetized data isn't as natural a progression for LTE as it is for WiMAX.

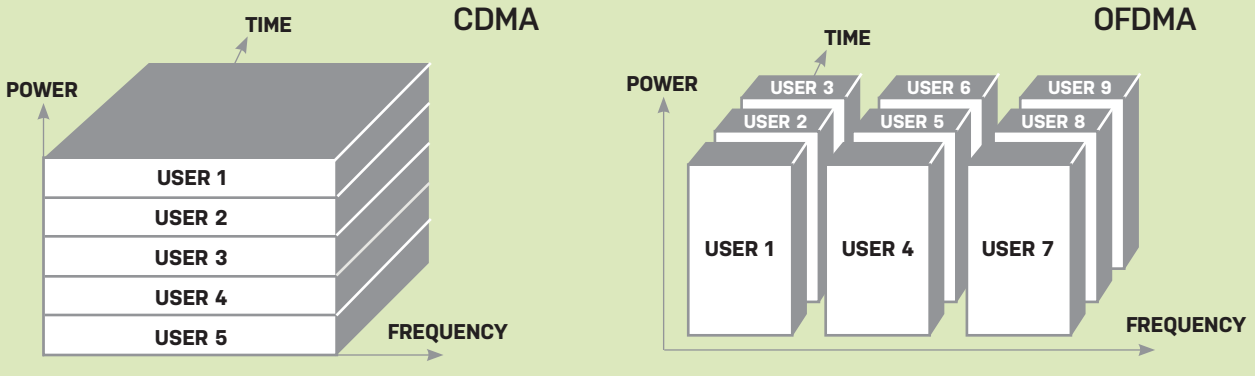
The problem isn't a flaw in the LTE specification; rather, it's the flexibility built into spec. Verizon's network runs in the 746–787MHz frequency range while AT&T, for example, operates from 704–746MHz. They're both in the 700MHz band, but the actual frequencies have only one small point of overlap at 746MHz. Given the possibilities, if push came to shove, it would be entirely possible for one manufacturer to effectively lock out all the others. The days of the simple SIM card swap to change carriers would be just a fond memory as we descended into the realm of proprietary devices once again.

THE CRYSTAL BALL

It wasn't long ago that the availability of 3G networks was at best spotty, so perhaps we shouldn't be surprised by the paucity of 4G coverage today. Carriers can't, after all, make the transition without at least temporarily inconveniencing a large chunk of their existing 3G customer base. As for what's next, we predict LTE networks will continue to prevail for now, and that LTE-Advanced will dominate the true 4G market in the years ahead. Bear in mind, however, that "evolution" means change and "long term" doesn't necessarily mean years.

CDMA vs. OFDMA

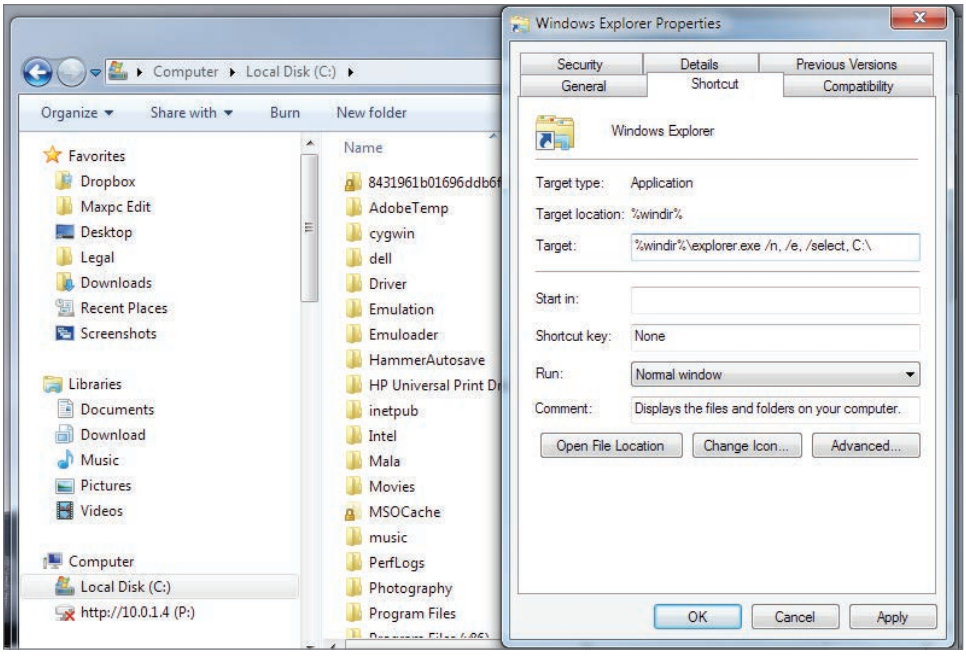
CDMA allows many users to use the same frequencies at the same time. OFDMA does the same, but it delivers more bandwidth by dynamically assigning each user a subcarrier within each time slot.



HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

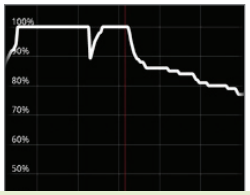
WINDOWS TIP OF THE MONTH



CHANGE WINDOWS EXPLORER'S DEFAULT START LOCATION

If you want Explorer to point somewhere other than Libraries by default, follow these steps: **1)** Copy the complete path of the folder you want to start in. **2)** Right-click the Explorer icon in the task bar, then right-click Windows Explorer, and select Properties. **3)** In the target box, enter **%windir%\explorer.exe /n, /e, /select, [the folder path you copied]**.

MAKE - USE - CREATE



ALEX CASTLE
ONLINE MANAGING EDITOR

PERSONAL WEBSITE, MADE SIMPLE

IN ONE OF THE how-to articles this month, we show you how to make a QR code for your business card, which can make a great impression on a potential customer or employer. But first, you've got to have something to link to.

A good personal website can make all the difference. Here are three free services that make it easy to set up a great-looking site to show yourself off.

About.me: After you create a free About.me profile, you'll be walked through a 15-minute set-up process that leaves you with a simple, stylish profile that links out to everywhere else you are on the web.

Central.ly: Very similar to About.me, Central.ly is aimed at small businesses. If you run your own business, this site's a great way to save money on a web designer.

LinkedIn: You're already familiar with LinkedIn, but it's worth mentioning that linking directly to your LinkedIn profile can be an easy, workable alternative to setting up a personal site.

↘ submit your How To project idea to: comments@maximumpc.com

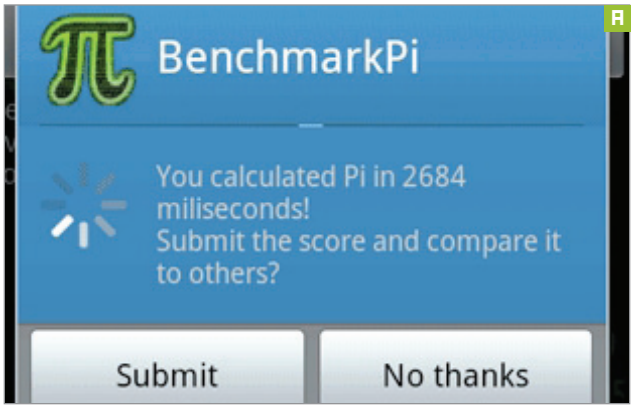
Benchmark Your Android Phone for Free

–Seamus Bellamy

CAR NUTS RACE their rides to see whose machine is the fastest. Fitness fanatics run marathons to test their physical limitations and endurance against that of their fellows. Geeks and gearheads? Our battles are fought and won on the basis of how capable our hardware is. While our desktops and laptops might be a thing of wonder to behold, carrying them around with us for the sake of collecting the accolades we deserve isn't always convenient. Carrying around a smartphone or tablet, however, is.

Benchmarking quantifies your device's capabilities; it also provides the added benefit of telling you how well your phone manages the current version of your handset's operating system and apps, as well as whether future OS upgrades will slow all that zippy mobile computing hotness to a bag of sluggish hardware fail. If you're the owner of an Android handset, there are a lot of options out there for measuring its performance. Here are three of our favorite free benchmarking tools, and why we think you should use them.

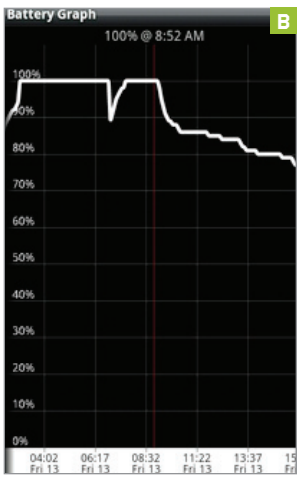
1 BENCHMARKPI BenchmarkPi (bit.ly/t7JJkP) gauges processor efficiency so well it'd make a grown man cry **(image A)**. The genius of BenchmarkPi is its simplicity: By measuring how quickly your handset is able to calculate Pi to a particular number of decimal places, BenchmarkPi can ascertain how powerful your processor is. Additionally, the app is great at being able to tell whether or not your device is burdened by other programs running in the background, making it easy to troubleshoot problem apps. If you're feeling competitive, you're in luck: BenchmarkPi also maintains a constantly updated list of the top 300 Android phones out there, ranking them by their processing power.



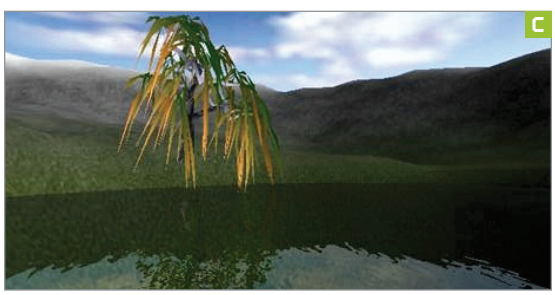
2 BATTERY GRAPH The harder your smartphone has to chug in order to crunch the numbers necessary to do important work (and by work we mean running a session of Minecraft Pocket Edition), the less juice your battery will have left for lower-priority tasks, such as calling your loved ones to assure them you're still alive and well despite the Creeper's best efforts.

» Battery Graph (bit.ly/see2TK) is designed to run in the background on your handset while you go about your business **(image B)**. Start it up when you turn on your phone, and check it out at the end of the day. While you're busy texting, finding your way with Google Maps, or having a jaw-wag with a co-worker via Skype, Battery Graph will quietly collect data on how each hoop you force your phone to jump through effects its power reserves. To snag a balanced benchmark of your battery's performance, drain its battery all the way down and then charge it completely before starting.

» In order to paint a true picture of your battery's performance, run Battery Graph over several days under normal operating conditions. Doing so will let you discover what applications and times of day take the biggest bite out of your battery's life, as well as show you how long your battery lasts during an average day.



3 NENAMARK 1 & 2 Available in two different flavors—one for high-end Android phones and the other for handsets wielded by mere mortals—NenaMark (www.nena.se) is one of the easiest ways to benchmark your phone's GPU performance for free. By measuring the number of frames per second your smartphone can crank out in the face of parametric surfaces, varying light models, particles, and reflections **(image C)**, NenaMark is able to ascertain whether your phone takes graphical hits like a champ or a glass-jawed featherweight. Your handset's results can then be measured against those of other makes and models to see how your phone ranks.



Create a Personalized QR Code

–Alex Castle

IF YOU'VE BEEN in a public space in the last year or two, you've probably seen a QR code—a small, square two-dimensional barcode that looks a bit like a miniature crossword puzzle. They've been around for more than 15 years, but they've recently exploded in popularity, thanks to smartphones, which are perfect QR-scanners.

Unlike traditional supermarket-style barcodes—which codify an identification number—QR codes are binary representations of numbers or letters, and can be many different sizes. A tiny QR code can represent just 30 numbers, and a giant one can represent thousands of letters, numbers, and punctuation marks. With that much flexibility, everyone can find a use for QR codes. In this article, we'll show you how to make a distinctive, personalized QR code to put on your business card, or anything else.

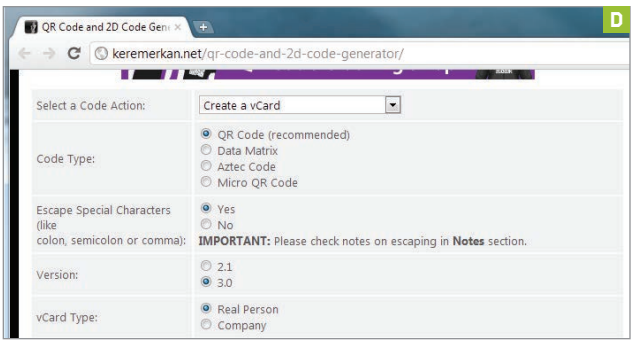
1 GET YOUR VCARD We're going to avoid the obvious joke here and let you know that vCard is a standard for digitally transmitting contact information. You might have encountered a vCard attached to an email message in the past, but they work great in QR codes, too—most QR reader apps are designed to detect vCards and automatically enter the data into the phone's contact list.

» There are plenty of sites that will create a vCard QR code for you automatically (just a Google search away), but we recommend the web app at bit.ly/dziTfO.

