MAXIMUM PC

Give Windows a

Start!

Eradicate system clutter & make your rig run like new with our step-by-step guide

THE TOP 100
PRODUCTS, EVENTS,
& PEOPLE OF 2008

FEBRUARY

50

MAXIMUM PC

This Column Is Brought to You by the Letter T

In the spirit of trying new and exciting things in the year ahead, this month I decided to upend my column-writing strategy: Instead of writing about whatever's stuck in my craw, I asked the folks following my Twitter stream to tell me what I should write about—a contest of sorts. The responses of my fellow Twitterinos ranged from mildly kooky to wildly off-topic, and while there's absolutely no way to write about everything suggested, I'm going to give it the ol' *Maximum PC* try. Here we go.

- The first respondent, @terryrobinson, wanted to know, "What's next after we win the battle against DRM and GNU becomes the standard software license?" Well, while I love your optimism, Terry, I think it's much too early to dream of a post-DRM world. We've made good progress against DRM in music, but there's a long road in front of us with respect to movie and game content. And no one's even talking about electronic books, like the Kindle and its proprietary locked format. So while I'm sure we'll one day live in a magical Internet wonderland filled with open content, free software, and unicorns, for now at least, it remains a long way off.
- Fellow Rock Band aficionado @strngwys wanted a column about how excited I am to unleash my inner Eddie Vedder when *Ten* is released this spring. No column required, stranger, just three words: REALLY, REALLY EXCITED.
- I can tell @wunderbar that I've never met a cupcake I didn't like, but I recently learned that Sprinkles cupcakes are worth a 90-minute drive—especially if that's what your wife wants for her birthday. I'm partial to the peanut butter ones; they're best enjoyed with a tall glass of milk.
- One of my coworkers, JT, wanted me to write about one of three subjects I'm wildly unqualified to offer my opinion on: piracy off the coast of Sudan, the International Monetary Fund's role in diplomacy, or popcorn-eating hamsters on pianos. The hamsters are awesome, JT. AWESOME.
- Finally, @johntr wanted me to write about Twitter. While I might not know much about any of the aforementioned subjects in this column, I think I can safely say that I managed to knock this one out of the park. See you guys next month.

P.S.: People who sign up for my Twitter feed will have the only chance of winning in our Win a Tsotchke Trivia Contest. That's right, I'm giving away all the cool vendor swag that's sent to me, ranging from mouse pads to T-shirts to netbooks. The contest starts on January 20, so sign up soon!

THINGS THAT ARE AWESOME!

HAMSTERS & PIANOS
www.youtube.com/watch?v=tRzTfgds0UI

WILL'S TWITTER
http://twitter.com/willsmith

SPRINKLES CUPCAKES
www.sprinklescupcakes.com

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

THE NEWS

Nvidia's PhysX Momentum?

EA and Take-Two sign on to use the physics-acceleration API, but potential pitfalls remain for the fledgling tech —WILL SMITH

EA and Take-Two recently signed a deal to license Nvidia's PhysX tech for use in upcoming games developed by both publishers. This move enables both publishers' in-house development teams to utilize the full power of the PhysX API for materials simulation, more accurate ragdoll effects, and upgraded particle effects (like breaking glass).

What does this mean for you? Well, if you own a GPU from the GeForce 9000 series (or newer cards, natch), PhysX will be enabled automatically simply by updating to the most recent drivers. If you have multiple GPUs in your rig, you can even dedicate one to graphics rendering and use the second exclusively for physics acceleration. But with the relatively small number of games currently taking advantage of PhysX, we wouldn't encourage anyone to do that right now. However, this new announcement could be the precursor to a flood of PhysX-enabled titles coming in 2009 and beyond.

This announcement is a significant step forward for proponents of hardware-based physics acceleration. Getting developers to implement PhysX when the installed base was limited to a few thousand of Ageia's dedicated cards was impossible, but with 150 million GPUs capable of running Nvidia's implementation in the wild today,

PHYSX WILL LIKELY AMOUNT TO LITTLE MORE THAN COSMETIC ENHANCEMENTS IN SUPPORTED GAMES.

it's worth developers' time.

Still, there's a pretty big gotcha. Right now, ATI holds about 40 percent of the standalone graphics card market, and ATI cards don't support PhysX acceleration. Fortunately, ATI owners will still be able to play games that utilize PhysX. In addition to having PS3, Wii, and Xbox 360 support, PhysX

Mirror's Edge is one of EA's first titles to fully embrace PhysX. When the PC version ships in January, Nvidia users will see tearing cloth, better glass, and a host of other physics effects.

can also run on the CPU. However, PC gamers whose GPUs don't support the API will have a greatly toned-down experience lacking nifty cloth effects and enhanced particle effects.

Therein lies the hitch. While we're excited at the prospect of games supporting PhysX, without ATI (and likely Intel, with its forthcoming Larrabee part) supporting the API, we're extremely unlikely to see games from major publishers that rely on hardware-accelerated physics support for gameplay. Instead, PhysX will probably amount to little more than cosmetic enhancements in supported games—the same torn cloth, shattering glass, and fancy ragdolls that Ageia first showcased more than three years ago. We don't expect to see games that *require* physics acceleration—no publisher will green-light a multimillion-

dollar title that will run on only 60 percent of PC gamers' machines.

So what are the prospects of ATI implementing PhysX and thus enabling physics acceleration using Nvidia's API? According to Nvidia, "They [third parties] would have to develop a C compiler for their GPUs…. We encourage them to do that, but it is ultimately up to them to develop that and make it work on their GPUs." ATI's response? "We remain committed to our partnership with Havok, as announced back in June."

It remains to be seen whether EA and Take-Two will begin widespread development of games using the PhysX API. We're hopeful that one day developers will be able to harness the power of physics acceleration in games; however, for the time being we're skeptical that their recent deal with Nvidia heralds a new age of physics-accelerated gameplay.

DX10 on a CPU

Microsoft's WARP10 bypasses old videocards

If your graphics card doesn't support DirectX 10 or 10.1, don't worry. Microsoft is working on a new component called WARP10 (Windows Advanced Rasterization Platform) to be included in Windows 7 that essentially ports DX10 duties to the CPU.

The upshot is that anyone who can run Vista will have access to DX10 eye candy, even if their hardware doesn't support it. Minimum requirements for WARP10 are the same as they are for Vista—an 800MHz processor and 512MB of RAM. So if you have the hardware to run Windows 7, in theory you should be able to enable advanced effects regardless of your videocard.

Microsoft isn't pitching WARP10 as a replacement for graphics, though. The rasterizer is intended as a diagnostic tool to help developers validate any visual artifacts as being rendering errors or problems with hardware or drivers. **–PL**

Imagine playing Crysis without the aid of a modern videocard!

IBM's MS Office Alternative

IBM, working in conjunction with Virtual Bridges and Canonical, hopes to save corporations a bundle (and make a tidy profit itself) by offering a virtual desktop package that will be free of Microsoft applications. Virtual Bridges is supplying the virtual desktop client while the Linux-based OS comes from Canonical.

The Ubuntu-based suite will include a collection of office, messaging, and collaboration apps, and IBM boasts that by going without Microsoft, companies could save from $500 to $800 per user on software licenses alone; further savings would come from reduced hardware demands, power consumption, and IT costs. All told, IBM claims, companies would see a 90 percent savings in desk-side PC support and a 50 percent savings in help desk and software install costs. **–TE**

TOM HALFHILL

Requiem for Analog TV

No doubt you've heard that analog TV in the U.S. goes off the air on February 17, replaced by digital TV. If you haven't heard, you must be in a coma. Four times as much money has been spent to prepare Americans for this transition as the U.S. government spends on adult education each year. Who says politicians can't get their priorities straight?

I'm dreading the switch. I'm a diehard who still plays vinyl records, subscribes to a daily newspaper, and snatches free TV from the ether with rabbit ears. And I'm not alone. Thirteen percent of U.S. households still depend on TV antennas.

Although the DTV transition won't affect people who have cable or satellite TV, it does reveal an inherent flaw of digital technology. This flaw afflicts almost all digital media, including the digital photos you take, the digital video you record, and the digital music you download. Digital data can be rendered useless by minor damage that wouldn't matter if the media were in analog form.

At my home, for example, DTV is a bust. NBC is the only network my indoor antenna can receive. CBS, ABC, and PBS are dead air. Yet my antenna points toward the region's largest hilltop broadcast tower, just 10 miles away. For years I've received analog TV that's a little snowy but quite watchable.

The problem is that DTV signals are typical of digital media. They are all or nothing. If anything interferes with the compressed bitstream of ones and zeroes, the error-correction algorithms may not be able to reconstruct the lost data. So, when a digital TV gets a weak signal, it doesn't get a snowy picture—it gets no picture. The same errors can make digital photos, videos, and music unreadable. I've seen JPEG files irretrievably scrambled by a single data error.

By comparison, analog media are more robust. I've scanned 100-year-old photographic negatives that were scratched all to hell, but they still yielded usable images. I have restored 60-year-old acetate recordings that sounded like popcorn but were still audible.

To protect your digital media, keep multiple backups. Although this solution doesn't apply to DTV, it will help preserve your digitally stored memories.

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

Maximum PC through the Ages

Google Book Search now includes complete OCR'd replicas of *Maximum PC* from 1998 to the present at http://tinyurl.com/6gzl5d.

Of course, this magazine's online presence extends far beyond Google's searchable archive; remember, you can find breaking news, exciting features, product reviews, and PDF archives at MaximumPC.com. –KS

Intel, Micron Make Smallest NAND chip

IM Flash Technologies, a company jointly owned by Intel and Micron, has developed the smallest NAND process geometry on the market. Using its 34nm process, IMFT will begin mass production of 32Gb multilevel-cell NAND flash chips in June to be used in a variety of portable devices, as well as solid state drives with double the storage capacity of today's SSDs. –KS

THOMAS MCDONALD

Tomb's Edge

My first thought was, "Aw, not this crap *again!*"

I was somewhere in the second location of Tomb Raider: Underworld. There was a jump that needed to be made—there's *always* a jump that needs to be made—and every time I tried to get the right angle, the camera disappeared into Lara Croft's gigantic backside like a twitchy colonoscope. If I turned a little bit, Lara herself vanished into the rocks.

Twelve years on, and with Tomb Raider creator Core now little more than a stack of deval-ued assets, the problems that plagued the series are still haunting Lara Croft like the Ghosts of Polys Past. Underworld is a creaking old hulk of a game, building very slightly on Legend's meager innovations but still delivering most of what fans expect: running and jumping, some combat, puzzles, and Dr. Lara.

Then I turned to Mirror's Edge and could not imagine two more sublime contrasts. It is the anti-Tomb Raider. Faith is Bizarro Lara: a wispy, mopey Asian goth with the body of an anorexic 12-year-old boy. Everything about Mirror's Edge is fresh and new, from the bright whitewashed concrete and dazzling sky of the setting to the groundbreaking running and jumping controls. The sensation of motion and the feeling of control is something actually *innovative*. Not in-novative in the sense of "really good and a little bit new," but a by-gum fresh way of interacting with a game world.

And I *hated* it. Oh, how I hated it, with a hatred that burned hot and radioactive like the Springfield reactor. Put aside the insipid story, characters, and social critiques, and you have a maddening kind of Stockholm-syndrome game-play that tries to convince you that repeatedly plummeting to your death when you fail to pull off improbable moves is actual entertainment.

Just for laughs, I returned to Underworld after I escaped from Mirror's Edge, and you know what? I found myself enjoying my time with the old girl. Gamers are like middle-aged men (and I'm both): They may look at the skinny, quirky new girl, but they always stick with the solid, reliable woman in the end.

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

Microsoft to Offer Free Antivirus App

Company pulls plug on OneCare

OneCare won't be sold after June 2009, but customers will be protected through the life of their subscription.

Having achieved only modest market share with its subscription-based OneCare PC security plan, Microsoft is switching gears and offering consumers a free antivirus app beginning mid-2009. Code-named Morro, the app will focus strictly on malware protection versus OneCare's combo of AV, system maintenance, and data backup; it will be available for XP, Vista, and the upcoming Windows 7 OS.

Microsoft says its motivation is to get antivirus protection on more PCs. But the company has no plans to bundle the app with Windows. Rather, it will be available for download, which should help the company avoid any antitrust flak.

Are AV heavyweights McAfee and Symantec worried that Microsoft's free app will lure their paying customers? Representatives for both companies say no. As Symantec's Senior VP of Consumer Business Rowan Trollope puts it, "We view this announcement as a capitulation by Microsoft and a reinforcement of the notion that it's simply not in Microsoft's DNA to provide high-quality, frequently updated security protection…. Making a significantly scaled-back version of that same substandard security technology free won't change that equation." Ouch. –KS

PHENOM II X4 IMMINENT

AMD's 45nm shrink promises far more clock headroom than before

Don't call it P-II. AMD is expected to release a 45nm shrink of its Phenom CPU, which will be called Phenom II X4. Although AMD wouldn't comment on the CPU, leaked info suggests that the X4 should come in a 3GHz version with 8MB of cache and oodles of overclocking headroom.

The original 65nm-based Phenom performed well but couldn't compete with the frequencies of Intel's Core 2 chips. That may change with Phenom II, which will likely run at 4GHz on air and 6GHz on liquid-nitrogen.

How Phenom II will perform against Intel's Core i7 is unknown, but the former should be a winner in the budget department. Initial Phenom IIs will drop into many existing and affordable AM2 and AM2+ motherboards and use thrifty DDR2 memory. –GU

Time to dust off your aged Voo-doo3 videocard.

3dfx Drivers Updated

If you've long been hanging on to an old 3dfx Voodoo videocard for sentimental reasons, you can now feel justified in your unhealthy attachment. That's because although 3dfx has been defunct for years, a dedicated legion of fans lives on in the form of 3dfx Zone (www.3dfxzone.it), which recently released updated drivers for 3dfx cards to work with Windows 2000/XP 32-bit or XP x64. Based on a unified architecture, the SFFT 1.5 driver package works with multiple 3dfx GPUs, including the entire Voodoo3 family as well as the VSA-100 Voodoo4 and 5 cards. –KS

LCD Makers Admit to Price Fixing

Penalties in excess of $500 million

LG, Sharp, and Chunghwa recently pleaded guilty to charges of conspiracy in an attempt to keep the price of LCD panels artificially high; the companies will pay $585 million in fines, with LG paying $400 million of that total. The U.S. Justice Department charged LG and Chunghwa with conspiracy for meeting to discuss prices and exchanging sales information. Sharp was charged with three counts of conspiracy to fix prices of panels sold to Dell, Motorola, and Apple. This isn't the end of the issue, however. All three companies face a number of class action suits from affected parties, and the European Union also has yet to weigh in on any fines for the companies. –TE

HP Prototypes Memristor Chip

Memristors, the fourth fundamental circuit (after capacitors, resistors, and inductors), have been theorized since UC Berkeley Professor Leon Chua predicted their existence in 1971, but it wasn't until April 2008 that Hewlett-Packard Labs built a working memristor prototype. Memristors are nanoscale switches that act as logic gates, but with a twist—they "remember" their state even when powered down, so they can perform calculations *and* act as nonvolatile memory.

In November, HP announced a prototype chip that incorporates both transistors and memristors—the first of its kind—and though it's a long way from a production model, it points to future applications in neural-net-type processors, as a replacement for volatile RAM, and eventually as even a processor/memory hybrid.

HP's memristor prototypes are built on a 15nm scale—much larger than the 4nm HP thinks it can achieve but already smaller than the 45nm process of modern chips. And even though current memristor-chip prototypes run at about a tenth the speed of DRAM, we expect Moore's Law to kick in any day now. We wouldn't be surprised if, thanks to memristors, the computers of 2018 look nothing like today's. –NE

From Orphans to Captives?

Usually, I don't write about Google, because googling it is so hard. But ambiguity isn't enough to thwart my interest in Google's recent movement in the world of books. Google Books (originally Google Print) has come to a settlement with publishers that will, in essence, make it the default collecting society for out-of-copyright books—with no congressional oversight.

It's the result of 1337 legal hacking. In 2004 Google announced plans to scan in-copyright books that were part of university holdings, something no other book scanner had talked about doing. In 2005 the publishers and authors sued Google in a move that sent waves of *not shocked at all* through the copyright community. It was closely watched by sad copyright wonks (*moi*) as possibly defining fair use online.

Google skipped all that and instead suggested amassing a library no one could duplicate and selling the books. The publishers went along for a cut of the action. Thing is, because Google settled, it's a deal only Google gets.

This leaves access to most 20th century books to one company. On the one hand, someone is finally scanning and making orphan works available to the world. Isn't it better that they exist at all, even if it would take a crack team of pirating ninjas to sneak them out of the Google machine rooms?

Maybe not. Google has closed the door behind them, and other public-trust scanning projects, governmental and nonprofit, are left out in the cold.

Organizations like Openlibrary.org have always wanted to create a universal library for all. Google's always wanted to control a universal library for all. As well it should be—Google is a company, and to the extent that it's a steward of our cultural heritage, its first purpose is to make its shareholders richer. Doesn't that sentence make you feel icky?

Some say companies are the best way to protect our culture. As a fan of the Library of Congress, NASA, NOAA, the USGS, the Park Service, etc., I disagree.

The deal still has to be approved by the 2nd Circuit Court in New York—then it's one for the sad antitrust wonks to watch.

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

THE LIST

9 Tech Developments to Watch for in 2009
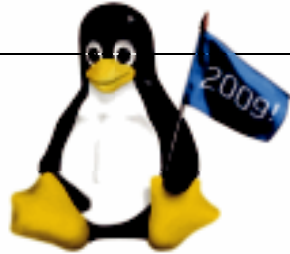
9 PHENOM II
AMD's been working feverishly to get its 45nm next-gen chips out of the fabs and into our PCs.
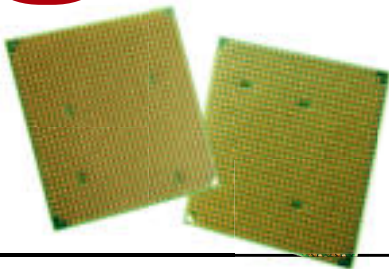
8 LINUX ON THE DESKTOP

7 USB 3.0
Up to 4.8Gb/s bi-directional transfer—a tenfold increase in speed from USB 2.0.

6 LARRABEE
The many-cored GPU archi-tecture with a shared cache is perfect for distributed computing tasks.

5 BETTER OLEDs
Organic LED displays are flex-ible and don't need current to stay bright—and now blue OLEDs finally last as long as reds and greens.

4 ANDROID
Sure, the G1's already here, but it's no iPhone killer. Expect one in 2009, once the OS matures and manufactur-ers turn out second-gen handsets.

3 SECOND-GEN NETBOOKS
The first generation impressed us with their small sizes and good price/performance ratios. Now let's work on the battery life!

2 BETTER SOLID STATE DRIVES
Watch as storage-capacity increases and the price per gigabyte drops.
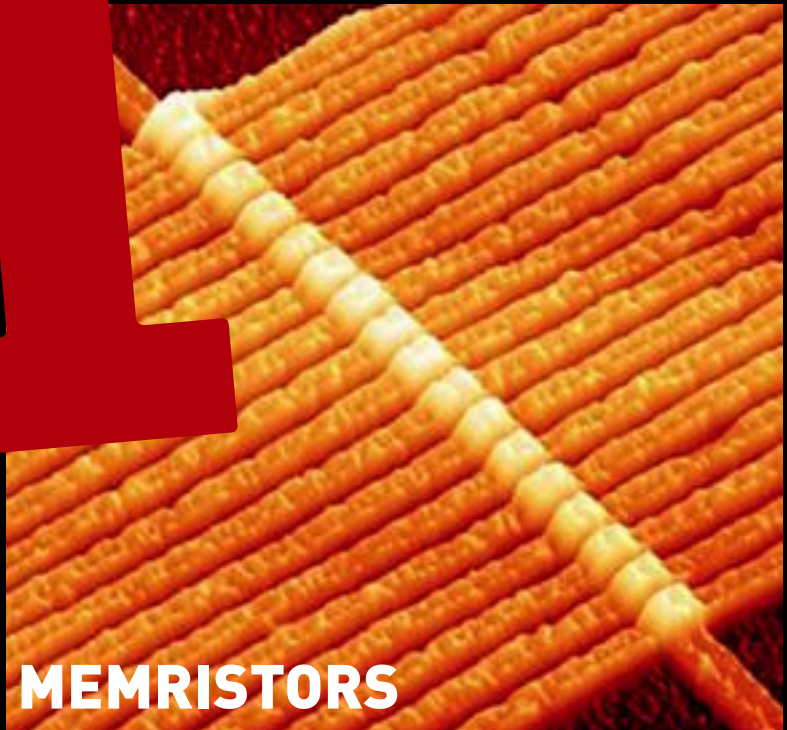
1 MEMRISTORS

Nanoscale switches with variable resistance and persistent memory can replace transistors in circuits, and now HP has built a hybrid memristor-transistor chip prototype. This won't become commercialized in 2009, but expect big strides in both calculation and storage if these take off.

