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The first prefab oil-immersion computer you can buy

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MINIMUM BS • HOLIDAY 2008

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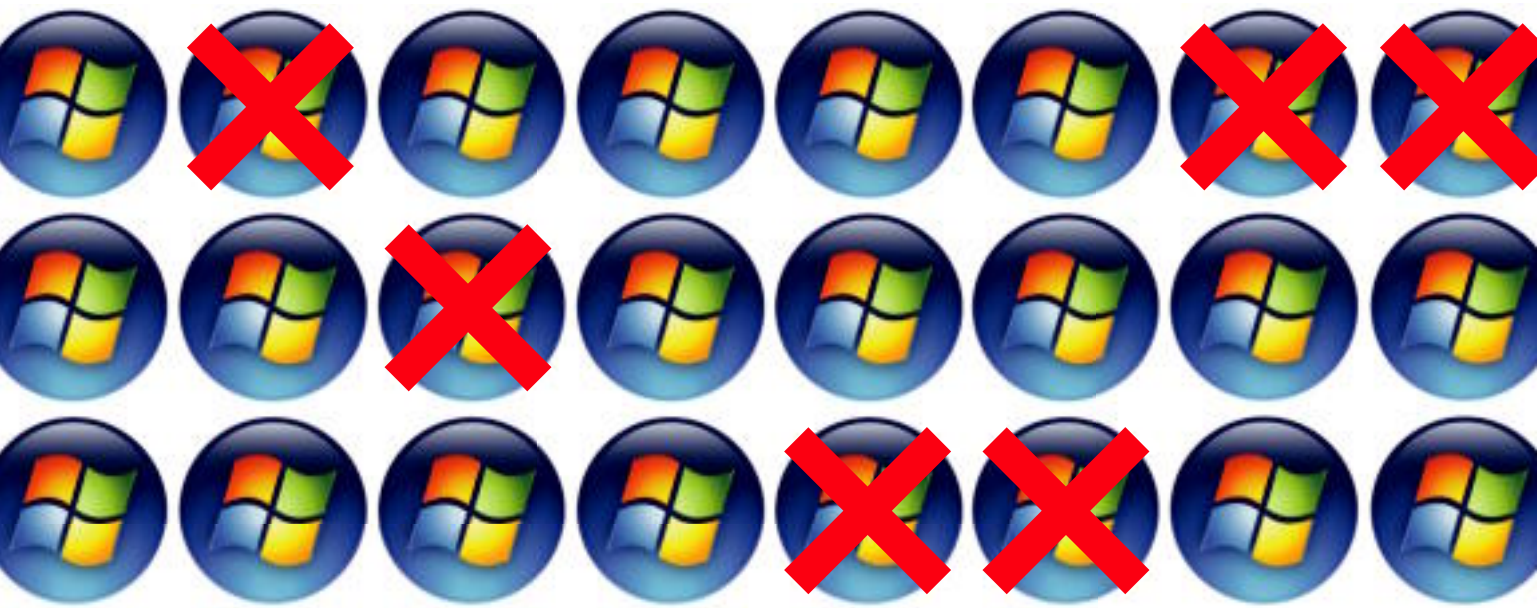
the best **EXPLAINED!**

the worst **DEBUNKED!**



WORLD EXCLUSIVE!

Left 4 Dead Review

BEST CO-OP SHOOTER EVER

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HANDS-ON PREVIEW

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Don't Pay for Digital Downloads

Longtime readers of this column know that I love the convenience of digital downloads. Naturally, I'm not purchasing any video or audio encumbered with digital rights management (DRM), but I'm perfectly content to rent movies for limited playback over the Internet, whether they contain DRM or not. In fact, I have a couple devices that offer that functionality in my entertainment center—namely, an AppleTV and an Xbox 360.

However, I'm afraid I may have jumped the early-adopter gun once again and am going to get burned. For one, the quality of the downloaded video—even the H.264-encoded 720p films I rent from the iTunes store—is inferior to the crappiest 1080p native Blu-ray disc in both resolution and encoding quality. It's simply a file-size problem—movies distributed via the iTunes Store are typically about 4GB. In contrast, Blu-ray movies are typically between 10GB and 20GB on the disc (not counting extras), depending on the codec and bitrate used. Since most new Blu-ray discs use H.264, both formats are using the same codecs. With around four times more data and more than twice as many pixels on the disc, we're not surprised that Blu-ray simply looks better.

Unfortunately, iTunes's video quality isn't likely to improve anytime soon. With broadband either too slow to accommodate larger files (sorry, DSL users!) or cable providers like Comcast threatening to disconnect service for anyone who downloads more than their "fair share" (between 25GB/month and 250GB/month depending on the generosity of the provider), there's no reason for Apple or other online rental services to increase the resolution or quality of their movies. If iTunes Store downloads approached the video quality of Blu-ray discs, most consumers would be able to download only a handful of movies a month before facing angry letters from their ISPs.

So, what's the solution? I'm not sure, but I think that the ISPs will eventually have to budge on their bandwidth caps as non-piratical uses for mega-downloads become more mainstream; still it's unclear if Apple and other providers will be able to maintain the current prices for downloadable content if the amount of bandwidth used for transfer multiplies by four. Hell, if people are watching their HD downloads on 6-year-old 720p HDTVs, they may not even notice a difference!

In the meantime, I've found a happy medium. For the price of about four HD movie rentals using Apple's service every month, I get three movies a week from Netflix, plus all the streamed content I want to view on either my PC or my Xbox 360. Sure streamed Netflix isn't high-def, but it's free!* That seems just about right to me.

Will Smith

** With paid subscription*

EDITOR'S CHOICE!

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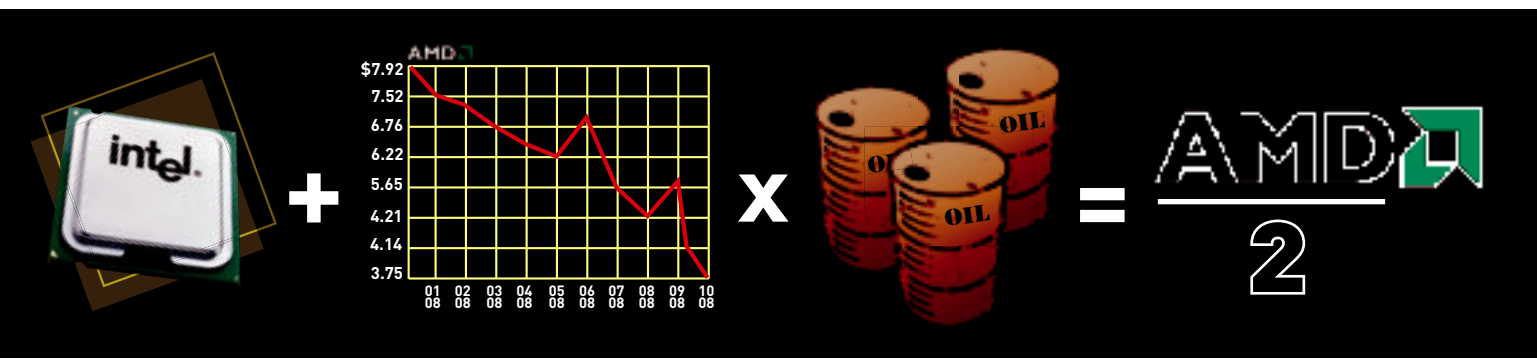
Braaaains!
PAGE 50

LETTERS POLICY Please send comments, questions, and Twix 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

AMD Does the Math

Company spins off fabrication unit to reduce debt, increase options —NATHAN EDWARDS



After being thoroughly trounced in recent years by Intel and Nvidia in the CPU and GPU markets, respectively, it was clear AMD had to do something drastic. A recently announced spin-off of the chipmaker's fabrication division appears to be AMD's Hail Mary.

Under a deal announced in October, AMD will split into two separate entities: a CPU and GPU design company keeping the AMD name and a fabrication company, temporarily called The Foundry Company.

Enabling this move? Cold hard cash, and lots of it, from two companies owned by the government of Abu Dhabi, one of the United Arab Emirates. The first, Mubadala Development Company, is paying more than $300 million to obtain a 19.3 percent share of AMD. The second, Advanced Technology Investment Company, is ponying up $2.1 billion for 55 percent of The Foundry. The money will go toward decreasing AMD's debt, part of which is transferring to The Foundry. In addition, ATIC will contribute $3.6 to $6 billion more for renovations and new construction on AMD's fabs (now transferring to The Foundry) in Dresden and New York. AMD and ATIC will have equal voting control over The Foundry.

Bold moves. But will the AMD split be the kick in the pants the company needs to remain a serious competitor to Intel?

"Absolutely," says technology analyst Rob Enderle. "Most analysts were guessing that AMD would be out of business in 24 months. AMD needed an investor who didn't need a quarterly payback—someone who was willing to invest in the future. Oil money becomes one of the few places you can get funding for something like that." ATIC's stated goal, after all, is to generate long-term revenue for Abu Dhabi—all that oil won't last forever, and the Emirate is looking to other sectors for growth.

"MOST ANALYSTS WERE GUESSING THAT AMD WOULD BE OUT OF BUSINESS IN 24 MONTHS.... IT NEEDED TO GET CREATIVE, FAST."

Microprocessor research and development is enormously expensive—it costs hundreds of millions before the first production chip ever rolls off the line. Factories cost money. Dies cost money. It can be years before a company sees any return on its investment. AMD needed to "get creative, fast" said Enderle.

But the deal is by no means guaranteed to go through. One potential roadblock: Intel is making noise to the effect that the split violates the terms of AMD's x86 license, since AMD won't be physically producing its chips anymore. Without that license, AMD would have trouble operating.

While the version of the agreement we've seen is redacted, Rob Enderle noted that due diligence would have required full disclosure to the investors. The fact that they approved the split suggests that AMD thinks it has a pretty strong case.

If the deal is approved, AMD will get the resources it desperately needs to stay competitive with Intel and Nvidia, which can only benefit consumers.

Google Goes to Washington

D.C. ditches Microsoft's Office suite for online alternative

Washington D.C. joins the ranks of more than 500,000 businesses and organizations that have their heads in the clouds. D.C. CTO Vivik Kundra inked an agreement with Google that will port all 38,000 municipal employees over to Google Apps.

According to Bloomberg, the agreement, which was signed in June, is worth almost $500,000 a year and will include such applications as Gmail, Google Docs, Google Video for business, and Google Sites.

But Google isn't the only company challenging Microsoft in the productivity world. Zoho also offers a collection of online apps and managed to snag GE as a customer. Meanwhile, Microsoft has largely been content to ride the success of its offline Office suite, but things could get interesting if cloud computing continues to pick up steam. –PL

Judge Halts Sales of RealDVD

RealNetworks failed to convince a U.S. District Court judge to lift a temporary halt on distribution of its RealDVD software after a suit filed by the MPAA claimed the company had violated the Digital Millennium Copyright Act's anticircumvention rules.

The MPAA stated that the software circumvents copyright protections because it doesn't require the physical disc to be in the drive during playback, allowing users to rent, rip, and return movies with ease.

RealNetworks insists it's not infringing on any licenses because the software keeps the CSS encryption intact after ripping DVDs. The MPAA admits that there is nothing specifically written against what RealDVD does.

U.S. District Judge Marilyn Patel vowed not to remove the suspension until she is convinced that the software is not in violation of the DMCA. –FI

In Living Color

LaCie's 700-series LCD monitors are designed to dazzle

Fabs Overboard

By now you've probably heard of AMD's complicated deal to spin off its chip-fabrication plants to a newly formed independent company. Essentially, AMD is exiting the manufacturing biz to focus on chip design.

This long-expected move was greeted with both cheers and jeers. Some investors applauded AMD's decision to cut loose the riskiest and most capital-intensive part of its flagging business. Others worried that AMD is merely jettisoning ballast on a sinking ship. Numerous observers proclaimed the end of an era, often quoting former AMD CEO Jerry Sanders III: "Real men have fabs."

All the above may be true. Fabs cost billions of dollars to build and operate, and only high-volume production makes them profitable. Intel introduces a new-generation fabrication process every two years, exerting enormous pressure on AMD to keep up. AMD has temporarily improved its balance sheet, but it may not be enough. And when Sanders uttered his famous words in the 1990s, fabless semiconductor companies were still the upstarts—all the big semi companies owned their fabs.

Times change. Today, Intel is pretty much the last man standing. Intel continues to build and operate its own fabs and develop its own fabrication technology. Even mighty IBM can't stand alone anymore. IBM forges partnerships with other companies to share the huge capital expenses of fab construction and technology development. In fact, AMD is one of those partners. There's no shame. It's simply the new reality.

Fabless semi companies have two options. They can manufacture their chips in fabs jointly owned and operated with partners, or they can completely outsource the manufacturing to independent companies whose specialty is chip fabrication (those companies are called foundries). AMD may do both.

Either way, shifting production to outside fabs is potentially hazardous. Remember Transmeta, the fabless startup company whose Crusoe and Efficeon processors challenged Intel's chips in notebooks? One reason Transmeta got stomped is that manufacturing problems delayed production for a whole year. PC companies couldn't get deliveries and jumped ship.

Outsourcing the production of microprocessors isn't like outsourcing the production of shoes. AMD is making a tough business decision, but it's a risky move that Intel will try to exploit to the fullest.

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

Ion Audio Drum Rocker

Love Rock Band? Love to play the drums? Then you'll love Ion's premium drum set ($300, www.ionaudio.com). Using the quiet velocity-sensitive pads found in the company's high-end electric drum kits, Ion has built the ultimate drum controller. And with the purchase of a PC drum brain, you can connect the kit to your PC to make real music! **–WS**

Verdict Tossed in RIAA vs. Thomas

RIAA watches $220,000 award slip away

In October 2007, Jammie Thomas was ordered to pay $220,000 to the RIAA for copyright infringement after she was found to have made 24 songs available for download on Kazaa. Now, a year later, the verdict is being tossed out. U.S. District Court Judge Michael Davis declared a mistrial on the grounds that he misinformed the jury about copyright infringement when he said simply making copyrighted songs available constituted infringement. RIAA spokesman Jonathan Lamy says the organization still has confidence in the case, with evidence of actual distribution on its side. **–BH**

Wal-Mart's DRM Woes

Wal-Mart no longer sells digital music wrapped in DRM, but the retailer will continue to pay the price for its past practices. The company has retracted its decision to shut down its DRM key servers after a spate of customer protests and negative PR.

Customers would have had difficulty holding on to their music once the servers went offline.

The chain of events isn't surprising. Plans by both Yahoo Music and MSN Music to shut down their DRM servers were similarly thwarted, with MSN deciding to leave its key servers up until 2011 and Yahoo offering vouchers.

Wal-Mart hasn't specified how long its servers will remain online. **–FI**

Email Wingman

A new app from Google Labs aims to give you a moment's pause before you send a 3:00 a.m. whiskey-soaked email from your Gmail account to that special someone who broke your heart.

Mail Goggles makes you take a timed five-question math test before sending a message. By default, the app is on during the weekend late-night hours but can be adjusted to your prime drinking hours. The app can be enabled from the Labs tab within the settings menu. **–TE**

GAME THEORY

Return of the Code Wheel

I think everyone would like to go back in time and visit their younger selves, maybe give some good advice, tell them everything will work out OK.