» There, you simply click the Select a Code Action drop-down box, and select Create a vCard. Then, enter your personal information into the boxes below **(image D)**, and hit Generate Code. Note that QR code size is dependent on the number of characters encoded, so you might find yourself dealing with a giant, unwieldy code that will be hard to fit on a business card. To get it down to size, we recommend using only vital information, like your name, phone number, and email address.

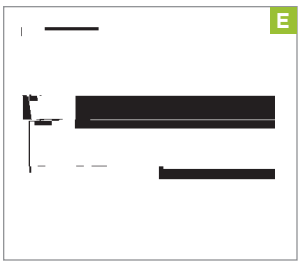
» Another way to get around having a huge QR code is to have a personal website with your contact info (perhaps in a downloadable vCard) and to embed a link to that in a QR code. You can use a link shortener to make the URL and QR code as small as possible, which you will want for the next section

D

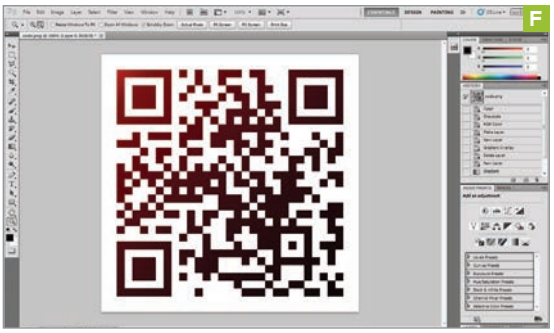


2 PERSONALIZE YOUR CODE One downside to QR codes is that by default they look a little impersonal **(image E)**. If you want to give your business card some visual appeal, there are a couple of simple things you can do. For one, you can give it a more interesting color scheme. The

E



F



QR code generator we recommended defaults to black-on-white, but you can tell it to use any color for the foreground or the background. Make sure the background is lighter than the foreground, and that there's decent contrast between the two. Otherwise, reader apps may have a hard time with it.

» An even neater-looking trick, and one that's still easy to pull off is to use a subtle color gradient. To do this, just open your image editor of choice (Photoshop and the free GIMP both work great), create a color gradient, and then use your QR code as a mask for that layer **(image F)**.

» If you want to go a step further by introducing a logo into your QR code, that's entirely possible, as well. Just make sure to use the highest error correction setting (this can be set in the web app we recommended earlier) when you generate your QR code. This will make the code larger, but will allow it to be read even if up to 30 percent of the code is erased and written over. For best results, don't place your graphic or logo over the tracking boxes in the corners of the code. With some trial and error, you should be able to find out what scans and what doesn't **(image G)**.

G

BUILD IT

NATHAN EDWARDS **SENIOR EDITOR**

Time to Break in Sandy Bridge-E

Intel's new enthusiast platform is here. I'm going to put it through its paces with a quiet riot of a gaming rig

LENGTH OF TIME: **2 HOURS**

LEVEL OF DIFFICULTY: **INTERMEDIATE**

THE MISSION Intel has just released its new Sandy Bridge-E platform. With six- and eight-core processors, eight DIMM slots, and multiple PCIe 3.0 slots, it's Nehalem's true heir and the answer to complaints that Sandy Bridge, while awesome, just isn't enthusiast enough. The i7-2600K is a great part, but it's only a quad-core, and there hasn't been a six-core enthusiast CPU from Intel since the i7-990X, which is on a dead platform.

I've gotten my hands on the Sandy Bridge-E flagship CPU: the Core i7-3960X, a $1,000, six-core beast at 3.3GHz. Oh, and a motherboard and cooler to go with it. I've rustled up a passel of RAM, a titanic GPU, a quiet case, and a speedy SSD. I'm going to see whether X79 has what it takes to wrest the enthusiast crown from X58, and whether it can do so quietly.

INGREDIENTS

PART/URL	PRICE
Case Antec P280 www.antec.com	$140
PSU Thermaltake Toughpower Grand 850W www.thermaltakeusa.com	$195
Mobo Asus P9X79 Deluxe www.asus.com	$400
CPU Core i7-3960X www.intel.com	$100
Cooler Intel RTS2011LC www.intel.com	$100
GPU Asus ROG Matrix GTX580 www.asus.com	$530
RAM 32GB Corsair Vengeance DDR3/1600 (8x4GB) www.corsair.com	$190
Optical Drive Plextor PX-B320SA Blu-ray combo drive www.plextor.com	$110
SSD 256GB Samsung 830 Series www.samsung.com	$420
Hard Drive 3TB Hitachi Deskstar 7K3000 www.hitachigst.com	$360
OS Windows 7 Professional 64-bit (OEM) www.microsoft.com	$99
TOTAL	$3,544

BUILDING FROM THE CPU OUT

WHY A $1,000 CPU? Well, it's the only Sandy Bridge-E chip we could get our hands on, but it's also multiplier unlocked, so in a matter of moments that 3.3GHz hexa-core becomes a 4.3GHz without even trying, thanks in part to the desktop overclocking software included with Asus's P9X79 Deluxe motherboard. Intel's RTS2011LC cooler is Asetek-made, and should enable nice overclocks without causing much noise.

The mobo's eight memory slots and the low cost of 4GB DDR3 DIMMs make the RAM choice easy—two 16GB Corsair Vengeance DDR3/1600 kits cost less than $200. A 256GB Samsung 830 SSD will hold my OS and games, with a 3TB Deskstar for storage.

Asus's ROG Matrix GTX 580 is one of the quietest full-powered videocards we've ever tested, and its massive fans mean it stays quiet even when overclocked and overvolted. Speaking of quiet: Antec's P280 combines the quiet competence of the P180 series with modern niceties like cable-routing cutouts and USB 3.0 front-panel connectors. Thermaltake's Toughpower Grand 850W provides the juice for my build while promoting good cable management with its modular design. Add in a Blu-ray combo drive, and I've got all the ingredients for a fantastic, overclockable, quiet gaming rig. With 32GB of RAM. Still not tired of that.

ASSEMBLING THE HARDWARE

1 PREP THE BOARD

UNLIKE PREVIOUS Intel LGA sockets, Sandy Bridge-E's LGA2011 socket requires the use of two levers to secure the CPU, not just one. When installing the CPU, make sure the first arm is secure over the socket top's lip **(image A)**, then secure it. Afterwards, secure the bottom arm **(image B)**.

Because LGA2011 comes with its own universal backplate, you don't need to install a separate one for the cooler. Instead you'll just follow the instructions on the cooler to prep the retention mount for LGA2011 install.

I'm using all eight DIMM slots on the X79 board, so I don't need to worry about which slots to populate first. If you are only using four, however, install your DIMMs in the blue (outer) sets of slots, not the black ones.

2 PREP THE CASE

I'M USING Intel's RTS2011LC cooler, which usurps the rear exhaust fan mount, so the first thing to do is remove the 12cm exhaust fan (don't forget to detach its speed toggle from the rear panel). The P280 doesn't ship with any intake fans by default, though it provides mounts for two 12cm fans fore and aft of the hard drive tray. The fan's power cable won't reach the motherboard from the front intake mounts, so either mount it on the inside of the hard drive cage **(image C)** or invest in an extension cable.

Install the motherboard's I/O shield, then the motherboard itself.

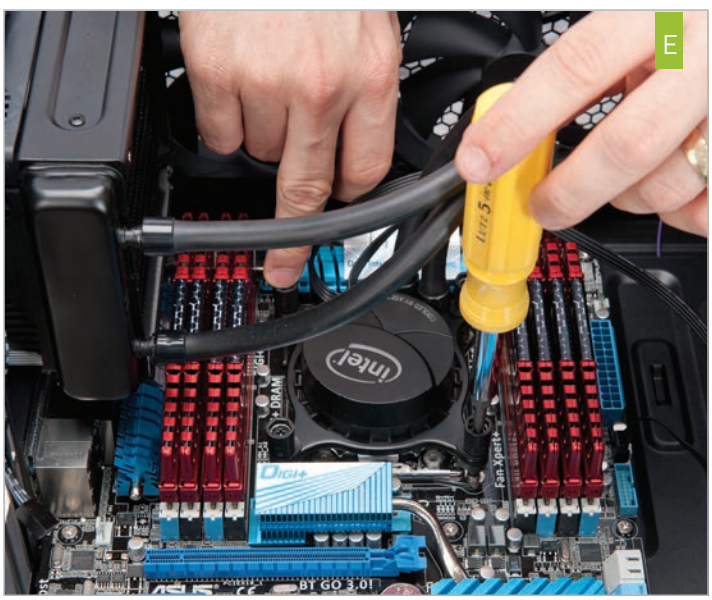

C


D

3 INSTALL THE CPU COOLER

HERE'S WHERE it gets tricky. The P280's rear-panel fan-control switch won't allow us to install the radiator directly against the rear panel; we have to put the fan in first. The fan that comes with Intel's RST2011LC, though, only has mounting holes on one side of its housing. In order to mount the fan as intake (rather than exhaust), we'll need to use the four aluminum spacers Intel ships with the cooler. Install as shown **(image D)**.

Once the radiator and fan are installed, apply a dollop of thermal paste half the size of a pea to the CPU's heat spreader, and attach the CPU retention clamp to the backplate by using the shorter of the two sets of mounting screws included with the cooler. Seat the cooler on the CPU, then align the ledges on the cooler with the barbs on the mounting plate, and tighten the screws, opposite corners first, like changing a car tire **(image E)**. Connect the fan's power cable to the header on the pump, then connect the pump's power cable to the CPU_FAN header.


E

4 INSTALL DRIVES

REMOVE THE top-most optical drive bezel and slide the Blu-ray drive into the slot; the toolless mechanism will engage when the drive is in all the way. Secure the drive with screws if you'd like, then connect a SATA cable from the optical drive to one of the blue SATA ports on the motherboard.

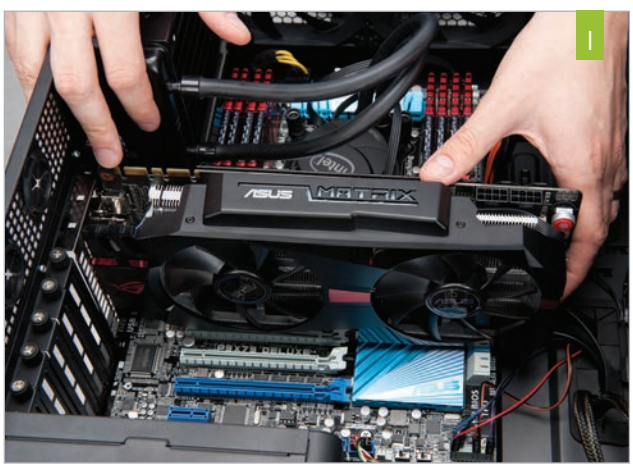
The P280, like previous Antec cases, is all about silence, and its hard drive trays bear that out. Rather than attaching to the sides of the hard drive, like most trays, the P280's trays attach to the bottom of the drive through thick silicone grommets **(image F)**. These dampen vibration and prevent noise.

Since SSDs don't produce vibration, they just mount to the middle of the drive tray. Install both drives, slide the trays back into place, and attach each drive to the top gray 6Gb/s SATA ports on the motherboard with the black-and-white 6Gb/s SATA cables that come with the motherboard.


F

6 INSTALL THE VIDEOCARD

FROM AN installation perspective, the only unusual aspect of the Asus Matrix GTX 580 we're using is its tremendous size—it uses three expansion slots instead of the usual two. Install it in the case's second through fourth expansion slots, which correspond to the top PCIe x16 slot on the motherboard **(image I)**. Attach the two 8-pin power connectors. Double-check to make sure everything is connected and powered, and you're all set!



I

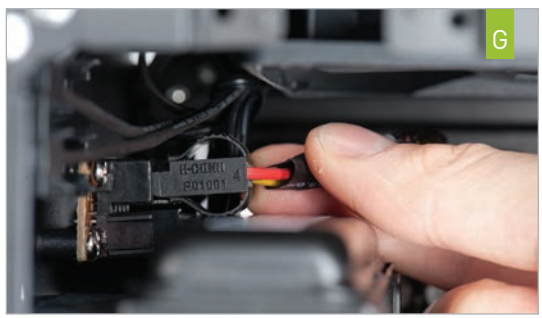
5 INSTALL PSU, ROUTE WIRES

CONNECT THE front-panel connectors to the motherboard, then install the PSU in the bottom of the case with the fan pointing down. Use the four extra-long screws that come with the PSU. Route the 24-pin and 8-pin ATX power cables behind the motherboard, as well as one Molex power connector, which you should bring behind the motherboard tray with the 8-pin ATX power cable, to plug into the fan controller at the top rear of the case **(image G)**.

You should be able to power the optical drive and both storage drives with a single SATA power strand; I found it helps to bring the cable through the bottom cutout, back out through the top, and use the first SATA power port on the optical drive, then bring the rest of the strand back through the cutout and down to the hard drive and SSD.

Don't forget to attach two 8-pin PCIe power cables (the ones with the red connectors) to your PSU and run them up to where the videocard will be. When completed, the right side of my case looked like **image H**.