DEATHMATCH

Western Digital Velociraptor vs. Seagate Barracuda 1.5TB

The age-old dilemma: speed or capacity? In the days of yore, men spoke in whispers of enterprise drives, which married the two, but lesser mortals had to choose between large amounts of storage and speedy access to data. The gap, at least within the realm of standard hard drives, is narrowing—today's high-capacity drives often have read times that are within spitting distance of the speediest consumer drives, a title Western Digital's Raptor line has held for years. This month, we pit Seagate's 1.5-terabyte Barracuda against this generation's 300GB Western Digital Velociraptor. —NATHAN EDWARDS

WESTERN DIGITAL VELOCIRAPTOR 300GB
$300, www.wdc.com

ROUND 1
SPEED

Hard drive speed isn't the most important factor to consider when building your dream PC, but there's no denying that a faster hard drive equals better performance. The 10,000rpm WD Velociraptor is the fastest consumer hard drive on the market (excluding SSDs), reaching burst read speeds of 249MB/s in HD Tach, with average reads hovering around 108MB/s. While the 7,200rpm Barracuda's burst speeds are 20 percent slower than the Velociraptor's, the former manages to eke out average reads of 104MB/s, and its average write speeds are actually about 3 percent faster than the Velociraptor's. The Velociraptor's random-access speed, though, was twice that of the Barracuda's in our tests.
WINNER: VELOCIRAPTOR

ROUND 2
CAPACITY

The Raptor line has always favored performance over capacity; 2003's model had a scant 36GB of storage. And while you still won't buy a Velociraptor for its size, the latest model offers a respectable 300GB of storage—enough for your operating system and quite a few movies and games.

Nevertheless, the Seagate Barracuda 1.5TB drive has this category locked up. Not only does its capacity trounce the Velociraptor's by a factor of five, but it's also half again the size of the terabyte drives that are its closest competitors.
WINNER: BARRACUDA

ROUND 3

ROUND 4

PRICE PER GIGABYTE

The 300GB Velociraptor will cost you about $280 (street price), or 93 cents per gigabyte, while the 1.5TB Barracuda can be found for $180—about 12 cents per gigabyte. That's a big difference, especially considering the Barracuda's more-than-respectable read and write performance. In fact, it's hard to find any hard drive with a better price/capacity or price/performance ratio than the Barracuda.
WINNER: BARRACUDA

SEAGATE BARRACUDA 7200.11 1.5TB
$225, www.seagate.com

BENCHMARKS

	Western Digital Velociraptor	Seagate Barracuda
Size	300GB	1.5TB
HD Tach Burst (MB/s)	**249.7**	209.3
HD Tach Random Access (ms)	**7.1**	15.2
HD Tach Average Read (MB/s)	**108.4**	104.4
HD Tach Average Write (MB/s)	100.0	**103.8**
PCMark05 Overall	**9,450**	5,093

Best scores are bolded. HD Tach version 3.0.1.0 used.

And the Winner Is...

We love the Velociraptor—the speed and reliability of the Raptor line are legendary for good reason. But we have to give the Seagate Barracuda 1.5TB more props for sheer size and value.

If we had our druthers, we'd say get both drives—the Velociraptor for your OS and speed-sensitive applications and games, and the Barracuda for media storage and backup. But if you can afford only one drive, the Barracuda's the way to go.

At 12 cents per gigabyte, with nonburst speeds approaching those of the Velociraptor, Seagate's drive offers the perfect combination of size and performance at a killer price. Who could ask for anything more? ⏻

Our consumer advocate investigates...

▶BatteryRefill.com out of Refills?
▶OS Licensing
▶Recall Roundup

Battery Not Refilled—or Returned

It finally happened to me. I needed a new battery for my son's Sager laptop, so I decided to try BatteryRefill.com. You ship them your old battery; they "refill it" and send it back to you. My credit card was charged in early October and, per the company's instructions, I sent the old battery to them three days later. The company emailed a receipt for the battery a week after that.

Since then, I've had only one contact with the company (despite my repeated attempts), and the person I spoke with over the phone said the battery would be sent

within five to seven business days. You can guess what happened: nothing.

I know, I should have known better. I just checked the BBB and saw that BatteryRefill.com has an F rating. I should have checked this first. Can you help me get both my money and battery back?

—Doug Novin

Unfortunately, Doug, like you, the Dog was unable to reach any humans at BatteryRefill.com. You're right though, BatteryRefill.com gets a big, fat F from the Better Business Bureau, with 82

complaints racked up in the last 36 months. The BBB indicates that the Ontario, CA, company operates under the name eBattery and lists Kay Choi as the primary contact. Unfortunately, the Dog was unable to reach a representative by following those leads. A single online search, however, revealed numerous posts warning about the company's poor service. As far as the Dog can tell, the company has had a hit-or-miss record with customers over the years. At Resellerratings.com, some customers reported being pretty tickled to get refilled batteries very cheap while others had hair-pulling experiences similar to yours.

Obviously, what you

should do is immediately call your credit card company and dispute the charges. As for the battery, you probably won't get it back, but at least it was dead, so it has fairly low value. The lesson for all of us is to do a little research before making a purchase.

OS out of Service

After more than 10 years of building PCs as a hobby, I did

BatteryRefill.com has a bad reputation with numerous consumer sites.

not know that an OEM copy of Windows dies when the computer it was installed on is dismantled. A friend of mine had his 3-year-old Dell damaged beyond repair. As a *Maximum PC* reader, I told him to build a new machine and recycle the parts from the old PC. The hard drive, DVD drive, and graphics card made the jump, but when I called to reactivate the Windows XP license, I was told I could not use it since it was a preinstalled copy and the license dies when the computer it was on dies.

Is that correct? I always believed that when I purchased a computer with an OEM version of Windows, I also purchased a full license for the OS—not just a "temporary" one.

What happens if I buy a computer and then install Linux right away: Would I be able to legally

use the Windows license that came with the computer on another machine? Apparently not. So why am I allowed to buy an OEM version of the OS purchased with a computer component, such as memory or a hard drive? The same situation doesn't seem to apply in the latter case, unless Microsoft is able to verify that I'm still using my OEM OS with the component it was purchased with. Something doesn't seem right to me. Please shine some light on this issue.

—Michele Persiani

You bring up a good point, Michele. Microsoft allows stores to sell copies of OEM OSes with single part purchases, such as a hard drive, mouse, or even a Y-splitter cable, so what happens to the OS when you swap out that part? Here's the skinny: Regardless of whether you buy

> ## IF THE HARD DRIVE TAKES A DUMP, IF THE VIDEOCARD OR NIC DIES, NO PROBLEM, YOU HAVE THE OS REACTIVATED.

your OEM OS with a PC or just a single piece of hardware, Microsoft considers the OS tied to the motherboard it's first installed on. If the hard drive takes a dump, if the videocard or NIC dies, no problem, you can have the OS reactivated. However, if the motherboard the OS was installed on fails, Microsoft can consider it deadski. In some cases, the company will reactivate a dead board's OS—say, Dell has a run of bad boards on some machines and it has field techs replace the bad mobos. The Dog has also heard stories of Microsoft being flexible in enforcing the OEM rules. The company might let you slide, for instance, if you bought an OEM copy of the OS and installed it on subsequent home-built rigs, but trying to use a product key from an OEM PC, like a Dell, on your home-built rig is not going to fly. That's probably because while you and I might pay $100 for an OEM copy of XP, Dell, HP, and other large vendors pay substantially less.

So, no, you would not be allowed to use your copy of Windows XP from a new OEM machine if you installed Linux. Some companies will allow you to buy a machine without an OS, however, if you intend to install Linux. Retail copies of Microsoft's OSes do not die and can be transferred to a new machine an unlimited number of times. ⏻

■ ■ ■ **RECALL ALERT**

➜ **DYMO is recalling some 17,000 power adapters sold with its printers that may create a power surge that overheats the printer and poses a burn hazard. The adapters were sold with the DYMO LabelWriter 400, DYMO LabelWriter 400 Turbo, DYMO Label Writer Twin Turbo, DYMO LabelWriter Duo, and DYMO Desktop Mailing Solution.**

DYMO printer adapters with the RoHS symbol are good.

This power brick with the date code of 2407 and without the RoHS symbol is bad.

If you have one of these printers, examine the power adapter and look for a date code of 2407, 2507, 2607, or 2707 and make sure the adapter does not have a RoHS symbol—these are the indicators of an impacted brick. Any adapter bearing the RoHS symbol, even if it has one of the above date codes, is not part of this recall.

If you have a bad supply, you should unplug it from the wall and contact DYMO for a free replacement. Call DYMO at 888-658-3904 between 9 a.m. and 8 p.m. Eastern Time or visit http://global.dymo.com/poweradapter.

➜ **Battery-Biz is recalling about 1,300 notebook power adapters that may fail, overheat, and pose a burn hazard. The company said about five people have complained about the batteries overheating. The adapters are marked Duracell Universal Power Adapter.**

The recall applies to the 130-watt combo AC/DC version with the model numbers EA10900, AC-6501, and DRUM130 and date codes 0804 and 0805.

The bad adapters were sold through Dell.com and Duracelldirect.com between February and March last year for $80 to $120. Anyone with a recalled adapter should stop using it and contact Battery-Biz at 800-780-6552 between 7:30 a.m. and 4:30 a.m. Pacific Time Monday through Friday.

Give Windows a clean start

When you can't fix it. When you can't repair it. When you can't even boot, it's time to reinstall your OS—the right way. We'll show you how

BY GORDON MAH UNG

Clean start. OS reset. Nuke and pave. Whatever you call it, no matter how good a personal system administrator you are, there's a time to take your OS install out behind the shed and put two in its head.

When would you need to take such extreme measures? If the networking stack is splayed out on the floor and no amount of patching, registry editing, or Winsock repair tools can fix it. If you can't get hibernate or stand-by to work anymore. Or if you've had a horrible malware or rootkit breakout. Sure, you may have reclaimed control of your PC after an epic five-day battle with the beast, but can you really trust your OS anymore? You

don't want to reenact the final sequence from *The Thing*, you and your PC eyeing one another wondering if the other is not what he seems to be.

A clean start is the only way to relieve your paranoia. It can also save you countless hours of troubleshooting and tweaking a misbehaving machine. Follow along as we instruct you on the proper way to do a clean install—whether you're using XP or Vista—that will have your OS acting like the young pup it once was. Plus, we'll show you how to create a pristine image of your OS that'll save your bacon the next time your rig melts down.

For that New
**Hard
Drive
Smell!**

Out with the Old, in with the New

Before embarking on our clean start regimen, read through the instructions to make sure you have all the tools you'll need and a thorough understanding of the process

BUY SOME BREATHING ROOM

You can do a clean start using just your old drive and a pile of DVDs for backup, but we recommend that you use our method and buy two new hard drives. You'll use one as your new C: drive and the second to store your backups and images. (Consider the original drive as a backup of all your data up to this point.) Here's our reasoning: First, an OS reinstall is the perfect time to make the jump to a new drive. Second, the performance benefits of your clean install will only be enhanced by using a newer, larger drive. The new 1.5TB Seagate Barracuda, for example, has an average read speed of 104MB/s. Your old 500GB drive probably tops out in the 50MB/s to 60MB/s range, depending on the generation of the drive. You'll also see significant performance benefits if you have a lot of data because a drive's performance weakens as it approaches full capacity—so that 400GB of data on a 1.5TB drive or even a 1TB drive won't impinge performance as it would on a 500GB drive. Finally, storage has become one of the most inexpensive components in a PC. So take our advice and spend the $200 on two new 1TB drives and save yourself some heartache.

If you choose to ignore our advice and reinstall the OS on your original drive, you must back up all your data to discs before proceeding.

Magic Jelly Bean 2.0 may help you locate serial numbers you'll need to reinstall your applications.

TAKE STOCK OF YOUR APPS

Before you make a clean start, you need to consider the applications you'll be bringing with you. First, make sure you have all of your application discs. One of the most important tasks is to take stock of any registration codes that you need for your software. Locate and record the registration keys that you will need. If you can't find the keys, try Magic Jelly Bean 2.0, a free utility available at Download.com or Sourceforge.net. The application will search through the registry for application keys. It won't find all the keys you need, but it might help you locate that one key you can't find. Magic Jelly Bean 2.0 is sometimes identified as a hacking tool by antivirus apps, but if you download it from a reputable

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▪▪▫ FIRST THINGS FIRST

Deactivate Application Activation

Software activation is the harsh consequence of software piracy. Fortunately, it's merely an inconvenience, not a major undertaking. To minimize your reinstall efforts, you should take stock of the applications that require activation before you do your clean start. Most professional Adobe applications require that you deactivate the program before it can be installed elsewhere. To do this, click Help and then Deactivate. This should deactivate the suite, but to be safe, fire up your other Adobe apps and check to see if they have been deactivated. You'll need Internet access for the application to talk to Adobe's servers. Adobe's activation is more finicky than the one Microsoft uses, and disk changes, such as imaging from one drive to another, can trigger activation. For other pro-

grams, you may want to research how the individual software vendor treats reactivation. Microsoft Office 2007 can simply be reinstalled on your new hard drive and reactivated. You'll likely have to reactivate by phone though, as the program may fail an Internet reactivation. Just explain that you are installing to a new hard drive and you should be fine. Not all vendors are as accessible, however, so if there is a critical application that you need access to, you may want to contact the vendor first to find out what the activation policy is. Obviously, if you don't know if the program will reactivate and you need to access it, wait until you have the answer *before* you do your clean start and consider doing your reinstall during normal business hours when the vendor can be contacted.

It's very important that you deactivate some applications, such as Adobe's Photoshop CS3, before you take down your old drive or you may have problems reinstalling it.

site such as Download.com, you should be fine. If you can't locate a particular key, contact the vendor for a replacement key or a copy of your original key before you proceed if you know you're going to need access to the app. You did write down your Windows XP or Windows Vista key, right?

DEACTIVATE YOUR APPS

Many applications require activation before running—even if you have a legitimate serial number. You can't, for example, reinstall Photoshop without reactivating it, so deactivate any programs on your old drive that use this copy-protection technique (for more information on deactivation see our sidebar on page 26).

PREP ITUNES AND STEAM

Moving your iTunes library is fairly easy, but it can be made more complicated by differences among versions. If you're running iTunes 7 and plan to use iTunes 8 on your clean install, we suggest that you install iTunes 8 on your existing hard drive first. It doesn't always happen, but people have reported issues migrating the database from iTunes 7 to iTunes 8. You should also consolidate your library by going to File > Library > Consolidate Library in iTunes. This will copy the various music and video files that are scattered around your PC into the iTunes directory at C:\Documents and Settings*your user name*\My Documents\My Music\iTunes (or C:\Users*your user name*\Music\iTunes on Vista). Once you're done, migrating your library is as easy as copying the iTunes folder of your old drive into the \My Documents\My Music\ folder of your new drive. Your final move in iTunes will be to turn out the lights. In iTunes, go to Advanced > Deauthorize and deauthorize the computer. This will prevent you from playing any protected content that you downloaded from iTunes on your PC until you

have reauthorized the computer on your new OS install.

Likewise, if you have any games using Valve's Steam service, we recommend that you use the program's built-in backup feature to create a backup of your games folder. Generally, just copying the entire Steam directory over to the new install will work, but having the backup file will help should you encounter problems. While the old drive is up and running, you should hunt down any saved games you want. We can't tell you where to find the saved games for each particular title, as developers use different locations. Check the individual C:\Program Files*game name* folders to see if the saved games are there, if they aren't in a subfolder of Documents.

COLLECT YOUR DRIVERS

Gather all the driver discs for the peripherals connected to your PC. If you can't find a particular disc, chances are you can get the driver off the manufacturer's website. There's no reason to rely on the driver CD that came with your motherboard since it's likely out of date. Go to your motherboard vendor's site and download the latest drivers and applications for your board. The NIC driver is most critical. It's unlikely Windows XP will have native NIC support, so you'll need the driver. Microsoft Vista could have support for it, but many newer chipset NICs are not supported, so download the version you need. You should also download the most recent drivers for your videocard and any other add-in cards you have in your PC.

While you're online, download the latest Service Pack for the OS you're installing. If you have a Windows Vista disc with SP1 already integrated, don't worry about it. If not, download it at http://tinyurl.com/5w44a9. For Windows XP, you'll want to download the network installation package of the Service Pack (http://tinyurl.com/5ofnk8). It's designed to be installed on multiple computers, but it will also let you install the Service Pack without having to connect to the Internet. You can put all the drivers and the Service Pack in a folder on the hard drive you'll be replacing or save them to a USB key.

SAY YOUR GOODBYES

OK, you've got your keys and apps, your drivers and Service Pack. It's time to leave behind your previous install. Completely power down your machine by unplugging it or switching it off
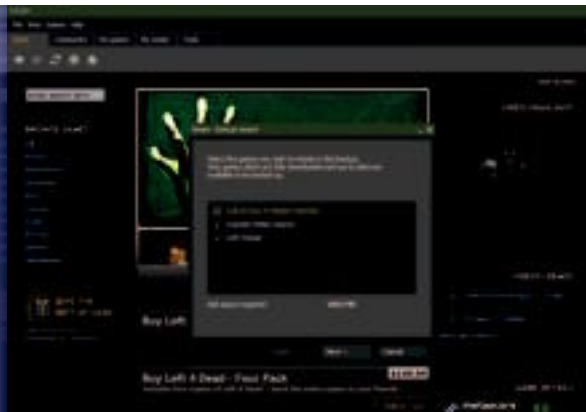
Backing up your Steam games with the app's built-in utility will save you a lot of downloading later on. Alternatively, you can copy the entire Steam directory over from your old drive to your new one.
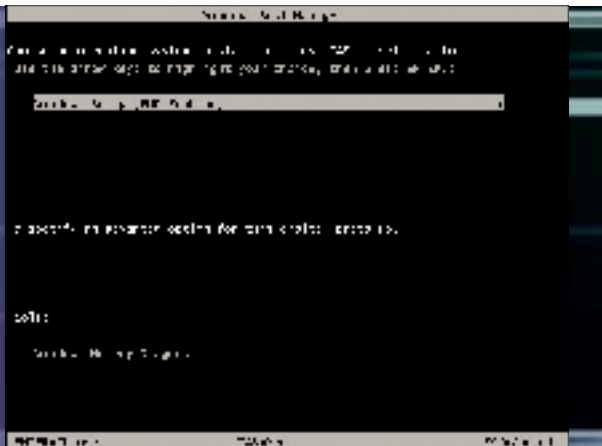
Complain about Vista all you want, but the installation process is exceedingly easy. After launching Setup from the DVD, you can be on the desktop in as few as seven steps.

Most people will be suited by using one single contiguous partition for the OS, so just click next and Vista will format the drive that way.

at the PSU. Open your PC and install your new hard drive in an empty bay and plug it into an open SATA port. Remember, some motherboards use multiple hard drive controllers. You should plug your drive into the ports numbered 0 to 3 (for a total of four) as they are usually the SATA ports native to the chipset. If you use a third-party controller chip, you'll need to have the drivers for it on floppy disc for XP. Vista supports USB and optical devices for drivers, so you can use the CD that came with the mobo or just drop the drivers on a USB key.

Since we're going to copy the files directly over from the old hard drive to the new one, we recommend that you unplug your old drive's SATA and power cable for now so you don't accidentally reinstall Windows over your critical data. Once you've done this, boot the machine and put the OS disc in the optical drive. The optical drive is usually first in the boot order, but if it isn't, go into the BIOS and set it as the first boot device. Some boards let you temporarily alter the boot order by hitting F10, F11, or F12

during boot. If your board doesn't, you'll have to go into the BIOS by hitting DEL or F2 during boot and change the boot order so that your optical drive is first. Finally, disconnect your computer from the Internet.

READY, STEADY, GO!

Let's start with Vista: Hit the space bar during boot and begin installing Windows. Installing Windows Vista is very straightforward. Just enter Windows Setup, enter your product key, select the version of Windows you bought, and hit Next. Accept the terms of the license and continue until Vista asks you what kind of install you want.

Since the new drive is empty, you'll be offered the Custom option to install a clean copy of Windows (Upgrade appears only on a drive with an OS on it). After you click Custom (Advanced) you'll be asked what drive you want to install Windows to. If you're presented with drive letters you can't account for (your single, new drive should be a single Disk 0), the OS is likely recognizing a multiformat memory-card reader as multiple hard drives. Vista does not have issues with this, but Windows XP will sometimes install the OS as the F: drive because of a multiformat card reader. Having Windows XP default as anything but C: causes all kinds of problems and we generally don't recommend it. There is a way to fix it, but it's not pleasant. If this happens, power down, disconnect your card reader, and restart.