I'd like to go back and visit Tom circa 1987, or maybe 1990. I'd find a skinny, overcaffeinated, PO'd wretch hunched over a sheet of dark-purple paper printed with black ink, trying to puzzle out the copy protection for Maniac Mansion or maybe twirling a code wheel to find the right unlock code so he could continue with The Secret of Monkey Island.

I'd tell young Tom how copy protection has moved on. There are no more code wheels or cues to find the fourth word in the 12th sentence on the 34th page in order to continue playing. "We have digital rights management now!" I'd say. "In the wonderful world of DRM, copy protection no longer relies on pausing the game to puzzle out a code. It's a lot more like *this*..."

And then I'd kick him repeatedly in the happy sack.

Let's be clear on a couple of points first. Game companies invest vast amounts of money to create their products, and they have a right to be paid. Period. If they're not paid, the entire process grinds to a halt. People who copy software are merely thieves. On the other hand, consumers have a right to what they buy, and any obstacle that cripples that right has to be rejected.

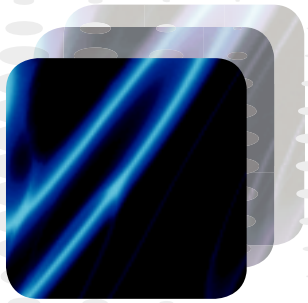
The current trend in PC-gaming DRM is intolerable. SecuROM isn't a legitimate security system. It's a virus. It invades your system without warning, cripples your software, and prevents you from properly using your own property. The three-install limit is absurd. I take games on and off my computer, or move them from system to system, countless times. It's none of EA's business where, when, or how often I load Spore in my own home.

And it doesn't work. At all. In fact, fury at SecuROM is probably increasing piracy, as consumers reject the heavy-handed approach and punish publishers by seeking out protection-free software. It's time to admit that software-based copy protection is a failure.

It's time for the return of the code wheel!

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

12x Blu-ray

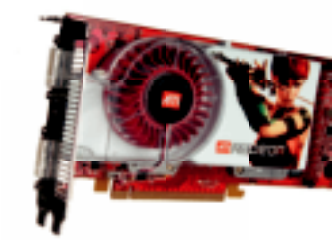


Sanyo has developed a blue-laser diode that puts today's best consumer optical tech to shame. The laser can emit a beam of 450 milliwatts, double the power of lasers found in current Blu-ray Disc systems. As a result, we can expect 12x read/write speeds as well as 100GB four-layer media—in two to three years time. –KS

DOJ Ends GPU Investigation

Nvidia, ATI agree to settlement for alleged price fixing

The Justice Department has ended its two-year investigation of Nvidia and ATI following the companies' announcement that they had settled a class-action lawsuit alleging price fixing. As part of the out-of-court settlement, the chipmakers will not admit to any wrongdoing but will each provide $850,000 to a fund that will make payments to individuals who purchased GPUs from the companies between December 4, 2002 and November 7, 2007. Nvidia alone made a separate settlement of $112,500 for individuals who bought GPUs through third-party companies.



If you purchased a card from the ATI or Nvidia website, you may be owed some cash.

Much of the Justice Department's investigation centered on email exchanges between executives of the two companies—in particular, comments from Dan Vivoli, Nvidia's senior vice president of marketing and ATI's president, David Orton. In one exchange, Vivoli stated, "As you and I have talked about, even though we are competitors, we have the common goal of making our category a well positioned, respected playing field. $5 and $8 stocks are a result of no respect."

Details of how affected parties can make a claim are expected to be released soon. –TE

WORD WATCH

Freecycling

It's cliché but true: One man's trash is another man's treasure. And thanks to the Internet, it's never been easier to connect the two parties. In fact, the practice of trading unsellable goods has gained enough traction to spawn a new term: freecycling. And there's an official network devoted to the cause: Freecycle.org, a collection of local email groups where people post stuff they want to unload and others take it. –KS

BYTE RIGHTS

QUINN NORTON

Stop DRM Crime Spree

I want to let media rights-holders in on a secret. They're making pirates. They've got their own pirate factory—it's called digital rights management, and it comes with most of their download sales.

At first, the advent of iTunes and other online services seemed like a godsend. It was easy: You just clicked things and they appeared. This was the culmination of a part of musical history—the steady contraction of the time people spent hunting around for the song they wanted to hear.

But there's this catch. Because DRM made music software instead of just music, coding glitches could make it unplayable. Worse, a service disappears, or a software version leaves you fiddling, configuring, and patching longer than you've ever looked for the music in the first place.

Eventually you give up, purple with rage. You Google "index apache gloria gaynor i will survive" because, dammit, you paid for it and you're entitled.

While you're there, you just might be tempted to grab the rest of *The Best of Gloria Gaynor,* too. So now you're a Dirty Rotten Pirate Destroying Music. Might as well head over to the Pirate Bay and get everything else you've paid for so it doesn't happen again.

I found myself in Sweden talking to Peter Sunde of the Pirate Bay, and a couple days later I spoke with Monique Wadsted of Sweden's Motion Picture Association. They didn't agree on much. Except for this: A usable commercial alternative would kill the Pirate Bay. Forget prosecution, security, or morality. There's only one thing large-scale piracy can't survive: ease of use. People will pay good money for convenience. The problem with DRM is that it adds all the bother of piracy and charges you for it.

That really galls, and the bitterness can send former customers to piracy for life. The more unbreakable DRM becomes the more customer hemorrhage makes it commercially self-defeating.

People who once might have supported artists through legitimate commerce view piracy as simply more reliable in the long run. But we're so close to click-it-and-it-works—if only the DRM would get out of the way.

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

THE LIST

9 Things Microsoft Got Right

1 MAINSTREAMING THE PC

PCs used to be expensive and hard to use. Thanks to Windows's least-common-denominator approach, we now have ubiquitous, inexpensive computers.

2 THE "MOSTLY OPEN" PLATFORM

It's not open source, but Windows's well-documented APIs foster application development.

3 XBOX LIVE

Bringing Internet multiplayer to the mainstream is a massive gaming accomplishment.

4 PUSHING MINSPEC HARDWARE

Each version of Windows brings a new baseline hardware spec for developers to build against, forcing change and ensuring progress.

5 MOUSE AS A BIZ TOOL

Prior to Windows 3.x, the mouse was a fringe tool for Mac users and other hippies.

6 BRINGING TCP/IP TO THE MASSES

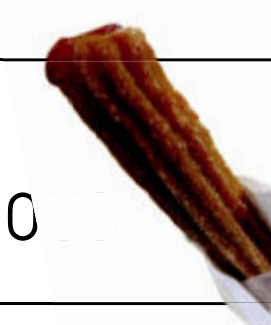
Bundling TCP/IP (and a fully fledged web browser) with Windows 95 made the Internet accessible to people who wouldn't pay $100-plus for Win3.1 TCP/IP stacks.

7 SUPPORTING LEGACY DEVICES AND APPS AT ALL COSTS

8 DIRECTX

Remember Dos4gw? So do we.

9 CHURROS: CHEWY. CINNAMONY. DELICIO



DEATHMATCH

Amazon MP3 vs. iTunes Store

Since its inception in 2001, Apple's iTunes Store has been the undisputed leader in the downloadable music market, largely due to the service's close integration with the iPod. But its dominance hasn't kept other companies from joining the fray. Indeed, with digital music sales rapidly overtaking sales of compact discs, bold companies have stepped up to challenge the iTunes throne, with varying degrees of success. Most notable of the competitors is Amazon's downloadable music store, Amazon MP3, which distinguishes itself by offering an entirely DRM-free music catalog, and more recently, with the announcement that it would be preinstalled on the first Android-based phone, HTC's G1. To find out whether Amazon MP3 has a fighting chance against the iTunes stronghold, we're putting both music stores to the test, where matters of audio quality, song selection, and customer support will determine who deserves the crown. —FLORENCE ION

AMAZON MP3
www.amazon.com

ROUND 1

FLEXIBILITY

To thwart the illegal distribution of purchased music, Apple implements a proprietary DRM on its tracks, using a tech it calls FairPlay on the vast majority of music it sells. As a result, this music is restricted to Apple's own portable devices. EMI's decision in 2007 to offer its catalog only sans DRM forced Apple to alter its policy somewhat; now EMI's music, as well as that of several indie labels, is available in an open format, designated as iTunes Plus, but this collection constitutes just a small percentage of iTunes's total offerings.

All music sold on Amazon MP3 uses a standard DRM-free MP3 file format, enabling no-hassle transfers between devices an unlimited number of times.

WINNER: AMAZON MP3

ROUND 2

SELECTION

Both iTunes and Amazon MP3 boast a library of more than 6 million songs, including titles from the Big Four—Sony BMG, Universal, EMI, and Warner. Independent and mainstream artists are abundantly available on each music service, although iTunes appears to have an edge in the more obscure offerings. For instance, we searched both sites for a handful of lesser-known selections—e.g., some trance and international tracks—and were able to find more of what we were after on iTunes. In some instances, Amazon had singles available for digital download, but the album was available only in CD format. Nevertheless, international artists and garage bands are hit-or-miss on both services. But for folks with incredibly niche music tastes, iTunes will likely better cater to your needs.

WINNER: ITUNES

ROUND 3

AUDIO QUALITY

The majority of iTunes's music is offered at 128Kbps, while all Amazon MP3s are encoded at 256Kbps—frankly, we'd much rather have the larger file. Apple's DRM-free iTunes Plus tracks are also encoded at 256Kbps, but as we mentioned before, selection is limited. Fortunately, iTunes Plus music is no longer more expensive than standard iTunes tracks.

WINNER: AMAZON MP3

ROUND 4

PRICE

Pricing on iTunes is pretty straightforward: Singles cost 99 cents and albums cost $9.99. Amazon MP3 offers more variation: A significant number of its singles cost just 89 cents, including many of its top 100 songs of the day; most other tracks cost 99 cents. Full albums on Amazon MP3 are priced between $5.99 and $9.99, with top artists coming in one to two dollars less than they cost on iTunes (Miley Cyrus's album *7 Things* is only $8.99, for example). What's more, Amazon MP3 offers a Friday Five for $5 deal, which can lead to both an empty bank account and an eclectic music library.

WINNER: AMAZON MP3

ROUND 5

DISASTER RECOVERY

Don't count on either service to help you restore your entire library. In their respective published terms of service, iTunes promises only to offer credit (but no refunds) in the event you don't receive a product you paid for. Amazon encourages you to promptly make backup copies and warns that you bear all risk of loss after purchase.

We contacted iTunes customer service to help us restore a song we lost during a hard drive failure. It took the company two days to respond to our email query (there is no phone support), and despite our efforts, the song is still resting in the valley of the dead. An Amazon customer service rep responded to our phone message in less than a minute. We hadn't lost any Amazon MP3 songs, but the representative assured us that we would receive store credit if we happened to lose a few tracks.

WINNER: AMAZON MP3

ITUNES
www.apple.com

And the Winner Is...

Amazon MP3 outshines iTunes in numerous ways. Its download client is exceptionally compact and speedy; unlike its adversary, Amazon MP3 doesn't run in the background unless it's downloading something for you, and the client uses hardly any memory. Amazon tracks are instantly transferred to a music folder nestled comfortably in My Music, unlike the iTunes library's complicated file structure. And as a rule, Amazon MP3 files are of a higher quality when burned to a compact disc or transferred to a portable player, including the Apple iPod. The impressive convenience and usability of Amazon's service makes us never want to go back to iTunes, let alone walk into a record store.

Our consumer advocate investigates...

Onboard X-Fi Support
OEM Troubles
Hot iPhone Supplies

Clubit Clubbed my CPU

Six months ago I did a complete upgrade on my PC, including the addition of a Core 2 Quad Q6600 and GeForce 8800 GTX. Fast-forward to now. My machine started freezing and I isolated the issue to the CPU.

Now here's the problem: PC Club/Clubit.com apparently went out of business. I have tried to get an RMA countless times, without luck. The website does not work: There's a dead link for account info. What's weird is that I can still access Clubit.com and it looks like the site is still selling parts. Intel does not offer warranty support for OEM CPUs, so what do I do?

—Juan Ehringer

"I WANT TO RUN A SOUNDCARD WITHOUT HAVING THESE TYPES OF SERVICES INSTALLED."

Juan, you're right. After 16 years, PC Club boarded the night train to the big adios. It filed for Chapter 7 bankruptcy in May and all of its retail stores were shut down two months later. It's likely that early on someone forgot to pull the plug on the website; now the site takes you to a placeholder. It's not like the company had been doing well. Before PC Club shut down, the Los Angeles Better Business Bureau gave it an F rating.

As you know, OEM CPUs are supposed to be directly supported by the store or PC maker the parts were purchased from. How long are OEM CPU warranties? Ask the store where you bought the part, says Intel. Intel technically washes its hands of all OEM CPU support. That doesn't always mean you're screwed though.

While Intel discourages end users from seeking warranty support on OEM CPUs, the company isn't totally heartless. The Dog recommends that you contact Intel support with the circumstances of your story—PC Club did go out of business, after all—and see if you can get assistance. If you're respectful, and the person reviewing your case has a big heart, maybe you can get a lifeline. CPU failures are actually few and far between under normal usage, so you might be able to catch a break.

Retail boxed CPUs are covered by a three-year warranty, but even those users should remember to save all the packaging and the original heatsink that came with the CPU, in case they ever need warranty support.

Warranties for OEM, or "bare," chips are offered only through the store where the chips were purchased and are much shorter than retail warranties.

P45 Mobo: Licensed for Sound

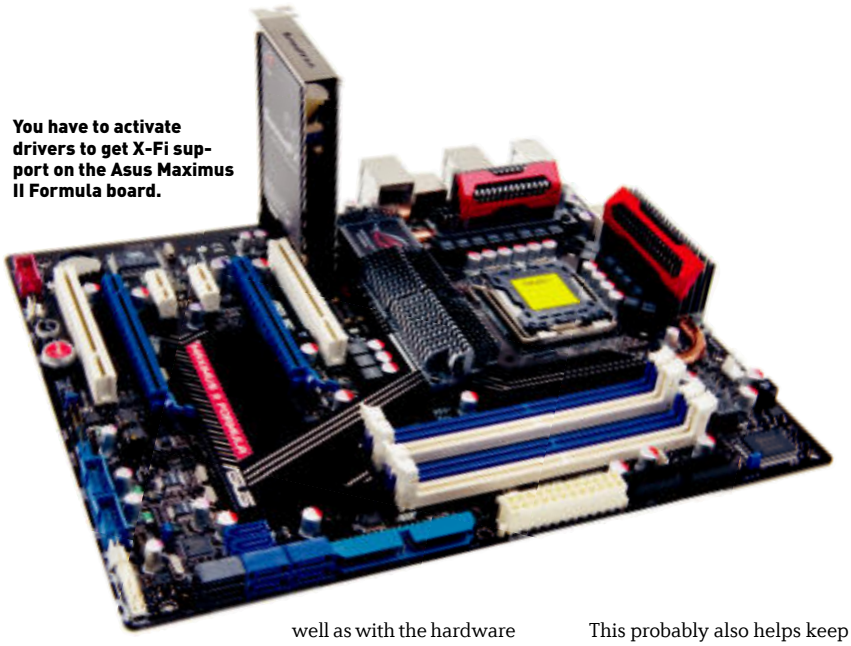
Since when do I need to "license" my PC in order to install a soundcard? Since now, I guess. I just bought an Asus Maximus II Formula P45 mobo that happened to come bundled with Creative's Sound Blaster X-Fi audio riser card. I thought, great, now I don't have to purchase a soundcard.