If you haven't already, take the time to plug in the front-panel connectors: the USB 2.0, HD Audio, and front-panel controls go to the bottom of the motherboard, and the USB 3.0 internal header attaches at center right.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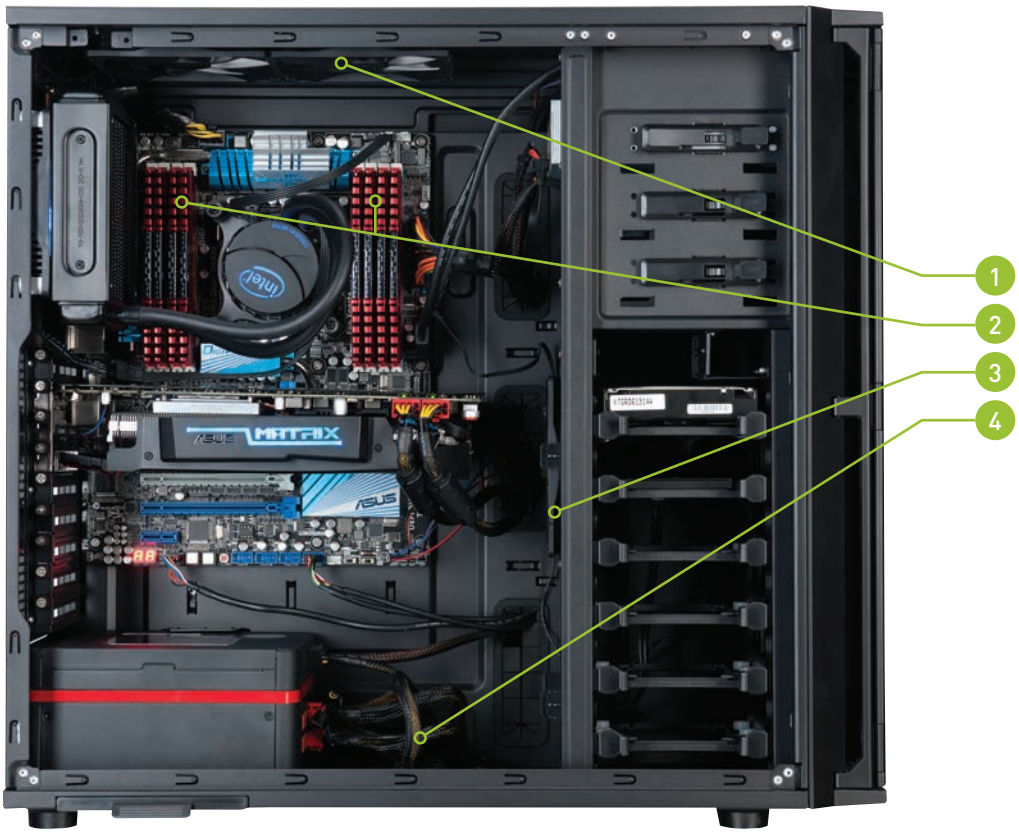
H



1. Antec's two-speed fans are near-silent on low, and I didn't have to switch 'em up to high, even with GPU and CPU overclocked.

2. 32GB of RAM is probably overkill, but with DDR3 so cheap and slots so plentiful, how could we resist?

3. The fan we moved from the rear exhaust draws cool air from the front of the case over the hard drive, then straight to the GPU.

4. The Antec P280 case doesn't have quite as many behind-the-motherboard cable-routing options as other cases, but it's still easy to do a neat wiring job

IT'S A QUIET RIOT, ALL RIGHT

EVEN BEFORE I overclocked the machine, its results were impressive, but once I got the CPU up to 4.4GHz and the GPU up to 930MHz (from its 816MHz default), it blew our zero-point out of the water. Thanks to those six overclocked cores and 32GB of RAM, the Sandy Bridge-E rig was a whopping 60 percent faster than the zero-point in our Vegas Pro 9 test, 45 percent faster in Lightroom, 40 percent faster in ProShow, and 54 percent faster in MainConcept Reference. The overclocked GTX 580 even outperformed the dual-GPU Radeon HD 5970 from our zero-point.

In CPU- and RAM-dependent tests, my X79 also trounced Dream Machine 2011's overclocked 2600K, though the single GTX 580 in my rig, overclocked as it was, couldn't match the three GTX 580s in the Dream Machine, producing just 51.6fps in our Stalker benchmark to the Dream Machine's 125.9fps. It fared a bit better in our Far Cry 2 benchmark, at 124.5fps, but the tri-SLI Dream Machine pushed over 203fps to our 2650x1600 panel. Still, with a few more GPUs, the Sandy Bridge-E machine would trounce our Dream Machine.

One thing I didn't get to try was building out a RAM disk—yet. With 32GB to play with, I could make a 20GB RAM disk with read speeds in the 4,000MB/s range and still have 12GB of RAM for day-to-day tasks. I also probably could have clocked the CPU up a bit more, but I ran out of time. Still, 4.4GHz is quite nice. I'm also really impressed with how easily the Matrix GTX 580 overclocked with Asus's GPU Tweak software, and how quietly it ran even at a 13 percent overclock.

Another nice surprise was Antec's P280 chassis. This was my first build into that case, and frankly, I expected to have to add more fans. While it's not the easiest build I've ever done, the P280's guts are miles ahead of Antec's older designs, and the darn thing is quiet.

It did feel weird to pay just $200 for 32GB of RAM, yet more than $350 for a 3TB hard drive. The flooding in Thailand had just started to affect hard drive supplies at the time I was building, and I was startled to see prices on existing stock double nearly overnight.

After this build, I'm definitely excited for Sandy Bridge-E. The platform's sheer power and ease-of-overclocking breathe new life into enthusiast computing. Most people will find that Socket 1155 Sandy Bridge machines are still a better buy from a cost/performance standpoint, but those who need power by the bucketful will find it here.

BENCHMARKS

	ZERO POINT	
Vegas Pro (sec)	3,049	1,905
Lightroom 2.6 (sec)	356	245
ProShow 4 (sec)	1,112	795
MainConcept 1.6 (sec)	2,113	1,379
STALKER: CoP (fps)	42.0	51.6
Far Cry 2 (fps)	114.4	124.5

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

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

INSIDE

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Falcon Northwest Mach V Icon 2

It's more a work of art than a PC

Sometimes, it's the outside *and* the inside that matters.

YOU CAN'T TRULY appreciate the paint job on Falcon Northwest's Mach V unless you can fondle it. We mean it—you just can't comprehend how damn smooth the paint is without lovingly stroking your hand on the side of this beauty as if you were a presidential candidate.

Inside the Mach V, you'll find a pedigree of hardware to match its stunning exterior. Intel's top gun—the 3.3GHz Core i7-3960X—gets top billing, of course. This hexa-core chip simply makes all other chips before it—quad- or hexa-core—seem downright weak. Falcon mates the chip with a top-end Asus Rampage IV Extreme board. In addition to sporting the very cool ability to update the BIOS from a USB key without a CPU or RAM installed, the Rampage IV caters to extreme overclockers with such over-the-top tricks as an "overclocking key." The overclocking key is an external video dongle that lets you display an overlay of any of the CPU's temps and various voltages on a single-link monitor in real time.

Why would anyone ever want to do this? Believe it or not, extreme overclockers need the information in real time during their liquid-nitrogen escapades, and this feature can save them the price of buying a very expensive Fluke meter.

The Mach V, of course, doesn't run on liquid helium or liquid nitrogen; it uses a Cool-It Eco II ALC cooler, which enables the CPU to go from a stock 3.3GHz all the way to 4.4GHz. Falcon takes full advantage of the Intel X79 chipset's support for eight DIMM slots, too, fully populating the board with 32GB of DDR3/1600 RAM. We know 32GB is overkill, but there's some appeal to it: We're talking RAM disk, baby! Sure, an SSD can post read speeds of 500MB/s, but a RAM disk can post a staggering 4,000MB/s! It's a small RAM disk, but it delivers phenomenal disk I/O. For graphics, Falcon outfits the Mach V with a pair of EVGA GeForce GTX 580 Classified cards. These aren't just overclocked cards, mind you, they also pack massive 3GB frame buffers—double the size of a standard GTX 580 card.

So how does the Falcon stack up? It's wicked fast and handily pounds the crap out of our elderly zero-point system, as well as the majority of the Core i7-990X boxes we've tested in the last year. But how does it stack up against the Digital Storm HailStorm we reviewed in the Holiday 2011 issue? There's the rub: Digital Storm clocked its Core i7-3960X part even higher, to 4.7GHz. That 7 percent edge gives DStorm's system a boost in just about everything that's processor bound. Digital Storm also takes the lead in gaming performance, thanks to its tri-SLI GTX 580 configuration. That design choice endows the DStorm with a 20 percent boost in most high-res games. Yeah, we know, a pair of GTX 580s is crazy fast for every game out today; but three of a kind trumps a pair, no matter how you cut the benchmarks.

We have to note, however, that the Digital Storm rig costs about $400 more than this Falcon. Still, when each price tag is pushing $7,000, it's hard to snivel over a few hundred bucks. The Falcon Mach V is the sexier beast, though; and make no mistake: She's fast enough for you, old man; she's just not the fastest machine we've tested. —GORDON MAH UNG

BENCHMARKS

	ZERO POINT	
Vegas Pro (sec)	3,049	1,853
Lightroom 2.6 (sec)	356	240
ProShow 4 (sec)	1,112	790
MainConcept (sec)	2,113	1,303
STALKER: CoP (fps)	42.0	94.3 (+213%)
Far Cry 2 (fps)	114.4	200.0

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 1,750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and the 64-bit version of Windows 7 Ultimate.

VERDICT 9

Falcon Northwest Mach V Icon 2

+ HAL 2000 The smoothest paint job we've seen in a long time; damned fast.

– ED 209 Expensive; an SLI rig will never beat a tri-SLI config.

$6,993, www.falcon-nw.com

SPECIFICATIONS

Processor	Intel 3.3GHz Core i7-3960X OC'd to 4.4GHz
Mobo	Asus Rampage IV Extreme using Intel X79 chipset
RAM	32GB Kingston DDR3/1600
Videocard	EVGA Classified GeForce GTX 580 (3GB) in SLI
Soundcard	Onboard
Storage	256GB Crucial M4, 2TB WD HDD (7,200rpm)
Optical	LG Blu-ray UH12LS28K
Case/PSU	Mach V Icon 2 Case/ Silverstone Strider Gold 1,200 Watt

Asus P9X79 Deluxe

A deluxe board with an enthusiast price tag

LET'S BE FRANK: If you're even thinking about buying into Intel's deliciously fast LGA2011 platform this early, you are an enthusiast—Enthusiast with a capital-freaking-E, since you can't even look at LGA2011 without buying a $550 chip.

So if you're jumping in, you might as well use both feet. Asus's P9X79 Deluxe certainly fits that bill, delivering cool features and a stout price tag: This X79-based board will set you back a cool $400.

"Deluxe" features on board include digital VRMs, Asus's trademark UEFI, and built-in Wi-Fi and Bluetooth, with a bundled smartphone app that enables you to remotely overclock and monitor your system. This board also has an all-new feature that lets you use a particular USB port to update its BIOS without a processor installed.

The P9X79 is an eight-DIMM-slot board, not one of the weaker four-slot boards that limit your upgrade path. The eight-DIMM design will let you build a 32GB PC for less than $200 in memory cost. Doing that on any four-slot board will set you back more than $1,000. What do you do with 32GB? You set up a RAM drive, of course! We set up a RAM drive on this board using eight 4GB sticks of Corsair Vengeance RAM and saw read speeds of 4GB/s. Take that, SSDs!

But what you get in RAM, you lose in storage. The PCH in the X79 has the circuitry to support many more SAS and SATA 6Gb/s ports, but compatibility concerns caused board makers to "de-feature" it at the last minute. So instead of a board bristling with 10 SATA 6Gb/s ports, we get the standard Z68 layout of two SATA 6Gb/s and four SATA 3Gb/s. Asus tries to beef up the board's six standard ports (four 3Gb/s and two 6Gb/s) with a Marvell 6Gb/s controller that also does SSD caching. Few of us could afford to install that many HDDs given today's prices, of course, but that doesn't render the lack of native support any less of a letdown—this is a $400 motherboard, after all.

We fired up Intel's new DX79SI mobo to compare its performance to that of the P9X79. While we don't normally expect to see big performance deltas between boards based on the same chipsets, the Asus board generally produced better benchmark numbers, with one significant exception: Intel's board delivered much faster SATA 6Gb/s write speeds. We normally use OCZ's Enyo external drive to test USB 3.0 performance, but the P9X79's USB controller uses the new and speedier UASP protocol, so we also used an OWC SATA 6Gb/s drive inside a new Asus enclosure. With UASP, we saw USB 3.0 speeds climb to a nice 225MB/s read and 217MB/write. We would have liked to compare this to a USB 3.0 enclosure that doesn't support UASP, but our generic USB 3.0 enclosures don't seem to like any SATA 6Gb/s drives.