After selecting your hard drive, click Next to continue with a standard single-partition install. For most people, a single partition on the drive is fine. If you like to separate partitions for data and apps, select your main drive and click New. Enter the size of the partition you want, click Apply, and continue on with Next.

If you're running a RAID configuration in Vista or need to install special drivers for your controller card, hitting Load Driver will allow you to install the drivers from a floppy, CD, or USB key. After you've pointed the installer at the correct drive, Vista will scan it and present a list of available driver options. Select the driver you need and click Next. Vista will now install the OS to your drive in 30 to 60 minutes. When you come back to the desktop, you'll be asked to enter a user name and password. The only decisions you'll make from this point on are the name of
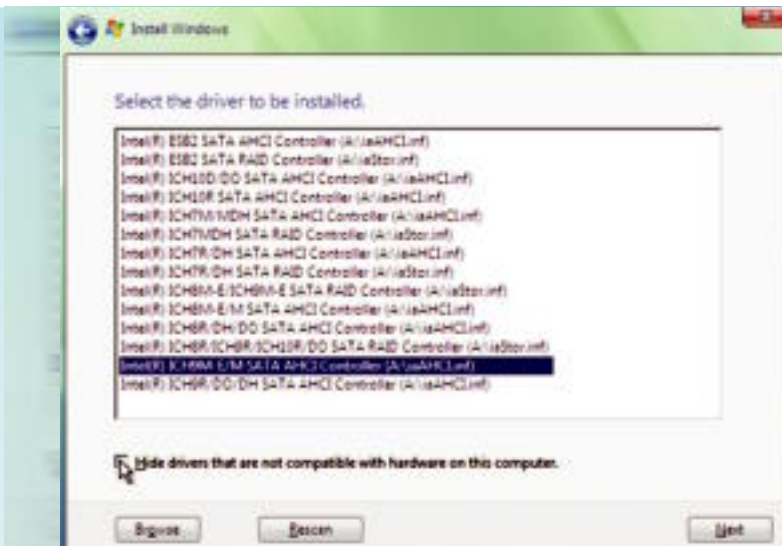
Loading third-party drivers for RAID, SCSI, or other controllers is a snap in Vista and you can finally do it from a USB key!

the PC, the desktop background, the Windows update settings (Recommended Settings is right for most people), and the location setting for the Network: for home, select Home, if you're at work, select Work.

A RAID config on XP is a different story. If you want to install RAID, AHCI, SCSI, or any third-party controller drivers, they can be installed only from a floppy drive, and many XP discs will not support newer USB floppy drives. Even more inane, to install the drivers, you'll need to punch the F6 key within a three-second window just after the installer has started. It's like Dragon's Lair but without the fun; miss the F6-key window and you'll have to reboot and try it again until you hit it just right.

If you have timed it right, you'll see a screen that tells you that the OS cannot determine the type of mass storage controller. Put your floppy with the drivers in, hit the S key, and select the device driver you need. XP will continue to ask you if you need to install additional drivers, but if you're done, just hit the Enter key.

The installer will present you with what drive you want to install the OS on. Unless you need to create multiple partitions, just hit Enter. Windows XP will now give you a choice of a quick format or a full format. The rule of thumb is to do a full format on new drives since the OS will map out any bad sectors on the disc. Quick formats should be done only on drives known to be good. However, a full format on a 1.5TB drive will take hours to run. If you don't like to be told the odds, do a quick format and then perform a chkdsk /r as soon as you have some spare time. Once the format is complete, XP will begin the install. At some inconvenient point, XP will ask you to customize your region settings, enter a user name and password, enter your product key, name the PC, and set the time. You'd think that would be all it needs, but after 20 minutes or so, XP will halt the install and ask you for network settings (select Typical Settings and click Next) and any work group or domain settings (enter these later or just accept the default and move on; you can change these later). Now XP will make you wait another 10 or 15 minutes while it finishes. This stop and go can mostly be avoided by building an automated slipstream disc using nLite (http://tinyurl.com/6d7aed), but honestly, unless you install the OS a lot, it's faster to just deal with the prompts.

INSTALL SERVICE PACKS

You disconnected your PC from the network, right? This is just an optional precaution for Vista, as its firewall is on by default. But, it doesn't hurt to be extra careful, so until you have the latest Service Pack installed, don't connect your rig to the net. Windows XP is far more vulnerable because non–Service Pack builds don't have the firewall on and connecting the machine directly to the Internet will infect a new install almost instantly. We know of people who got caught in an infinite loop of getting infected and not knowing how it happened since each instance was a "clean" install from a factory Windows XP disc. Even if you're on the other side of a router, there's no guarantee that your PC won't be infected by a machine inside the network, so disconnect that XP box.

Once the machine is running, power down and plug your old hard drive back in and boot into the BIOS. Make sure your BIOS is set to boot from your new drive, not your old drive. Now boot

Blink and you may miss the F6 prompt during Windows XP's install for third-party drivers such as RAID, AHCI, or SCSI.
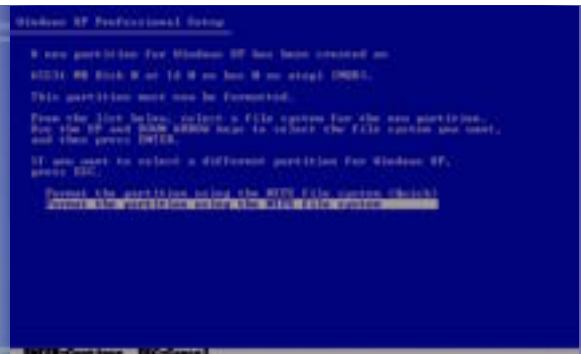
If you are installing Windows XP on a new disk, we recommend that you perform a full format that maps out the bad sectors on the hard drive. If you skip this, you can perform a chkdsk/r at a later point.

into the OS. Find the old drive (it will have a letter other than C:) and install the Service Pack you downloaded. For Windows Vista, Service Pack 1 is the current version. For Windows XP, it's Service Pack 3.

MOVE IN

The first driver you install should be the chipset driver. Next, reboot and install the audio drivers, NIC, SATA, and any other devices your board has. Some of the drivers will require a reboot and should prompt you if they do. Once those are done, move on to your other devices, such as the graphics card, add-in soundcard, and TV tuner. Now connect the machine to the Internet and run Windows Update. You might also need to activate Windows. If Microsoft's server doesn't accept the activation, be prepared to do a phone activation. Now, install the applications you gathered up earlier and do any OS tweaks, such as setting the standby mode, installing your favorite screensaver, changing the desktop background, and arranging the icons just so.

MIGRATE YOUR DATA

Now it's time to move all your data over to the new drive. Open My Computer, find your old drive and start copying your files over. In Windows Vista, the bulk of your user files are located in C:\Users*your user name*. Since your new drive

is so deliciously huge, you can copy the contents of the directory over to your desktop. This will let you go through the folders and conduct a spring cleaning to weed out, say, that 10GB of blurry photos. One thing you can instantly do is move your iTunes directory over, after first installing iTunes on the new hard drive.

Windows XP users can find their iTunes folder on the old drive by looking in C: \Documents and Settings*your user name*\My Documents\My Music\iTunes; Vista users can look in \Users*your user name*\Music\iTunes\. Copy the contents from there to the same place on the new drive.

For Steam games, download the latest version of Steam and install it. In Vista x64, copy over the Steam Apps directory from \Program Files (x86)\Steam\ to the same directory on your clean drive. Relaunch Steam and your games will be ready to play. Windows XP and 32-bit Vista users will find the files in \Program Files\Steam\.

CONSIDER YOUR IMAGE

Once you have your OS installed, patched, and tweaked just the way you like it, you should make an image of it. A disk image of your pristine OS allows you to instantly have a custom reinstall up and running should you experience a catastrophic malware attack or hard disk failure. We like Acronis True Image Home 2009 ($50, www.acronis.com).

If you haven't used disk imaging software in a while, you'll notice that it's changed quite a bit. Disk imaging used to be
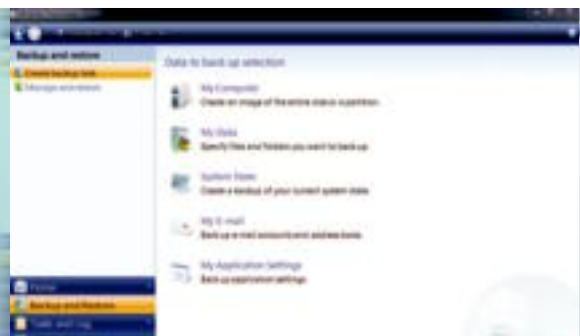
Acronis True Image 2009 is fairly easy to use and lets you make complete images and file backups, including specialized backups of email, the registry, and application settings.

monthly or biweekly basis. File backups can be done weekly or daily depending on your level of paranoia.

SET UP YOUR SAFETY NET

You're no longer at risk of simply losing your old schoolwork when your hard drive craps out. Today, a hard drive failure will wipe out gigabytes of invaluable memories and entertainment. While an external RAID 5 NAS backup drive would provide peace of mind, that's a silly-expensive solution and rather slow. And even pairing a backup drive with your primary drive in RAID 1 isn't the best solution. We like to use a single backup drive equal or near-equal in size to our primary drive along with a disk imaging app—in this case, Acronis True Image. We set the disk imaging app to make a weekly image backup of our primary drive and file backups every other day. We like this configuration because it gives us some fallback that a RAID 1 only doesn't. If you erase something on RAID 1 and realize you need it the next week, it's gone. Or if a virus runs amok on your primary drive, it does so simultaneously on its RAID 1 counterpart. With a disk image and regular backups, you can choose from multiple points in time to recover.

So power down your machine, disconnect your old drive, and put it in a safe place. Install the second new drive, plug it into the port the old drive was in, and power up. Right-click My Computer, click Manage, select Storage, and Windows should ask you to initialize the new disk. Create a partition on the drive and format it. Again, unless you have a need for separate partitions, one single contiguous partition mitigates the drive letter confusion.
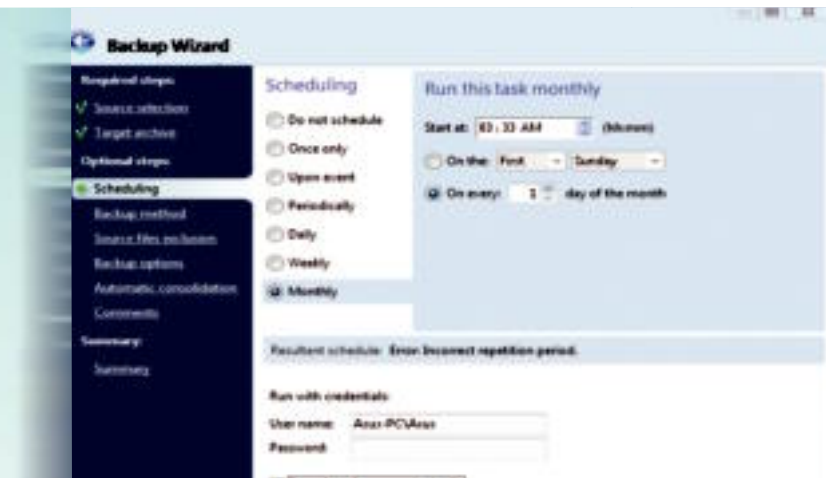
You can set Acronis True Image Home 2009 to make a monthly image of your machine so a restore won't take you back to day one. You can also tell the program to back up your application data and documents on a daily basis.

run only on occasion to create a static image that when used would take your machine back to the very day the image was built. While it would save you the time of dealing with an OS reinstall from scratch, you would have essentially lost months of changes. Today's disk imaging applications not only build an initial static image, but also update the image, so you could, say, restore the PC to the state it was two weeks before the drive went kaput. The apps also now support file backups, so you have two layers of safety: first, a full image that is updated on a

SCHEDULE YOUR BACKUPS

Install True Image Home 2009. (Note: Although Acronis True Image Home 2009 works with RAID, it doesn't work with all RAID configurations. Acronis's True Image Echo Workstation is a better choice for RAID imaging, albeit more expensive.) Launch the program, click Back Up, and select My Computer. Select the C: drive for backup. Click Next and select your target for the archive. Choose the second drive, create a new folder by clicking Create New Folder, name the file, and click OK. In the Scheduling pane, select a backup schedule that works for you—one that doesn't run during the times you use your PC. Enter a user name and password so Acronis can run the backup unattended. Under Backup

Method, select Incremental. Hit Next for the next four tabs and your hard drive will be backed up on the specified schedule.

You should also create a separate image that you keep handy if you do need to roll your machine back to day one status. To do this, go to the opening menu of True Image, select Backup and Restore and My Computer, select your C: drive, and click Next. Select Target archive and put the image in a directory on your second drive. Name the file Day1.tib. Select Schedule and make sure it is set to Do Not Schedule. The window should say "Run this task manually." Click Summary and then Proceed.

You should also now set True Image to make automatic backups of your data. After you select Backup and Restore, select the My Data option. This will let you select the type of data you want to back up and the frequency of the backups. You can run it daily or every other day since the process should be much faster once you've made the initial backup.

And before you finish with Acronis, you should create a boot disk, which, in the event that your drive or OS goes kaput, will allow you to boot the machine in order to access the restore image from your backup drive. Do this by clicking Start > Programs > Acronis True Image Home > Bootable Rescue Media Builder. Select Acronis True Image Home, click Next, and Next again, and select CD-RW. Pop a blank disc in the optical drive and your boot disc will be created.

Congrats. You're done and fully prepared for just about any type of catastrophe.

Restoration Software

Putting your defensive strategy to work

So the worst case scenario happens: Your hard drive dies or you try a Windows "performance" trick and accidently nuke everything on your drive. Not a problem. Grab the True Image Home 2009 rescue disc that you made and drop it into the optical drive. Boot the machine off of the disc. Select Acronis True Home 2009 and click Manage and Restore. Locate the image that you want to restore from your secondary hard drive. If you want the last automated image True Image Home made, select that. If you decide you want to go back to your day one image, point it at that directory.

Select Restore Whole Disks and Partitions and then select the disk you want to restore from the backup image. Since you had only one partition on your original drive, you should be presented with only the C: drive and the MBR and Track 0. Select both. Now select the destination drive where you want the partition to go. If the target drive still has a partition on it (whether infected or corrupted) you'll get a warning message saying so. Just click OK. Click Next until you get to the Summary screen and click Proceed. True Image will proceed with the image restoration and you should be able to boot directly into the OS as it was last backed up. ⏻
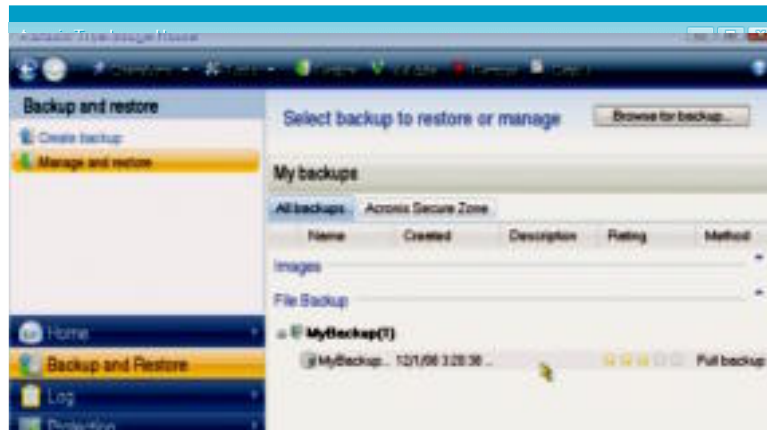
Restoring your image is as easy as popping in the boot CD, selecting the image you want to restore, and waiting for your system to come back to life.
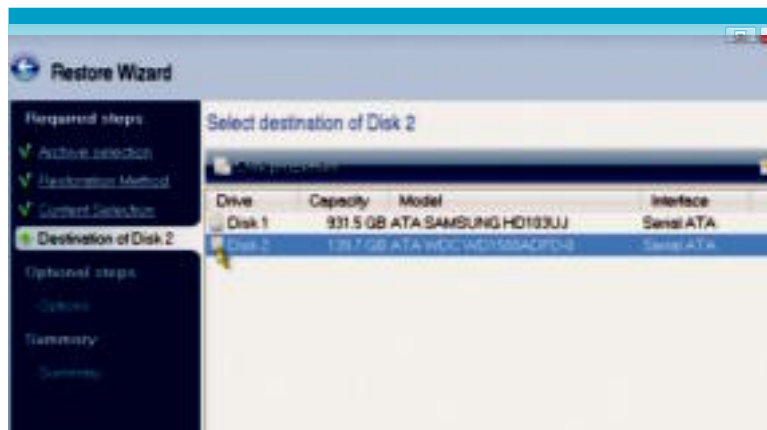
Make sure that you select the correct disk that you want to restore your image to.

MAXIMUM PC
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We present the most intriguing tech products, people, and news of 2008

Years from now, when future geeks muse over the history of PC tech, what will they remember about 2008? That's the question we sought to answer when we compiled this comprehensive technology retrospective of the last year. Make no mistake, identifying and sorting the year's most significant tech events was no easy task. We locked ourselves in a room where we mentally relived the last 12 months, pondering hundreds of items of note and debating the importance of each to find its appropriate rank on our list. Behold the result: our countdown of 100 items representing the most noteworthy events and product releases that shaped the PC computing landscape in 2008. Of course, there are more than just 100 things about this past year worth mentioning. Find our complete list of 250 entries online at http://tinyurl.com/mpc250.

BY THE MAXIMUM PC STAFF
AND PAUL LILLY

100 FREE FULL-FEATURED GAMES Quake Live and Battlefield Heroes betas prove that free games are worth your time.

99 ASUS STRIKER II EXTREME Fast and boldly different from the 790i reference design, the Striker II Extreme will likely mark the zenith of Nvidia's chipsets.

98 KINDLE MAKES A KILLING, ENCORE TO FOLLOW An estimated 240,000-plus Kindle sales can't be ignored; thus, Amazon hatches plans to release a follow-up e-reader.

97 WAL-MART WAVES GOODBYE TO LINUX Lackluster demand forces Wal-Mart to end its four-month, 600-store trial of selling $199 Linux-based Evermax computers (online sales remain).

96 HARDCORE'S REACTOR Oil-immersion computing goes mainstream with the release of the Hardcore Reactor PC.

95 OPENOFFICE 3.0 LAUNCHES WITH IMPROVED DOC SUPPORT The open-source productivity suite steps up its game by implementing filters for Microsoft's XML format, allowing for easy importing of Office 2007's .docx files.

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94 SKULLTRAIL TRAILBLAZES Intel's insane, over-the-top Skulltrail platform gives consumers the ability to have their very own dual-proc, eight-core monster.

93 ICANN VOTES TO ALLOW CUSTOM TOP-LEVEL DOMAINS Following a weeklong meeting in Paris, ICANN, the Internet's nonprofit overseer, loosens its grip on generic top-level domain names.

92 JOHN CARMACK DEEMS DIRECTX 11 UNNECESSARY In a sit-down with us at E3, Carmack admits he doesn't see a need for either DirectX 10 or 11, given the maturity of the DirectX 9 API and the prominence of compatible hardware.

91 HYBRID GRAPHICS HOP ONTO DESKTOPS Rivals ATI and Nvidia both release hybrid graphics solutions enabling users to combine integrated graphics with discrete graphics cards.

90 KODAK DEVELOPS 50MP SENSOR Kodak's new flagship CCD sensor capable of 51.6 million square pixels promptly gives every other digital camera on the market megapixel envy.

89 AT&T FIRST TO SHOVE MICROSOFT'S SURFACE INTO RETAIL STORES AS A SHOPPING TOOL Microsoft's scintillating Surface technology makes its retail debut in select AT&T stores and steals the show from the mobile devices it's intended to help sell.

88 NVIDIA ACTIVATES PHYSX AND CUDA

87 JURY HELPS RAMBUS STICK IT TO MEMORY INDUSTRY A jury rules that Rambus did not commit fraud or engage in anticompetitive practices when obtaining its patents for memory technology.

86 AIRLINES TAKE WI-FI ABOVE THE CLOUDS Gogo provides passengers with the ability to take their forum disputes to the skies by incorporating wireless Internet access on select flights.

85 MICROSOFT SPENDS $300 MILLION ON GRASSROOTS "I'M A PC" CAMPAIGN

84 ADOBE AIR VS. MICROSOFT SILVERLIGHT With rich Internet applications gaining ground, Adobe's AIR sets the stage for a long-term showdown with Microsoft's Silverlight API, despite each one's different approach (runtime vs. browser plugin).

83 LORD BRITISH LAUNCHES INTO SPACE Most know Richard Garriott as the creator of Ultima, but on October 13, 2008, Garriott, aka Lord British, leaves videogames behind for new adventures in outer space.

82 AMD RELEASES PHENOM, RIGHT INTO THE BARGAIN BIN Following Phenom's unspectacular debut, AMD finds itself in the familiar position of battling for the bang/buck crowd.