But when it came to installing the software to run the board, I had to provide a computer fingerprint, similar to what you get when you install Vista. Not only did I have to do that—which in retrospect, I wish I hadn't, because I shouldn't have to license drivers and software that work only with a specific piece of hardware—but I also ended up with a Sound Blaster X-Fi MB Licensing Service running on my machine. Why should I have to burden my machine with this service if I own the hardware?

Is it just me or is this getting out of hand? I want to run a soundcard without having these types of services installed. Can you help me out?

—John

EMAIL THE WATCHDOG If you feel you've gotten a raw deal and need assistance setting a vendor straight, email the Dog at watchdog@maximumpc.com. Please include a detailed explanation of your problem as well as any correspondence you have sent concerning the issue.



You have to activate drivers to get X-Fi support on the Asus Maximus II Formula board.

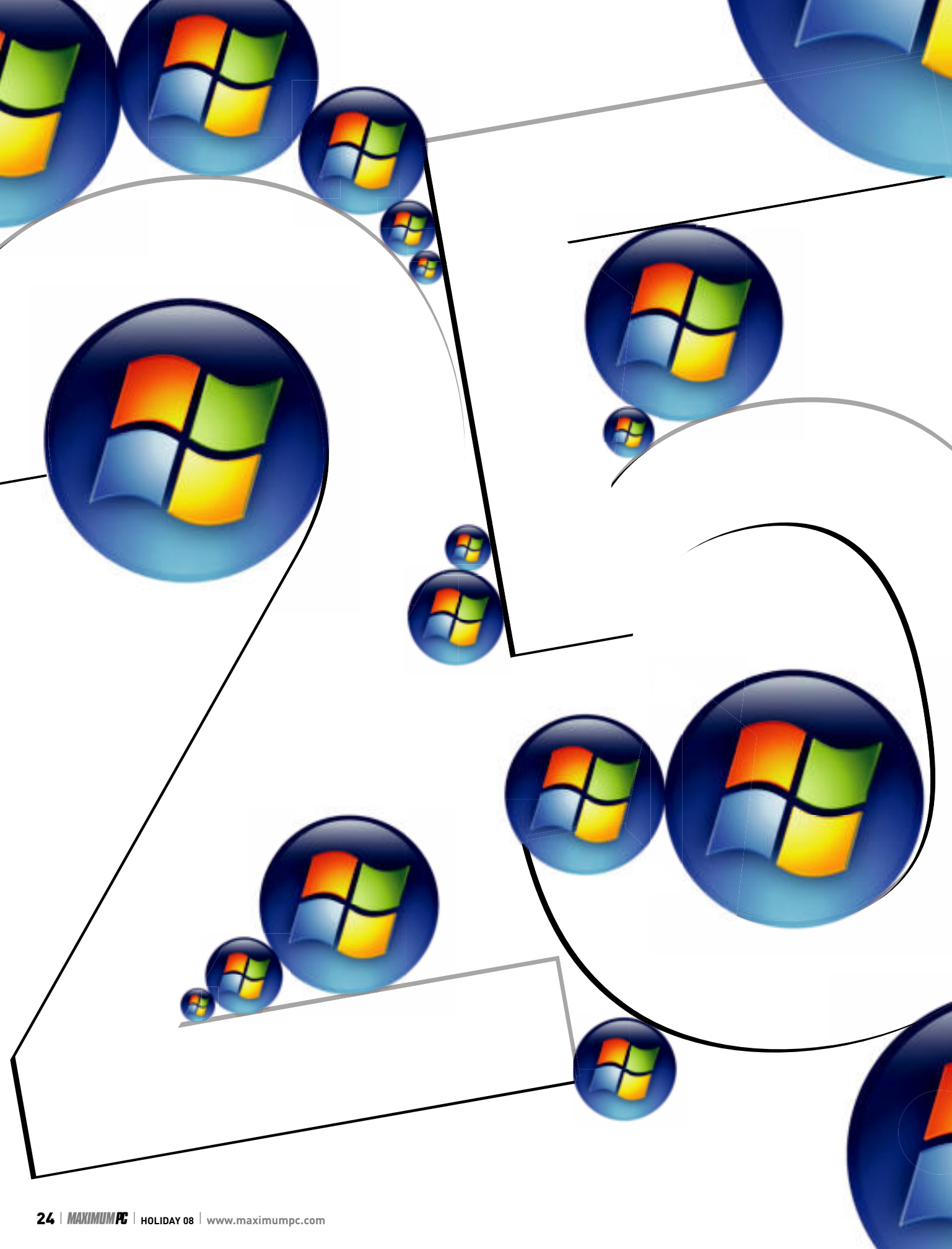
This isn't a totally new practice. Creative began using activation on its X-Fi cards that feature Dolby Digital Live support as an accounting tool. Since the company pays Dolby for each soundcard owner that uses Dolby's real-time encoder, Creative forces each person to activate the card's drivers. The activation process also helps Creative address the issue of end-users using its drivers to add Dolby Digital Live to the company's other products. That practice got Creative into some hot water with Dolby—as well as with the hardware community, which balked when Creative squelched the bootleg drivers.

In the case of the Asus Maximus II Formula board, the Dog suspects that Creative is using activation to protect its own intellectual property. These motherboards don't actually use any of Creative Labs's hardware, just the company's algorithms. The activation is probably there to prevent some enterprising lad or lass from simply sharing the audio drivers with someone who didn't pay for a board with licensed X-Fi support. This probably also helps keep the motherboard vendors happy because if they had to pay an extra $5 to Creative for the driver support, they'd be pissed if brand B basically got it for free.

Still, it's a pretty lousy situation for the consumer, as the monitoring mechanism does use RAM and CPU cycles to determine you're using a licensed version of the drivers. You can avoid all this by just not installing the X-Fi drivers; the Maximus II Formula works fine without the drivers, but you do lose much of the advanced functionality.

RECALL ALERT

→ Apple is recalling almost every charger sold with its 3G iPhone due to a shock hazard. The Ultracompact USB Power Adapter may snap off and leave exposed prongs sticking out of the socket. Apple said it has received a small number of complaints but has decided to recall all of the chargers for the phones. Defective chargers were sold in the U.S., Canada, Japan, Mexico, Ecuador, El Salvador, Guatemala, Honduras, Peru, Argentina, Chile, Costa Rica, and Panama. Updated chargers for phones that are not part of the recall have a small green dot on the bottom. If your charger does not have the dot and looks like the charger in the picture, Apple recommends that you disconnect it and discontinue use. In the meantime, you can charge the iPhone 3G by plugging the USB cable into a powered computer's port until a new charger is sent to you. Bad chargers may also be exchanged for free at Apple stores. For more information consumers should visit http://tinyurl.com/hotapplepie.



Windows Tips: Do the most popular ones really do anything?

BY CHRISTOPHER NULL

Since the dawn of Windows, power-user tipsters (us included) have proffered hundreds of suggestions with the promise of improving your PC's performance or streamlining its operation. The tip-givers have the best of intentions, but do all of those tweaks, registry hacks, utilities, and "undocumented secrets" really make any difference? To our surprise, in a number of cases, it turns out that tips that sound great on the surface don't actually do anything when you put the screws to them. And some of those complicated registry hacks are more easily done with tools like TweakUI, saving you a lot of hassle.

We put 25 of the most commonly published XP and Vista performance tips and registry hacks to the test. Do the speed tweaks yield dividends? We clocked performance with PCMark and timed boots and shutdowns repeatedly after making the changes suggested in the tips. In the end, we found that many tips were right on the money, but some were outright wrong or just a waste of time. Some tips fell into the gray area in between, offering some improvement but perhaps not enough to merit the trouble of the hack to begin with. On the following pages, we indicate the strength of each tip with a validity meter.

Read on for our results. You'll never tweak the same way again!

XP/VISTA

you need to overwrite your hard drive seven times with random data to make data unrecoverable

Conventional wisdom holds that you need to write and rewrite a hard drive numerous times with garbage before it will be totally unrecoverable by forensics experts. That's not exactly the case: We overwrote a hard drive just once with zeroes and asked the recovery gurus at DriveSavers if they could rescue it. The answer: They couldn't save a single bit. Now we don't pretend to know about the hardcore resources of groups like the NSA, so if you're *that* paranoid about being branded a terrorist because of a deleted PDF of *The Anarchist's Cookbook* discovered on a used drive you bought on eBay, by all means, spend a week wiping that drive. But if you're just casually recycling a drive for resale or donation, a single pass will do the trick and will save you literally days of time waiting for the wipe to finish.

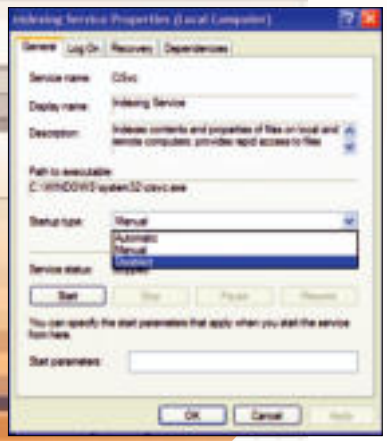
DO IT Run a program like KillDisk (www.killdisk.com) and select a single zeroes-only pass.

VISTA

turning on multiple cores in vista improves boot time

You'll find an option within Vista's msconfig utility that cryptically lets you set the "Number of processors" used during boot. By default it is turned off (with the drop-down set to 1). We tried upping the setting to 2 on a dual-core system and, guess what, no change in boot time whatsoever. Turns out this is just a debug setting for coders who want to test how programs load on single-core machines without having to physically go to a less-sophisticated PC. It can be completely ignored. By default Windows uses all your cores.

DON'T DO IT



XP

disabling XP's indexing service can improve performance

You can almost ignore the question of whether XP's Indexing Service slows down your computer. The fact is it doesn't do much good anyway. Indexing is supposed to help Windows keep better tabs on files, but it does a terrible job of it and offers the user no options for configuring what gets indexed. It's almost beside the point that it can slow your system—sometimes only a little and sometimes to an outright crawl. Even Microsoft acknowledges that the Indexing Service can cause hard drives to thrash and that it "uses lots of pagefile space and lots of CPU time"—in fact, Microsoft often recommends disabling it. Note, however, that Vista's integrated search and indexing system is considerably improved.

DO IT There are several ways to turn off XP's Indexing Service. The most thorough is to open the Control Panel, open Administrative Tools, then open Services. Scroll down to Indexing Service and double-click it. Change the Startup type to "Disabled."

VISTA

superfetch boosts performance

Superfetch is an update of the XP Prefetcher, designed to more intelligently load applications into RAM based on frequency of use. With Superfetch on, your PC should theoretically get faster over time, particularly when loading frequently used apps. You won't see improvement in general performance, like rendering Photoshop files, but Superfetch does tend to make apps load 10 to 20 percent more quickly, depending on their size.

DO IT Superfetch is on by default. To ensure that it's active, go to the Control Panel, open Administrative Tools, and select Services. Scroll down to Superfetch and ensure that it is set to "Started" and "Automatic."

VISTA

write caching will improve performance on SATA drives

This feature is disabled by default in Vista because if your computer loses power before a write is completed, you can lose data. If you're confident in your UPS's capabilities, crank it up and you'll see at least a 10 percent improvement in performance. Remember, write caching is supported only on SATA drives. The options are grayed out for older ATA disks.

DO IT In Explorer, right-click the drive you want to speed up and select Properties. Click the Hardware tab, select Properties again. Click the Policies tab. Check both of the boxes beneath "Optimize for performance."

XP/VISTA

clearing the prefetch directory (or cache) will improve startup time

One of the most notorious Windows tips ever is that deleting all the files in the Windows\Prefetch directory will cause your system to boot faster. We tested the tip by repeatedly measuring boot times on a trio of both XP and Vista machines with overstuffed Prefetch folders, then running the same test after clearing the folders out. The result: No improvement in boot time in any of the cases. Some testers have reported that clearing the Prefetch cache actually *lengthens* boot time, though we didn't experience this either.

DON'T DO IT

XP/VISTA

disabling unused network connections will improve boot time

Say you set up a network drive for a computer you had months ago but is no longer on your network: When Windows boots, it spends at least some time reconnecting to that drive, wasting precious seconds you could be spending on Facebook. While XP and Vista are better than older versions of Windows about network connections (who can forget those interminable "Connecting..." messages?) it still makes sense to disconnect from network shares you no longer need. You won't actually boot noticeably faster without those extra drive letters, but Explorer will become usable more quickly after launch. This is especially noticeable in Vista, which has a helpful "loading" progress indicator that overlays the address bar: Having any number of network shares will cause it to take an extra 10 to 20 seconds to fully load.

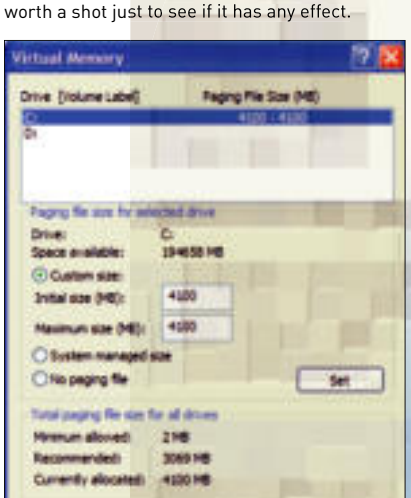
DO IT Right-click each shared folder in Explorer and select Disconnect. This will permanently remove them from your drive list unless you map them again.

XP/VISTA

you can tweak virtual memory settings for improved performance

In the Windows 95/98 era, conventional wisdom held that you should manually set your virtual memory (i.e., pagefile) size to at least 1.5 times the amount of RAM in order to optimize performance. (By default, Windows will manage pagefile size on its own: You will likely find the initial pagefile size set to 0.5x or 1x the amount of RAM you have). We were skeptical about this tip, but our benchmarks surprised us: Some systems showed no change at all, but some (particularly older machines) showed substantial improvement beyond the usual random noise we see in benchmark results. We got at least a 10 percent jump after we upped the initial pagefile size to 2x the amount of RAM on two separate machines. It won't work for all computers, so the jury's still out on this one, but because it's so easy to do and there are no negative consequences, it's worth a shot just to see if it has any effect.

DO IT In the XP System Control Panel, click Advanced, then (under Performance) click Settings, Advanced. In the Virtual Memory module, click Change. Click Custom size then up both Initial and Maximum size to roughly double your amount of RAM. Click Set (important!), then OK out of all windows. In Vista, click "Advanced system settings" in the System Control Panel and follow the same instructions.

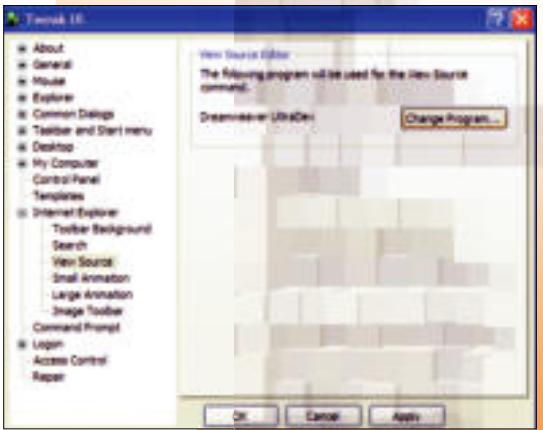


XP

change your default 'View Source' application with a registry hack

Viewing web-page source files in Notepad is hardly a user-friendly experience. You can hack the registry to change which app opens source files, but using TweakUI is a better choice.