In the end, The P9X79 Deluxe gives you just about everything an enthusiast would truly want: SLI, tri-SLI, CrossFire X, PCIe 3.0, tons of overclocking features, lots of USB 3.0 ports, and truly fast performance (albeit it only in comparison to the limited number of X79 boards we've seen so far). Now if only it had more SATA 6Gb/s ports and the price wasn't so painful. —**GORDON MAH UNG**

BENCHMARKS

	Asus P9X79	Intel DX79
PCMark 7 overall	**3,662**	3,489
Valve Particle (fps)	**299**	260
SiSoft Sandra (GB/s)	39.9	38.9
SATA 6Gb/s read (MB/s)	**508**	499.9
SATA 6Gb/s write (MB/s)	224	**252.2**
USB 3.0 read (MB/s)	198	202.3
USB 3.0 write (MB/s)	**175**	168.5
SLI compliance	Yes	Yes
32GB compliance	Yes	Yes

We tested both boards with a 3.3GHz Core i7-3960X, 16GB of DDR3/1600, a 150GB Western Digital Raptor, a GeForce GTX 580, and 64-bit Windows 7 Professional SP1. Performance scores for the SATA 6Gb/s and USB 3.0 were attained using CrystalDiskMark 3 run against an OCZ Enyo USB 3.0 drive and an OWC Mercury Extreme Pro SSD.

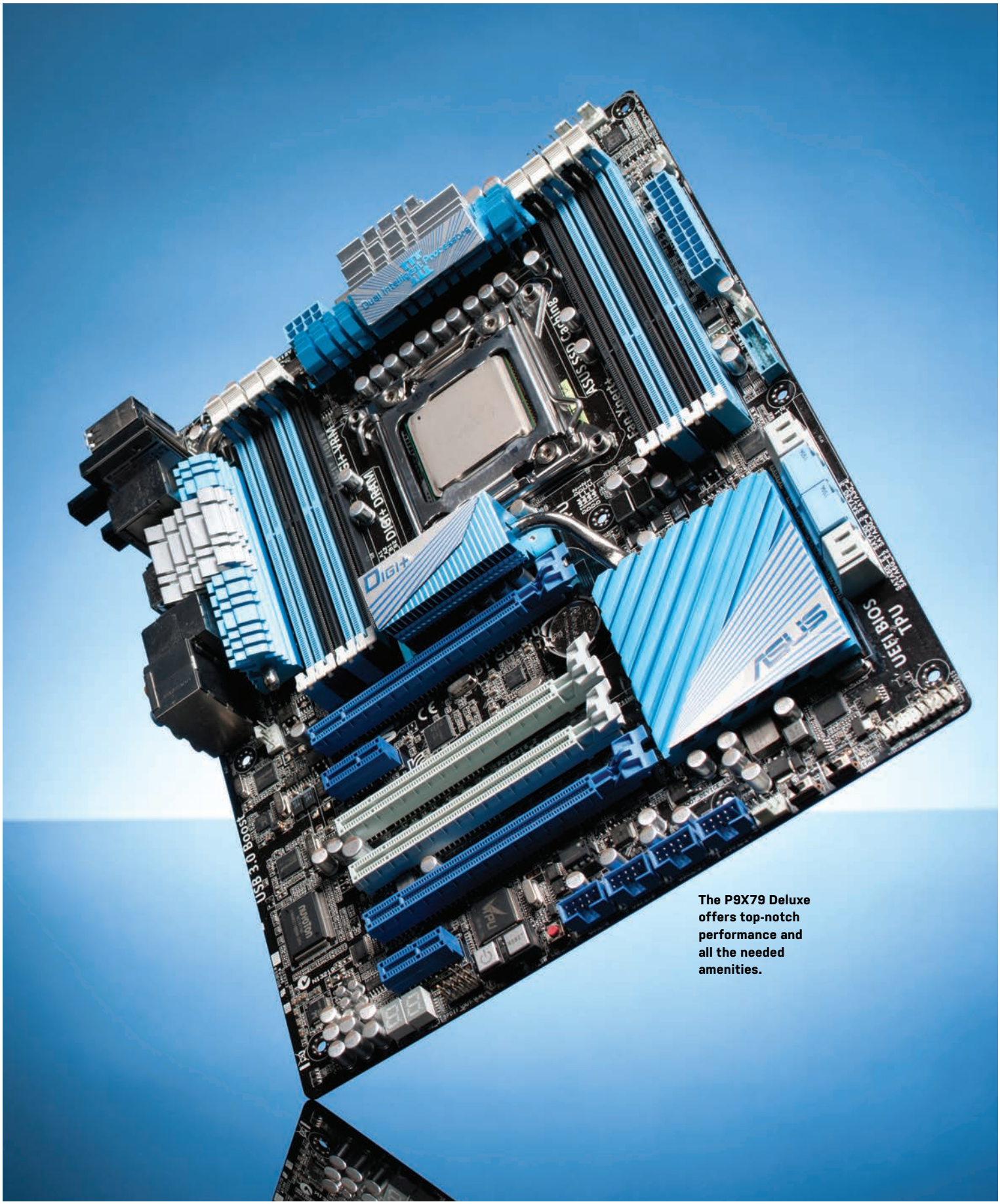
VERDICT **9**

ASUS P9X79 DELUXE

+ MCLEAN DELUXE Tons of USB 3.0 ports; well laid out; fast.

– MCHOTDOG Painful pricing; needs more SATA 6Gb/s ports.

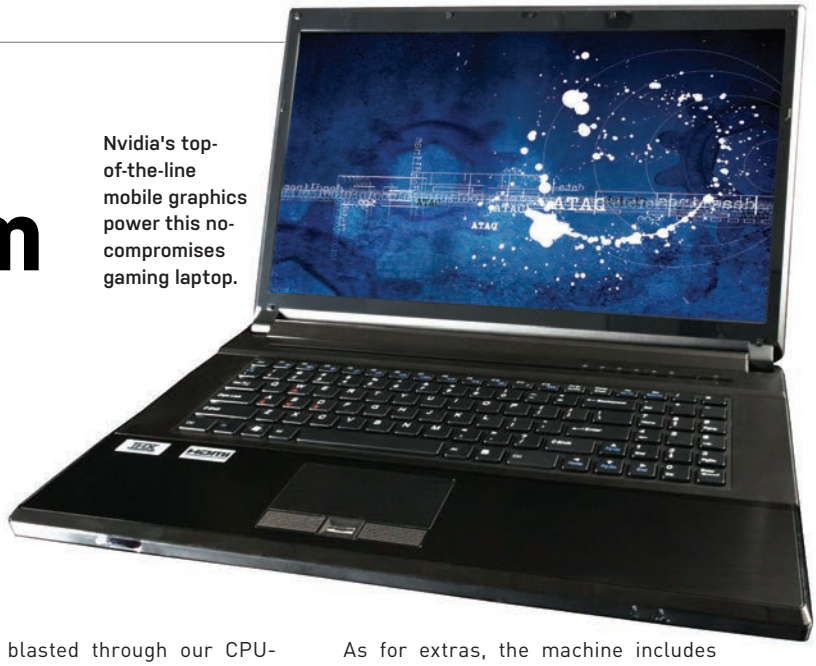
$400, www.asus.com



The P9X79 Deluxe offers top-notch performance and all the needed amenities.

Digital Storm x17 Laptop

Fast performance and no frills



Nvidia's top-of-the-line mobile graphics power this no-compromises gaming laptop.

WE GET TO TEST a lot of unusual laptops—overclocked, oversize, over-dimensional, and just altogether overdone. Digital Storm's x17, from first impression to Lab testing to real-world evaluation, is just a normal 17-inch laptop. It has high-end components that make it an extremely fast 17-inch laptop, but we're not sure that's enough to justify its high price.

The centerpiece of this system is Nvidia's GeForce GTX 580M graphics card with 2GB of memory. As the current top-of-the-line of Nvidia's mobile offerings, it delivered unflinchingly fast performance in all of our benchmarks. For example, it rendered 86fps in our Far Cry 2 benchmark and 115fps in Call of Duty 4. That's almost twice the speed of our reference system, leaving plenty of headroom for more demanding games to come in the future. That's the advantage of shelling out extra money for a top-of-the-line gaming laptop—you stave off obsolescence just a bit.

The quad-core Intel Core i7-2820QM chip running at 2.3GHz, with Turbo Mode to 3.4GHz, was also essential to the laptop's good showing in our tests. Digital Storm's x17 blasted through our CPU-intensive tasks, with special help from its 120GB SSD (SATA 6Gb/s) in the video rendering. We're happy to see that solid-state drives have become almost standard in high-end laptops; they make perfect sense in terms of durability, energy use, and, of course, speed. Digital Storm also included a 750GB 7,200rpm mechanical drive for storing your prized collection of kitten videos.

Though we can't complain about the guts of the system, we do have some quibbles with some of the design choices. For one thing, the laptop has HDMI and DVI ports for video output, but no old-fashioned VGA port. That's nothing that a $3 adapter can't fix, but for a laptop, which you might want to plug into random projectors and monitors, we'd prefer a VGA port always at the ready. The glossy surface of the 17.3-inch LED-backlit display is a bit too glossy for our taste; glossy means reflective, and we prefer not to look at ourselves while we sit in front of a laptop. We also prefer touchpad buttons that give a more definite click when you press them.

As for extras, the machine includes a fingerprint reader integrated into the touchpad as well as excellent speakers with THX audio. Many of the laptops we test have speakers that just aren't loud enough, and the x17 offered both full-blast volume and a comparatively rich sound through its five speakers and built-in subwoofer.

Digital Storm's x17 is about as fast a gaming laptop as you are going to find, short of an SLI configuration. In fact, it's fast in anything you might want to do. The only real drawbacks are the price and its decidedly unexceptional appearance.

—KEN FEINSTEIN

VERDICT 9

Digital Storm x17 Laptop

+ BANANA SPLIT Extremely fast gaming performance; booming audio.

– PLAIN VANILLA Humdrum, uninspired design; pricey.

$2,890, www.digitalstormonline.com

BENCHMARKS

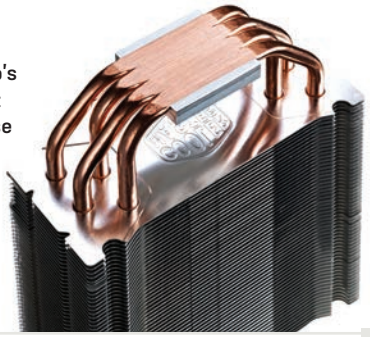
	ZERO POINT	
Premiere Pro CS3 (sec)	899	480
Photoshop CS3 (sec)	131	74
ProShow Producer (sec)	876	541
MainConcept (sec)	1,782	1,074
Far Cry 2 (fps)	48.5	86.4
Call of Duty 4 (fps)	62.2	115
Battery life (min)	96	130

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

Our zero-point notebook is an Asus G73Jw-A1 with a 1.73GHz Intel Core i7-740QM, 8GB DDR3/1066, two 500GB Seagate 7,200rpm hard drives, a GeForce GTX 460M, and Windows 7 Home Premium 64-bit. Far Cry 2 tested at 1680x1050 with 4x AA; Call of Duty tested at 1680x1050 with 4x AA and 4x anisotropic filtering.

SPECIFICATIONS

CPU	2.3GHz Intel Core i7-2820QM (Turbo Mode to 3.4GHz)
GPU	Nvidia GeForce GTX 580M 2GB
RAM	8GB DDR3
Chipset	Mobile Intel HM67 Express
Drives	120GB SSD, 750GB 7,200rpm SATA Hard Drive
Optical	Blu-ray combo drive
Connectivity	HDMI out, DVI out, Ethernet, two USB 3.0, two USB 2.0, Wi-Fi, FireWire, eSATA, headphone, mic, line-in, S/PDIF output, media reader, webcam
Lap/Carry	8 lbs, 9.6 oz / 11 lbs



The Hyper 212 Evo's flat direct-contact heat pipes increase the surface area that comes into contact with the CPU's heat spreader.

Besides the heat pipes, the Evo's translucent PWM fan is the only difference between this and previous iterations of the Hyper 212 CPU cooler.

Cooler Master Hyper 212 Evo

The low-cost champion, evolved

FREQUENT MAXIMUM PC readers will have noticed our love affair with Cooler Master's Hyper 212 Plus CPU cooler. The 212 Plus came out of nowhere and captured our hearts—and a spot on our Best of the Best list—with its excellent cooling power and rock-bottom $30 price tag way back in 2009. It's not the best CPU cooler we've tested, but we've installed it in virtually every stock-clocked PC we've built since, thanks to its unbeatable price/performance ratio. Cooler Master's all-new Hyper 212 Evo costs five dollars more than the Plus. But is it five dollars better?

Like its predecessor, the Evo is a skyscraper-style heatsink with four direct-contact heat pipes rising through a stack of aluminum cooling fins. It's 6.3 inches tall from the contact plate to the top of the heat pipes, 2 inches deep (3.13 inches after adding one 12cm fan), and 4.7 inches wide. Cooler Master provides a universal mounting bracket that will fit AMD and Intel LGA775, 1155/1156, and 1366 sockets, and a separate one for Socket LGA2011. Four standoff pegs bolt through the motherboard and onto the backplate, and an X-shaped bracket holds the contact plate to the CPU with four spring screws attached to the standoffs. Plastic clips secure the 12cm fan to the heat exchanger in a fashion similar to the most recent 212 Plus coolers we've used (the original Hyper used wire clips).