81 CRYTEK CEO ESTIMATES PIRACY RATE AS HIGH AS 20:1 Piracy continues to plague PC sales, but during an interview, Crytek CEO Cevat Yerli puts a number on the problem, claiming that 15 to 20 PC games are pirated for every one that is sold.

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80 SPORE GOES GOLD Will Wright's magnum opus arrives in stores, making demigods of gamers everywhere.

79 AMAZON ENABLES CELL PHONE SHOPPING WITH TEXTBUYIT

78 GOOGLE DRESSES UP GMAIL WITH GOGGLES, EMOTICONS, AND THEMES Gmail, while still—and perhaps forever—in beta form, receives several delightful new features.

77 COMPUTING TAKES COVER IN THE CLOUD The concept of cloud computing draws increased interest from heavy hitters in the tech industry, including IBM, which invests $300 million to upgrade its infrastructure to offer cloud-based services.

76 SEAGATE BARRACUDA 7200.11 1.5TB HDD A decently fast, stupid-huge 7,200rpm hard drive for less than $200? Sign us up!

75 REALNETWORKS RELEASES, THEN SUED OVER DVD COPYING APP What happens if you release DVD copying software capable of copying DVDs without circumventing the CSS encryption? You go to court anyway.

74 TORRENTSPY SAYS GOODBYE, THEN ORDERED TO PAY $110 MILLION IN DAMAGES TorrentSpy becomes a self-proclaimed martyr when it shuts down rather than log user data.

73 THE PIRATE BAY GROWS TO 10 MILLION USERS Much to the dismay of the RIAA and MPAA, the Pirate Bay's explosive growth yields 10 million peers managing one million torrents.

72 THERMALTAKE DUO ORB Our favorite CPU air cooler eschews the high-rise trend and still outperforms the competition.

71 APPLE BUNDLES A LOAD OF CRAPWARE WITH ITUNES Apple enters the bundled crapware racket by foisting first Safari and then MobileMe on unsuspecting Windows owners using Apple's software update utility, which is included with iTunes.

70 CENTRINO 2 CRUISES ONTO LAPTOPS Intel's long-awaited Centrino 2 platform lands on laptops, bringing with it several improvements in both performance and power management.

69 WINDOWS XP SP3 ARRIVES AFTER ROCKY START XP owners are able to download the OS's third Service Pack, but not before a compatibility issue forces Microsoft to temporarily pull SP3 from the web.

68 PC GAMING ALLIANCE: WHOOP-DE-DO The death of PC gaming continues to be exaggerated, but should the threat become imminent, the PC Gaming Alliance will be there to do nothing about it.

67 CREATIVE GETS CRANKY WITH

X-FI/AUDIGY DRIVER MODDER DANIEL_K Daniel Kawakami's modified X-Fi and Audigy drivers, which fix several issues in Vista, are heralded by all except Creative, which publicly chastises the programmer in a letter on the company's forum.

66 CANON LAUNCHES EOS 5D MARK II DSLR Even without the ability to shoot HD video, Canon's new DSLR kicks all kinds of ass, starting with a full-frame 21.1-megapixel 14-bit CMOS sensor.

72

65 WESTERN DIGITAL VELOCIRAPTOR With no 10,000rpm challengers in sight, Western Digital pummels its own flagship Raptor line by launching the Velociraptor, a speed successor wrapped in a black heatsink.

64 COOLIT FREEZONE ELITE The Freezone Elite thermoelectric CPU cooler strikes a mostly elegant balance between cooling prowess and size.

63 INTEL QUAD-CORE PROCESSORS DROP BELOW $200

62 CREATIVE CREATES WORKING X-FI DRIVERS FOR VISTA USERS Late to the party, sure, but after waiting nearly two years, Creative throws Vista owners a

59

bone with X-Fi drivers re-establishing Dolby Digital and DTS decoding.

61 SUPREME COURT UPHOLDS FIRST FELONY SPAM CONVICTION Not surprisingly, free speech doesn't include using fake email addresses to sell scam products. What is surprising is the close 4-3 vote denying spammer Jeremy Jaynes's appeal.

60 SEVERED UNDERSEA CABLES GIVE RISE TO CONSPIRACY THEORIES The culprit in a rash of ruptured telecommunications cables in the Arabian Sea? Abandoned anchors dragged by inclement weather.

59 INTEL X25-M SSD This notebook-size 80GB drive essentially gives you RAID 0 performance in a single drive.

58 MICROSOFT MASKS VISTA AS A NEW OS IN MOJAVE EXPERIMENT Apparently, Vista's problem is one of perception, or so Microsoft tries to prove by disguising it as a new OS called Mojave and then demoing it to 140 people with no prior Vista experience.

57 PENRYN: HONEY, I SHRANK THE CPU Intel's biggest Core i7 competitor doesn't come from AMD—it comes from Intel's own older, wildly successful 45nm-based Penryn family of CPUs.

56 UBUNTU 8.04 HARDY HERON ARRIVES While both Apple and Microsoft struggle with their operating systems, the open-source wunderkinds at Ubuntu release the best version of Linux yet.

55 GROWING TREND IN GREEN COMPUTING Energy efficiency moves to the forefront of the IT industry, igniting a mass movement among manufactures of everything from green hard drives to green wireless routers.

54 ADOBE CS4 ARRIVES WITH GPU SUPPORT In the "Why the frak didn't someone do this earlier?" department, Adobe's Photoshop CS4 lets you use the GPU to enable smooth-as-butter zooms and rotates in photo editing.

53 LARGE HADRON COLLIDER GOES LIVE AND WORLD SURVIVES Having already dodged a bullet in the Y2K scare, the human race once again cheats death when physicists switch on the LHC without destroying the universe.

52 OPENING CEREMONIES KICK OFF WITH GIANT BSOD AT BEIJING OLYMPICS As Li Ning, one of China's sporting greats, dangles in midair preparing to light the cauldron, behind him onlookers catch a glimpse of an Olympic-size blue screen of death.

51 EU SLAPS MICROSOFT WITH RECORD $1.3 BILLION FINE European Union regulators call Microsoft out on its penchant for straddling the line between healthy competition and unfair business practices with the largest fine ever imposed on an individual company.

50 ATI RADEON 4870 X2
With two R700s packed in a single board and a whopping 2GB of GDDR5 memory, this is the fastest videocard we've ever tested.

49 GOOGLE JUMPS INTO THE BROWSER BATTLE WITH CHROME Looking to shake things up in what has traditionally been a stale two-man fight between Microsoft and Mozilla, Google bursts into the browser scene with Chrome.

48 LENOVO THINKPAD X300 With a 1.2GHz Core 2 Duo, this is the ultimate road-warrior rig for anyone who values substance over style.

47 EVERYONE DISCOVERS TWITTER (EVEN SHAQ!)
According to the latest Nielsen Online statistics, Twitter's year-on-year growth reaches 343 percent, making it the fastest-growing social-networking site.

46 AMD AND NVIDIA SUED FOR PRICE FIXING
A class-action lawsuit accuses rival graphics-chip makers AMD and Nvidia of conspiring to fix prices of their respective GPUs and videocards.

45 MICROSOFT TAKES OFFICE ONLINE WITH OFFICE LIVE WORKSPACE
Microsoft's Office Live Workspace boasts hundreds of thousands of registered users by the time the software giant opens the beta to the public.

44 GIZMODO STAFFER BANNED FROM CES FOLLOWING TV REMOTE PRANK

Using an infrared TV-B-Gone remote, a Gizmodo cameraman plays a practical joke on CES exhibitors by turning off flat-screen displays around the show.

43 IPHONE SOFTWARE 2.0
Apple caves to software developers and lets users create and sell third-party apps with this major update.

42 GOV'T POLICY GIVES U.S. AGENTS RIGHT TO SEIZE AND RETAIN LAPTOPS
The tech community is shocked to learn that U.S. border agents have been granted the power to confiscate documents and electronic devices for an unspecified time frame.

41 PROTESTORS EGG STEVE BALLMER
During a speech at a Hungarian university, the animated CEO is forced to take cover behind a desk to avoid being hit by a barrage of eggs.

40 INSTANT-ON TECH GAINS TRACTION
DeviceVM's Splashtop instant-on software finds its way onto several notebooks, allowing users to hop online within seconds instead of waiting for Windows to load.

39 JACK THOMPSON, OUTSPOKEN ANTI-VIDEOGAME LAWYER, PERMANENTLY DISBARRED

38 INTEL LAUNCHES ATOM PROCESSOR, IT DOESN'T BOMB Essentially a dumbed-down version of Intel's more powerful desktop chips, the company's Atom processor is every

48

bit as significant and helps low-power PCs explode in popularity.

37 NETFLIX EXPANDS STREAMING SERVICE IN A BIG WAY In an aggressive campaign to attract new customers, Netflix makes its streaming service compatible with several devices, including Microsoft's Xbox 360 console and TiVo.

36 MICROSOFT ADMITS THAT VISTA UAC IS INTENTIONALLY ANNOYING
Speaking at an RSA Conference in San Francisco, Microsoft Program Manager David Cross tells listeners that Vista's UAC was designed to annoy users.

35 INTEL X58 CHIPSET
We've been sick of the hard partition between CrossFire and SLI motherboards for some time; X58 finally fixes that.

34 YAHOO DODGES MICROSOFT'S TAKE-OVER ATTEMPT In an open letter, Steve Ballmer threatens Yahoo with a hostile takeover if it doesn't accept Microsoft's unsolicited bid, but Microsoft's interest wanes over time.

33 MICROSOFT ANSWERS APPLE WITH TONGUE-IN-CHEEK AD CAMPAIGN
Jerry Seinfeld and Bill Gates star in Microsoft's first round of long-overdue ads aimed at debunking boring PC stereotypes (and promoting delicious churros).

32 ACTIVISION + VIVENDI = ACTIVISION BLIZZARD
Originally announced in late 2007, the game-company merger that would create Activision Blizzard finalizes in July 2008 for just shy of $19 billion.

31 USB 3.0 SPEC COMPLETED SuperSpeed will deliver 5Gb/s data transfers when it goes live next year.

30 DDR3 IS HERE, GET USED TO IT The heir to the RAM throne benefits from a perfect storm of Core i7's tri-channel config, reasonable prices, and AMD's DDR3 Phenoms this year.

30

29 MICROSOFT EXTENDS XP SALES UNTIL 2010
Despite repeated attempts to kill off Windows XP, strong customer feedback convinces Microsoft to issue a stay of execution until 2010.

35

28 GATEWAY STUNS WITH AFFORDABLE HIGH-END GAMING NOTEBOOK Geeks get their game on with Gateway's P-7811FX notebook, a sub-$1,500 powerhouse that pummels the competition.

27 NVIDIA RELEASES GT 200 SERIES For raw single-GPU performance, you just can't beat Nvidia's GT200 GPU, which powers the GeForce GTX 260 and 280 cards.

26 LEFT 4 DEAD REDEFINES CO-OP Valve's vision of the zombie apocalypse redefines the cooperative multiplayer experience.

25 GAMING COMMUNITY DECRIES SPORE'S DRM Electronic Arts saddles Will Wright's Spore with a modified version of SecuROM, sparking a backlash from angry gamers.

24 GOOGLE'S OPEN-SOURCE ANDROID OS DEBUTS T-Mobile and handset-maker HTC partner up to release the first mobile phone built around Google's Android platform.

23 INTEL MOTHERBOARDS FINALLY SHIP WITH SLI SUPPORT

22 NVIDIA SUED OVER BAD NOTEBOOK GPUS A shareholder hits Nvidia with a class-action lawsuit over faulty notebook GPUs that the graphics-chip maker admits suffer from an "abnormal failure rate."

21 SEAGATE LAUNCHES WORLD'S FIRST 1.5TB DESKTOP DRIVE Seagate's 1.5TB hard drive not only offers the most storage space of any desktop drive on the planet but also qualifies as the largest capacity increase ever.

20 AMD SPLITS INTO SEPARATE DESIGN AND MANUFACTURING COMPANIES Tough times call for drastic measures, and for AMD, that means splitting into two companies so that one can focus entirely on chip design while the other takes on the more expensive role of manufacturing.

19 FANTASY BUFFS MOURN THE PASSING OF D&D CO-CREATOR GARY GYGAX

18 MICROSOFT NAMES, DATES, AND DEMOS WINDOWS 7 Details regarding Microsoft's next OS, Windows 7, pour out of Redmond, revealing everything from what changes Vista owners should expect to how MS came up with the name.

17 EVERYONE GETS RICK-ROLLED, EVEN THE NEW YORK METS New York Mets fans are forced to listen to "Never Gonna Give You Up" after various web communities vote to have the 1987 hit single played at Shea Stadium. Also hit: the Macy's Thanksgiving Day parade

16 MICROSOFT POINTS FINGER AT NVIDIA FOR POOR PERCEPTION OF VISTA Despite Microsoft's public ballyhooing over Vista's sales numbers, consumers view the OS as crash prone, a perception the software giant blames on buggy Nvidia drivers.

15 RIAA WINS $222,000 JUDGMENT—THEN LOSES IT A jury finds Jammie Thomas guilty of copyright infringement and orders her to pay $222,000 in associated penalties before the case is later declared a mistrial.
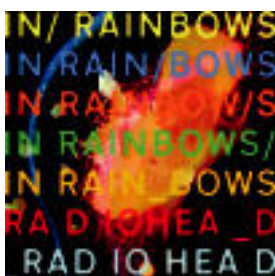
14 RADIOHEAD ASKS FANS TO PAY WHAT THEY WANT FOR ALBUM

13 VERIZON WIRELESS WINS LION'S SHARE OF 700MHZ SPECTRUM Verizon Wireless posts the winning bid for the coveted 22MHz band of spectrum known as the C-block in the FCC's 700MHz auction.

12 HULU'S LAUNCH A HUGE SUCCESS Met with skepticism before its public launch, Hulu—an NBC Universal and News Corp joint enterprise—gets the last laugh as the online video service becomes an instant hit.

11 BILL GATES RETIRES. WELL, SORT OF At just 52 years old, Bill Gates completes his transition into semi-retirement, trading in his daily responsibilities for a cozy position as company chairman and the early-bird buffet.

10 COMCAST AND AT&T CAP BANDWIDTH Comcast makes Internet waves by imposing a 250GB bandwidth cap on its broadband customers, followed by AT&T's experiments with limits based on the service level.

9 BLU-RAY BEATS HD DVD, NOBODY CARES No one anticipated that the high-definition format war would end as abruptly as it did, but as more and more studios jump aboard the Blu-ray bandwagon, Toshiba is left with no choice but to abandon the HD DVD format.

8 MOZILLA RELEASES FIREFOX 3 AND GRABS MORE MARKET SHARE Mere months before celebrating Firefox's fourth birthday, Mozilla launches version 3.0 of its open-source browser and also celebrates a record number of downloads.

7 EEE PC'S SMALL FOOTPRINT A BIG STEP FOR PORTABLE COMPUTING Technically, Asus didn't create the term netbook, but it might as well have, as the company's Eee PC becomes the face of the fad.

6 STORAGE BECOMES STUPID-CHEAP At roughly a dime per gigabyte, the Tera Era enters full swing, making the recycle bin nearly obsolete.

Photo thanks to batmoo www.tinyurl/5smskw

5 VISTA SP1 ARRIVES AND FIXES A BROKEN OS

Vista users fed up with slow file transfers and lackluster performance celebrate the OS's first Service Pack and its many fixes. Much more than just a series of security plugs, SP1 offers speed gains in everything from browsing network file shares to manipulating zipped files, and so much more. Even the photo screensaver is snappier. For the first time since its release, Vista isn't all that bad.
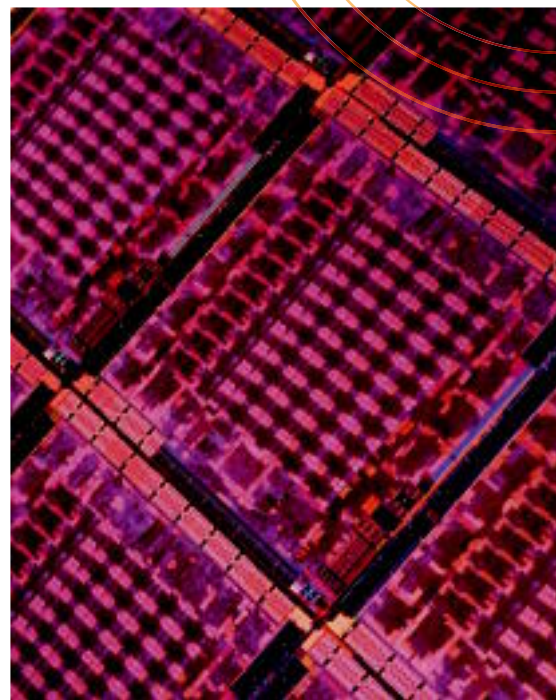
4 DEATH KNELL RINGS FOR DRM

After suffering through years of music tethered to annoying DRM schemes, consumers (and the voice of reason) finally win out as DRM-free downloads become the norm and not the exception. DRM isn't completely obliterated, but it becomes clear that the days of restricted music are at an end when Sony BMG, the last major holdout, embraces MP3s free of shackles, just as God intended them to be.

3 SOLID STATE DRIVES STORM THE MAINSTREAM

As prices for NAND memory continue to fall, storage manufacturers seize the situation by moving solid state drives from a high-priced niche category to an affordable storage alternative. Surprisingly, it's OCZ and Super Talent that lead the initial charge with low-price offerings. The price-to-performance ratio still keeps SSDs from supplanting hard drives by and large, but SSDs find a home in low-power netbooks and notebooks.

2 ATI R700 GPU

It's rare that we heap hearty praise on a chip that's actually slower than the competition, but ATI's R700, which powers the Radeon 4000 series, deserves accolades for focusing on efficiency first, then performance. By stepping back from the power-consumption brink, ATI delivers a lustworthy GPU that kicks ass in single- and multi-GPU configurations, without requiring a crazy 1400W PSU.

1 CORE I7 KILLS ALL OTHERS

Born from a weekend fling between a Core 2 Quad and an Athlon 64, Intel's Core i7 inherits the best attributes of its parents to become the most badass CPU on the planet. With an on-die memory controller, chip-to-chip interconnect, tri-channel DDR3, individual core Turbo mode, instructions to aid supercomputing tasks, and Hyper-Threading, the Core i7 instantly makes all previous desktop CPUs obsolete and girlie-men all at once. ⏻

Greatest Geek JOBS

Interstellar Tech Support

Jon Britton holds the key(board) to space travel with enough awesome computing power to simulate entire galaxies

BY NORMAN CHAN

Space may be the final frontier, but so far it's an exclusive destination reserved for only a few astronauts and billionaire space tourists such as game developer Richard Garriott. For the rest of us, the closest we'll ever get to touching the stars is a visit to the local planetarium. Fortunately, that experience is closer than ever to the real thing thanks to amazing advances in modern planetarium technology. Star balls and laser-based optical projectors seem archaic when compared to the fully digital projection systems that harness the muscle of computer clusters to render 3D images. Jon Britton, the senior system engineer at San Francisco's Morrison Planetarium, is one of the talented people bootstrapping planetarium technology into the digital age.

With a background in computer science and virtual systems engineering, Jon joined the staff at the new California Academy of Sciences to lead the engineering team responsible for wiring the entire building. Not an easy task when the facility is a single structure housing dozens of complicated exhibits, including an aquarium, a self-contained rainforest, and one of the largest—and most technologically advanced—planetariums in the world. Jon and his team designed a system of three computing clusters that each channel gigabits of visual data through a high-speed network to a set of six $20,000 Projection Design projectors that combine their images to simulate one massive display. And as impressive as

NO PLACE LIKE DOME The Morrison Planetarium's 90-foot-diameter dome is the most imposing structure inside the California Academy of Sciences. In keeping with the building's green design, the dome's structural frame is made of 100-percent recycled steel. Even when looking to the stars, the Academy is thinking about Earth.

the computing hardware is, what's more remarkable is how seamlessly this complicated setup works to produce a breathtaking show.

Currently, visitors to Morrison Planetarium enjoy a presentation called *Fragile Planet*, which runs on one of the computing clusters using Global Immersion software. The 25-minute show was written, scripted, scored, and digitally modeled in-house by film industry veterans and lifts viewers out of their seats on an exploratory journey through our solar system and beyond. The planetarium's domed display fills your entire peripheral vision—an effect so encompassing that you really feel as though you're soaring over the landscape of Mars or warping across the Milky Way.