DO IT Load TweakUI (http://tinyurl.com/553fw6) , browse to Internet Explorer > View Source. Click Change Program... and browse for whatever app you prefer. This only changes the setting for Internet Explorer; to change the View Source app for Firefox, type `about:config` in the address bar, scroll to view_source.editor. path, and change the setting by pasting in the full path to the application you want to use. (The Firefox tip works with XP and Vista, but you'll have to tweak the registry if you want to do the same for IE under Vista.)

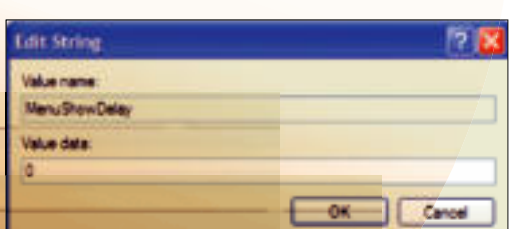


XP/VISTA

minimize menu loading delay time through a registry hack

By default, both XP and Vista wait 400 milliseconds before presenting expansion menus (those menu items with right-facing triangles on them). You can eliminate the wait completely for instantaneous menu expansion (though be warned, you may not actually like it). Note that this will *not* make, say, your primary File or Edit menu show up faster—those menus automatically load as fast as possible.

DO IT Run regedit at the Run prompt. Browse to HKEY_CURRENT_USER\Desktop. Double-click the MenuShowDelay key in the right-hand pane and set the value to 0.



XP/VISTA

disabling QoS and IPv6 options will improve bandwidth and web performance

The theory goes that you should disable any service you aren't using, and that turning off IPv6 and QoS Packet Scheduling options in your NIC properties will boost browsing speed. One absurd legend holds that QoS alone actually "reserves" 20 percent of your bandwidth. Microsoft has formally debunked this tip, and our tests back that up: We found zero difference at all in file-transfer speeds whether QoS and IPv6 options were on or off, on both XP and Vista systems.

DON'T DO IT

XP/VISTA

putting your paging file on a second hard drive will improve performance

Splitting up the pagefile and your everyday apps is common sense. Doing this allows Windows to dump temp junk onto one drive while not having to interrupt reads or writes on the other. If you have two hard drives, this is a tip that definitely works and works well: Expect at least a 5 to 10 percent speed boost, depending on the existing speed of your rig and, especially, the performance of your drives. But any second drive will help at least a little: While not recommended, you can even put the pagefile on an external USB drive and see some performance gains.

DO IT Follow the same instructions as the "Virtual Memory" tip on page 28. When in the VM settings, click your secondary drive, add a "Custom size" or "System managed size" paging file, and click Set. On your primary drive, select "No paging file" and click Set. OK out and reboot.

XP/VISTA

turning off System Restore improves performance

System Restore is a real aid when it comes to rolling back bad Windows patches and driver updates, but by its very nature, it is said to impact performance because it's always creating restore points, thus robbing you of a little power. The truth: System Restore lurks idle most of the time and rarely does anything at all, creating checkpoints only during app installs plus once every 24 hours by default. Even then it spends only a few seconds doing so and only during idle time. It's virtually unthinkable that you'd try to run a program at the exact same time that System Restore began creating a restore point, and even if you did, you probably wouldn't notice. The proof is in the benchmarks: We got nearly identical results on PCMark whether System Restore was on or off. (Note, however, that System Restore can consume a fair amount of disk space—this is configurable—so if gigabytes are precious to you, consider throttling it back.)

DON'T DO IT

XP/VISTA

cleaning out cached and temp files improves performance, especially of your web browser

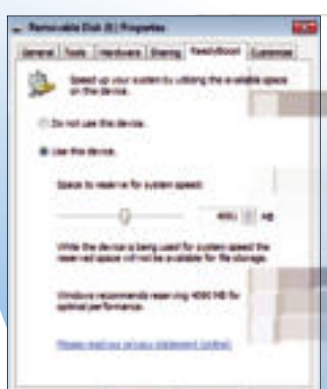
Unless you have so much junk on your hard drive that you are nearly out of free space, deleting any number of files—whether they're temp files or permanent ones—won't improve performance at all. The only exceptions to the rule are for programs or processes that involve every file on your drive: Virus scans or full disk backups, for example, are faster if there's less data to deal with. It makes sense to clear these files out using Disk Cleanup every now and then for the sake of good digital hygiene, but you won't get a performance boost for your trouble.

DON'T DO IT

VISTA

ReadyBoost will improve system performance

Yes and no. If you have a reasonably modern system, with even 1GB of RAM or more, you won't see any performance increase from ReadyBoost, which lets you use removable flash memory to cache disk operations. In fact, with lots of RAM, we saw a slight dip in performance when using ReadyBoost. The picture is different if you're pathetically RAM-poor: With just 512MB of RAM, app load times and general performance can be modestly improved with ReadyBoost... but why not spring for some real DIMMs instead of this half-baked setup? You shouldn't be running Vista at all with so little RAM, nor should you be reading this magazine. 2GB of name-brand RAM will cost you less than 50 bucks; pricier than a 2GB thumb drive but oh so worth it.



DO IT If you really want to run ReadyBoost, the easiest way to turn it on is to insert your thumb drive and allow AutoPlay to run. Select "Speed up my system" from the menu. If you have AutoPlay disabled, right-click the thumb drive in the Computer view, select Properties, and choose the ReadyBoost tab. Dial ReadyBoost up to the maximum supported level of 4GB.

XP

hack the registry to make your system shut down more quickly

When's the last time you *didn't* have an application hang on you during shutdown? XP waits a grueling 20 seconds by default before trying to kill services that are still running when you're trying to get out of the office, but you can knock this down to as low as zero with a quintet of registry hacks.

DO IT Make the following changes in regedit:

- Under HKEY_USERS\.DEFAULT\Control Panel\Desktop, change the values for WaitToKillAppTimeout and HungAppTimeout to 1000 or 2000 (this is the wait time in milliseconds).
- Under HKEY_CURRENT_USER\Control Panel\Desktop, change the values for WaitToKillAppTimeout and HungAppTimeout to 1000 or 2000.
- Under HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control, change the value for WaitToKillAppTimeout to 1000 or 2000.
- Use the same value for all three settings.

XP/VISTA

defragmenting SSD drives is useless

Regardless of the actual value of defragmenting a physical hard disk (see the tip on the right), there's *really* no value at all in defragging an SSD. The reason has to do with the way flash memory is constructed. The theory behind defragmenting a hard drive is to order data into contiguous, uninterrupted segments of the disk. But flash memory isn't built that way: Blocks of data are placed throughout the drive space and are all accessible with the exact same speed, and since there are no moving parts in an SSD, there's no advantage to rearranging them. Some even caution that, since flash memory is limited to a finite number of writes before it fails, defragmenting can actually do more harm than good.

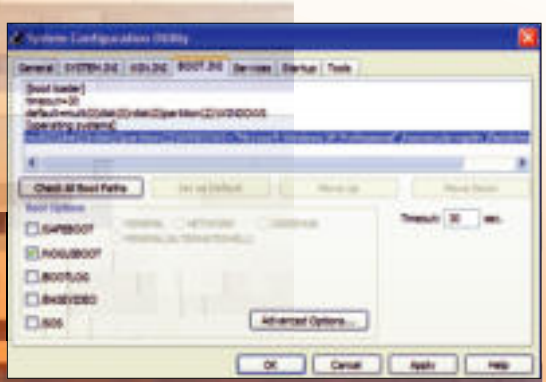
DON'T DO IT

XP/VISTA

eliminate the Recent Documents/Recent Items folder with a registry hack

For privacy reasons, many users on shared computers like to clear the Recent Documents folder or delete it altogether. Totally understandable, but there's no need to turn to the registry to do the job. It's all in the invaluable TweakUI (and in Vista, it's built into the OS).

DO IT In XP: Install TweakUI and browse to the Explorer section; then uncheck "Allow Recent Documents on Start menu." In Vista, right-click the taskbar, click the Start Menu tab, and uncheck "Store and display a list of recently opened files."



XP/VISTA

defragmenting your hard drive improves performance

One of the most venerable suggestions for improving disk performance is to defragment your hard drive regularly. The science of defragging is sound: By putting all the bits of a file or application in sequential order on your drive, the drive should have to do less work (and spend less time) to access those files. Thus: faster performance. Well, in practice it's not really true. Today's hard drives are fast enough to make fragmentation largely irrelevant, and our benchmark tests have repeatedly borne this out: On moderately fragmented drives, defragmentation will offer negligible to no performance increase. For seriously fragmented drives (think 40 percent or more), especially those running XP or older OSes, defragmentation can help, but don't expect the world. As for third-party defrag tools, there's no real evidence that they're any more effective than Windows' built-in defragger.

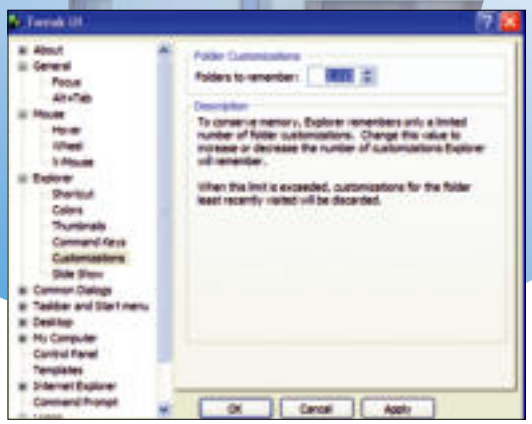
DO IT Click Disk Defragmenter under Accessories / System Tools.

XP/VISTA

turning off the Windows splash screen will shave time off your boot

No one seriously needs to be reminded they're running Windows while the computer is loading the OS, right? Turning off the Windows splash screen ought to cut a little bit off of system boot time. For most systems, this generally works, but we never saw an average improvement of more than two seconds—and even less on Vista systems (probably because in lieu of the animated progress bar, you get a colorful Aurora). Still, a second is a second....

DO IT XP: At the Run prompt, type `msconfig`. Click the BOOT.INI tab, and select the /NOGUIBOOT option. Very similar for Vista: Run msconfig, click the Boot tab, and select the No GUI Boot option.



XP

use TweakUI to set the number of customized folders in Explorer

Many users want photo folders to show up with thumbnails in Explorer and have, say, everything else default to the list-based detail view. But if you have a large number of folders, Windows won't keep track of them all, and if you go over the default of 400, some will revert to the standard view. This can be tweaked in the registry but it's easier with TweakUI: You can get Windows to remember up to a maximum of 65,527 customized folders with a simple change.

DO IT In TweakUI, scroll to Explorer > Customizations. Change the "Folders to remember" to whatever number you'd like.

XP

disabling the last-access timestamp will boost performance

A total bust. Turning off the mechanism that stamps a date and time on a file every time you access it (via a command-prompt instruction) does nothing for performance whatsoever. It may actually have negative consequences: Some sources worry that turning off these timestamps can wreak havoc on programs that rely on them, like incremental backups. Skip this one altogether.

DON'T DO IT

XP/VISTA

turning off support for 8.3 filenames will improve performance

To maintain backward compatibility, Windows keeps an alias of every file and folder name in the old 8.3 format, even on NTFS partitions that support long filenames. The odds that you will ever need to use this format to access a file are incredibly small, so you can turn it off via a registry hack. The tip does nothing for general performance, but it can shorten the time it takes to open and display folders, though you'll notice a difference only with extremely full folders (1,000 items or more) and usually only the first time they are opened.

DO IT Run regedit and browse to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FileSystem. Select NtfsDisable8dot3NameCreation and change the value to 1.

XP/VISTA

a registry hack lets you keep Windows from rebooting automatically after installing updates

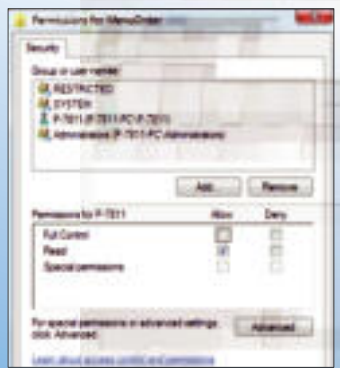
Another huge nuisance in Windows. There's just nothing quite like leaving a file open overnight, then returning to your PC in the morning to find that Microsoft has helpfully restarted your machine for you, shoving all your work into digital limbo and leaving an evil calling card: "This update required an automatic restart." It's possible to stop auto-reboots, but it'll take a registry hack.

DO IT Run regedit and browse to HKEY_LOCAL_MACHINE\SOFTWARE\Polices\Microsoft\Windows. Create a new key under Windows and call it WindowsUpdate. Now create another new key under WindowsUpdate called AU. With AU selected, in the right-hand pane right-click and create a New DWORD. Call it NoAutoRebootWithLoggedOnUsers. Double-click the DWORD and give it a value of 1. Reboot, and Windows's death grip over your system will be ended.

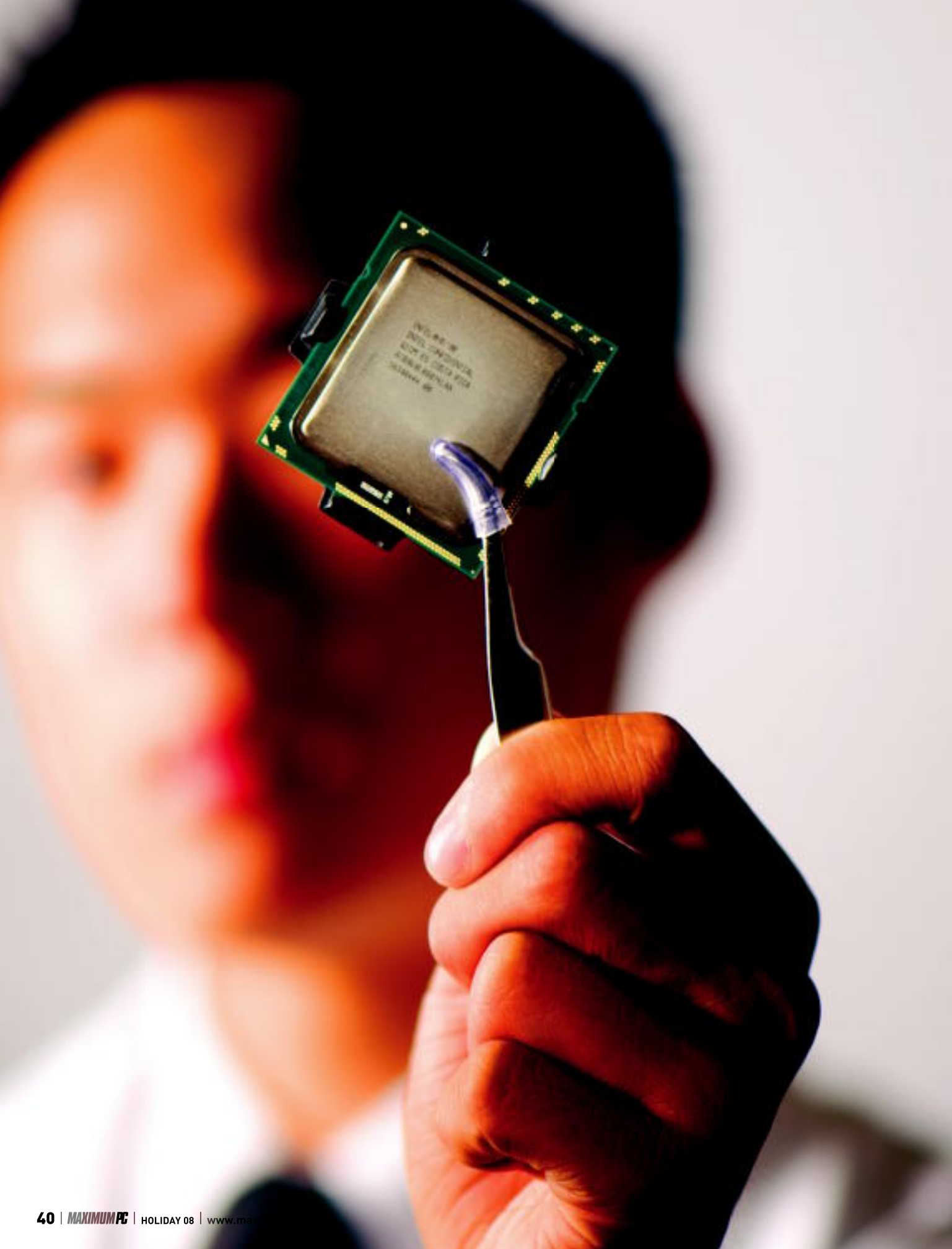
XP/VISTA

a registry hack lets you alphabetize the All Programs list automatically

One of Windows's little eccentricities is that when you install a new application it places it in the All Programs list at the bottom, not in alphabetic order where it belongs. You can manually reorder the list by right-clicking on one of its entries and clicking Sort by Name, but you'll need a complicated registry hack to automate things every time you install an app.