In short, the Evo is identical to its predecessor in every aspect but one: Where the 212 Plus's heat pipes meet the cooler's contact plate, small gaps reduce the surface area that is in direct contact with the CPU's own heat spreader. The bottoms of the Evo's heat pipes are so flat that these gaps are entirely eliminated.

At our i7-930 test bed's stock speed of 2.8GHz, it was hard to tell the difference between the two coolers: The Evo ran just over a degree Celsius hotter than the Plus at idle, and just under a degree warmer at 100 percent CPU burn. Both coolers far outperformed our stock cooler, by 4-5 C at idle and by a whopping 14 C at full burn.

We didn't notice a meaningful difference until we cranked up the test bed to our overclocking-challenge speed of 3.9GHz. At full burn, the Evo kept our CPU fully 9 C cooler than its predecessor could manage. Neither part came close to besting our air-cooling champion, Prolimatech's Armageddon, with this stress test, however; and the stock Intel cooler lasted just 20 seconds before the CPU began to throttle itself.

If you're already using a Hyper 212 Plus, we don't see a reason to switch to the Evo unless you'd like to crank your clock speeds a little higher. If you're building a new rig, or looking to upgrade from a stock cooler, on the other hand, the Evo is a worthy successor to the 212 Plus. Five dollars for a cooler that can keep an overclocked proc 9 C cooler? We'll take it.

We could wish for an easier mounting bracket, but honestly, the Hyper 212 Evo is a damn-good deal at $35.

—NATHAN EDWARDS

BENCHMARKS

	Cooler Master Hyper 212 Evo	Cooler Master Hyper 212 Plus	Prolimatech Armageddon	Stock Intel Cooler
Ambient (C)	25	25	25.3	24.6
2.8GHz idle (C)	38.75	37.5	**36.25**	42.5
2.8GHz 100% burn (C)	57	56.25	**51.25**	71.5
3.9GHz idle (C)	45	46.25	**42.5**	55.25
3.9GHz 100% burn (C)	84.25	93.25	**73**	WNR

Best scores are bolded. Ambient represents ambient air temperature in the Lab at time of testing. All coolers tested with a Core i7-930 at both stock 2.8GHz and overclocked to 3.9GHz on an Asus P6X58D Premium motherboard in a Corsair 800D chassis with stock fans, 6GB DDR3 RAM, and Radeon HD 5850 GPU. Clock frequencies measured with TMonitor; temps with HWMonitor. Stress tests performed with Intel's internal testing utility running at 70 percent load.

VERDICT 9 KICK ASS!

Cooler Master Hyper 212 Evo

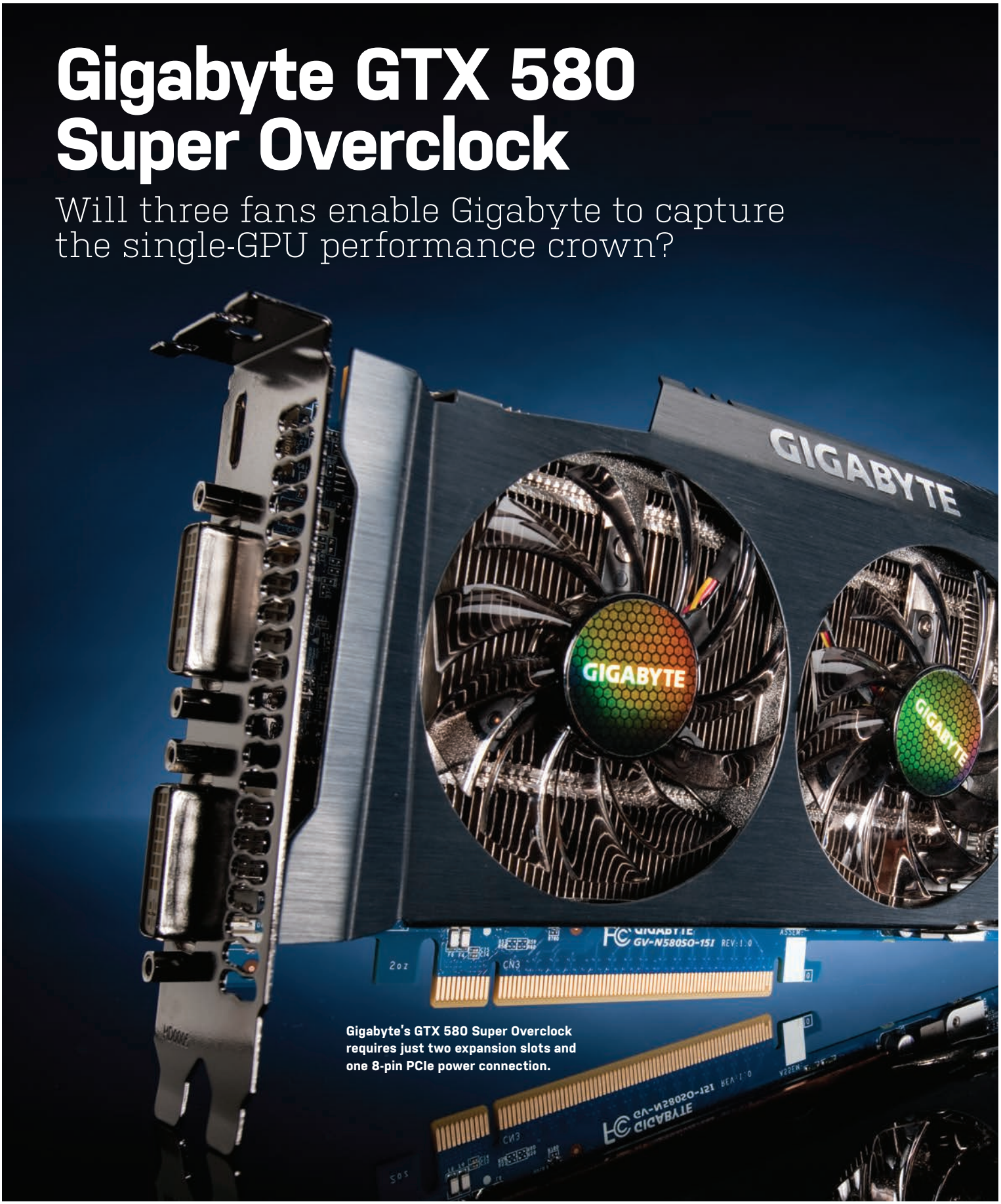
+ EVO Nearly identical to the Plus; excellent value for the money; better performance on overclocked chips

– PLUS Nearly identical to the Plus; mounting bracket is getting old.

$35, www.coolermaster.com

Gigabyte GTX 580 Super Overclock

Will three fans enable Gigabyte to capture the single-GPU performance crown?



Gigabyte's GTX 580 Super Overclock requires just two expansion slots and one 8-pin PCIe power connection.

WE FOUND THE Asus Matrix GTX 580 Platinum that we reviewed in the November 2011 issue to be pretty badass: It's a solid, factory-overclocked card that's impressively easy to push even harder. But it's also three slots wide and requires two 8-pin PCIe power connectors. Gigabyte's GTX 580 Super Overclock (model GV-N580SO-15L) takes Nvidia's GPU even further, pumping the core from a stock 772MHz all the way to 855MHz, and the card's 1.5GB of GDDR5 memory from a stock 1,002MHz to 1,025MHz (the Matrix GTX 580 comes out of the box with its GPU running at 816MHz and its memory at 1,002MHz). And the Gigabyte takes up only two slots and uses just a single 8-pin power connector.

Gigabyte, like Asus, provides software to help you overclock the card even more, but Gigabyte's card lacks the other engineering amenities that Asus provides, including voltage control, insta-max fan speed, and reset-to-factory-settings buttons. This renders Gigabyte's offering less forgiving when it comes to pushing the envelope. The Super OC ships with three cooling fans, which must be better than the two on the Matrix, right? Well, the card remained cool enough during our benchmarks, but we also found it to be noisier under load than the Matrix card.

With those thoughts in mind, let's discuss performance: Gigabyte's card edged out Asus's, but it was by no means a clean sweep: the Asus Matrix card won several benchmark categories, with Unigine Heaven being the most notable. Several other results—including Just Cause 2 and Metro 2033—were essentially ties. So the Gigabyte's performance is pretty good, but it's not quite as over-the-top as we had expected. Also, take a look at the difference in power consumption. This is where Asus's careful binning of GTX 580 GPUs comes in: The Matrix consumes much less juice than the Super Overclock, which likely will leave you more headroom for overclocking.

All these factors are reflected in the card's street price, which is $10 less than the Asus (and Gigabyte was offering a $20 rebate at press time). So the Super Overclock delivers fewer features and a little less performance and headroom, but also a lower price tag. You'll need to decide which factors are most important to you. **—LOYD CASE**

VERDICT

8

Gigabyte GTX 580 Super Overclock

+ CAPTAIN AMERICA Good performance at base clocks; requires only one 8-pin PCIe power connector.

– CAPTAIN UNDERPANTS Consumes more power; somewhat noisier; likely offers less room for overclocking beyond the factory's numbers.

$520, www.gigabyte.com

BENCHMARKS

	Gigabyte GTX 580 Super OC	EVGA GTX 580 SC	Asus Matrix GTX 580	XFX Radeon HD 6970
3DMark 2011	**6,885**	6,105	6,677	5,314
3DMark Vantage Perf	**24,762**	23,888	24,212	20,443
Unigine Heaven 2.1 (fps)	34	36	**38**	27
BattleForge DX11 (fps)	**82**	78	78	47
Far Cry 2 / Long (fps)	123	122	**124**	94
HAWX 2 DX11 (fps)	**167**	158	164	81
STALKER: CoP DX11 (fps)	**61**	58	59	53
Just Cause 2 (fps)	55	52	**56**	41
Aliens vs. Predator (fps)	42	44	**45**	40
F1 2010 (fps)	**76**	72	74	65
Dirt3 (fps)	65	74	**75**	52
Metro 2033 (fps)	26	26	**27**	22
System power @ idle (W)	157	141	**132**	139
System power @ full throttle (W)	397	395	369	**331**

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

3TB Seagate Barracuda

Three platters, three terabytes

Although this is a 7,200rpm drive, Seagate hasn't given it the "XT" branding; it's just a Barracuda.

SINCE TIME BEGAN, man has looked at four- and five-platter 3TB hard drives and dared to say, "That's cool, but when will we get hard drives with one terabyte per platter?" Man is impossible to please. Nevertheless, drive makers have cracked the 1TB-per-platter limit, and this year we'll see 4- and 5TB drives, and even one-platter 1TB drives. The first 1TB/platter drive to cross our bench, though, is Seagate's new 3TB Barracuda.

This is the first from Seagate's simplified 3.5-inch-consumer drive lineup. The LP and XT designations, for "green" and "enthusiast," respectively, are gone. In fact, Seagate has entirely phased out 5,400rpm and "green" drives. The Barracuda lineup now consists exclusively of 7,200rpm drives with 6Gb/s SATA controllers. The 2- and 3TB models use three platters, the 1.5TB version uses two, and the 1TB and lesser-capacity drives all use one. Increased areal density allows for faster read and write speeds, which should mean a faster drive. Does it?

It does. On our Sandy Bridge test bed, the 3TB Barracuda had average sequential read speeds higher than 155MB/s, with max sequential read speeds of 200MB/s. Average sequential write speeds were higher than 150MB/s. The two 7,200rpm 3TB drives we reviewed in July 2011—Seagate's Barracuda XT and Hitachi's Deskstar 7K3000—were both slower, by around 30MB/s. Random-access times for the three-platter drives were less than 15ms—speedy for a mechanical drive, although nowhere near the 0.1ms random-access times an SSD will post.

In our Premiere Pro encoding benchmark, the three-platter Barracuda lagged slightly behind the five-platter Deskstar, and both five-platter drives bested the three-platter model in PCMark Vantage.

As with all drives higher than 2.2TB, you'll need a motherboard with UEFI, the ability to make GPT partitions, and a 64-bit operating system in order to create a bootable 3TB partition on your drive. If you don't meet those criteria, you can use Seagate's included DiscWizard software to help create multiple partitions. Or you can use Disk Management in the control panel, as the gods intended. Most *Maximum PC* users will opt to use their 3TB drives as storage volumes, anyway, and you don't need UEFI to create 3TB non-booting partitions in Windows.

If you can find it at its MSRP of $180, the three-platter 3TB drive is a steal, combining sustained speeds of over 150MB/s with, well, three terabytes of storage. But given the hard drive shortages forecast due to this autumn's flooding in Thailand, supplies could be tight and street prices much higher. —NATHAN EDWARDS

BENCHMARKS

	Seagate Barracuda 3TB	Hitachi Deskstar 7K3000 3TB	Seagate Barracuda XT 3TB	WD Caviar Green 3TB
HDTune 4.01				
Avg read (MB/s)	**155.8**	119.5	124	101.5
Random-access read (ms)	**14.9**	15.7	17.2	15.7
Avg write (MB/s)	**150.7**	118.5	122	96.9
Random-access write (ms)	14.9	15.7	17.3	**15.6**
Burst write (MB/s)	**335.5**	315.6	284.8	183.1
Premiere Pro Encode (sec)	455	**435**	447	530
PCMark Vantage	6,910	**7,663**	6,975	4,910

Best scores are bolded. All drives tested on our hard drive test bench: a stock-clocked Intel Core i3-2100 CPU on an Asus P8P67 Pro (Rev 3.1) motherboard with 4GB DDR3, running Windows 7 Professional 64-bit. All tests performed using native Intel 6Gb/s SATA chipset with IRST version 10.1 drivers.