A second computing cluster—consisting of seven HP XW8600 workstations, each running a dual-core Xeon processor and an Nvidia Quadro FX5600 videocard—powers real-time Uniview software, the platform on which presentations such as *Fragile Planet* can be scripted, pre-visualized, recorded, and even played back in real time with OpenGL, like a secret director's cut edition of Spore. All the high-definition video is channeled through dual-link DVI cables into a Black Diamond DVI
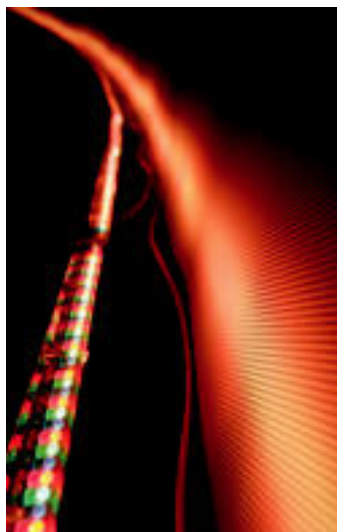
HALO EFFECT A ring composed of thousands of LEDs encircles the base of the dome's interior, providing ambient lighting of any desired color. The dome's surface is made of special reflective nanoseam panels, which blend together to look like one giant screen from a distance.

AN ARCHITECTURAL MARVEL Completed after nearly a decade of work (and $500 million), the Academy building is an achievement in both design and technology, fusing its unique form with the heady exhibits housed within. The living roof, for example, is a 2.5 acre parkland that is home to 1.7 million native plants.

TAKING THE HELM Nested at the rear of the theater is a dimly lit control room where a program operator can control the planetarium's three visual presentation systems. In addition to a traditional, highly detailed star map, presenters can activate the pre-scripted *Fragile Planet* movie or dive into a fully interactive 3D simulation of the galaxy rendered in real time. Soaring through the stars doesn't require dizzying cosmonaut training—it's made easy with Xbox 360 controls!

BETTER THAN IMAX Six DLP projectors unite to project a seamless 3600x3600-pixel digital image onto the 75-foot dome. Unlike traditional planetariums, this theater is tilted at 30 degrees and features stadium seating so each member of the 300-person audience has an unobstructed view of the show. The screen's concave curvature even gives a convincing illusion of depth to increase the sense of realism.

matrix, and the systems are remotely controlled with a fiber-optic-based KVM.

But the job doesn't just end after all the cables are connected and the computers are up and running. Jon is busy at work with innovations like tweaking the software to run on iPhones so program presenters can pilot the show on the fly while fielding questions from the audience. And for hardware upgrades, he is looking forward to swapping out the existing projectors for ones that'll output in 4K resolution—that's 4096x2160 *each*. Consider us officially jealous. ⏻

Do you or someone you know have a great geek job? Drop us a line at comments@maximumpc.com.

BRAINS OF THE OPERATION Three clusters of seven computers each render and feed high-definition video to projectors using a DVI matrix.

MIRROR, MIRROR Several of the projectors bounce light onto carefully aligned mirrors to cast their images on the screen. These 1920x1200 professional-grade projectors also have custom-made frames attached to their lenses to create the appropriate aspect ratio for their images to overlap perfectly.
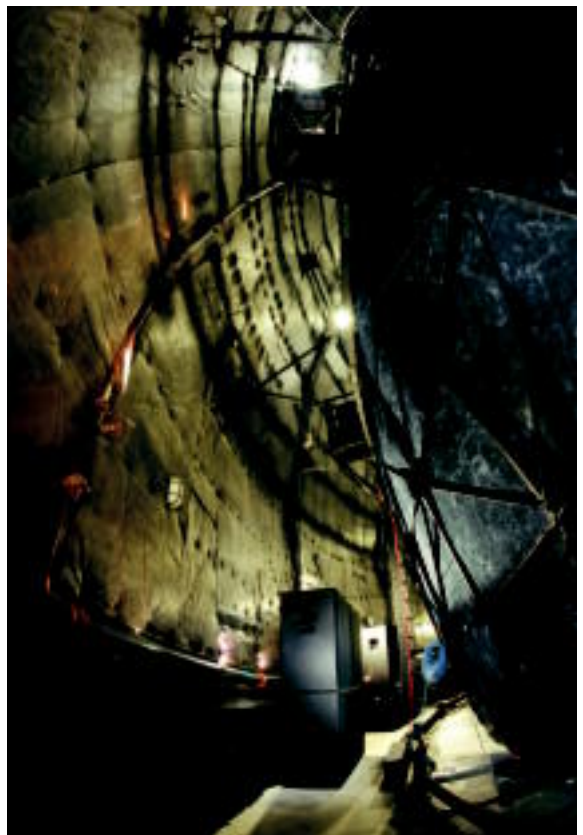
SPACE BETWEEN THE WALLS Exploring space is more than just a visual experience. An imposing set of monolithic subwoofers and an array of Meyer Sound speakers hide backstage to provide the thundering sound effects and Sigourney Weaver's narration for the show.

WHITE PAPER

Solid State Drives

They're faster and more durable than traditional hard drives and use much less power. Here's why they're the future of personal computing —NATHAN EDWARDS

In the past year and a half, solid state drives have come from nowhere to take their place as the Next Big Thing in storage, especially in notebooks. The MacBook Air and the Asus Eee PC and OLPC XO-1 (One Laptop Per Child) netbooks were among the first consumer notebooks to utilize solid state drives. While SSDs are still most popular in netbooks, they have begun appearing in more mainstream notebooks and even high-end desktops.
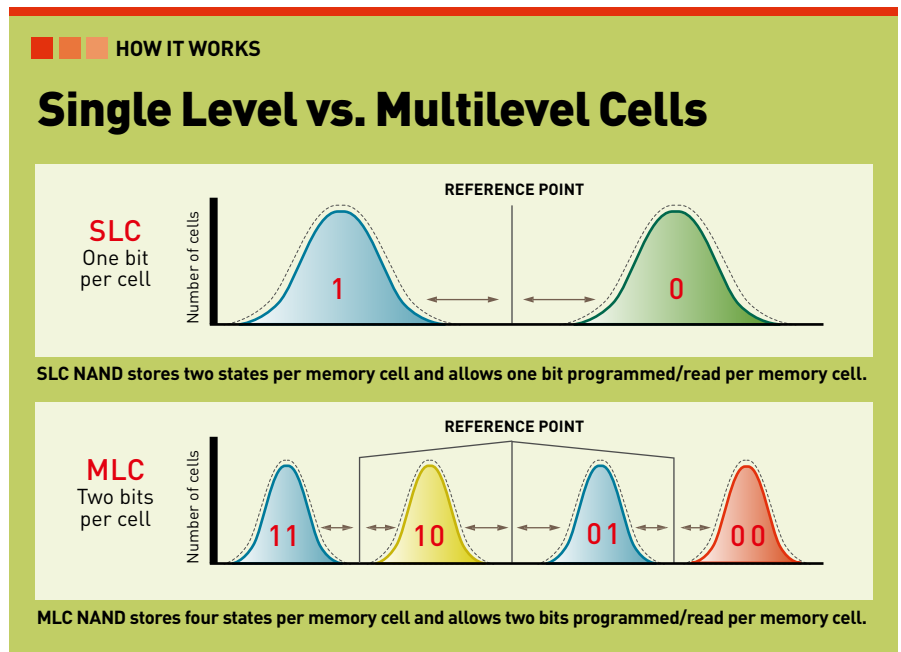
SSDs have much higher read speeds than traditional drives, and with no moving parts, they're more durable. They're not susceptible to magnetic interference or vibration, and they use less power and run much more quietly than standard magnetic hard drives. Best of all, they come in standard 3.5-inch and 2.5-inch formfactors with SATA connectors and emulate traditional drives, so they're compatible with existing architecture. Unfortunately, they're also orders of magnitude more expensive per megabyte, thus limiting widespread adoption, at least for now.

Although the fastest solid state drives use DRAM for storage (with a battery backup to preserve data), this White Paper will focus on flash-based SSDs—the variety most commonly found in consumer gear.

ARCHITECTURE

As the name implies, a solid state drive's first point of departure from a standard hard drive is that it has no moving parts. A mechanical hard drive uses a magnetic read/write head over rapidly spinning platters, like a super-high-speed record player, while a solid state drive writes data to NAND flash memory, similar to that used in other flash-based storage, such as memory cards and USB thumb drives.

While magnetic hard drives are marvels of modern engineering, solid state drives

HOW IT WORKS

Single Level vs. Multilevel Cells

SLC One bit per cell

SLC NAND stores two states per memory cell and allows one bit programmed/read per memory cell.

MLC Two bits per cell

MLC NAND stores four states per memory cell and allows two bits programmed/read per memory cell.

Single-level cells store one bit of data per cell; multilevel cells store two bits but are more susceptible to errors.

are much simpler—they are composed of just a SATA interface, a controller that emulates a hard drive and allocates reads/writes, and a collection of NAND flash modules that data is stored on. Since NAND modules don't need to wait for a drive head to find the appropriate data sector on a moving platter to read data, their random-access times are extremely fast, as are their

AS MORE MANUFACTURERS GET INTO THE SSD GAME, PRICES CONTINUE TO GO DOWN.

read times. And because they're solid state, they neatly sidestep many of the failure points of traditional drives: Vibration, dust, magnets, and jarring are all potentially

damaging to the read/write head and platters in a magnetic drive, but do not affect flash memory.

Flash-based SSDs come in two flavors: single-level cell (SLC) and multilevel cell (MLC). SLCs store one bit of data per cell, while MLCs store two bits per cell. SLCs are faster, provide less storage, and last longer. MLCs are cheaper and store more data, thus achieving better density rates, but they are susceptible to higher error rates and slower read/write times. Most cheap SSDs, especially those used in netbooks such as the Asus Eee PC, use MLCs for cost reasons, while performance SSDs use SLCs.

For an inside look at an SSD, check out last month's Autopsy. For more on NAND flash memory, see the October 2007 White Paper (http://tinyurl.com/5kke3p).

DISADVANTAGES

Despite their many advantages over traditional hard drives, current-generation solid state drives have several drawbacks. Flash memory is still much more expensive than magnetic media, though as more manufacturers get into the SSD game, prices continue to go down. The average capacity of SSDs is much smaller than that of standard drives—the largest consumer HDDs on the market currently are 1.5TB; the largest SSDs are 256GB. Write times are still slower than those of top-end magnetic drives, because in order to write to NAND memory, the entire block of memory the data is being written to needs to be erased and rewritten.

Finally, flash memory cells are rated for a finite number of read/write cycles: around 10,000 for MLCs and 100,000 for SLCs, so SSDs have a limited life span. Fortunately, solid state drives include a wear-leveling algorithm to distribute read/write cycles over the entire drive evenly. When a solid state drive reaches its cycle limit, it doesn't crash; the drive just stops allowing writes and becomes read-only, so you can still access your data, unlike a standard hard drive failure.

An SSD's life span might sound bad, but take heart. No long-term studies on the life spans of consumer SSDs exist, but even an MLC drive should last at least five years with near-constant usage, about the average life span of a magnetic hard drive. Single-level-cell SSDs should last much longer—decades, hopefully.
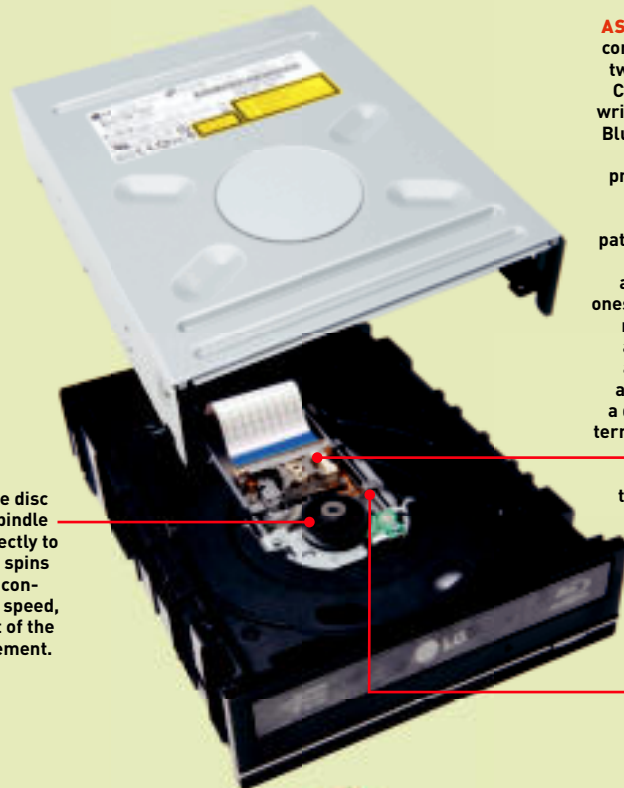
THE FUTURE

In November 2008, SanDisk announced a system called ExtremeFFS that it claims will make random write speeds 100 times faster. It does this by keeping a number of small memory blocks that are marked for deletion actually erased. By making sure there are always small empty blocks to write to, ExtremeFFS ensures much speedier random writes. Since Windows makes lots of random writes in the course of its normal operation, this should increase overall system performance.

In the next few years, all major hard drive manufacturers will begin offering SSDs, and so will many flash-memory manufacturers. Drive capacity will increase and costs will decrease following roughly the same exponential pattern that standard storage has for years. And as the technology matures and SSDs become more prevalent, expect even wilder innovations. We wouldn't be surprised if SSDs become nearly ubiquitous by 2014. ⏻

LG GBW-H20L Blu-ray Burner

Ever wonder about the gears and levers at work beneath the hood of a Blu-ray drive? We dismantle our favorite 6x burner, for an in-depth look.

LASER PICKUP ASSEMBLY A small compartment holds two lasers, one for CD/DVD reads and writes, the other for Blu-ray. For writes, the laser burns precise portions of the underside of a disc, creating a pattern of reflective and unreflective areas that map to ones and zeroes. For reads, the beams are modulated to a lesser strength and simply reflect a disc's digital patterns onto an optical sensor, which conveys that info to a processor for playback.

SPINDLE The disc sits atop a spindle attached directly to a motor that spins the disc at a constant rate of speed, independent of the laser's movement.

SCREW DRIVE Underneath the laser pickup assembly is a screw drive that causes the sensor apparatus to travel from the inner to the outer edges of a spinning disc along two lubricated rails.
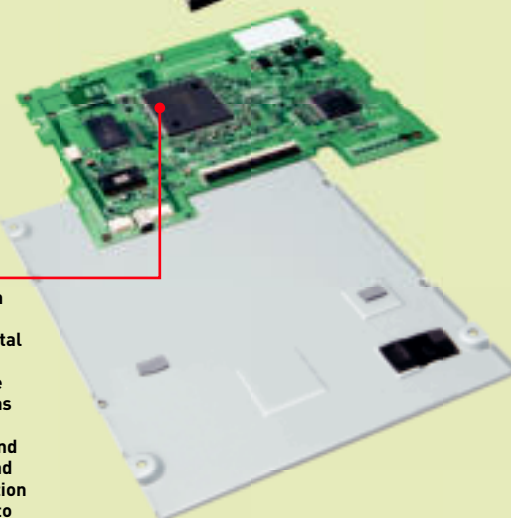
DIGITAL SIGNAL PROCESSOR Much like the CPU in a computer, the digital signal processor is the brains of the operation. It acts as a conduit between the optical drive and the PC, sending and receiving information as data is written to and read from a disc.

HOW TO
Mash Up Your Music

Hearing top rock, hip-hop, country, and pop artists jam together on a tune may sound like a clash of genres and egos, but anything is possible when you don the producer's cap —KRIS FONG

TIME = 120 MIN

WHAT YOU NEED

- **MUSIC, DIGITAL FILES OR CDs**

- **AUDACITY 1.3.6**
  Free, http://audacity.sourceforge.net

- **HEADPHONES OR DECENT SPEAKERS**
  (Not your laptop speakers)

- **NCH SOFTWARE SWITCH FOR WMA FILE CONVERSION**
  (Optional)

- **APPLE ITUNES OR OTHER CD RIPPER**
  (Optional) Free, www.apple.com

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

Radiohead jamming with Kanye West would be an odd pairing on any stage, but in the world of mashups—where the vocals of one song are folded into another—the weirder the combination, the bigger the bragging rights. While the RIAA is determined to put an end to the art form, many artists are releasing a cappellas (vocal-only tracks) and stems (individual tracks of a mix) to support the creative movement. And you can be part of it too.

Pros often look to Sony ACID Pro ($315, www.sonycreativesoftware.com) or Ableton Live ($600, www.ableton.com) to mash up music, but you can do it on the cheap with Audacity, an open source audio-editing app, and your own music. We'll show you some basic techniques—you just need to find two tracks to work with. Find songs in the same key (like Chris Brown's "Kiss Kiss" and Puddle of Mudd's "Blurry") or ones that have a similar groove and chord progression (such as Jet's "Are You Gonna Be My Girl" and Iggy Pop's "Lust for Life"). Or Google "a cappella download" to find vocal track downloads (for personal use only) and choose a song in your music collection to pair it with. We always thought 4 Non Blondes's "What's Up?" sounded just like Bobby McFerrin's "Don't Worry, Be Happy," so for simplicity's sake we'll use these songs for our example.

CONVERT YOUR FILES

1 While Audacity plays nice with WAV, AIFF, MP3, and Ogg Vorbis files, it doesn't do WMA (Windows Media Audio), AAC (iTunes), or copy-protected audio file formats, so you may need to convert files before you start mashing (if not, skip to step 2). If your song resides on a CD, copy it to your computer as a WAV or AIFF file, using iTunes or any other CD-ripping software. If you have nonprotected WMA files, NCH Software's Switch is a free utility that'll convert them into WAV or AIFF. Likewise, you can use iTunes to convert nonprotected or CD-ripped AAC files (M4A) into WAV or AIFF files. However, if you purchased your song through the iTunes Store, you can't convert copy-protected AAC files (M4P)—sure, it's easy to burn protected songs to a CD and then reimport them, but you're not going to read about how to do that here. Nope. No-sir-ee Bob….

PUT TOGETHER A PROJECT

2 Launch Audacity, choose File > Import > Audio, select your main song file (the one that'll serve as the crux of your composition; for us, it's the 4 Non Blondes tune), and click Open. Your song will appear as two (stereo) audio waveforms in track 1. Next, choose Tracks > Add New > Stereo Track twice to add two blank stereo tracks (tracks 2 and 3); these will serve as your composition palettes as you piece together your mashup. Finally, choose File > Import > Audio, select your secondary song (our McFerrin tune), and click Open to add it to track 4. Then choose File > Save Project. If you press Play (the green arrow button at the top of the window), you'll basically hear a raw mashup (or more like a munch up) of your music. This probably ain't gonna sound good; the songs may be in different keys, the tempos won't match, and the parts you want to align are not going to line up from the get-go. Time to do some fixin'….

FIT A PITCH

3 Next, you'll need to change your second song's pitch to fit with the first's. Audacity's Change Pitch processor lets you transpose a song's pitch/key without affecting its tempo. So how do you determine how much pitch shifting is necessary? If you're musically inclined, determine each key by jamming along on your guitar or synth. You can also try searching for sheet music for your songs (try www.musicnotes.com) to find the key. Or figure it out by trial and error. Click the left panel of track 4 (your secondary song) to select the entire track and choose Effect > Pitch and Tempo > Change Pitch. If you know what keys your songs are in, choose the appropriate ones from the From and To pop-up menus, select which direction to transpose the pitch—Up or Down—and click OK. If you're winging it, focus on the Semitones (half-steps) field. Enter a positive (transpose up) or negative (transpose down) whole number and click OK; 12 semitones equals one octave, so try numbers from ±1 to ±11 (the larger the number, the bigger the pitch change—if your songs have too much pitch disparity, the vocal could sound bad). Press Play or the space bar to check your work; if you need to try again, press Control-Z to undo and then repeat this step.

■ ■ ■ **BEST OF THE BEST**

Learn from the Mashup Masters

The best mashups feature contrasting genres, a few surprises, and flawless song weaving. For inspiration, take a listen to mixes from these mashup masters. Party Ben's (www.partyben.com) "Boulevard of Broken Songs v2" (Green Day meets Oasis, Travis, and Aerosmith) is one of our favorites, but "Single Ladies (In Mayberry)," which pits Beyonce against the *Andy Griffith* theme, makes us smile.

Mark Vidler (www.gohomeproductions.co.uk) is best known for his "Rapture Riders" mashup (Blondie vs. the Doors); we also like "Paranoid Rock" (Queen vs. Black Sabbath).

DJ Zebra (www.dj-zebra.com) is French, as is the copy on his website, but click Productions and you can check out his work, including "Suck My Kelis" (RHCP vs. Kelis) and "Come Closer" (the Beatles vs. NIN).