DO IT Run regedit and browse to HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer. Right-click the MenuOrder key (in the left-hand pane) and select Permissions. Click Advanced. Deselect "Include inheritable permissions..." (Vista) or "Include from parent the permission..." (XP). Click Copy at the Security pop-up. Click OK. Now, back in the Permissions view, select your user name and deselect "Allow" next to Full Control in the Permissions pane at the bottom of the window. Repeat this step for any groups you are part of (Administrators, etc.). Reboot. Now when you install apps, they'll be alphabetized automatically. Whew!



CORE i7 Up Close

Does Intel's next-generation chip live up to the hype? Hell yeah

BY GORDON MAH UNG

Tick tock? More like ding-dong, mutha—shut your mouth. What baby? We're talkin' about Core i7.

Our apologies to Isaac Hayes, but if he were alive, we're almost certain he would have been tapped to hammer out a theme song for Intel's most significant CPU launch in, well, ever.

Why is this CPU more significant than the 8088, Pentium, or Pentium M? As the second new chip produced after a series of embarrassing losses to archrival AMD, the Core i7 will answer for the world whether Intel is prepared to ride the momentum of its Core 2 launch with another winning chip or if it's content to rest on its laurels, as it did with the Pentium 4.

Core i7 also represents a major new direction for Intel, which has stubbornly clung to the ancient front-side-bus architecture and discrete memory controller for years. Indeed, with its triple-channel integrated DDR3 memory controller and chip-to-chip interconnect, the block map of a Core i7 looks more like an Athlon 64 than a Core 2 chip.

Intel actually has three quad-core Core i7 CPUs ready: the top-end 3.2GHz Core i7-965 Extreme Edition, the performance-oriented 2.93GHz Core i7-940, and the midrange 2.66GHz Core i7-920. For the most part, all three are exactly the same except for clock speeds, multiplier locking (only the Extreme is unlocked), and QuickPath Interconnect speed. See the chart on page 42 for details.

The bigger issue is how Core i7 performs. To find out, we ran the Extreme 965 against AMD's fastest proc as well as Intel's previous top gun in a gauntlet of benchmarks. Read on for the results.

PHOTOGRAPHY BY MARK MADEO

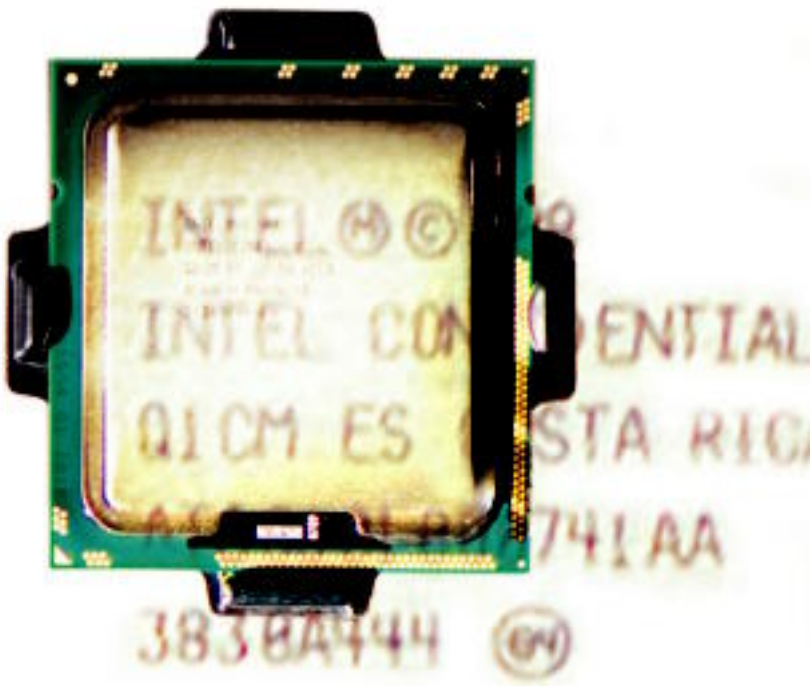
Core i7 Versus the World

Three CPUs enter—only one emerges alive!

To test the Core i7's mettle, we threw it in the ring with the two quad-core class leaders available today: AMD's 2.6GHz Phenom X4 9950 Black Edition and Intel's 3.2GHz Core 2 Extreme QX9770. We paired each with its respective top-end chipset: a 790FX board for the Phenom X4 and an X48 for the Core 2, while the Core i7 partnered with an Intel DX58SO board using the new X58 chipset. All three systems were outfitted with an Nvidia GeForce 8800 GTX card, the same graphics driver, a Western Digital 150GB Raptor 10K hard drive, and the 64-bit edition of Windows Vista Home Premium.

For RAM, we couldn't use the same components in all three systems; the Phenom uses DDR2 while both Intel CPUs use DDR3; the Core i7's triple-channel DDR3 requires three DIMMs for maximum bandwidth while the Core 2 needs just two. Our solution favored the Phenom and Core 2: We populated the Phenom X4 with 4GB of Patriot DDR2/800 and the Core 2 with 4GB of Corsair DDR3/1333, each receiving a pair of 2GB modules. The Core i7 made do with three 1GB DDR3/1066 DIMMs from Qimonda. The Core i7 officially supports DDR3 at 1066 at this point, so we stuck with stock speeds, although motherboard vendors tell us they're able to hit far higher DDR3 speeds.

We selected a combination of tests that stress memory performance, computational abilities, and real-world performance. The vast majority of the application tests are multithreaded. The gaming tests, beyond 3DMark Vantage, reflect performance optimized for dual-core CPUs, at best. For our real-world gaming tests, we turned down graphics and resolutions to the minimum to remove the GPU as a bottleneck.



THE CORE I7 FAMILY

	Core i7-965 Extreme Edition	Core i7-940	Core i7-920
CLOCK SPEED	3.2GHz	2.93GHz	2.66GHz
L2 CACHE	1MB	1MB	1MB
L3 CACHE	8MB	8MB	8MB
PROCESS	45nm	45nm	45nm
TRANSISTORS	731 million	731 million	731 million
QPI SPEED	6.4GT/s	4.8GT/s	4.8GT/s
MULTIPLIER LOCK	No	Yes	Yes
DEFAULT MULTIPLIER	24	22	20
VOLUME PRICING	$999	$562	$284

THE UPSHOT

If we had to describe the Core i7 in one word, it would be *monster*. The CPU is to benchmarks as Godzilla is to downtown Tokyo.

Take, for example, the Core i7 Extreme 965 versus the Phenom X4 9950 Black Edition. It's no surprise that the Core i7 throws the Phenom X4 through a couple of concrete walls and right into a telephone pole. We witnessed performance differences of 87 percent, 95 percent, and even 133 percent over the fastest Phenom X4 part. AMD's best and brightest part was utterly crushed by Intel's new baby. Naturally, some folks will argue that it's unfair to put a $1,000 chip against one that sells for $174, but we don't feel that way. The Phenom X4 9950BE is AMD's fastest CPU. If AMD doesn't feel comfortable selling it at higher clocks, that's AMD's problem. Sure, we could overclock the Phenom part to 3GHz, but we could also overclock the Core i7. In the interest of a more competitive landscape, let's just hope AMD's 45nm CPU—due out soon—puts some pep back in the company's step because the situation is getting beyond ugly.

A more closely matched fight was expected between the Core i7-965 Extreme Edition and Intel's own Core 2 Extreme QX9770, both of which churn along at 3.2GHz. Nevertheless, the Core i7 managed to maul its sibling in several benchmarks. In our MainConcept H.264 encoding test, the Core i7 was 55 percent faster.

In ProShow Producer, the Core i7 completed its runs about 25 percent faster. Using WinRAR to compress a folder of digital RAW files, the Core i7 was 43 percent faster. In other tests, especially gaming, the QX9770 closed the spread down to single digits, but for the most part, the Core i7 was from 14 to 20 percent faster than its Penryn counterpart.

Not everything came up roses for the Core i7, however. We saw the Core i7 cough up a hair ball in FEAR with an odd 51fps compared with the QX9770's 122fps and a shocking 239fps from the Phenom. Intel says this is the result of a USB bug, as a duplicate system in its lab performed as expected. A more believable result was in World in Conflict: The Core i7 reached 250fps versus the QX9770's 220 and the Phenom's 136.

Even an Arthur Andersen accountant would have to declare the Core i7 the new champion after peeping our benchmark table. From encoding performance to 3D rendering to gaming, the Core i7's more efficient core, boatloads of memory bandwidth, and low RAM latency make it a shockingly fast CPU.

BENCHMARKS

	Core i7-965 Extreme Edition	Phenom X4 9950 Black Edition	Core 2 Extreme QX9770
MainConcept (sec)	**958.0**	1,897.0	1,489.0
MainConcept Pro (sec)	**608.0**	1,124.0	889.0
ProShow Producer 3.1 (sec)	**619.0**	1,210.0	772.0
Premiere Pro CS3 (sec)	**617.0**	987.0	686.0
Cinebench 10 32-bit	**15,398.0**	8,179.0	12,175.0
Cinebench 10 64-bit	**18,963.0**	10,431.0	13,849.0
ScienceMark Overall	**2,091.2**	1,608.7	1,920.2
ScienceMark Membench	**13,312.0**	7,279.0	8,559.5
PCMark Vantage x64 Overall	**7,510.0**	5,724.0	6,423.0
PCMark Vantage Overall	**6,705.0**	5,299.0	5,961.0
Sisoft Sandra RAM Bandwidth (GB/s)	**18.2**	9.7	7.4
Sisoft Sandra RAM Latency (ns)	**77.0**	95.0	79.0
Everest Ultimate MEM Read (MB/s)	**15,167.0**	6,701.0	8,252.0
Everest Ultimate MEM Write (MB/s)	**12,041.0**	4,856.0	8,490.0
Everest Ultimate MEM Copy (MB/s)	**15,583.0**	7,760.0	8,426.0
Everest Ultimate MEM Latency (ns)	**39.2**	64.7	66.7
WinRAR 3.80 RAW files (sec)	**584.0**	1,091.0	837.0
POV-Ray 3.7 (sec)	**408.0**	712.0	488.0
Photoshop CS3 (sec)	**110.0**	168.0	115.0
Valve Map Compilation (sec)	125.0	167.0	**116.0**
3DMark06 OV	12,859.0	11,639.0	**12,906.0**
3DMark06 CPU	**5,638.0**	3,532.0	4,717.0
3DMark Vantage	7,516.0	7,301.0	**7,588.0**
3DMark Vantage CPU	**39,725.0**	26,709.0	32,446.0
3DMark Vantage GPU	5,917.0	5,877.0	**6,044.0**
FEAR (fps)	51.0	**239.0**	122.0
Quake 4 (fps)	**228.0**	152.3	206.6
Valve Particle Test	**161.0**	69.0	111.0
Crysis (fps)	**164.0**	112.0	153.0
World In Conflict (fps)	**250.0**	136.0	220.0

Best scores are bolded.

The Core i7 Dissected

The CPU sports some unique features—we test their merits

HYPER-THREADING: THE NEXT GENERATION

Hyper-Threading got a bad rap under Pentium 4 for being more a hindrance than a help to performance. Our tests then showed that HT generally helped, but the lack of threaded applications made the feature pretty near worthless. Intel has reintroduced Hyper-Threading with the Core i7 and says it's worth another look. We ran a handful of our multithreaded applications with HT both on and off and determined that this time around, it's good stuff. We generally saw a healthy double-digit boost in performance with HT enabled. Using the latest version of ProShow Producer, we actually took a 26 percent hit by turning off Hyper-Threading. MainConcept's encoder experienced a drop of 17 percent without Hyper-Threading. So, if you ask us, you oughta leave it on.

BENCHMARKS

	HT On	HT Off	Difference
MainConcept (sec)	**958**	1,153	-17%
ProShow Producer 3.5 (sec)	**642**	868	-26%
Cinebench 10 32-bit	**15,398**	13,451	-13%
Cinebench 10 64-bit	**18,963**	16,613	-12%
POV-Ray (sec)	**408**	416	-2%
3DMark Vantage CPU	**39,725**	35,623	-10%

Best scores are bolded.

TINKERING WITH TURBO MODE

Intel's Turbo Mode gives the user fine-grain control over individual cores. By shutting down individual cores that aren't used during, say, a single-threaded game, you can pick up what is essentially free performance by overclocking, or rather, Turboing, from 3.2GHz to 3.8GHz. We dialed up the allowable, um, Turbos from the stock 24 to 27 to see if the feature works. Indeed it does. In our mostly single-threaded Photoshop CS3 test and World in Conflict, we saw the scaling you'd expect from a 10 percent overclock. Since we didn't choose to overclock for two threads, we didn't see much of a change in Quake 4. Our verdict is that it's a worthwhile proposition, the caveat being that you will need liquid cooling or a big, fat heatsink to truly exploit its potential.

BENCHMARKS

	Turbo On	Turbo Off	Difference
Photoshop CS3 (sec)	**102**	110	8%
Quake 4 (fps)	**233**	228	2%
World In Conflict (fps)	**272**	250	9%

Best scores are bolded.