VERDICT 9

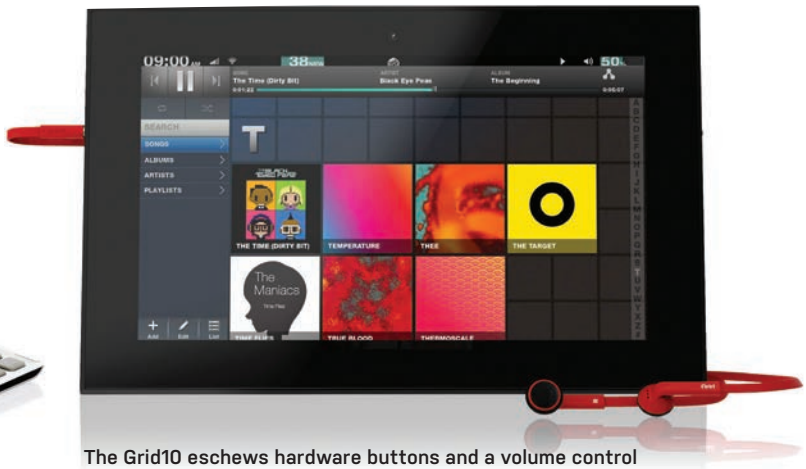
Seagate 3TB Barracuda (ST3000DM001)

+ BREAKING BAD Blazing-fast sequential reads and writes; fast access times (for mechanical storage).

– BREAKING DAWN Encoding and Vantage scores lag slightly behind.

$180 www.seagate.com

Take your pick of an Asus Slider in either Mocha or White, and with 16 or 32GB of onboard storage.



The Grid10 eschews hardware buttons and a volume control in favor of onscreen gestures and controls. A proprietary combo connector for charging, USB, and HDMI replaces standard ports.

Not Your Average Androids

Three unique tablets bring something new to the market

We've previously decried the deluge of 10-inch Android tablets as an attack of the clones; very little distinguished one from the other besides the brand name and color on the back panel. Each entry in this new crop of Android oddities, however, is unique in its own endearing—and sometimes frustrating—way. While it can no longer be said that tablet developers aren't trying anything new, we sheepishly admit that the clones are all right. —**MARKKUS ROVITO**

ASUS EEE PAD SLIDER SL101-A1

It's easy to believe that a new tablet's sole purpose is to model the latest fall fashions. Much ado is made of how thin and light each latest entrant is. Well, the Slider is more whale than waif. This is a product with a specific focus: to provide an Android (Honeycomb) tablet alternative to a cheap laptop. In that regard, the Slider manages to seem downright svelte.

A follow-up to the Asus Eee Pad Transformer, the Slider converts to a propped-up tablet with a full keyboard much more elegantly than the clamshell Transformer did. Simply pull up on the lip above the Slider's webcam and the display slides up and out to a perfect angle, revealing a keyboard that also improves on the usability of the Transformer's plank. While you don't get as many function keys, and there's still some annoying spacing problems with the Shift and Arrow keys, the Slider has a far better typing keyboard.

The Slider is a chunky slab that doesn't cotton to single-handed use because its display doesn't detach like the Transformer's. You also don't get the extra battery that the Transformer dock provided, and the Slider's battery life suffers for it. You might be able to put in a full eight-hour day on a single charge if you're just hacking away at a doc using the included Polaris Office suite; but if you're vegging out to some Hulu, expect the laziness to last closer to five hours.

While rocking the same (some would say "aging") Tegra 2 CPU that is standard on so many tablets today, the Slider exhibits exquisite performance in terms of smooth app switching, web browsing, and gaming. That, along with the beautiful colors and crisp detail of its display, comprises the highlights of the Slider experience. We also appreciate the full-size USB 2.0 port for adding a mouse or connecting an external drive, while the MicroSD slot provides a convenient means of expanding the 16GB of storage (32GB in the pricier SL101-B1).

Don't even think about the Slider if you're not serious about using it as a laptop replacement. But if this curious form factor appeals to you, step right up. Its excellent display and performance, reasonable keyboard, and extra features, such as Asus cloud storage, make the Slider go down easily.

VERDICT **8**

Asus Eee Pad Slider SL101-A1

$480, www.asus.com

FUSION GARAGE GRID10

If you believe beauty for its own sake needs no justification, you may have something in common with Fusion Garage. The boutique manufacturer out of Singapore wrote GridOS on top of the Android 2.2 kernel for the purpose of, we assume, looking really cool. The OS, which aside from the Settings screen bears little resemblance to Android, looks great; but the Garage needs a lot of tinkering in terms of performance to be more than a pretty face.

GridOS opens on a home screen where named clusters of apps are arranged on a rectangular grid that you can organize to your liking. Inward finger swipes from the top, bottom, and right of the bezel act in lieu of the typical Android home, menu, and back buttons, while the left-to-right swipe takes you to the GridOS Heartbeat,

The 8-inch VTAB1008 adds about 30 percent more screen real estate than a 7-inch tablet, but its weight makes it less appealing for one-handed e-book reading.

an innovative hub that shows all your email, social media, calendar, and app notifications. Other Grid apps, such as Calendar, Contacts, and Messages, as well as the video, music, and photo galleries, also run with the grid theme, presenting content in a compelling and clear manner.

All of that would be great if it weren't for inconsistent performance (especially with touch-screen responsiveness for gestures and web page scrolling), poor battery life (about four hours doing little more than web browsing and email), and the Google disconnect. Grid10 goes the non-Google route, confining you to the anemic Amazon Appstore and depriving you of Google apps and integration (although sideloading is possible). Sure, Fusion Garage provides capable Calendar and Contacts apps; but without Google integration, you must GridLink the tablet to Twitter or Facebook to import contacts, a process that in our opinion entails offensive privacy intrusions.

GridOS is visually stunning, and the Grid10 delivers some high-end hardware (including the highest-resolution display on a 10-inch tablet) for a reasonable price—even when you factor in the optional USB and HDMI cables at $29 and $39, respectively. But in the end, there's little to no extra functionality to justify the extra headaches.

VERDICT 6

Fusion Garage Grid10

$300, fusiongarage.com

SPECIFICATIONS

	Asus Eee Pad Slider	Fusion Garage Grid 10	Vizio VTAB1008
CPU	Nvidia Tegra 2 1GHz dual-core	Nvidia Tegra 2 1GHz dual-core	Marvell Armada 600 1GHz single-core
RAM	1GB	512MB	512MB
OS	Android 3.2	Grid OS (built on top of the Android 2.2 kernel)	Android 2.3.2
Display	10.1 inch, 1280x800, LED-backlit LCD	10.1 inch, 1366x768 TFT LCD	8 inch,1024x768, LED-backlit LCD
Storage	16GB (SL101-A1)/32GB (SL101-B1)	16GB	4GB
Camera	1.2MP front; 5MP rear	1.3MP front	VGA front
Connectivity	USB 2.0, Mini HDMI, MicroSD, headphone/mic, Bluetooth 2.1, 802.11b/g/n	Docking port (power and optional USB and HDMI) MicroSD, headphone/mic, Bluetooth 2.1, 802.11b/g/n	Micro USB, Micro HDMI 1.4, MicroSD, headphone/mic, Bluetooth, 802.11b/g/n
Dimensions (WxHxD inches)	10.7x7.1x0.68	10.8x6.8x0.55	6.6x8.1x0.48
Weight	2.1 lbs	1.7 lbs	1.5 lbs

VIZIO VTAB1008

As the Amazon Kindle Fire extends the expectations for low-cost tablets, models such as the VTAB1008 are already selling for less than $200. While Vizio can't match Amazon's content delivery or cloud storage, it does have a feature no other tablet offers: a built-in IR blaster and Remote Control app with a comprehensive device database. This renders the VTAB1008 a handy universal remote control (Vizio is best known for manufacturing big-screen HDTVs, after all).

We successfully controlled an entire home entertainment system with this tablet, which has a custom user interface running on top of Android 2.3.2 (although we think the transition from controlling one device to another was a trifle awkward). Common tasks such as jumping to the home screen, opening apps, and zooming in and out of pages felt sluggish. Touch-screen responsiveness seemed a bit off, as well, but we're not sure if this was due to the 1GHz single-core processor not being able to keep up with us.

The screen's 1024x768 resolution certainly didn't blow us away, but it did exhibit natural color and good contrast. While it seems as though every display in the world is widescreen these days, the VTAB1008's 4:3 aspect ratio is well suited to standard-definition movies and TV shows, and Vizio provides buyers with extended free trials for Netflix (30 days) and Hulu Plus (90 days). Connect the tablet's HDMI output to a higher-resolution display, and it will produce video at the native resolution of the stream (up to 1080p). Three strategically placed speakers, meanwhile, ensure stereo sound in either portrait or landscape mode.

Vizio sells this tablet primarily as a TV accessory—touting its universal remote control features and its ability to browse the web and use email while watching television; something we know multitasking tablet users love to do. In other words, it's not aimed at power users. Vizio nonetheless does plan to offer a Honeycomb update; and the VTAB1008 can access the Android Market, unlike the Kindle Fire (which we'll review next issue). If you're interested in a budget tablet with strong battery life that can double as a universal remote, this could be the device you're looking for.

VERDICT 7

Vizio VTAB1008

$330, www.vizio.com

Cubitek XL Tank

An all-aluminum chassis from a newcomer

The customizable aluminum GPU-support column is perfect for folks who drag their machines around to LAN parties.

Is Lian Li-esque a word?

CUBITEK CALLS this chassis the XL Tank, although we're not sure what the XL stands for. At 19.3 inches tall by 9.1 inches wide by 20.7 inches long, the XL Tank could be a large midtower, or a small full-tower case—but it's not extra-large by any means.

The XL Tank is a spiffy-looking case, featuring full aluminum construction and a slick, black brushed exterior with sharp, defined angles that remind us of more expensive Lian Li chassis. The interior panels are unpainted glossy aluminum, which we like—unpainted aluminum looks much better than unpainted steel.

The XL Tank can accommodate XL-ATX, CEB, ATX, microATX, and Mini-ITX motherboard configurations. The motherboard tray includes a large CPU backplane cutout, as well as 14 cutouts for cable management. None of the cutouts feature grommets or padding of any kind, although the edges have been deburred.

The inside of the chassis offers slightly more building space than your average full-tower, and while the hard drive cage can be removed to gain space, we were able to cram a 12-inch videocard inside without moving anything.

The XL Tank also sports several unique features, including an aluminum videocard-support column; washers and screws enable you to place varying degrees of pressure on the top of your card to secure it in place. Rigging your hard drives into one of the six available drive bays involves attaching wheels to the sides of the drives, rolling them into place, and then locking them down with a hex bolt. Even the case's plastic feet can be removed using a screwdriver. A toolless case this ain't; in fact, the eight PCIe mounting brackets are the only components that use thumbscrews.

The XL Tank comes with four fans: two 14cm top fans, one 23cm front fan, and one 14cm exhaust fan. The chassis also features two rear cutouts for water cooling. The front panel is relatively spartan, with two USB 3.0 ports (using pass-through cables), two USB 2.0 ports, and a single eSATA port. There are four optical drive bays—one of which harbors a 3.5-inch adapter—that require small screws to secure the drives.

This is a very quiet enclosure when powered up, but you needn't worry that it won't keep your gear cool. CPU temps on our thermal testing setup hovered around 55.7 degrees Celsius while under full load, and 35.7 C at idle.

The XL Tank provides for a straightforward build experience, it stays cool under load, and we dig its understated style. Cubitek, for whatever reason, provides a profusion of extra bolts and screws—easily twice as many as is typical—but each bag is clearly labeled, and we had no trouble figuring out which ones we needed. Steer clear of this case if you're looking for a quick-and-easy, toolless build, but the XL Tank will provide ample rewards to those willing to invest a little extra time and patience. —ALAN FACKLER

VERDICT 8

Cubitek XL Tank

+ TANK Retro styling and minimalist approach; cool idling temp with stock fans; GPU support column is a nice touch; lots of cable routing cutouts.

– STANK Too many screws and bolts; no toolless enclosures; some screws need an Allen wrench (provided); no padding on cutouts.

$170, www.cubitek.com

The third-generation WD TV Live is thinner and more capable than previous models, and the remote is significantly better.

Plenty of device support here, with both analog and digital audio and video outputs.

Madcap Media Streamers

One of these things is not like the other

Media streamers like the Western Digital WD TV Live and Netgear NeoTV make just a little less sense than they did a couple of years ago. In those days, they were the perfect alternative to stuffing a home theater PC into your entertainment center. These days, you can get nearly all the same functionality from a new Blu-ray player or a Smart TV.