CHECK THE TIME

4 Most likely, your two songs won't have the same tempo, but they don't need to be completely in time with each other—just on the parts you want to work with. Audacity lets you change a song's tempo without affecting its pitch, so you won't have to worry about your singer sounding like the Chipmunks… or Tay Zonday. With track 4 selected, choose Effect > Pitch and Tempo > Change Tempo. If you don't know the BPM (beats per minute) of your songs (see the Quick Tip), you'll have to wing it; in the dialog box, use the Percent Change slider to either slow down (slide left) or speed up (slide right) the tempo. The more you slide, the more you'll affect the timing, so gauge your songs and prepare for some trial and error. Click OK to make the change and check your work. If things don't line up very well, undo your deed and try again.
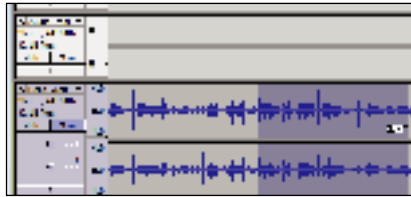
SAMPLE YOUR SONG

5 You'll now sample the vocal parts in your second song that you want to pair with the first song; since our songs share the same chord progression almost throughout the song, we're going to alternate the vocals in the verses. Click the Solo button on track 4 so you hear only that track and then click the Zoom In tool repeatedly to see more waveform detail. Next, select the Selection tool, drag it across either waveform where you think your desired vocal part starts and ends, and press the space bar to hear your guesswork. To get those start and end points exact, hover the Selection tool over the left side (start point) of your selection until it turns into a pointing finger, click and drag to the left or right to reset the start point, and press the space bar to hear your progress. Once you nail the exact start point, do the same to the right side of your selection to reset the end point. Then copy your selection (Control-C), click track 3 at the point where you want this sample to begin, and paste (Control-V). Repeat for any other desired parts.
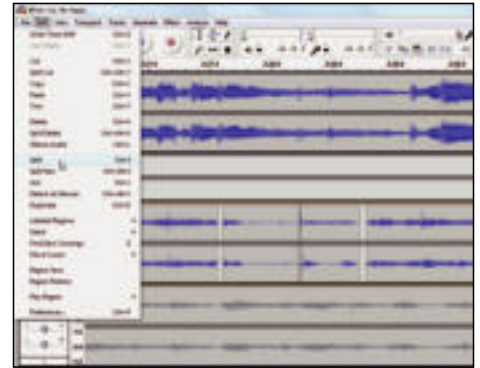
PLACE AND PACE PARTS

6 To move things into the proper place, click Solo on track 4 to unsolo the track and then click Mute. With the Selection tool, click the area before any vocal snippet in track 3 and press the space bar to start playback from that point; listen to how the new vocal sits on top of your core song. To move the region, select the Time Shift tool and drag the region until it starts exactly where you want it. If the timing is a bit off, use Change Tempo on just that region to fine-tune it. If you want to get a little funky with the vocal delivery, do a little slice-and-slide to change up the pace; take a listen to the vocal and pay attention to its waveform peaks, which represent percussive attacks (such as vocal utterances, drum hits, and guitar strums). Zoom in and locate the words and associated peaks that fall off the beat. Then click the wave directly before the peak, choose Edit > Split, select the Time Shift tool, and nudge the right side split a tad to the right to pace it later in time.

■ ■ ■ **DOS AND DON'TS**

Tips for Budding Mixmasters

- **Find songs with long intros, solo breaks, or a cappella passages, as these offer the greatest mashup opportunities.**
- **Avoid choosing songs that vary greatly in key, as too much pitch shifting can make vocals sound horrible.**
- **Use EQ and volume levels to bring more clarity to the parts you want to emphasize, tone down the stuff you don't, and balance things together.**
- **Don't focus on just the vocals; you can create some interesting mixes by layering instrumental parts together.**
- **The age-old K.I.S.S. (Keep It Simple Stupid) rule applies—toss in too many melody lines at once and your music will lose focus.**
- **Experiment and have fun! There is no right or wrong way to mash up songs, as long as it sounds good to you.**

SWITCH UP THE STRUCTURE

7 To prevent your sampled vocals from clashing with the original, you may want to replace sections of your first song with an instrumental version taken from a different section (such as an intro or instrumental break). First, solo track 1, use the Selection tool to select the section you want to replace, leaving a little extra behind on the start and end points for blending, and choose Edit > Split Delete to delete it (or select Edit > Split New to preserve the unwanted selection in a new track, which you can use as a scrap bin). Then select the replacement section, taking a little extra beyond the start and end points for blending, and copy and paste this into track 2 below the hole in your timeline. Unsolo track 1, mute tracks 3 and 4 so that only tracks 1 and 2 are enabled, and play back your work. Move the region if needed so that it syncs up with the song. To make the edit less noticeable, apply a little fade-in/fade-out to your overlapping edit points. Select the end point overage in track 1 and choose Effect > Utility > Fade Out, then select the start point overage in track 2 and choose Effect > Utility > Fade In. Now click anywhere before the edit point and press the space bar to check it. Do the same for the ending edit, except fade in the track 1 restart point and fade out the track 2 region ending.
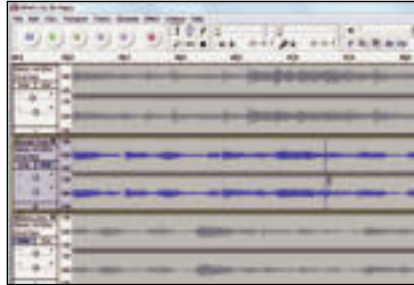
CLEAN UP AND BLEND PARTS

8 Finally, do some cleanup to reduce or remove any extraneous instrumentation in your mashed-in vocal parts and blend everything together. While it's almost impossible to isolate a vocal completely from its instrumental accompaniment, there are things you can do. Try using the EQ to turn down the frequencies outside the vocal range—solo the track, select the region, choose Effect > Filter > Equalization, select the Graphic EQ button, notch down some frequency sliders, and click Preview to hear your progress. However, depending on the instrumentation, this might not be very effective. Another way to do this is to remove the instrumentation between each vocal utterance—solo the track, zoom in on a region, select stuff between two vocalizations, choose Edit > Split Delete to remove it, and repeat as needed. To ease any abruptness in your edits, try using the fade-in/fade-out technique on your region snippets. When you're satisfied with your mix, select File > Export to save your project as an audio file in your preferred format. ⏻

This month the Doctor tackles...

▸ **RAM Issues**

▸ **Migrating RAID**

▸ **Sticky Keys**

RAM Timing

My roommate, with my help, built a brand-new PC worthy of mention in your magazine; it has a Q6600, 4GB of DDR2/1066, an ATI Radeon 4850 GPU, and a DFI P45-T2RS motherboard. After installing his student copy of Windows Vista x64 and some of his favorite programs, I advised him to run CPU-Z to ensure that the motherboard had set everything correctly, as I didn't really want him to have to dive into the BIOS unnecessarily. CPU-Z reported that his RAM was cruising along at DDR2/800.

He has a 1,066MHz frontside bus, so the RAM timing was unusual, especially since the board is certified for DDR2/1066. We checked the BIOS and found that we cannot set that frequency without overclocking, which causes the machine to become unstable. We decided that the problem is the BIOS and discovered that DDR2/1066 is supported only in the latest BIOS—but DFI's BIOS update utility doesn't work with Vista x64! Neither of us owns a floppy drive anymore, so we thought we might try booting from a USB drive, but we can't find any Vista 64 capable tools for creating that, either.

What should we do to update the BIOS?
—Lyle Goodwin

You have several options. The first is just to let it be. Your friend will see minimal gains (and possibly even losses in some applications) by running the RAM at DDR2/1066 versus DDR2/800, so he can avoid the headache and just not fiddle with it. Remember, motherboard vendors always recommend that if the board's working fine, don't mess with it.

For most enthusiasts, though, this situation is an invitation to immediately update to the latest beta BIOS. An alternative option is to look at the BIOS screen during boot. You should see a prompt or option for some kind of built-in updating tool. Many current motherboards let you update the BIOS using a built-in flash utility. Just store the updated BIOS file on a USB key (the key must be in before booting the machine), boot the PC, start the utility, and point it toward the USB key. A third option is to use Hewlett-Packard's free utility that lets you create a bootable USB key. The Doctor would provide a link, but HP's website seems to shuffle the URL around on a regular basis. Instead, go to www.hp.com and search for "cp006049.exe." A final option is to keep an $8 floppy drive in your tool kit.

Every notebook manufacturer has different graphics-card specs; this GeForce Go 6800 from an Alienware m7700 fits in just a handful of laptops.

Alien? Where?

I have an Alienware Area-51 m7700 laptop computer with 2GB of memory and an Nvidia GeForce 6800 Go with 256MB GDDR memory. It's three years old and runs fine, but I would like to upgrade the graphics to get better video response. I play World of Warcraft and occasionally have problems with the video becoming a bit choppy. Plus, with the economy in its current poor state, I don't really want to buy a new computer anytime soon, so upgrading my current computer seems like a good, relatively inex-

pensive way to go. The problem is, when I talked to a tech support person at Alienware, I was told a video upgrade isn't available for my computer because the current videocards work with only the current bus configurations, not with my computer's bus. Is there truly no way to upgrade my laptop's video?
—Thomas Oglesby

The tech support guy is right, Thomas. Each new mobile GPU typically runs hotter and requires more power than the previous iterations, and there's no universal laptop graphics hardware spec. You've already got the best videocard you can put in your rig. You can increase performance relatively inexpensively by upping your

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

RAM to 4GB—you can get 1GB and 2GB SO-DIMMs for your machine for nearly nothing, and that'll help with your game performance—but since the m7700 runs on a 32-bit Pentium 4 processor, you won't be able to utilize the full 4GB. Other than that, you're out of luck.

Migrating RAID

A few months ago, my 5-year-old Alienware Area 51 died. I narrowed my problem down to the motherboard. Since this computer is so old, I decided to

THE DOCTOR STRONGLY ADVISES KEEPING REGULAR BACKUPS OF RAID 0 CONFIGS.

replace it with a new, updated computer. The busted rig had two 200GB hard drives on a 3ware RAID controller (RAID 0 configuration). Is it possible to install the RAID controller and drives (as is) on my new computer as a secondary drive and retrieve the existing data, or will I have to rebuild my RAID during installation?

—David Truan

The Doctor strongly advises keeping regular backups of RAID 0 configs, especially if you plan on migrating your data. In fact, when possible, back up your data and re-create the array from scratch on the new machine, then move your data back to it.

That said, we know it's not always possible to back up before a move, especially in cases like this, which are essentially rescue missions. Moving a RAID array can be a tricky proposition, but it's much easier if you use the same RAID controller. The Doctor spoke to a 3ware tech-support rep who said that as long as your new motherboard plays nice with the RAID controller, you shouldn't have any

problems. Wait until your new computer's fully set up and functional before moving your RAID over. Install your RAID controller's drivers and then (with the machine powered down) install the RAID controller with the drives attached. When you power on the computer, your array should show up.

The Dirty Shift

When my computer is on, the Shift key seems like it's being pressed repeatedly, even though I'm not pressing it. The StickyKeys feature keeps coming up and I can type only caps and symbols, not numbers. When I click an app on the desktop, it highlights almost all of them. When I click in my web browser, all of the screen's text gets highlighted. I'm really not sure if this is a virus or a malfunction in the hard drive or what. The

computer is a 3-year-old HP ZV6000 laptop.

—Nick Olson

It sounds like the problem is with your keyboard—something caught under one of your Shift keys might be keeping the contact closed. First, try to dislodge whatever's under there with a can of compressed air. If that doesn't work, pry the Shift keys off with a butter knife (carefully!) and clean underneath them with a damp lint-free cloth—but make sure your computer is off. Then reseat the keys. Still no dice? The next step is replacing your keyboard. You can find one on the web for between $15 and $50.

0x00000 OMG

I am becoming increasingly frustrated trying to fix a problem I'm having with a videocard driver (I think). My computer is crashing in the middle of games. The error message I get when I reboot is: STOP 0x000000EA THREAD_STUCK_IN_DEVICE_DRIVER. I have searched forums and tried different things, but nothing seems to work except when I install an old videocard (Nvidia 6800 GS).

I'm running an Intel Core 2 Quad Q6600 processor, Asus P5K motherboard, EVGA 8800 GT GPU, and 4GB of RAM. I also have an Nvidia 9800 GTX+, and when I installed it, the problem became worse.

—Gman

If it were just one videocard that was causing the problem, the Doctor would suspect something was wrong with the card itself. But since you've tried three cards and the problem affects only the newer two, the Doctor believes you're suffering from either old drivers or a faulty power supply. We can't tell from your email whether you've already tried updating to the latest Nvidia drivers, but you should reinstall the latest drivers whenever you change cards. You can find Nvidia drivers at (surprise!) www.nvidia.com.

If that doesn't help, the problem could be your power supply—either it's failing or it doesn't have the juice to run high-powered videocards like the 8800 GT and 9800 GTX. 700W should be enough. Just make sure to buy a name-brand PSU; we recommend PC Power & Cooling. ⏻

REVIEW

Tested. Reviewed. Verdictized

PLUS **Best of the Best, Editors' Blogs, and the No BS Podcast**

MSI Eclipse SLI

Alphabet soup heaven: Tri-SLI, i7, and X-Fi

An eclipse occurs when one celestial body obscures another. When MSI stuck its X58 motherboard with that moniker, we wondered just what it wanted to hide. Our guess is it's the fact that the board supports ATI's CrossFire X. Despite the Eclipse's support for CrossFire X, MSI chose to change the name of the board at the last minute from simply Eclipse to Eclipse SLI. Regardless, the Eclipse SLI is jam-packed with features that would make any geek weep, including cross-platform GPU support, Core i7, six-slot DDR3, and onboard soft X-Fi audio.

We've now tested three X58 boards, and the Eclipse SLI has an edge over its closest competitor, the Asus P6T Deluxe, which we reviewed in January, as well as the stock Intel DX58SO board that we used for most of our Core i7 testing. The Eclipse SLI is technically able to run tri-SLI. We say technically because though you might be able to jam a GTX 280 into the third slot, you'll probably have to saw off the end of the card to make it fit in your case—the card has to be seated in the bottom slot and hangs over the mobo by about an inch. We tested the Eclipse with a pair of EVGA GTX 280 cards but were unable to test it in tri, as our early board shipped without a bridge. MSI will include bridges with retail boards.

Right now, it's difficult to compare the performance of the three X58-based boards we've tested, as it's challenging to make sure the boards are all set to the same specs. We attribute most of the performance differences we've seen to how each vendor sets up the CPU, not to the performance differences with each board. One thing in the Eclipse's favor: There's no need to activate the X-Fi drivers on the board, which is necessary on the Asus boards that feature host-based X-Fi drivers.

So what board would we stick our Core i7 in? It's hard to say at this point, but if we were forced to choose, the Eclipse SLI would just edge out the Asus P6T Deluxe. But to be honest, with BIOS updates coming out in near real time for the new CPU and new chipset, the answer to that question might be different next month. **–GORDON MAH UNG**

BENCHMARKS

	MSI Eclipse SLI	Intel DX58SO
PC Mark Vantage x64	**7,204**	7,082
PCMark Vantage HDD	**4,225**	3,509
ProShow Producer (min:sec)	**9:08**	9:12
MainConcept Reference (min:sec)	17:58	18:00
3DMark Vantage CPU	**11,257**	11,239
3DMark Vantage GPU	**46,410**	45,424
HD Tach (MB/s)	**219**	185
Valve Particle test (fps)	**160**	155
Quake 4 (fps)	**237.5**	224
Everest Ultimate Copy RAM (MB/s)	**19,766**	19,182
Everest Ultimate Latency (ns)	32.3	**31.9**
Sisoft Sandra RAM Bandwidth(GB/s)	**27.1**	26.3

Best scores are bolded. Our test bed consists of a Core i7-965 Extreme Edition, EVGA GeForce GTX280 videocard, 6GB of Corsair Dominator DDR3/1600, WD Raptor 150 and Vista Home Premium 64-bit. Our HD Tach score was achieved using an Intel X25-M SSD.

We can hear the scream from Ontario: "It does CrossFire X too, damn it!"

■ ■

VERDICT 9

MSI ECLIPSE SLI

+ STRIDER
Tri-SLI capable, six DIMM slots, and no X-Fi activation required.

– BUCK
Questionable placement of third x16 slot; flaky USB support.

$360, www.msicomputer.com
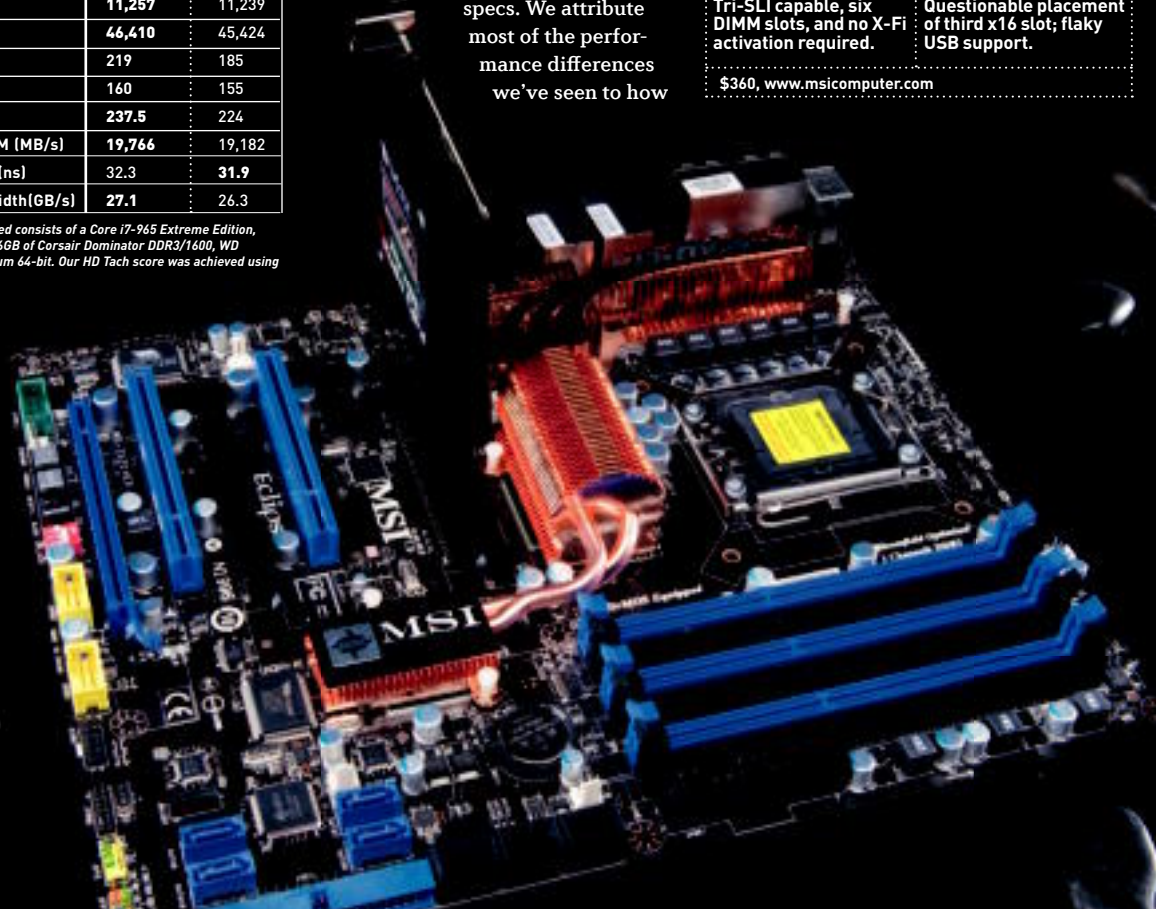
Sapphire Radeon HD 4850 X2

A surprisingly speedy videocard powered by ATI's midrange GPU

As a general rule, our belief is that pairing two slow-performing cards using SLI or CrossFire is a bad idea—you're usually better off running a single faster card. However, the Radeon 4850 X2 delivers astounding performance compared to the single-GPU boards in its price range, spanking the Radeon 4870 and the GeForce GTX 280, with none of the pitfalls that have plagued dual-GPU boards in the past.

At the heart of the board is a pair of ATI's RV770 GPUs running at 625MHz, just like the single-GPU in the 4850 boards. Each GPU features a full complement of 800 stream processors, which are connected to identical 1GB GDDR3 frame buffers running at 993MHz on a 256-bit bus. Although X2 boards are labeled as featuring 2GB of memory, because the contents of each GPU's frame buffer must be mirrored, applications can utilize only 1GB of video memory.

Like its 4870-powered predecessor, the 4850 X2 sports ATI's advanced video decode acceleration, allowing you to view fully accelerated picture-in-picture Blu-ray discs. It's fully compatible with multiple-monitor displays, and we love that this board features four DVI ports for multi-mon madness.

In our performance testing, the 4850 X2 unseated the fastest single-GPU videocards, the GeForce GTX 280 and Radeon HD 4870, in almost every benchmark. The exception to the rule was Crysis at high visual-quality settings and high resolution. When running at 1920x1200 with 4x antialiasing and the visual-quality settings cranked to Very High, we hit the 4850 X2's memory bandwidth wall. Despite running at a higher clock speed than the 4870-family boards, the GDDR3 on the 4850 transfers half as much data per clock cycle.