TRI-CHANNEL MEMORY TESTED

Core i7's tri-channel DDR3 memory controller presents a radical alternative to the standard dual-channel configurations. Since the controller lets you run single, dual, or tri mode, we decided to take a look at the actual bandwidth offered by each scenario and the resulting real-world impact. Using three Qimonda 1GB DDR3/1066 DIMMs and a single Corsair 2GB DDR3/1600 DIMM (set at DDR3/1066), we ran two RAM benchmarks and Quake 4. The upshot is that for the best performance, you should populate three channels.

BENCHMARKS

	3 DIMMs (3GB)	2 DIMMs (2GB)	1 DIMM (2GB)	1 DIMM (1GB)
Sisoft Sandra RAM Bandwidth (GB/s)	**18.1**	12.7	7.1	6.7
Everest Ultimate MEM Read (MB/s)	**15,167**	14,388	8,317	8,236
Everest Ultimate MEM Write (MB/s)	12,041	**13,590**	8,285	8,187
Everest Ultimate MEM Copy (MB/s)	**15,583**	14,848	9,062	7,798
Quake 4 (fps)	**228.0**	172.4	213	167

Best scores are bolded.

EXCLUSIVE REVIEW!

LEFT 4 DEAD

Hide the children and shield your brains—zombies have risen to claim the earth

BY NORMAN CHAN

We've relished the movies about it. We've daydreamed about it happening in our own lives. We've even drawn up detailed plans for how to survive the admittedly unlikely event of a *zombie apocalypse* (answer: barricade ourselves in the local Costco). There's just something so tantalizingly thrilling about the prospect of fighting for survival in an undead-infested world.

Left 4 Dead, Valve Software's new multiplayer first-person shooter, delivers that awesomely terrifying experience to us. Abandoned metropolises, a ragtag band of hapless strangers, and an endless horde of infected humans—all the staples of a nail-biting George A. Romero zombie epic—are present and accounted for in this ambitious cooperative adventure. But how does this game hold up to our obsessive zombie fantasies? We busted a few thousand undead skulls to find out.

Survivor's Journal:
How We Lived through the Undead Uprising

In the global zombie apocalypse of Left 4 Dead, our goal was simple: just survive. But reaching a safe haven in hopes of getting rescued was easier said than done. We had to navigate through the crumbled ruins of modern civilization and defend ourselves against a mob of angry zombies that would stop at nothing to see us dead. Luckily, we were never alone in this frightening fight for survival. We were not only always accompanied by three teammates (controlled by either real players or AI) but also equipped with a zombie's greatest weakness: bullets. Lots of bullets.

Our nerve-racking journey was broken into four story campaigns, each consisting of five sequential levels. These "movies" all followed the same structure: The four of us traversed zombie-infested territory to reach safe houses at the end of each chapter, building up to a lengthy final stand while awaiting rescue at each campaign's finale.

We started off in the No Mercy act, which challenged us to find a way to the rooftop of a hospital from a distant apartment building. As we made our way through dimly lit hallways and claustrophobic stairwells to the street, we caught our first glimpse of the infected masses—soulless husks of our once neighbors and friends. It was a mistake to agitate them; once alerted to our presence, a wave of the ghoulish goons swarmed our position. These common zombies were easy to put down with our assault rifles and shotguns, but their overwhelming numbers and surprising speed made them formidable foes. Zombies would climb fences, claw through closed doors, and crawl over any obstacle for a taste of our flesh. Shooting off their limbs wasn't even enough to keep them down—the undead were impressively determined (a well-aimed headshot, though, stopped them in their tracks).

Frenzied shootouts were dynamically timed by the game's AI Director to give us moments to catch our breath after a slaughter (see the sidebar on the next page). These welcome lulls in the mayhem actually added tension because we weren't sure how much time we had before the next onslaught.

Even more frightening was the presence of five Boss Infected. More freakish than the common zombie ilk, each boss had a special ability to cause disarray among our group. The grotesquely obese Boomer vomited bile on us to attract hordes to our position, the stealthy Hunter pounced from the darkness to keep us pinned on the ground, the lanky Smoker snagged and strangled stragglers with his tongue, and the hulking Tank swatted us around like we were flies. The only way to stay alive was to work together, communicating frequently and calling out threats to avoid being caught off guard. The necessity for teamwork here is unmatched by any other multiplayer game, and the payoff for surviving the full campaign is incredibly rewarding.

Even inside a barricaded church, you're not safe from the zombie horde. When the swarm gets too close for comfort, your best bet is to knock 'em back with the butt of your rifle.

As the Hunter in Versus mode, you can pounce on a survivor and claw out his entrails while his friends are distracted. The Hunter, Smoker, and Boomer have low health, so you have to attack at once to avoid being shot down.

LEFT 4 DEAD

The other three campaigns were just as creepy, taking us through small towns, obligatory graveyards, construction sites, train stations, and even chilling forest regions. Our most memorable moment, however, was when we trekked through a large airport terminal and watched a full-size 747 airplane crash and burn on the runway. Wading through the wreckage of these realistically crafted environments was made all the more compelling by improvements to the game's Source engine, which uses cinematic filters and so-called filmic effects like enhanced contrast to augment the terror.

We made it through the four acts in about six hours on normal difficulty (advanced and expert modes are also available, and make a dramatic difference) and then jumped into the Versus gameplay mode. Here, four players play as the Boss Infected, terrorizing four Survivor players in the No Mercy and Blood Harvest campaigns. The zombie perspective is a refreshingly unique experience, where you're actually rewarded for griefing the opposing team. Cooperation is again essential for success, and we quickly learned how to string and combine our Boss Infected abilities to maximize the harassment. It's an exceptionally satisfying gameplay mode that alone promises hours of joy.

Left 4 Dead didn't just meet our high expectations for the zombie apocalypse, it exceeded them. And when the real undead uprising arrives, we'll be ready for it.

The survivors have to endure several "mini-finales," such as fending off the horde in a cramped hallway while waiting for an elevator to arrive. This is a good time to use pipe bombs and Molotov cocktails.

If you're lucky enough to spawn as the Tank, your job is to swat the survivors away from each other so your fellow Boss Infected can catch them off guard. Battered humans? Sounds tasty!

LEARN MORE AT MAXIMUMPC.com
http://www.tinyurl/left4dead-mpc

MAXIMUM PC KICK ASS! VERDICT **10**

LEFT 4 DEAD

+ 28 DAYS LATER	- 28 WEEKS LATER
Unrelenting zombie-killing action; satisfying cooperative campaigns; addictive Versus mode.	Only two of the four campaigns are available in Versus mode at launch.

$50, www.l4d.com, ESRB: M

BEHIND THE SCENES

Meet the AI Director

Left 4 Dead's zombie horde is controlled by a technology called AI Director, a complex intelligence algorithm that tracks and monitors your performance throughout the game to dynamically ramp up or tone down the difficulty. Attributes like the health of the team, available ammunition, and accuracy are taken into consideration when the director decides how many zombies to throw at you in each set piece. This ensures that the game not only feels balanced when you're playing with strangers of varying shooter aptitude but also that no two sessions will play out the same way. Variables that are changed include the number and location of the zombies you encounter, the timing of Boss Infected attacks, and the placement of weapon, health, and ammo drops. So even though you might learn the layout of a level after running through it a few times, you can still expect to be challenged and surprised by the AI Director's unpredictability. Left 4 Dead will ship with a software development kit that'll let modders build their own levels and populate them with the AI Director, as well. We can't wait to see what the community will do with this powerful tool.

PHOTOGRAPHY BY MARK MAJEO

In operation, the Reactor PC's guts are submerged in a tank holding 4.5 gallons of dielectric mineral oil.

A WELL-OILED MACHINE

Upstart PC maker Hardcore Computer unveils the Reactor—a rig that pushes the boundaries of cool

BY GORDON MAH UNG

Stop. You had us at the oil-submersed motherboard, CPU, and videocards. And even if you hadn't also dunked the SSDs and PSU in the same liquid-filled, bullet-resistant vat, we'd have been convinced that Hardcore Computer is, indeed, hardcore.

And yet the astonishing cooling apparatus is just part of the Reactor PC's glory. From its elegant aluminum case to its entirely custom design, every inch, nay, centimeter, of the rig oozes awesome. We can honestly say that in all our years of tinkering with the most exotic PCs on Earth, what Hardcore is attempting with its Reactor PC is so over the top that it's never before been tried with a production machine.

But before Hardcore can join the ranks of the most elite PC makers, it has to prove itself. Can the company really make these outrageous machines en masse and sell them at the competitive prices it claims it can? Will the Reactor really work as advertised? We got our hands on a couple of nearly complete machines and grilled company representatives for answers.

An Unprecedented Machine

Hardcore Computer asks enthusiasts to think *inside* the box: an oil-filled, overclocked box, that is

Over the years, we've seen it all—or so we thought: PCs that are water-cooled, Peltier-cooled, both water- and Peltier-cooled, even PCs cooled with phase-change refrigeration, but we've never before seen a submerged PC designed for mass production. Even more amazing, the Reactor doesn't use off-the-shelf parts that Joe Screwdriver can buy on eBay. Everything from the motherboard to the enclosure to the power supply is custom designed.

And what an impressive package it makes. If you hoisted this 110 pound beast onto a table at a LAN party, you would instantly cause a traffic jam of nerds rubbernecking your rig. In a circle of PCs, the Reactor would make the 12-layer paint jobs and curvaceous plastic bodies of its peers seem downright pedestrian.

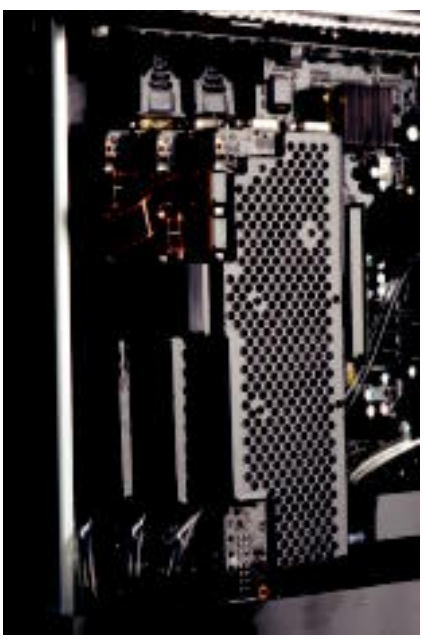
And that's the outside. Once you drill down into the guts of the machine, fondle the heavy-duty aluminum panels and ports, and finally lift the core from the PC's interior and watch the oil slowly stream off the components, you'll ask yourself how the hell anyone can make and sell this machine at a reasonable price (Hardcore says entry-level models will be $4,000; high-end rigs will push five figures).

That's what crossed our minds when we first saw the Reactor PC—can this really be pulled off? Is this some elaborate plan to have the coolest PCs on the Internet but not actually *sell* them? Apparently not. We did some sleuthing on Hardcore Computer and verified the company's incorporation date with the state of Minnesota, looked into the patents it holds, and ran a credit check. Nothing indicates that this company is a front for the Mob or a ruse for a *Punk'd* episode.

NOT A DELOREAN

Daren Klum, president of Hardcore, said it's all real. The company received $2.4 million in first-round funding and is expected to get a second round in the $10 million range. Hardcore has 30 employees, and the city of Rochester even loaned the company $200,000 last year. So put aside any fears you have that if you buy a Reactor the company might vaporize next year, Klum said.

"This is not a DeLorean," Klum said in



THREE'S NOT A CROWD
Thanks to its submersion technique, Hardcore says it can comfortably stack three overclocked GeForce GTX 280 cards as close as possible. The black plate is a stiffener to keep the card from bending in the mount.

THERMAL RADIATION
All of the Reactor's oil is circulated through a large radiator. This concentrates all of the thermals produced by the machine in one central place. Future designs may plumb an external AC unit to cool the oil.

BACK-DOOR ACCESS
Two fan-cooled 3.5-inch bays are easily accessed from the rear of the Reactor. There's no rear I/O in the way, as the connectors for the graphics cards are moved to the top of the case and the audio and USB connectors are moved to the sides (note the funky server-style power plug).

reference to the famed-but-failed stainless-steel gull-winged cars of the 1980s. "We're backed by very good funding sources."

Funding aside, we still have some pressing questions. To prove that the Reactor is not just a 3D render, Hardcore delivered a preproduction machine sporting a QX9770 CPU, a custom-designed Tyan motherboard using an nForce 790i Ultra SLI chipset and an integrated Creative X-Fi chip, and three GeForce GTX 280 cards—pretty much top of the line. However, it soon became clear that the box still needed some work: The PC suffered from overclocking issues at 4GHz, which the company attributed to a faulty liquid-metal pad between the CPU and the water block. We also inadvertently broke off three SATA ports when replacing the top of the machine; Hardcore said a last-minute cable change was to blame and it would be corrected before shipping. A replacement machine ran at a stable 4GHz, except for occasional hard locks in Crysis, but ran louder than some of the loudest air-cooled machines we've tested. Hardcore said this was the result of a faulty preproduction fan-controller board. In other words, the bugs are clearly still being worked out.

MUCH ADO ABOUT OIL

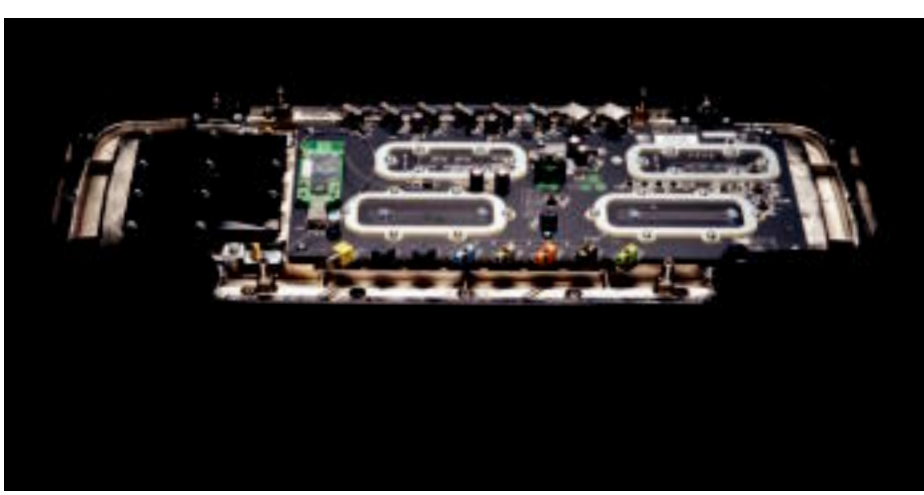
So why go the oil route? Oil is a far better conductor of heat than air is. By dunking the guts of the Reactor in 4.5 gallons of dielectric (nonconducting) oil that is circulated through a radiator, Hardcore said the machine is capable of keeping not just the CPU and GPUs cool but also the RAM, the voltage regulators, and the motherboard itself. Ideally, those components will never get more than a few degrees hotter than the ambient room temperature. The CPU, GPU, and chipset require more direct cooling, so blocks and hoses help shoot oil over those components at higher velocities. The oil isn't pumped back in through an inlet as it is in a traditional setup; it's simply emptied into the open tank, where it's circulated up into the radiator.

Technically, the spot cooling on the CPU and GPU cores isn't any more effective than the use of conventional liquid-cooling blocks and hoses—but those parts don't cool any other components. Hardcore has plans for a Peltier block to get temps to even frostier levels. The submersion scheme actually helps eliminate the major problem with Peltier cooling: condensation and sweating. The company is also toying with the idea of building an auxiliary refrigeration block that would sit near the machine to lower temps more.