On the other hand, the latest incarnations of these two products cost less than a new Blu-ray player, and they're several orders of magnitude cheaper than a new HDTV (or a home theater PC, for that matter). And while they do have some features in common, the NeoTV delivers far fewer features than the WD TV Live and is priced accordingly, so we're not making a direct a head-to-head comparison between the two here. —MICHAEL BROWN

WESTERN DIGITAL WD TV LIVE

For a company whose primary business is manufacturing hard drives, Western Digital sure knows a lot about digital media and how to stream it over a network. Each succeeding generation of the company's WD TV Live product has led the market in terms of features, price, and performance, and this one is no different.

With this incarnation, WD adds several new services (including Hulu Plus and Spotify), a collection of simple online games, an integrated Wi-Fi adapter, and even the ability to decode Dolby TrueHD. Unlike the pricier WD TV Live Hub, which remains in Western Digital's lineup, this product does not include any local storage. But it is equipped with two USB 2.0 ports, so you can easily connect a portable drive. You can also connect a USB keyboard, which makes initial setup (entering Wi-Fi and network user IDs and passwords, for instance) considerably easier than hunting and pecking using the remote and the onscreen keyboard.

Most people will connect the WD TV Live to their entertainment system using the HDMI 1.4 port (you'll need to provide your own cable), but the device will happily accommodate older equipment with its analog A/V and digital S/PDIF outputs. There's also an Ethernet port in the back panel, but the integrated 802.11b/g/n wireless client adapter proved plenty fast for streaming video at 720p—an impressive achievement, considering that we tested the box in a room-within-a-room home theater at Maximum PC Lab North. We needed a hardwired connection to stream video at 1080p. Image quality was excellent.

The remote is easily the best that WD has come up with so far, with a molded grip that feels very natural in either hand. We needed to bend our thumb to reach the alpha-numeric keypad on the bottom half the device, but we seldom use those buttons, anyway. We used the home, arrow, mute, and transport (play/pause, stop, fast forward/rewind, and skip forward/back) buttons far more frequently, and those are all within easy reach. The remote also has four shortcut buttons—labeled A, B, C, and D—that can be custom programmed.

Western Digital offers a strong collection of online movie and music services in addition to the new ones mentioned earlier. You'll find all the old standbys here, including Netflix, YouTube, and Pandora; but you'll also get CinemaNow, Blockbuster on Demand, Live365, and several others. Unfortunately, you won't be able to tap what we consider to be the best online, on-demand movie service of them all:

Anyone considering buying one of Roku's streaming boxes should take a long look at what Netgear has to offer with the NeoTV NTV200.

Netgear's app lets you use your smartphone as a remote.

Vudu. Western Digital does deserve praise for its broad media file and container file support, which includes the video standards AVI, MKV, MPEG-1/2/4, h.264, VOB, and M2TS (the container for Blu-ray movies); the audio formats AAC, FLAC, OGG, and MP3 (including 24-bit/48kHz FLAC); and the digital photo formats BMP, JPEG, and PNG. The device supports playlists and subtitles, too.

The WD TV Live is the best full-featured media streamer you can buy today, but we'd like it even more if it included Vudu.

VERDICT 9 KICK ASS!

Western Digital WD TV Live

$120 street, www.wdc.com

NETGEAR NEOTV NTV200

Craving a spot at the commercial online media buffet, but not at all interested in ripping your own media? Netgear has just the right dish. The NeoTV taps your broadband connection to serve up Netflix, Vudu, Pandora, YouTube, Picasa, and plenty of other online services; but it can't tap media stored on your own network, and it doesn't have any USB ports to access local storage.

We initially considered this to be a major disappointment: If you own a late-model Blu-ray player or a Smart TV, the NeoTV has very little to offer. But plenty of us haven't made such investments, and if online entertainment is all you're looking for, Netgear's device costs $40 less than Western Digital's. You're not getting as many features, but you're also not being forced to pay for features you won't utilize.

The NeoTV's built-in 802.11b/g/n Wi-Fi adapter performed just as well as the one inside the WD TV Live—we had no problem streaming Netflix and Vudu movies without wires (although we were once again limited to 720p resolution; we needed to plug in a CAT5 cable to enjoy Vudu movies at 1080p). The only other connectivity features on the box are HDMI and S/PDIF—there's no support for analog audio or video devices at all.

Netgear provides a very basic remote control with the NeoTV. We have no complaint with the button layout, and we like the clicky, tactile feel it provides much better than the mushy buttons on Western Digital's controller; but there's no alpha-numeric keypad for typing search queries (you must use the arrow buttons to navigate an onscreen keyboard), and there's no mute button. But Netgear redeems itself with a free app that will turn your iPhone or Android phone into a compatible remote. That's sure to come in handy when the regular remote's two coin batteries crap out late one evening.

There's also a very good collection of streaming media services on tap. While Western Digital scores a big win with its support for Spotify, Netgear can deliver movies in HD and in surround sound on demand via Vudu. And if you're a Napster subscriber, you can listen to your tunes on the NeoTV, but not on the WD TV Live. There's a long list of other less interesting services, including a host of video podcasts (does anyone actually watch those?) and some very basic online games (the same ones that Western Digital offers, including Black Jack Royale, Kaboom, Sudoku, and Texas Hold 'Em).

Enthusiasts will want more than what the NeoTV delivers, but this is a good product to recommend to friends and family who just want an easy way to stream media from the Internet to their entertainment center.

VERDICT 8

Netgear NeoTV NTV200

$80, www.netgear.com

iHome iW1 Wireless Speaker

A good wireless speaker tied to a middling networked audio ecosystem

The iHome iW1 is as attractive as B&W's iconic Zeppelin—albeit in a much more understated fashion.

THE AIRPLAY-CAPABLE iW1 wireless speaker is by far the iHome's most advanced product, but its $300 price tag pits it against some tough competition, including the Sonos Play:3. The Sonos sounds just slightly better, and the Sonos Wireless HiFi system remains the best inexpensive multiroom audio system we've tested (iHome recommends limiting an AirPlay network to just three iW1s), but the iW1 is eminently portable and can operate on battery power.

Most people will stream music to the iW1 over their Wi-Fi network using Apple's AirPlay technology or by docking an iOS device using the provided USB cable. But you can connect any audio source to the speaker using a 1/8-inch cable. The iW1's battery charger sits beneath the unit and is completely hidden while charging. The balance of the iW1's industrial design is equally elegant. Touch-sensitive controls for volume and iPod/iTunes control are located on the top of the device, along with a collection of status LEDs.

A 13-watt-per-channel Class D amplifier drives two, 3-inch, long-excursion polypropylene woofers and two, 1-inch silk dome tweeters. The amp is strong enough to fill an average bedroom with sound, and it's fine for providing background music in larger rooms, but we wouldn't rely on it for a lively party. We've said the same about the Sonos Play:3.

Like Bowers and Wilkins' pricier Zeppelin Air ($600), the iW1 takes the digital output of a docked iOS device, bypassing the digital-to-analog converter on the device. But where B&W uses a dedicated, high-end DAC for this task (an Analog Devices AD1936 that delivers a signal-to-noise ratio of 106dB), and first upsamples the bit stream to 24-bit resolution and a 96kHz sampling rate (using an Analog Devices ADAU1445 sample-rate converter), iHome uses a lower-precision multifunction codec (an Analog Devices ADAU1761 that delivers a signal-to-noise ratio of 98dB). The ADAU1761 combines a DSP, DAC, ADC, mic input, and more—it's the type of chip that you might find on a smartphone or digital camera as readily as a bookshelf audio system.

As with other AirPlay devices we've tested, iHome uses BridgeCo's DM870 networked media processor to handle wireless media streaming. The DM870 also runs the Bongiovi Acoustics Digital Power Station software, which will restore life to music that's been encoded using lossy codecs such as MP3 and AAC. The Bongiovi DPS (sorry, we can't help but pronounce this "bong-jovee") does make compressed tracks sound better; but if you're using iTunes and an iOS device, you really should encode your music using the Apple Lossless codec.

We used a number of such tracks to evaluate the iW1's audio chops, including Cara Dillon's rendition of the Irish folk song "The Parting Glass," from *Live at the Grand Opera House*. This track consists of nothing more than Dillon's delicate voice accompanied by grand piano, and it gave us a good opportunity to evaluate the speaker's performance with both streaming and hardwired audio. The Zeppelin Air, as expected, wiped the floor with the iW1; but the comparably priced Sonos Play:3 also delivered a slightly better performance than the iHome. Dillon's voice sounded crisper, and the piano notes decayed just a little more naturally.

If you can't afford a Zeppelin, and portability ranks higher than assembling a multiroom audio system, iHome's iW1 is a very attractive system. —MICHAEL BROWN

VERDICT 7

iHome iW1 Wireless Speaker

+ AIRPLAY Rechargeable battery; elegant industrial design; solid sound.

– PAY TO PLAY Ties you to iTunes; AirPlay is inferior to Sonos network; lacks a hardwired Ethernet port.

$300, www.ihomeaudio.com

Corsair Vengeance 1500 USB Gaming Headset

A pretty impressive second act, literally, figuratively, and audibly

WE AWARDED CORSAIR'S HS1 USB headset a 9 verdict last year, remarking that its huge 50mm drivers, solid and comfortable construction, and $100 price tag added up to a surprisingly good value for a freshman effort. The one element that denied the HS1 a Kick Ass award was its uninspired—nay, downright ugly—industrial design.

Corsair's new flagship USB headset, the Vengeance 1500, retains all the strengths of the HS1 and eliminates nearly all its weaknesses. The Vengeance 1500 packs the same gigantic drivers as its predecessor, providing top-notch sound quality for this price range. The circumaural design and thick, squishy padding make for a tight seal around your ears that isolates you from the pollution of ambient noise. While it doesn't deliver the level of quality that some higher-end products provide—Sennheiser's PC 333D G4ME, for example—the Vengeance 1500 does provide respectable dynamic range and bass response that's perfectly suitable for both games and movies. And while nothing can compare to an actual surround-sound setup, Corsair does deliver Dolby Headphone. This software algorithm upmixes stereo and 5.1-channel sources to simulate a 7.1-channel speaker system wrapped around your head, delivering better positional awareness than stereo phones are capable of providing.

Build quality as compared to the HS1 has also improved significantly. The struts connecting the ear cups to the headband feature an attractive brushed-aluminum finish, and the cups themselves swivel to lay flat against your chest when the headset is resting on your neck. They might feel odd if you're transitioning from an on-ear headset, but after many extended gaming sessions, we've found the Vengeance 1500 to be one of the most comfortable headsets we've tested. They are quite large, however, so they might not be the right choice if your head is particularly small.

Corsair's HS1 is a solid headset; the only reason we wouldn't recommend it today is that the Vengeance 1500 is even better. If you're looking for a serious gaming headset and can afford to spend 100 bones, you won't go wrong with this one. —**ALEX CASTLE**

The Vengeance 1500 sounds every bit as good as Corsair's earlier HS1 USB headset, and it looks a whole lot better.

VERDICT 9 KICK ASS!

Corsair Vengeance 1500 USB Gaming Headset

+ VENGEANCE High construction quality; good sound; comfortable; good value.

– PENANCE Too large for folks with wee heads.

$100, www.corsair.com

Battlefield 3

Behold the Chimera!

THERE IS A CREATURE in Greek mythology known as the Chimera. The Chimera was an unholy patchwork of a beast, a combination of lion, snake, and goat. Battlefield 3 is the software equivalent of a Chimera—a beast of a game stitched together from disparate parts.

Battlefield 3's single-player campaign is undoubtedly the goat. The game resorts to every dirty funneling trick to keep you on its chosen path, ranging from invisible walls to flat-out killing you and forcing a reload if you wander. You'll spend much of the game running a high-speed conga line with your AI squad mates, dashing from one checkpoint to the next.

The action remains maddeningly scripted when you reach those checkpoints. Ever-present mortar, grenade, and rocket explosions, combined with seemingly random enemy spawns, leave you waiting behind cover while the game essentially plays itself. Make your presence felt and your AI squad mates will do their best to get you killed by bumping into you, shoving you out of "their" cover, and getting in the way of your shots, all while the enemy seems to target you exclusively.

And if ever there was a game you didn't want to play staring at teammates' backs, it's Battlefield 3. This game boasts the most photorealistic graphics we've ever seen, with crisp textures, smooth animation, and almost no texture pop-in, a feat made all the more impressive by the game's high fidelity and remarkable draw distance. The Frostbite 2 engine's hyper-realistic volumetric effects add to the visual wow factor: Black smoke belches from burned-out tanks, sand blows across desert wastelands, and every explosion ejects chunks of dirt and plumes of dust skyward.

EA's digital-distribution and DRM system, Origin, plays the part of the snake, slithering into your Battlefield 3 experience whether you want it or not. While we suffered no technical or stability problems with Origin, the client is wholly unremarkable. It gets the job done, but it pales in comparison to Valve's well-established and feature-rich Steam. EA's Battlelog, the web-based launcher that serves as BF3's main menu, is equally unimpressive: Managing and communicating with friends is cumbersome, voice chat is absent, and trying to set up a game with a large group is nigh impossible.

Battlefield 3 offers an expansive battlespace that can go from desolate to crowded in a heartbeat on 64-player maps.