With a street price that's less than $300, the 4850 X2 is a great deal for owners of lower-resolution 22-inch monitors. However, if you use a 24-inch or 30-inch panel, it's probably worth ponying up for a card with a peppier memory pipeline. —WILL SMITH

BENCHMARKS

	Sapphire 4850 X2	Radeon HD 4870 X2	GeForce GTX 280
Driver Version	8.12	8.12	180.48
Crysis 4X AA/Very High (fps)	12.41	**29.6**	18.35
Crysis No AA/Very High (fps)	27.87	**31.6**	22.28
Call of Duty (fps)	80.7	**106.5**	68.09
Far Cry 1920x1200 (fps)	60.3	**68.5**	52.2
Far Cry 1680x1050 (fps)	64.9	**72.2**	58.7
Vantage Game 1 (fps)	17.54	**19.2**	17.32
Vantage Game 2 (fps)	14.25	**18.9**	13.11

Best scores are bolded. Benchmarks are run on an Intel Core 2 Quad Q9770 Extreme, with 4GB of memory running Windows Vista. Crysis, and 3DMark Vantage are run at 1920x1200, with 4x AA and 8x anisotropic filtering, unless otherwise noted. Call of Duty is run at 2560x1600 with 4x AA.

KICK ASS!

VERDICT 9

SAPPHIRE RADEON HD 4850 X2

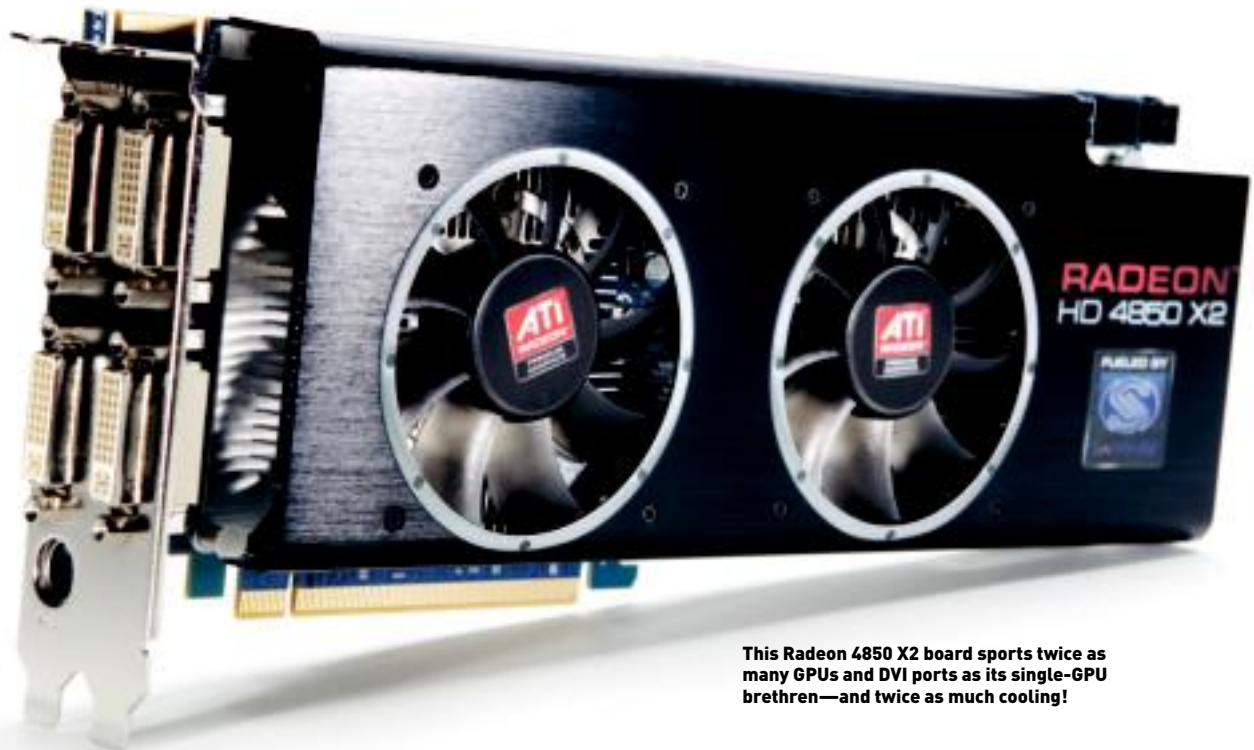| ➕ EMERALDS	➖ AMETHYSTS
Killer performance for $300. Four DVI ports! Faster than a GTX 280.	GDDR3 hurts memory bandwidth. Four DVI ports leave no room for rear exhaust vents.

$330, www.sapphiretech.com

This Radeon 4850 X2 board sports twice as many GPUs and DVI ports as its single-GPU brethren—and twice as much cooling!

HP's second-gen Home Server looks like the original, but inside are four hot-swappable SATA bays, a 2GHz Celeron, and 2GB of RAM.

HP MediaSmart EX487

Back up every machine in your home and stream your media to any room

There's a lot to be excited about when you consider the features Windows Home Server offers out of the box—primarily, automated backup of all your desktop and mobile machines and media streaming to every room in your house. HP builds on this goodness with a second-generation WHS product that boasts both improved hardware and a supercharged features list.

When we reviewed HP's first foray into the world of Windows Home Server last year, we were optimistic about the future of the platform but a bit underwhelmed by the performance of the little box. Since then, the Home Server software has gone through some teething pains, including a horrific bug that corrupted users' files (since corrected with the first Service Pack for the Home Server software).

To the base that Windows Home Server provides, HP has added a ton of powerful new features, including a much-improved media streamer; an iTunes streaming server; the ability to back up OS X–based machines using Time Machine; online back-up for crucial files; integration with photo-sharing services, including Picasa, Flickr, and Facebook; and the HP Media Collector, which scans your client computers and automatically copies new photos, music, or videos to the Home Server. Typically, we're not fans of the heavily customized shovelware that comes with OEM hardware, but in this instance, HP has added genuine value to the Home Server platform with these software enhancements. The Media Collector is especially valuable because it pulls photos from our client machines to the server automatically—a huge benefit, and one that's not built into the core Windows Home Server functionality.

On the hardware front, the EX487 features a beefier configuration than the first-gen MediaSmart. Instead of an AMD Turion processor, 512MB of RAM, and a pair of 500GB drives, the new hardware boasts a 2GHz single-core Intel Celeron paired with 2GB of RAM and a pair of 750GB drives. There are two bays in the EX487 free for expansion, in addition to an eSATA port and four USB ports. Despite the beefier hardware, the machine remains very quiet. It was inaudible in a typical living room environment.

While this isn't enough of an advance to consider it a sophomore effort, it's definitely spring semester of freshman year, and things are looking pretty good for Home Server. –WILL SMITH

BENCHMARKS

	MediaSmart EX487	MediaSmart EX475
Upload Transfer Rate (MB/s)	**47.4**	43.0
Download Transfer Rate (MB/s)	**65.6**	40.5

Best scores are bolded. To measure home server transfer speeds, we copy a 1,705MB H.264-encoded video file from a desktop machine hardwired to the server and back using the Windows browser.

MAXIMUMPC KICK ASS!

VERDICT 9

HP MEDIASMART EX487

+ HOME ALONE
Better hardware, corruption issues are fixed, and the HP add-ons are kick ass.

– HOME ALONE 2
We'd like a multicore edition to empower video-streaming apps like TVersity.

$800, www.hp.com

Peek

Mobile email—and nothing else

A power user expects a phone to be an all-in-one communication/personal entertainment device that includes a web browser, GPS, media player, camera, SMS, and IM. However, if you only want to make calls and check your email, a smartphone doesn't make much economic sense. The initial cost is high and monthly data plans are also expensive. Peek hopes its eponymous email-only device will catch on with people who want email on the go but not the other smartphone accoutrements.

The Peek is a slim (4.0"x2.7"x 0.4") handheld email device with a bright 320x240 screen. It retails for $80 with a $20 monthly data plan. And if all you want is email, the Peek gets the job done—with some caveats. For a casual user, the device's limitations may be inconsequential, but tech-savvy individuals will find the shortcomings to be deal breakers.

To get started, you simply enter the addresses and passwords of up to three accounts; the major providers—AOL, Gmail, Hotmail, and Yahoo—and numerous ISP-based services are supported. If you register multiple accounts, though, all your email will be dumped into one folder, and you can't create additional folders, making organization of incoming mail a challenge.

Limited support for attachments is a larger issue. The Peek can open most image-file types, including JPEGs and GIFs, but there's a size limit of 6MB per attachment and the device slows to a crawl as it tries to open images. Word docs, PDFs, and other types of attachments are not supported, though a spokesperson promised support for additional attachment types in 2009.

Peek leases bandwidth from a wireless phone provider and has stated that its coverage is "nationwide." While we had no problems connecting, sending, or receiving email anywhere in the Bay Area, if you live in an area with spotty cell reception, your experience may differ. This isn't push email, though—we generally waited five to eight minutes for mail to arrive.

Within the narrow focus of what it promises to deliver, the Peek succeeds. Just who would find this device appealing, though, is something of a mystery. **—TOM EDWARDS**

VERDICT	6
PEEK	

➕ LYNYRD SKYNYRD	➖ LEONARD PART 6
Does what it promises to do; simple to use.	Not for power users. Small attachment limit.

$80, www.getpeek.com

Samsung R610 Notebook

You get what you pay for

If it's odd to see Samsung's name on a notebook, you'll likely get used to it. While the company had previously sold its branded notebooks only overseas, it recently entered the U.S. market with no fewer than five notebook lines, ranging from netbooks to the desktop replacement model we review here, the R610.

Actually, desktop replacement is a bit of a stretch, unless your expectations are pretty minimal. Costing little more than a grand, the R610 is better classified as a budget notebook. And on first look, you might be impressed with what can be had for so little cabbage: a 16-inch glossy screen, a large keyboard and numeric pad, three USB ports, HDMI, dedicated graphics, and a relatively sleek and lightweight design.

But just a little time using the R610 is sure to bring out the critic in any power user. Our first disappointment was with the screen's image quality. There's a very narrow sweet spot at which the picture looks good. Stray from that spot either vertically or horizontally and the colors fade or reverse and the contrast is diminished—qualities suggesting this is a 6-bit-color panel, and not a good one at that. The keyboard feels similarly low rent.

It's no surprise then that the R610's performance also underwhelms. The machine sports a little-known Conroe 65nm Core 2 Duo Mobile CPU dubbed the T5800. The proc runs at 2GHz,

The R610's glossy chassis looks nice—until it's covered with fingerprints.

which puts it at a disadvantage against our aged 2.6GHz zero-point (not to mention Penryn-based notebooks) in just about every benchmark. In our content-creation tests, the R610's scores were inferior to our zero-point's in all but the Photoshop benchmark, where a larger hard drive and more RAM likely helped the R610 achieve its 6.8 percent lead. By comparison, the HP HDX 18 notebook we reviewed last month bested our zero-point in all of the content-creation tests by 15 to 40 percent.

The R610 did score a surprising 33 percent win against our zero-point in Quake 4. But to put that win in perspective, the HP HDX 18 from January and the Gateway P-7811 FX we reviewed in October trampled our test bed in Quake 4 by 235 percent and 375 percent, respectively. Furthermore, the R610's 9200M

GS graphics part did not hold up in FEAR, a better indicator of a chip's aptitude with more modern games.

The R610's 6-cell battery provided us with two hours and 12 minutes of DVD movie watching with the machine in power-saving mode.

Despite our criticisms, we're reticent to say the R610 is a bad buy. There are obvious signs of scrimping and performance is not its strong suit, but we can't imagine getting much more of a machine for the price. A power-user notebook this is not, but it's a decent deal for serious bargain hunters. **—KATHERINE STEVENSON**

SPECIFICATIONS

CPU	Intel 2GHz Core 2 Duo Mobile T5800
RAM	3GB DDR2/800MHz (2 DIMMs)
CHIPSET	Intel PM45
HARD DRIVE	250GB Samsung (5,400rpm)
OPTICAL	TEAC DV-W28S-R DVD burner
GPU	GeForce 9200M GS
BOOT/DOWN	70 sec/35 sec
LAP/CARRY	6 lbs, 2.2 oz/7lbs, 4.3 oz

VISTA 32-BIT BENCHMARKS

	ZERO POINT	
Premiere Pro CS3	1,860 sec	2,340 sec (-20.5%)
Photoshop CS3	237 sec	222 sec
ProShow Producer	2,416 sec	2,515 sec (-3.9%)
MainConcept	3,498 sec	4,350 sec (-19.6%)
FEAR 1.07	14 fps	12 fps (-14.3%)
Quake 4	29.1 fps	38.7 fps

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

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

VERDICT 6

SAMSUNG R610 NOTEBOOK

➕ **FIRE SALE**	➖ **FIRESTORM**
A multicore notebook for $1,000! Well-rounded amenities.	It looks, feels, and performs like a budget notebook.

$1,050, www.samsung.com

Thermaltake SpinQ

Is a skyscraper better than suburban sprawl?

At first glance, the Thermaltake SpinQ looks like nothing so much as a stack of bike gears with a fan mounted in the center. And that's basically what it is—50 circular aluminum fins mounted around an 80mm fan connected to a copper exchanger. The cooler measures 4.8" wide by 3.54" deep by 5.98" high—about the same height and width as the Zalman CNPS9700LED, but a bit deeper. The SpinQ is, essentially, the high-rise counterpart to the horizontal sprawl of its stablemate, the Thermaltake DuOrb.

Unlike the DuOrb, with its two fans and jarring red-and-blue LED color scheme, the SpinQ keeps to one color, a soothing blue, and a single fan. And instead of the DuOrb's retention system, which is sturdy but requires you to remove your motherboard, the SpinQ uses the same plastic mounting system as Intel's stock coolers, so provided you don't already have a retention plate from your previous cooler installed, all you have to do is snap the SpinQ onto the motherboard, tighten it, and go. Thermaltake definitely wins points for the SpinQ's ease of installation.

The SpinQ comes with a controller knob that lets you change the fan's speed from low, which is whisper-quiet, to its top speed, which sounds like a small jet engine, and every stop in between. It's a handy feature—if you don't mind reaching into your case, that is. It's too bad that at its lowest setting the SpinQ barely outperforms our stock cooler. At its highest (and loudest), it knocked eight degrees from our quad core's 100 percent burn temp—respectable, but not even close to the DuOrb's numbers, which cooled 15 degrees below stock at 100 percent burn.

If your tastes run more to silver and blue than copper and red (and blue), the SpinQ is a clear winner on the design front. But it can't match the performance of its sprawling, dual-fanned sibling.

Don't get us wrong, the SpinQ is not a

The Thermaltake SpinQ is respectable but not exceptional.

bad cooler. It's got looks, a fairly standard formfactor (as opposed to the DuOrb's expanse), and ease of installation in its favor, and its performance is nothing to scoff at. But in a fair fight, at 100 percent CPU utilization, it can't match up with its sibling. Both coolers retail for $80, so unless you're really cramped for horizontal space, you're better off with the DuOrb. —NATHAN EDWARDS

BENCHMARKS

	Thermaltake SpinQ (low)	Thermaltake SpinQ (high)	Thermaltake DuOrb	Stock Cooler
Idle (C)	37.5	35.5	**32.75**	38.8
100% Burn (C)	66.75	59.0	**51.75**	67.0

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

VERDICT 8

THERMALTAKE SPINQ

➕ SPIN CITY	➖ SPIN CLASS
Good looks, easy to mount, respectable cooling power.	Same price as the DuOrb, without the performance.

$80, www.thermaltake.com

BenQ E2400HD

Is this monitor built for Blu-ray?

BenQ promises that its E2400HD LCD monitor will provide "a brand-new standard for personal digital audio-visual entertainment…." And while we've grown weary of marketing hyperbole, at first glance, this 24-inch panel has the specs to back up this statement. The E2400HD sports a 1080p HDMI interface and utilizes a 16:9 aspect ratio (rather than the more common ratio of 16:10 for widescreen panels), two features that should improve the movie-watching experience. OK, perhaps "brand-new standard" is a bit overboard, but as we unboxed it, we did think that a 1080p 24-inch monitor for less than $400 was certainly intriguing—even if it sports a 6-bit panel.

A 16:9 aspect ratio should, theoretically, provide a better image when viewing high-def widescreen movies because a 16:10 monitor has to either stretch an image by 10 percent or add black bars to the top and bottom of the image to compensate for the additional space. In our tests with multiple DVD movies, however, those ubiquitous horizontal black bars appear during playback. While TV shows and many movies (typically romantic comedies) are filmed in a native 16:9 aspect ratio, many films are matted using a wide 2.35:1 aspect ratio where you'll still see black bars. Therefore, while the BenQ is capable of displaying a movie in its original widescreen glory, many DVDs will still not be able to utilize all of the screen's space.

Regardless, this is still a solid panel for watching high-def movies—when the monitor's Movie mode is used. In standard mode, *V for Vendetta* suffered from a washed-out palette. The panel couldn't differentiate the movie's many dark hues and the bright white seemed to take on a gray cast; however, Movie mode upped the contrast significantly, showing off both ends of the color spectrum. Gaming was also solid; the colors in Far Cry were vivid and we didn't observe any stuttering or ghosting during gameplay.

Our DisplayMate tests (www.display-mate.com) backed up what we observed in our real-world tests. We were able to differentiate colors at both ends of the spectrum in the grayscale tests, and the E2400HD showed no color-tracking or banding issues when we ran DisplayMate's scripts.

However, the same Senseye technology that improved our movie-watching experience was much less successful when we viewed high-def photos. With the Photo mode on, pictures took on a cold, blue hue. Standard mode seemed to present a truer presentation of the images colors, but lacked a certain vividness.

Whether the 16:9 aspect ratio will make any noticeable difference really depends on what type of content you'll be watching; still, with a street price hovering around $350, the E2400HD is a good value. But even at this midrange price, we expect more from the stand, which allows only minor tilt adjustments; if we were to use this monitor as our primary movie-watching or gaming panel, we'd prefer to also have height adjustment and swivel included as well.

—TOM EDWARDS

The BenQ E2400HD provides a 1080p viewing experience—but on a 6-bit panel.

SPECIFICATIONS

PANEL TYPE	TN
RESOLUTION	1920x1080
INPUTS	VGA, HDMI, DVI, audio-in

VERDICT 6

BENQ E2400HD

➕ HERMEY	➖ THE BUMBLE
A 24-inch LCD that supports 1080p for less than $400.	16:9 aspect ratio supported by limited number of films.

$400, www.benq.us

HP Mini 1001xx

A netbook with panache

The HP Mini 1001xx is easily the classiest-looking little netbook we've come across. Like most of HP's recent computers, from the Blackbird to the HDX 18, the Mini 1001xx opts for subtle design flair instead of solid colors—in this case, faint gray spirals on a glossy black clamshell lid. The interior is smooth and matte black, and the keys are soft and very square but still provide an audible click—no mushiness here.

The keyboard is the most comfortable we've ever used in a netbook; it doesn't feel cramped at all, although those with large hands will still find their wrists dangling off the end of the board—a familiar story in this category.

Like the other netbooks we've tested, the Mini 1001xx is built on Intel's 1.6GHz Atom processor, runs Windows XP, and has 1GB of DDR2 RAM. It has the smallest hard drive of any non-SSD netbook we've tested, but we suppose 60GB isn't terrible. Like the Lenovo S10, the Mini 1001 ships with only two USB ports, and the Ethernet port is so well hidden as to be virtually invisible, but it is there, behind a thick rubber cover.

On the performance front, the Mini shuffled through our Adobe Photoshop CS3 script in 802 seconds, nearly two minutes slower than the Lenovo IdeaPad S10, but it had no problem playing H.264-encoded MP4 files without stuttering. It lasted two hours and six minutes in our battery-rundown test, a few minutes longer than any non-SSD-based netbook we've reviewed, but certainly nothing to brag about.

Interestingly, the Mini 1001xx actually (eventually) managed to play Quake Live, something no other netbook we've tested has done. We think this is more likely the result of updates to Quake Live's still-in-beta code than anything HP's done, since the Mini has the same architecture as all those other netbooks.

Unfortunately, the 1024x600 monitor just isn't tall enough to fit the entire Quake Live game screen, so this ability is of questionable value.

Perhaps in an attempt to make the Mini 1001xx thinner, HP removed the industry-standard VGA port in favor of a proprietary port, which allegedly fits a VGA-out dongle; however, one wasn't included with our review unit, so we were unable to test this setup.

The Mini is neither the fastest nor, at $490, the cheapest netbook we've tested. But it's the first netbook that didn't look like a honey-I-shrunk-the-laptop version of a bigger device—it's comfortable being a netbook. And we're in favor of that. The Acer Aspire One still hits our price/performance sweet spot, but if you want a netbook that makes a style statement and don't mind paying a bit of a premium for it, the Mini is your model. —NATHAN EDWARDS

We can't say enough good things about the Mini 1001xx's keyboard.