One final note on the submersion technique: Theoretically, it should be very quiet.

DOES NOT ACCEPT COINS
A small pop-up door on the top of the case conceals a CMOS reset button and easy-access coin-cell battery.

PORT AUTHORITY
The starboard side of the Reactor features one six-pin FireWire, two Gigabit Ethernet, and five USB 2.0 ports.



WORKING FOR IT
Pulling the core out of the Reactor is similar to pulling an engine block. Just back out 20 hex screws, open two chambers, ease the core out a few inches, disconnect the cables, then lift!

A WELL-OILED MACHINE

And in fact, the first machine we received was the quietest multi-GPU machine we've ever tested. The second machine, however, was far from silent, so we'll have to wait for a final build to render a verdict.

AN INSIDE JOB

Opening the Reactor is not something you want to do on a whim. You have to remove 20 screws from the top, open up two wells, yank the core up a few inches, disconnect cables, and then finally pull the guts out of the well. This would let you service or swap out components. Given the rig's customization, it's expected that you would buy GPU upgrades directly from Hardcore, which modifies the cards with blocks and adds a stiffening plate to the underside. The company says it may also offer motherboard upgrades directly to end users.

For folks who don't want to get oily, the company plans to offer factory upgrades of the boxes. Since the same chassis will be used for the company's upcoming dual-processor workstation machines, Hardcore may even offer those mobos as an upgrade as well. The version of the machine we received sports a total of three x16 internal PCI-E slots and no PCI. Tri-SLI eats up all three slots, but with just one or two videocards, you could add other cards, e.g., an H.264 acceleration card—provided it was designed to live in liquid.

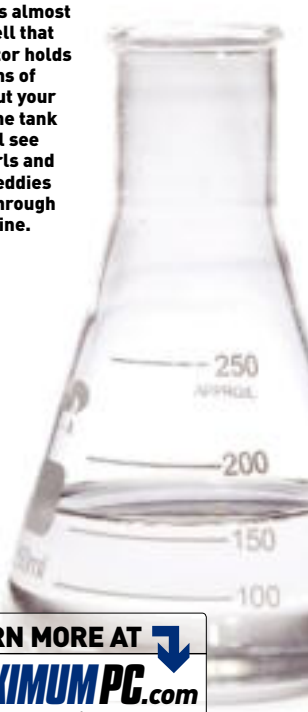
CUSTOM VS. PROPRIETARY

There's a very fine line between custom and proprietary parts. While enthusiasts are often open to parts that eschew a standard design in order to offer increased performance or cachet, they shun the prospect of being locked into a vendor's parts without any perceived benefit. Do the custom features of the Reactor cross that line or is it so damned cool that it's worth the sacrifice? We can't say yet, but we can say that the custom design has certainly hurt the machine in one big area: no Core i7. While a Core i7-based Reactor is forthcoming, the company doesn't have one to offer at launch. Other vendors can simply swap out old boards for new Core i7 boards, but Hardcore will have to spin up a new board, which will take some time. Having to wait on the latest, greatest parts may ultimately be where enthusiasts draw the line.

Stay tuned for a full review of the Reactor once final production models are available.

POWER SHARING
Dual 650-watt PSUs that work in backup and additive mode let the machine operate at reduced power if one supply fails.

ALL IT NEEDS IS SOME FISH
From certain angles it's almost hard to tell that the Reactor holds 4.5 gallons of oil, but put your nose to the tank and you'll see slow swirls and thermal eddies moving through the machine.



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http://www.tinyurl/hardcore-oilpc

WHITE PAPER

Cloud Computing

Internet access at broadband speeds could render the notion of installing application software on your PC entirely obsolete —MICHAEL BROWN

If a computer can exist without hardware, as we learned in last month's white paper about virtual machines, can it be useful without application software? It can if it relies on the concept of cloud computing.

Cloud computing describes a data-processing infrastructure in which the application software—and often the data itself—is stored permanently not on your PC but rather a remote server that's connected to the Internet. When you need to use the application or access the data, your computer connects to the server through the Internet and some of that information is cached temporarily on your client machine. What do clouds have to do with all this? The cloud is simply a metaphor for the Internet, based on the symbol that's used to represent the worldwide network in computer network diagrams.

The concept behind cloud computing actually predates the modern Internet, but the rise of personal computers rendered the cloud irrelevant, at least temporarily. In the 1960s and early 1970s, companies that couldn't afford to acquire and maintain the large mainframe computers of the day would instead rent processing time on someone else's machine. This time-sharing concept fell out of favor as smaller, cheaper midrange computers were released. And once PCs and small servers began to dominate the market, midrange systems also lost their luster.

THE CONCEPT BEHIND CLOUD COMPUTING ACTUALLY PREDATES THE MODERN INTERNET.

EVERYTHING OLD IS NEW AGAIN

The growth of the Internet has rendered the concept of shared computational infrastructure relevant once again. In fact, you've probably used cloud-computing resources without thinking much about it. If you've ever made a blog using Blogger, created a profile on Facebook or MySpace, or used a browser-based email service such as Gmail, you've experienced cloud computing. In each of these cases, the application and the data you create with it are stored on a remote server instead of your PC.

Software as a service (SaaS) products, such as Google Apps (on a small scale) and Salesforce.com (on a much larger scale), are another example of cloud computing. These services deliver software applications through a web browser, as opposed to a program that you install on your computer's hard drive. A hallmark of commercial cloud computing applications such as these is that users never purchase the software outright; instead, they pay a subscription fee to make use of it.

Google Apps Premier Edition ($50 per year; the ad-supported Standard Edition is free) is a software suite consisting of two broad segments: messaging (Gmail, Google Calendar, and the instant-messaging service Google Talk) and collaboration (Google Docs for word processing, Google Video for sharing video files, and Google Sites for sharing files, developing blogs, and building intranets). Salesforce.com is an enterprise customer relationship management (CRM) application that companies use to manage and track their interactions with their customers.

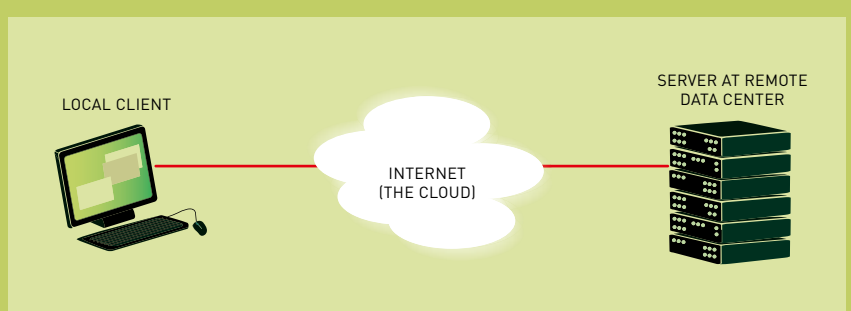
Easy collaboration is one of the many advantages that cloud-computing services offer. With both the application and the data stored in the cloud, i.e., on the Internet, it's easy for multiple users to work together on the same project. With Google Docs, for instance, several users can open, share, and edit the same document at the same time.

CLOUD COMPUTING AS GIANT KILLER

In the corporate world, cloud computing has made it possible for small companies to compete on an even footing with competi-

HOW IT WORKS

What's in the Cloud



The cloud is a metaphor for the Internet, so cloud computing refers to a data-processing infrastructure in which a client machine taps the computational abilities of one or more remote computers via the Internet. The remote computers are said to be "in the cloud."

tors many times their size. They can preserve capital by renting IT services instead of investing in hardware and applications or hiring programmers to design custom applications.

It might seem odd that Amazon, perhaps the world's largest e-commerce merchant with $17 billion in annual revenue, would stake out a major position in the cloud computing market, but it's actually a very shrewd move. The company has built up a huge information technology infrastructure over the years, with massive amounts of computing power and digital storage. But by some estimates, the company utilizes just 10 percent of its total capacity much of the time. The reason it needs so much headroom is to handle infrequent periods of peak demand; the rest of the time, the hardware largely sits idle.

Amazon jumped into cloud computing with its Amazon EC2 (Elastic Compute Cloud) service in an effort to increase its return on its IT investments by taking advantage of the excess idle time on its servers. Amazon EC2 is based on virtual machine technology, software-based computers that share their host's hardware resources.

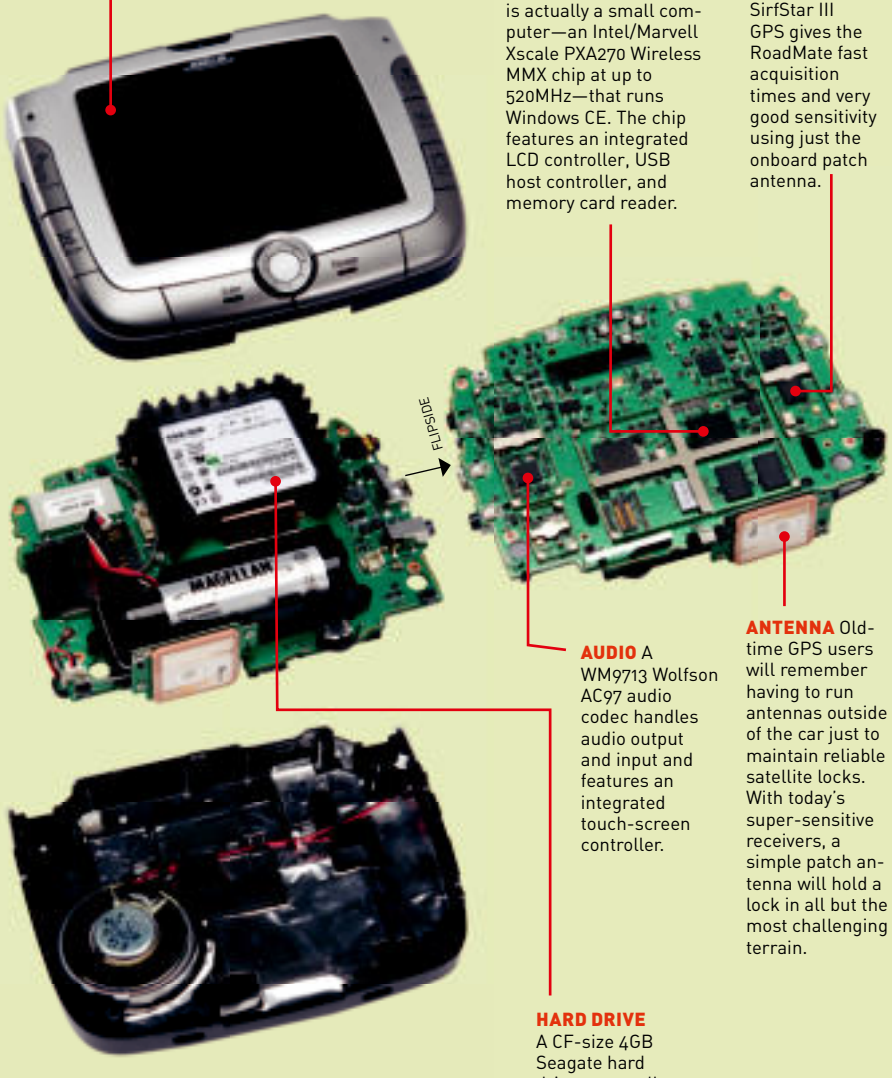
An Amazon EC2 customer creates and uploads to Amazon's servers something Amazon calls an Amazon Machine Image. This image consists of the operating system and application software the customer needs to run, plus the data associated with it. The customer then orders up whatever number of virtual machines they need for their computing environment.

Each virtual machine is called an instance, and each instance can be one of three sizes, based on memory, storage, and CPU power. A small instance, for example, is equivalent to a server outfitted with a 1.0GHz to 1.2GHz Opteron or Xeon CPU, 1.7GB of memory, and 160GB of storage. A large instance is equivalent to a server outfitted with four of those CPUs, 7.5GB of memory, and 850GB of storage. Small instances are capable of running 32-bit applications, while large instances can run 64-bit environments. Other configurations are also available. The "elastic" in Elastic Compute Cloud refers to the flexibility the system has to offer: Customers can tap fewer or more instances as their needs ebb and flow.

It's possible that cloud computing could even render the personal computer obsolete. Rather than buying a computer, one day you might purchase only a display, mouse, and keyboard and connect to virtual computing resources somewhere on the Internet. Wouldn't *that* be boring?

Magellan RoadMate GPS

The RoadMate 6000T is a bit hefty, but who can argue with its integrated traffic alerts, Bluetooth, and full text-to-speech capabilities? We crack open a unit to find out what's in a GPS these days.



TOUCH SCREEN A GPS without a touch screen isn't a GPS—it's a sad throwback to the '90s. The RoadMate features a bright, sunlight-readable LCD screen with an embedded touch sensor.

CPU As most folks know, the RoadMate is actually a small computer—an Intel/Marvell Xscale PXA270 Wireless MMX chip at up to 520MHz—that runs Windows CE. The chip features an integrated LCD controller, USB host controller, and memory card reader.

GPS The popular GSC3-7875 SirfStar III GPS gives the RoadMate fast acquisition times and very good sensitivity using just the onboard patch antenna.

AUDIO A WM9713 Wolfson AC97 audio codec handles audio output and input and features an integrated touch-screen controller.

ANTENNA Old-time GPS users will remember having to run antennas outside of the car just to maintain reliable satellite locks. With today's super-sensitive receivers, a simple patch antenna will hold a lock in all but the most challenging terrain.

HARD DRIVE A CF-size 4GB Seagate hard drive stores all the map, point-of-interest, and waypoint info for the RoadMate 6000T.

SUBMIT YOUR IDEA Ever wonder what the inside of a power supply looks like? Don't take a chance on destroying your own rig; instead, let us do the dirty work. Tell us what we should crack open for a future autopsy by writing to comments@maximumpc.com.

HOW TO

Customize and Streamline Your Windows Desktop

With a little know-how and the right tools, you can improve the look of your desktop and, thus, your overall computing experience —ADAM PASH

TIME = 44 MIN

WHAT YOU NEED

- **WINDOWBLINDS**
  Free, http://tinyurl.com/3ypwb
- **UXTHEME MULTI-PACKER**
  Free, http://tinyurl.com/bxtjd
- **VISTAGLAZZ**
  Free, http://tinyurl.com/2qpa7t
- **SAMURIZE**
  Free, http://samurize.com
- **ROCKETDOCK**
  Free, http://rocketdock.com
- **DESKSPACE**
  $25, http://tinyurl.com/2qgenx
- **FLICKR WALLPAPER ROTATOR**
  Free, http://tinyurl.com/25jmle

Any car enthusiast worth his salt knows that until you customize your ride, it's just another commuter. Likewise, your computer is little more than a generic PC in an ocean of look-alikes until you make it your own.

Here at *Maximum PC*, we don't settle for out of the box. To us, a computer is incomplete until it's been forged in our own image. To that end, we're taking a look at six unbeatable tools that can spice up a drab Windows desktop. When we're done here, you'll have given your default Windows interface a much-needed face-lift by adding custom themes, ditching the taskbar for a more attractive dock, and setting up your wallpaper to refresh on a schedule.

This newfound pride in your desktop will raise your morale while you're working for the man, and these apps will boost your overall productivity by better organizing your applications and icons on different virtual desktops and placing to-dos, system statistics, and other important information a keystroke away.