The Frostbite 2 engine delivers unparalleled lighting effects and stunning, near-photorealistic environments.

Thankfully, Battlefield 3 roars where it matters most: Multiplayer is nothing short of sublime. Classes are extremely well balanced, weapons are varied, and the leveling and unlock trees entice you to keep playing without overwhelming new players. The game features five competitive modes: squad deathmatch, team deathmatch, rush, squad rush, and conquest. In typical Battlefield fashion, vehicles play a big role, especially in the larger maps. The spectacle of 32 or 64 players firing devastating tank rounds, crashing helicopters, and shooting down jets leads to jaw-dropping "wow" moments of emergent, chaotic goodness.

So, is the Chimera that is Battlefield 3 held back by its worthless goat element and its sneaky snake component? Yes, but not all that much. Battlefield 3's unparalleled immersion factor and fantastic online modes render it the go-to multiplayer FPS well into the foreseeable future. —**DAN SCHARFF**

VERDICT 9

Battlefield 3

+ ROARING LION Refined, well-balanced, multiplayer classes; giant, chaotic, detailed maps; jaw-dropping pyrotechnic, lighting, and particle effects

– BLEATING GOAT Unfulfilling single-player campaign; Battlelog is a pain to deal with.

$60, www.battlefield.com/battlefield3, ESRB: M

LAB NOTES

NATHAN EDWARDS **SENIOR EDITOR**

Overclocking Sandy Bridge-E

Auto-overclocking provides a good starting point, with room to grow

LIKE SANDY BRIDGE'S "K" parts, some Sandy Bridge-E CPUs will have unlocked core multipliers to make overclocking easy. The Core i7-3960X is one such fully unlocked CPU, and it's easy as pie to overclock. I did it by slightly increasing the Bclock and upping the core ratio on my Asus P9X79 Deluxe's BIOS, but Asus's AI Tweak, which ships on the driver CD, lets you do the same thing with an easy-to-use GUI from within the OS. Open the TurboV Evo utility, and you'll be able to fiddle with every setting easily.

If you want a quick jumping-off point, though, you can just hit the Auto Tuning button. The utility will start stepping up the Bclock and core ratios automatically while stress-testing your CPU. Once it hits an unstable point, it'll reboot to a stable configuration, which you can stick with or—if you're adventurous—use as a baseline for more ambitious clocks.

Michael Brown
Reviews Editor

The more battery-powered streaming-audio speakers I review, including the iHome iW1 in this issue, the more I realize the glaring opportunity that Sonos has failed to seize. The company has the best affordable multiroom audio system, bar none, but it doesn't offer any battery-powered speakers. A portable outdoor model would be even better!

Alex Castle
Online Managing Editor

I've got a new gadget to add to my "scoffs-at-but-secretly-wants" list: the Sony HMZ-T1 Personal 3D Viewer. I haven't gotten to try it myself, but I've always secretly loved the idea of an immersive, head-mounted display. By all accounts the thing works pretty well—maybe I should get one for the office. For productivity only, of course.

Amber Bouman
Online Features Editor

I'm pretty thrilled to (finally) be starting a new build with my BitFenix Survivor case, Duke Nukem GTX 560 GPU, Asus P7P55D-E motherboard with an Intel Core i5-760 processor, and CoolerMaster V6 GT cooler. Now, if I can just track down a hard drive.

Markkus Rovito
Senior Editor

For a recent backpacking trip, I bought a Kinesis K3 USB charger, so my phone could serve as my video/photo camera, reading material, audio recorder, and notebook over seven grid-free days. The K3 has a 4,000 mAh battery that you can fill up via AC adapter and then replenish via solar and wind power. Pure ass-kickery.

Alan Fackler
Associate Editor

I know I'm going to catch some flack for this, but now that I've sat down with both Call of Duty: Modern Warfare 3 and Battlefield 3, I find that my loyalties lie with Modern War 3. The scope is scaled way down by comparison, but that addictive arena experience of just running and firing like crazy keeps me coming back. Now if only they'd update the damn graphics engine.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Windows 7 Tablets
> Digital Editions
> Best of the Best

Slated for Disapproval

I received my December issue of *Maximum PC* thinking that a good tablet article had finally been written. A 12-page article and not a single mention of the one tablet that actually deserved to be reviewed in *Maximum PC*?! Have you forgotten that there are Windows 7 tablets? Some actually make Androids and iPads look like the media delivery toys that they really are.

The one that should be at the top of your list is the Asus EP121, a Windows 7 tablet that is powered by an i5 CPU. Yes, a tablet with an i5 processor, 4GB of DDR3 RAM, an SSD hard drive, Cintiq-type graphics performance, and much more. I sold my year-old laptop after getting this amazing machine. Imagine that, a tablet that can actually do real work: MS Office, Coral Painter, Photoshop, etc.

–Randy Myers

SENIOR EDITOR MARKKUS ROVITO RESPONDS: Of course, we know about Windows 7 tablets, and in our experience with them, their battery life and performance speeds were appalling enough to politely decline their affections until they mature a bit. We do see your point, however, and there is a definite distinction between the Android and iPad couch buddies that are normally called tablets and the $1,000-plus workhorse slate PCs such as the EP121. There is a place for slate PCs in our pages and in our readers' lives, and we expect 2012 to be a real breakthrough year for those devices, especially once Windows 8 is ready for prime time.

Tablets in the Stream

I am shopping for an Android tablet and am in a dilemma. My main purpose for the tablet is entertainment—primarily, streaming videos at 720p. I have searched many forums and reviews for the best tablet for 720p streaming. Some have mentioned that Tegra 2 is really bad for streaming HD-quality videos. Some also mentioned that there are specific video streaming apps that work, and some that don't.

Can someone at *Maximum PC* recommend a tablet and app that work well for streaming 720p videos?

–Gio

SENIOR EDITOR MARKKUS ROVITO RESPONDS: When it comes to streaming 720p video to a tablet, we can't pin any problems specifically to the Tegra 2. Streaming video to a tablet is a sophisticated process that will have varying results depending on many factors besides the processor, including network connection quality or network interference, the source device of the video file, the number of tasks running in the background of the tablet, etc. You can't trust every Internet denizen to have it all sorted.

That said, more power doesn't hurt, so that's our recommendation. The Asus Transformer Prime just came out in December, and its quad-core Tegra 3 chip is supposedly five times faster than the Tegra 2, with improved power and only 61 percent of the power consumption. We'll be reviewing it soon, but the early hands-on reports confirm the speedier performance and sumptuous graphics. At $500/600 (32/64GB), the Transformer Prime is not cheap, but we suspect it will be a good value for what you get, and the boosted specs should only help with streaming video.

As for the app, we've had success with Qualcomm's Skifta, which was recently our Android App of Week online (bit.ly/v0iQsW). It turns your Android device into a DLNA Digital Media Controller, letting you stream media to or from it.

Digital Editions

I am in the process of switching my considerably large number of magazine subscriptions from paper to digital format. I am currently using one of two formats: Kindle or Zinio. Both of these offer the option of reading on my desktop or tablet. The Zinio edition has proven to be far superior to Kindle with most (if not all) of my magazines as an exact replica of the print version, whereas the Kindle removes many of the photos and illustrations. Kindle also removes the advertise-

> HAVE YOU FORGOTTEN THAT THERE ARE WINDOWS 7 TABLETS?

↘ submit your questions to: comments@maximumpc.com

ments, but frankly, I prefer to see the advertisements in *Maximum PC*.

My question is about the availability of *Maximum PC* in digital format. I thought I had seen mention that you would start offering that this fall and I have put off renewing my print subscription. But I have not seen any further mention.

—Bruce Noren

EDITOR-IN-CHIEF KATHERINE STEVENSON RESPONDS: Digital editions of *Maximum PC* are currently available for the Barnes & Noble Nook and Apple iPhone/iPad (through their respective newsstand apps). In both cases, the digital version is an exact copy of the print version, with ads and all. And in both cases, a single issue costs $7.99 while a subscription costs $.99 per issue.

Expect to see a digital version of *Maximum PC* for Amazon's Kindle Fire, as well.

Best of the Best Headset?

I was wondering why you do not have a headset in your Best of the Best section. Headsets are a necessity for gaming these days (with VoIP chat) and there are many different options out there. I am in the market right now for a new headset and I was wondering what *Maximum PC* recommends.

—Ryan Calvert

ONLINE MANAGING EDITOR ALEX CASTLE RESPONDS: You're absolutely right, Ryan, a headset is an important part of any gamer's kit—both because it lets you use voice chat in multiplayer games, and because it's a great way to play games after everyone else in your household has gone to sleep. Not featuring a Best of the Best headset is an oversight, and we're fixing it right now. You can see the extended list of Best of the Best products (now including headsets!) at MaximumPC.com.

As for what we'd recommend, see our review on page 90. The Corsair Vengeance 1500 is a great-sounding headset with a solid, comfortable build. At $100, it's not the cheapest on the market, but once you try it out, you'll see it's worth every cent.

Your Best of the Best is Bugged

I can no longer idly sit by while you continue to praise the Vertex 3 SSD. I have tried integrating these SSD drives several times on several different systems only to find that there are compatibility lockups. First you might think it's because of the SATA controller, but when several different controllers suffer from lockups and blue screens, and other competing SSDs such as the Intel 510 work flawlessly on the same system, it has to be a problem with the SSD. If you don't believe me, please look at the overwhelmingly high amount of negative feedback on various online web sales sites (Newegg, etc.). I demand your due diligence on the topic by investigating and revoking the drive's Kick Ass award.

—Joe

SENIOR EDITOR NATHAN EDWARDS RESPONDS: We never ran into the BSOD issue when we were testing or deploying the Vertex 3 in any of our systems, but we know that other users have. In October, SandForce finally tracked down the bug in its firmware that was causing the BSODs, and OCZ issued a firmware update, 2.15, that should fix the issue.

Regardless, the Vertex 3 is no longer our Best of the Best recommendation; it was replaced in the Holiday issue by Samsung's 830 Series SSD, which is as fast or faster in nearly every metric, and uses Samsung's controller, not SandForce's—and thus is not affected by the BSOD bug.

[NOW ONLINE]

THE F2P REVOLUTION: 25 ONLINE GAMES YOU CAN PLAY FOR FREE

One of the biggest trends in gaming over the last half-decade has been the rise of the Free to Play (F2P) online business model. You might have heard it called "freemium," or the pejorative "pay to win," but whatever you call it, it's here to stay.

We've rounded up 25 high-quality, big budget online games that you can play for free. For each one, we tell you what you get for free, and what will cost you. (bit.ly/sCgU32)

[NEXT MONTH]

COMING IN MAXIMUM PC's OCCUPY WINTER FEBRUARY ISSUE

Make Your Own Smart TV

There are multiple ways to bring the Internet to your TV, and stream the content from your TV to other devices. We're going to examine a slew of solutions for making your TV smarter.

Ultrabooks

You've been hearing about them for a while. Next month we'll put four Ultrabooks to the test.

Build a Bulldozer Box

We'll walk you through the process of building a PC using AMD's new eight-core processor.

HARDWARE

ROUTER

Netgear WNDR4500

Netgear's WNDR4500 is the first router we've been excited about since, well, Netgear's WNDR3700. It supports three 150Mb/s spatial streams on both the 2.4- and 5GHz frequency bands, so its wireless throughput is screamin' fast; it boasts two USB 3.0 ports, to support both NAS and a multifunction printer; and you can operate a guest network on both frequency bands. Netgear has also completely redesigned its browser-based user interface and come up with a user-friendly client app, so you can enthusiastically recommend this router to friends and family without worrying that they'll ask you to set it up for them. www. netgear.com

THE REST OF THE BEST

High-End Processor
Intel 3.3GHz Core i7-3960X
www.intel.com

Midrange Processor
Intel 3.5GHz Core i7-2700K
www.intel.com

Budget Processor
Intel 3.3GHz Core i5-2500K
www.intel.com

LGA1155 Motherboard
Asus P8Z68-V Pro
www.asus.com

AM3 Motherboard
Asus M5A99X Evo
www.asus.com

Price-No-Object GPU
Asus GeForce GTX 590
www.asus.com

Performance GPU
XFX Radeon HD 6970
www.xfxforce.com

Midrange GPU
MSI NGTX560 Ti Twin Frozr OC
www.msi.com

Budget GPU
XFX Radeon HD 6870
www.xfxforce.com

Performance Hard Drive
Samsung 830 Series SSD 256GB
www.samsung.com

Capacity Hard Drive
Hitachi Deskstar 7K3000 3TB
www.hitachigst.com

Air Cooling
Cooler Master Hyper 212 Evo
www.coolermaster.com

High-End Cooler
Prolimatech Armageddon
www.prolimatech.com

Blu-ray Drive
Plextor B940SA
www.plextor.com

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

Mid-Tower Case
Corsair White Graphite Series 600T
www.corsair.com

Midrange Display
LG E2370v
www.lg.com

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

GAMES WE ARE PLAYING

Battlefield 3
www.battlefield.com

Deus Ex: Human Revolution
www.deusex.com

Team Fortress 2
www.teamfortress.com

Magic: The Gathering: Online
www.wizards.com/magiconline

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