BENCHMARKS

PHOTOSHOP (SEC)	802
BATTERY (HRS:MIN)	2:06
H.264	Yes
QUAKE LIVE	Yes

SPECIFICATIONS

Display	10.2" TFT @1024x600
Processor	1.6GHz Intel Atom N270
Chipset	Intel 945GSE
Graphics	Intel GMA50
RAM	1GB DDR2/667
Storage	60GB Toshiba 1.8" HD
Ports	Two USB, audio in/out (single jack), multicard reader, proprietary video port
Wireless	Bluetooth, 802.11b/g
Lap/Carry	2lbs. 8 oz/3lbs. 1oz

VERDICT 7

HP MINI 1001XX

+ MINI COOPER	− D.B. COOPER
Great keyboard, best-looking netbook we've tested, decent battery life.	Small hard drive, only two USB ports, proprietary VGA port.

$490, www.hp.com

WD TV HD Media Player

Well played, Western Digital

Western Digital's WD TV HD Media Player is missing two components commonly found in digital media players: a display and storage. What the device does have is two USB ports, HDMI and composite video outputs, digital and analog audio outputs, and the ability to play almost any digital media.

Since you provide the storage media, you can never fill up the WD TV. You plug the player into your TV and connect your USB drive or digital camera to the player; it then creates thumbnails for all the digital movies, photographs, and music it finds stored there. If you connect storage devices to both USB ports, the WD TV will index the contents of both drives as if they were one.

The device delivers much higher video resolution than most media players, all the way from 480i using the composite video port to 1080p using HDMI (576p, 720i, 720p, and 1080i are also supported via HDMI). The WD TV supports a host of video formats, co-decs, and containers, including AVI, H.264, QuickTime, VOB, and Matroska. It does not, however, support DivX.

The player supports most digital photo formats, including BMP, TIFF, PNG, and GIF at resolutions up to 2048x2048; JPEG is supported at resolutions up to 4096x4096. Video quality via HDMI is excellent. High-res photos stored on the 250GB WD Passport drive we used took an average of 3.7 seconds to appear on the screen, which is plenty fast for slideshows, but the device's browser software is ploddingly slow about generating thumbnails. And while it can play slideshows while simultaneously streaming music, you can't queue up the music and start both at the same time.

Speaking of music, the WD TV supports almost all the popular file and container formats, including AAC, FLAC, MP3, Ogg, and WAV. We do wish, however, that it supported WMA Lossless. The player displays album art and artist, album, and track name information stored in id3 tags, but it doesn't inform you about the codec and bitrate used to encode the track. And it's a good thing the player has an optical S/PDIF output, because it has an atrociously bad DAC.

The WD TV is a ripper-friendly solution for anyone who doesn't have an HTPC, media-center extender, or other type of media streamer—and doesn't want one. It's also useful for taking media on the go (provided there's something to connect it to when you get there). —**MICHAEL BROWN**

VERDICT **8**

WESTERN DIGITAL WD TV HD

➕ **RIP**	➖ **TRIP**
Supports a host of popular media formats, codecs, and containers.	Awful DAC; doesn't support DivX, WMA Lossless, or any encrypted media.

$130, www.westerndigital.com

Western Digital designed a very good remote control for the WD TV HD; it's comfortable to hold and includes all the appropriate functions for the user interface, including a Home button that takes you to the root menu.

Samsung SH-S223

We weren't clamoring for faster DVD burns, but we'll take 'em

We'll admit we've been perfectly content with Samsung's SH-S203 DVD burner for more than a year. Once we were writing 4.38GB of data to a disc in five minutes flat, we were feeling pretty satisfied with the state of DVD technology. Nevertheless, we're not about to turn our nose up at a performance increase. And that's what Samsung's latest DVD burner, the SH-S223, offers.

As you might have guessed from the name, the SH-S223 represents a jump from 20x to 22x DVD+/-R burn speeds. In our tests, this effectively shaved 12 seconds off the time it took to fill a single-layer DVD+R disc. The SH-S223 took 4:46 (min:sec) compared with the SH-S203's flat 5:00. In both cases, we used 16x media, the fastest-rated media that's readily available. And in both cases, the drives' "over-speed" feature enabled them to burn data at higher than rated speeds. In the course of its write, the SH-S223 steadily climbed from a starting speed of 8.38x to 20.7x.

Besides the boost in DVD+/-R speeds, however, the SH-S223 has identical speed ratings to its predecessor for all other types of media. In our DVD+R DL write test, the SH-S223's 16x rating for that media amounted to a write time of 13:13 using 8x media, a mere three seconds slower than the SH-S203. Again, the SH-S223's over-speed feature kicked in, with a good portion of the burn occurring at 10x speed.

The SH-S223 is rated at 8x for DVD+RW and 6x for DVD-RW. We tested the drive with DVD-RW media rated at 4x. This time, rather than burning beyond the disc's speed rating, the SH-S223 stuck to it, maintaining a 4x speed throughout and writing 4.38GB to the rewriteable disc in 14:56.

This isn't all that surprising, as drives typically perform much more conservatively with rewriteable media, given its greater propensity for write errors.

Like the SH-S203 before it, the SH-S223 connects to a PC using a SATA interface and comes bundled with a host of Nero apps.

While we see no need to graduate from a 20x DVD burner—particularly the SH-S203—to the SH-S223, this is the drive to get if you're currently using anything less than an 18x model. —KATHERINE STEVENSON

KICK ASS!

VERDICT 9

SAMSUNG SH-S223

+ BIG BEN	− BIG BROTHER
All the goodness of the SH-S203, plus faster DVD+/- writes.	We'd have preferred speed improvements across the board.

$80, www.samsung.com

BENCHMARKS

	Samsung SH-S223	Samsung SH-S203
DVD+R Write Speed Average	**14.94x**	13.45x
DVD+R Read Speed Average	**12.16x**	12.13x
Access Times (random/full)	117/204ms	**116/198ms**
DVD+DL Write Speed Average	**9.12x**	9x

Best scores are bolded. All tests were conducted using Nero CD DVD Speed and Verbatim media. Our test bed is a Windows XP SP2 machine using a 2.66GHz Intel Core 2 Quad Q6700, 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard, one EVGA GeForce 8800 GTS card, a Western Digital 500GB Caviar hard drive, and a PC Power and Cooling Turbo Cool PSU.

The SH-S223 is indistinguishable from its predecessor in looks and the majority of its features.

Sacred 2: Fallen Angel

Over time, we learned to dig this hack-and-slash adventure

Sacred 2 is a hack-and-slash Diablo clone in the vein of Titan Quest, the late and much-lamented Mythos, and, of course, 2004's Sacred. And thanks to the original game's popularity, Sacred 2 is also the most-anticipated Diablo clone—other than Diablo 3, of course.

Much of Sacred 2 will feel pretty familiar if you've played Diablo—from the loot system, to inventory management, to the mobs-everywhere clickfest that is combat, to the screen-filling bosses.

But dedicated hack-and-slashers will find plenty to love in Sacred 2. The game world is huge and nonlinear—there are more than 22 square miles to explore. It's bigger than Oblivion, bigger than Fallout 3. Unfortunately, most quests take place within a few hundred yards of the roads, and most of the stuff in the middle, though occasionally interesting or whimsical, can be skipped. The graphics are pretty, but not revolutionary, even at the highest settings.

In Sacred 2, T-Energy threatens to destroy Ancaria, and you have to choose whether to save or destroy the world. Six different classes play two different campaigns, each about 40 hours long if you skip the side quests. Each class also gets a few unique quests, including one that lets you buy a powerful class-specific mount. Power-gamers, rejoice: With a level cap of 200, thousands of items, customizable combat runes, and several difficulties from bronze to hardcore, which features character permadeath, there are easily hundreds of hours of fun to be had.

That said, we hated the first few hours of Sacred 2. The story was vague and the default

Sacred 2's environments are lush and varied, but the enemies within each zone are a little similar.

fixed camera was atrocious (finding just the right angle in a dungeon so that you can see both yourself and your target is surprisingly difficult, though you get used to it after a while). The AI is nearly nonexistent, the pathing is quirky, and the quests, other than the main one, are mostly trivial. Also, it's not 2001 anymore. Can we please have a viewable area that's bigger than 60 feet? Or an over-the-shoulder camera? But somewhere toward the beginning of chapter two (of 10), the game hooked us, despite its shortcomings.

Maybe the character's oft-muttered witticisms started getting through. Maybe it was the game's incessant jolts of fourth-wall-breaking silliness—we were Rick-rolled by a gravestone in a cemetery, attended an in-game concert by real-life metal band Blind Guardian, and on one lonesome road found a shack labeled "Bus Stop." Or maybe it was the giant monitor lizard our ranged-weapon-specializing Dryad got as a steed that made combat feel like driving a big stompy tank down the highway. Whatever it was that bit us, it bit us hard—we haven't slept in days.

Although it has online and LAN multiplayer modes, Sacred 2 is essentially a massively single-player game. If you love MMOs for their mechanics and game worlds but hate the troglodyte players who inhabit them, grab a few friends and hop into Ancaria. It's not perfect by any means, but like the tortoises you'll occasionally mangle in-game, if you bash through the hard outer shell, there's plenty of delicious meat on the inside. **—NATHAN EDWARDS**

Each class has a unique mount available. We named our fighting lizard Stompy!

VERDICT **7**

SACRED 2: FALLEN ANGEL

➕ KILLA	➖ FILLA
Huge game world, large amounts of loot, cool mounts, and big bosses.	Frustrating camera, terrible AI, uncompelling side quests.

$50, www.sacred2.com, ESRB: M

LAB NOTES

Call It a Power Play!

Why I'm buying, not building, a home server

My power bill is bad every month, especially considering that I don't need a heater where I live. Sure, my wife works at home all day, and we do about 9,000 loads of laundry a week, but my computer gear always gets the blame when the big bill hits. So after I'd hooked my wife on the benefits of an always-on home server—streaming audio and video as well as constant backups—I suggested we invest in an OEM-built home server, such as the HP MediaSmart EX475 that I reviewed this month (page 86). While the MediaSmart is underpowered compared to my last gaming rig (which metamorphosized into my home server), it also draws a fraction of the power, roughly 10 percent according to my trusty watt meter. That along with setting the server to automatically turn off when it isn't needed should make for substantial savings on my power bill this winter.

WILL SMITH
EDITOR-IN-CHIEF

GORDON MAH UNG
SENIOR EDITOR

As someone too cheap to pay for anything beyond basic cable and standard def, I'm surprisingly pleased with Windows Vista's Media Center capabilities. With a Linksys Media Center Extender and a pair of ATI TV tuner cards in my office PC, I get absolutely silent access to more than 1,000 hours of TV on my aged tube.

TOM EDWARDS
MANAGING EDITOR

This year, I managed to do all my shopping without stepping into the mall or the post office. And while this turn of events has certainly kept my blood pressure down, my hope is that by next year teleportation technology matures to a point where I won't have to enter an airport either.
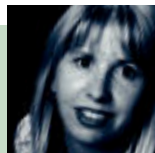
KATHERINE STEVENSON
DEPUTY EDITOR

What could be wrong with upgrading my Wi-Fi router to a newer model with WPA encryption? Well, if the router operates on the 2.4GHz band—as my new one does—it can conflict with the two cordless phones I rely on at home. That's the lesson I learned this month. So I'm trading said router in for a dual-band model.

NORMAN CHAN
ONLINE EDITOR

Will recently clued me in to Boxee, an amazing media center front-end that pulls Internet video from sites like Hulu, YouTube, and Comedy Central. The program is still in alpha, but the interface is intuitive and video streaming is seamless. Too bad it's (so far) only available for Mac OS X and Linux!

NATHAN EDWARDS
ASSOCIATE EDITOR

This month I ventured into the world of Ancaria for my Sacred 2 review, which really cut down on my sleep time. I learned that Ancaria has a lot of rats in it! The HP Mini 1001xx, on the other hand, is rat-free, and has a really comfortable keyboard. I also learned that the ThermalTake SpinQ is not pronounced "spink."

Win Rig of the Month

If chosen, your rig will be featured before all the world in Maximum PC—and you'll win a $250 gift certificate

TO ENTER: Your submission packet must contain your name, street address, and daytime phone number; no fewer than three high-res JPEGs (minimum size 1024x768) of your modified PC; and a 300-word description of what your PC represents and how it was modified. Emailed submissions should be sent to **rig@maximumpc. com.** Snail mail submissions should be sent to Rig of the Month, c/o Maximum PC, 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080.

The judges will be *Maximum PC* editors, and they will base their decision on the following criteria: creativity and craftsmanship.

ONE ENTRY PER HOUSEHOLD. Your contest entry will be valid until (1) six months after its submission or (2) the contest ends, whichever date is earlier. Each month a winner will be chosen from the existing pool of valid entries, and featured in the Rig of the Month department of the magazine. Each of the judging criteria (creativity and craftsmanship) will be weighed equally at 50 percent. By entering this contest you agree that Future US, Inc. may use your name and your mod's likeness for promotional purposes without further payment. All prizes will be awarded and no minimum number of entries is required. Prizes won by minors will be awarded to their parents or legal guardians. Future US, Inc. is not responsible for damages or expenses that the winners might incur as a result of the Contest or the receipt of a prize, and winners are responsible for income taxes based on the value of the prize received. A list of winners may also be obtained by sending a stamped, self-addressed envelope to Future US, Inc. c/o Maximum PC Rig of the Month, 4000 Shoreline Ct, Suite 400, South San Francisco, CA 94080. This contest is limited to residents of the United States. No purchase necessary; void in Arizona, Maryland, Vermont, Puerto Rico, and where prohibited by law.

We tackle tough reader questions on...

▸**Mac vs. PC**

▸**SAS** **Drives**

▸H.264 on a Netbook

AV Alternatives

I just finished reading the antivirus roundup by Paul Lilly in the January 2009 issue and found it to be informative, to a point. It seems like McAfee and Symantec always get included in these reviews by default. I would be interested in seeing how Computer Associates and Trend Micro compete with the Dynamic Duo. I have used both and find it invaluable to use their online services as well as their home computer products.

—Steve Gardner

Deputy Editor Katherine Stevenson Responds: Practically anytime we do a review roundup we have to limit the number of products we can cover—this isn't simply a matter of time and resources; it also keeps a single story from taking up too much space in the magazine. In choosing the 10 antivirus products for our January feature, we tried to select a mix that would be of

greatest interest to enthusiast users, but inevitably, some worthwhile products were left out. We appreciate your suggestions and will certainly take those apps into consideration the next time we do an AV story.

Mac Pro vs. PC

I would like to see you guys do a competitive comparison of the Mac Pro workstation booted directly into Windows (using Boot Camp) against comparable PCs. Why is this interesting? Because for technical applications (data acquisition, video capture, etc.) there's way more hardware and software for the PC than for the Mac. On the other hand, for day-to-day use (word processing, presentations) and particularly when accessing the Internet (email, web), it's more sensible to be in the Mac universe, if for no other reason than not to have to deal with Windows's incessant bugs and security holes. The ideal setup for me would be a single box that runs Mac OS X when connected to the Internet and for standard office work but which can be booted into Windows (and disconnected from the Internet as desired) for specialized technical applications.

The question is, how does such a setup compare to a standard PC workstation? It seems to me that this topic would be of great interest to hardware geeks like us who subscribe to *Maximum PC.*

—Cahit Kitaplioglu

Senior Editor Gordon Mah Ung Responds: I simply don't see a reason to do this comparison. As far as I'm concerned, a Mac Pro is not worth the premium price when you can actually get more performance from a Core i7 (which is not avail-

■■□ PHOTO OF THE MONTH

MPC's Newest Fan

Maximum PC reader (and Jack Black lookalike) Keith Whisman introduces us to a future *MPC* acolyte, his newborn son. Daniel Joseph Whisman was born on December 3 at 11:25 a.m., and we found Keith celebrating by posting comments on our website a mere hour later—a true testament to his devotion to our magazine. Meet Keith and other readers on the message boards and discussion threads at MaximumPC.com!

able on Macs yet) with many of the apps you will likely run. And if you're worried about security, you should know that Windows Vista has actually consistently out-scored the vaunted OS X in security exploits discovered, and Microsoft is far faster at addressing security holes than Apple is.

H.264? Really?

I was very impressed with your reviews of various netbooks in the December 2008 issue. It came out just

A MAC PRO IS NOT WORTH THE PREMIUM PRICE WHEN YOU CAN GET MORE PERFORMANCE FROM A CORE I7.

as I was looking to buy a netbook, so the timing could not have been more perfect. I picked up the Acer Aspire One and am loving it. I do have a question for you, though.

In the review, under Benchmarks, it states that the Aspire One can run H.264-encoded video. I've been trying to run some of the same on mine, but there is a great deal of stuttering in the video.

Additionally, the video is playing slower than the audio. Did you experience this in your benchmarks? The write-up itself makes no mention of how the H.264 video test is executed, but from the information in the table and the description of the test, I assumed it was possible to run video but not

encounter these issues.
—Craig Currier

Associate Editor Nathan Edwards Responds: Sorry for the confusion, Craig. The video file we used was a 1.92GB MP4, encoded with the avc1 H.264 codec at 720x358 at 1536KB/s, played back in Cyberlink PowerDVD 8. The maximum resolution of most netbooks is 1024x600.

You should have no trouble playing DVD-quality video, but we wouldn't rec-ommend anything higher than that. If you don't want to spring for the full version of PowerDVD 8, the free VLC player works fine too.

Taking It One Tip Further

Please make sure you let your readers know that when they disable the splash screen ("Windows Tips," Holiday 2008) they will no longer see the check disk process, so before they do a check disk they should go back to boot.ini tab and uncheck/NOGUIBOOT.
—Brian M., aka FreeWay

Getting SASsy

With the cost of your Dream Machine, why didn't you consider the Seagate Cheetah 15K.6 and Savvio 15K.2 drives? From

their spec sheets, these would seem even faster than the Western Digital Velociraptors you chose.

I realize those other drives are more expensive but not so much more that an enthusiast wouldn't still consider them. I put a 15K Cheetah (older model) in a system a few years back and was blown away by its better performance. I'd definitely be interested in seeing a review in your magazine sometime.
—Scott Albrechts

Associate Editor Nathan Edwards Responds: Both the Cheetah and Savvio are quite fast. But neither is available with a SATA interface. Although both drives come in a SAS (serial-attached SCSI) flavor with a SATA-type connector, SAS devices cannot run on SATA controllers, while SATA devices can run on SAS controllers. And SAS drives are still ungodly expen-sive, even compared to the Velociraptor.

Most enthusiast moth-erboards don't have SAS controllers, although that's changing—the Intel D5400XS we used in our Dream Machine has one.

We typically haven't considered enterprise or SAS drives when building our machines, but as SAS speeds get faster (up to 6Gb/s this year) and more boards start supporting SAS again, we'll look into it—expect a SAS vs. SATA Deathmatch later this year. Thanks for bringing the issue to our attention! ⏻

8-BIT
Black Mage

Some people want their rigs to be an approximation of what computers will look like at some point in the far-off future. Richard Clinton, though, wanted to look back to a simpler time: the 8-bit era. But while computer technology was less complex back then, building the Black Mage was anything but easy.

In order to re-create his favorite Final Fantasy II character type, Richard organized, glued, and painted 2,000 1"x1" cubes. All told, it took four months to assemble the Black Mage. To see the process shortened to 10 minutes, check out Richard's build video at www.youtube.com/watch?v=VoUVgK65FIA.

■■■ BE A WINNER!

For submitting this month's winning entry, Richard has won a $250 gift certificate. To enter the Rig of the Month contest, see the official rules on page 101.

A USB plasma orb (above) found at Think Geek completes the look.
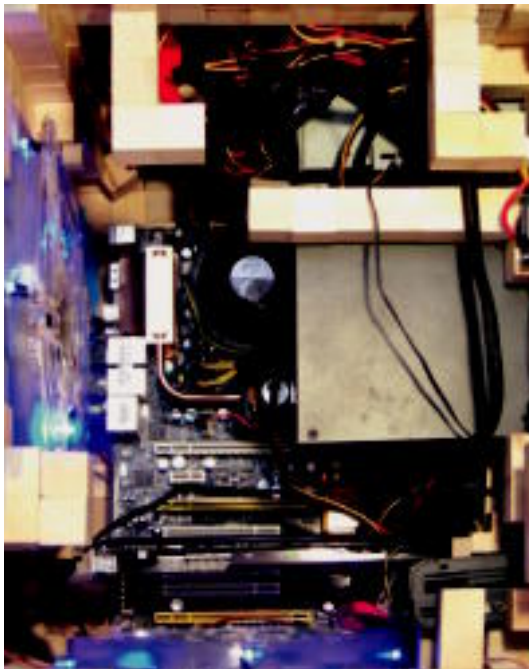
To keep all this hardware cool, Richard raised the motherboard an inch above the wood blocks and installed two 250mm fans.