Sound appealing? That's just the tip of the iceberg. It's time to turn that dreary Windows default into something you can be proud of.

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

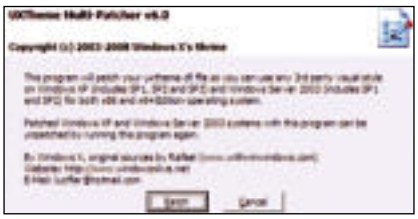
THEME WINDOWS WITH WINDOWBLINDS

1 If you want to make a dramatic change to the look and feel of your desktop, theming is the place to start. With the right application and skin, you can transform your Windows desktop into a work of art.

A quick trip to Google will net you more Windows customization apps, tutorials, and crapware than you can shake a stick at, but we're going to focus on just one Windows skinning program: WindowBlinds. This isn't the only theming tool available by any means, but it works on XP and Vista, is shareware (the free version is actually functional), and takes just a couple minutes to set up. So grab yourself a copy of WindowBlinds and let's get started.

The app comes preloaded with several starter themes. To enable one, simply choose a theme, click Apply My Changes, and voilà—you've themed your desktop. The preloaded default themes are fine, but they're not mind-blowing. To find a better premade skin, check out deviantART's extensive collection of WindowBlinds themes (http://tinyurl.com/48vj9z). Just find a theme you like, download it, and double-click the WBA file to install the theme alongside the defaults.

Finally, if the artist in you is dying to express your vision to a T, WindowBlinds is packed with options, so you can customize each theme to your heart's content.



THEME WINDOWS WITH WINDOWS

2 Granted, Windows comes with a built-in method for changing themes—namely, the Uxtheme.dll file. Unfortunately, the Uxtheme.dll file only allows you to use official Microsoft styles by default. However, the file can be patched to allow you to apply any custom style to your installation. This approach doesn't provide the same number of options a full-service application like WindowBlinds offers, but since Uxtheme skins Windows using the same native methods that Windows uses by default, it's generally easier on your system resources.

On Windows XP, the free application UXTheme Multi-Patcher takes care of patching the file for you. On Vista, try VistaGlazz. In both cases, it's wise to create a system restore point before proceeding—just to be on the safe side. Then follow the prompts and restart your computer.

Now that your Uxtheme.dll is patched, you're ready to apply custom themes. Again, artist community deviantART boasts a large and impressive collection of themes (http://tinyurl.com/vr3hz) you can download and install into C:\Windows\Resources\Themes. Once installed, applying a theme is as simple as right-clicking your desktop, selecting Properties (or Personalize in Vista), then clicking the Themes tab. Select your new theme, hit Apply, and you're done.

DITCH THE TASKBAR FOR A ROCKETDOCK

3 The Windows taskbar is functional—but it's not sexy. Mac users have boasted about the utility of the OS X Dock for years, but in the end, the joke's on them: The free Windows application RocketDock brings the same functionality, and then some, to your Windows desktop.

The app has a minimal footprint (around 12MB), is completely skinnable (from the icons to the dock itself), and offers a huge repository of free addons for customizing your dock to perfection. Customization aside, RocketDock, like the OS X Dock, let's you minimize windows to and launch applications from the dock.

Out of the box RocketDock underwhelms, but spend a little time browsing through the addons (http://rocketdock.com/addons) and digging through the application settings and you'll soon have a dock with a look and feel you can be proud of.

SIMPLE FIXES

No-Install Desktop Tweaking

Want to streamline your desktop without the weight of extra applications? Try swapping out your default icons for more attractive alternatives—like any of the free icon sets from DryIcons (http://dryicons.com/free-icons). To replace a folder's icon, for example, right-click the folder, choose Properties, and find the Customize tab. Then click the Change Icon button, which launches a simple dialog from where you can browse for the icon you want to swap in. Next, try auto-hiding your taskbar for a fuller screen experience by right-clicking any empty space on the taskbar, clicking Properties, and then ticking the Auto-hide taskbar checkbox. Last but not least, clear off considerable desktop clutter and better showcase your wallpaper by disabling desktop icons. In Vista, right-click the desktop, select View, and then untick Show Desktop Icons. XP users, right-click the desktop, select Arrange Icons By, and then uncheck the Show Desktop Icons entry.

CREATE A CUSTOM DESKTOP HUD

4 The free application Samurize embeds an information-rich heads-up display (HUD) on your desktop, including anything from a simple to-do list to your system's stats. You can customize virtually every aspect of Samurize, and it's extensible through plugins developed by an active community.

Samurize comes packaged with an example configuration file that demonstrates how to use the application as a system monitor—embedding your hard drive, RAM, CPU, and network stats directly on your desktop. That's a nice start, but this app doesn't really shine until you roll up your sleeves and open the Samurize Config Editor (right-click the system tray icon, then select Edit Config File). It's here that you define exactly what you want Samurize to do. To get familiar with your options, take a look at the Add Meter drop-down menu in the sidebar on the right. This menu contains every control Samurize can add out of the box.

QUICK TIP

When you feel comfortable working with Samurize's defaults, you're ready to graduate to the big leagues: Head to the Samurize scripts and plugins page (http://tinyurl.com/3fepp7) to try out some user-contributed plugins.

As a quick example, embed your to-do list in Samurize by clicking Add Meter > Add Text File. Click the Source tab and point Samurize to your to-do list on your hard drive. Now save your config, right-click the Samurize system tray icon, and select Reload Config. Your to-do list now lives on your desktop. Whenever you edit it—whether you're adding, editing, or removing an item from your—the changes will instantly update on your desktop.

ORGANIZE YOUR APPS WITH A 3D DESKTOP

5 Virtual desktops have been around forever, allowing users to relegate windows to different desktops and providing a more organized experience for the power user. But besides being functional, virtual desktops can be jaw-droppingly cool.

DeskSpace is a 3D virtual desktop that allows you to organize applications and icons on multiple virtual desktops on a three-dimensional cube. If you've seen the 3D Compiz Fusion desktop manager for Linux, you know what we're talking about. The 3D space makes the idea of virtual desktops much more intuitive, and DeskSpace allows you to customize each desktop individually.

That means each virtual desktop can sport a different look, so you know exactly where you are at any time. All it takes to spin the cube to a new desktop is a stroke of your mouse or keyboard. To invoke DeskSpace, just hold Ctrl+Alt+Shift or middle-click the taskbar. When you do, your desktop will pull away from you, revealing a translucent desktop cube. From your keyboard, you can switch to any of the six virtual desktops DeskSpace provides by simply pressing one of the arrow keys in the direction of the desktop you want to switch to. To complete the switch, just release the Ctrl+Alt+Shift shortcut (or middle-click anywhere with your mouse) and the new active desktop will fill your screen. You can even set rules so that specific applications always display on a specific desktop, allowing you to create context-specific desktops (e.g., an Internet desktop, work desktop, media desktop, etc.).

DeskSpace is shareware and costs $25 for a full license. If you're willing to do a little searching, you can find an older version called Yod'm 3D—DeskSpace's name when it was still a freeware application.

KEEP YOUR WALLPAPER FRESH

6 If customizing your desktop is like customizing a car, so far we've souped up the engine and added new chrome plating. But just as every car needs a paint job, a customized desktop needs killer wallpaper, and your choice of desktop wallpaper can make or break the whole aesthetic. Lucky for you, finding gorgeous desktop wallpaper is a breeze if you know where to look.

Our favorite resource is the popular photo-sharing website Flickr (http://flickr.com)—more specifically the Wallpapers pool (http://tinyurl.com/y5glw5). That's a good start, but even the best wallpaper can feel stale after a few days. The Flickr Wallpaper Rotator is a free application that automatically downloads and sets a fresh wallpaper from Flickr on a regular schedule, so your desktop background never gets old.

Flickr isn't the only place online where you can find extraordinary wallpaper, of course. Online artist community deviantART is another popular repository that hosts a large collection of incredible wallpaper images (http://tinyurl.com/yqelll). If you're sporting multiple monitors, Mandolux (http://www.mandolux.com) serves up stunning, high-res panoramic wallpapers that can stretch over up to three monitors. Can't find a dual-screen wallpaper to suit your taste there? Try InterfaceLIFT (http://interfacelift.com), a site that hosts wallpapers for every size of screen, from your mobile phone to your triple-monitor desktop.

This month the Doctor tackles...

- Security Overkill
- Water Cooling
- Missing Documents

Boot, Baby, Boot!

I was installing a Windows Update on my laptop, and I left it to finish making dinner, not realizing that the automatic update wanted to restart my computer.

While I was away, the computer restarted. From there, it basically locked up. I had recently purchased a hot-swap box that was compatible with laptop hard drives, so I put it in and completely formatted it. Now I can't do anything with it. I have been trying to reinstall from a boot CD, but I get an NTLDR Missing error. I know this is a Windows issue, and I want to install Linux. Can you help?

—Nick Folts

NTLDR is the Windows boot loader. It isn't that difficult to restore. But that's only necessary if you are planning on reinstalling Windows; since you're going for Linux this time around, you can bypass that step entirely.

First, the Doctor wants to make sure you're not trying to boot your drive from the hot-swap box. If so, that's the problem—put the drive back in the laptop and try again. Second, make sure your boot order is correct. All you need to do is go into your laptop's BIOS and change the boot order to look at your optical drive first.

Then just put in the install disc for your Linux distro of choice (we like Ubuntu—go to http://tinyurl.com/2mhay5 for our step-by-step install guide). It should let you format the drive for Linux and install right off the bat!

Security Slowdown?

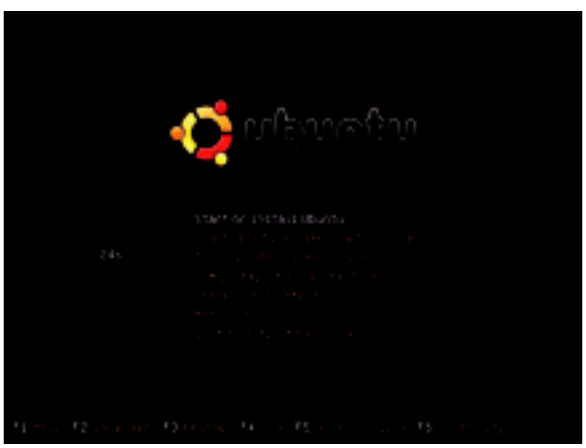
After reading the "Powerful Protection" Doctor question in the July issue, I started wondering what kind of performance hit I was taking from the plethora of security programs on my system. I have two Dell machines: an XPS-600 and an older Dimension 8300 (Windows XP Home, SP3 and IE7). They are connected to the net through a Linksys WRT150N router. Both units also have AOL 9.1, McAfee Security Suite, and SpySweeper. I know this is overkill, but I have no idea what to keep or what to disable.

—Loren

First, you should determine if your security programs are actually affecting your day-to-day use. To do this, install a benchmarking program like OpenSourceMark (http://tinyurl.com/566hsg) and run its full official test three times to establish an average score. Then disable or uninstall all of your security software and repeat the benchmarking process. Calculate the percentage difference (if any) between the scores to get an approximation of how much your machine may or may not be affected. If you see a huge performance loss, run this scenario with a single security program active each time to see which one taxes your system the most.

By the way, AOL 9.1 comes bundled with McAfee Internet Security Suite. It's not clear from your question whether your install of McAfee is the one that AOL offers or an additional install. If you're running it twice, that's certainly overkill—uninstall one of the versions.

You should also consider the features each program brings to the table. It makes no sense to double up. McAfee's product and Webroot's SpySweeper both contain anti-spyware functionality and are similarly skilled at addressing that problem—simply choose the one you prefer. Eliminating application redundancies is a great way to ensure that your system remains secure *and* speedy.



Your busted NTLDR is no problem if you're installing Ubuntu.

Feelin' My Flow

After many years of heating my room with an air-cooled PC, I'm thinking about building a water-cooled system. Since most rigs have blocks for just a CPU and maybe two videocards, I need some advice on how much pressure the pump needs to put out. My liquid circuit will include blocks for a Phenom 9950, two videocards, and some OCZ Flex IIs (liquid-cooled RAM). I'm worried about flow restriction from the length of the liquid circuit and the cooling effectiveness for the RAM.

—Michael O.

The Doctor fired up Dream Machine 08 to answer your question, Michael. And he's pleased to report that he saw no difference in cooling prowess whether the machine's Laing D5 variable-speed pump was cranked to its highest (317 gallons per hour) or lowest setting. It appears that the actual speed of the coolant through the

looped system has little effect on its temperatures.

That said, the Dream Machine uses half-inch tubing for its cooling loop, which provides better cooling performance than three-eighths-inch tubing. Keep your tubing and connectors a uniform size throughout your system to ensure maximum performance. And be mindful of how you wrap your tubing around your system. Cooling performance decreases if your tubing is kinked or restricted in any fashion (for example, using an L-shaped pipe to style your setup around a corner or bend). However, as long as the pump is able to move coolant through the system, your water-cooling setup should be fine.

same thing with the same error message. I've also tried Opera, and it seems to work OK. I have uninstalled and reinstalled Firefox and have even gone back to a previous version but that didn't help.

—Larry

Your problem doesn't seem to be related to Firefox itself, given that it's affecting both Firefox and Internet Explorer. The Doctor suspects that something has gone haywire with your Windows installation. But before you wipe and reinstall, make sure you don't have a hardware issue, such as a bad stick of RAM. Launch Windows Memory Diagnostic (http://tinyurl.com/vbqmq) to see if faulty memory is the root of your evil.

If that still doesn't fix your Firefox woes and you're running the most up-to-date version of the browser (and have installed all recent updates to your operating system), try running through Mozilla's extensive list of crash solutions: http://tinyurl.com/569xtb.

Sometimes, resetting your permissions will let you recover documents that appear to be missing.

"HER FILES ARE STILL TAKING UP SPACE, BUT THEY DON'T SEEM TO BE ANYWHERE. HELP!"

Firefox Blues

I have been using Firefox for a good while now, but I started having a problem with it a couple months ago. While using it, all of a sudden a box appears that says Firefox is shutting down. Sometimes, Firefox will run for a long time, but then other times it shuts down right away. When it shuts down, a box with the heading "firefox.exe" comes up; the text in the box reads, "Firefox.exe has encountered a problem and needs to close. We are sorry for the inconvenience."

I've even broken down and tried IE, but it does the

Where Are My Documents?

The XP Home SP1 install on my girlfriend's old laptop was getting a little buggy, so I decided to wipe and upgrade to XP Pro SP3. She had about 16GB of music and pictures stored on the laptop, which she wanted to keep. I created a new partition in the drive's free space and moved those files over so they'd be safe. All was well until the partition program goofed up the original XP Home installation so that it wouldn't boot anymore. The restore function didn't work, and loading the XP Pro CD restore function didn't help either.

Fortunately, XP Pro recognized the newly created D:\ drive, so I installed there. Everything went fine, but the My Documents folders in both partitions were blank. Weird thing is, XP Pro shows drive C:\ as 32GB (original drive size) with only 2GB free… and recognizes the D:\ partition it is installed on as being 7GB with nearly 6GB free. I still get two boot options on start up—XP Home and XP Pro. So her files are still taking up space, but they don't seem to be anywhere. Help!

—Andrew Kleinfeldt

First, search for one of the missing music files—they might just be lost somewhere on the drive.

No luck? It's possible you don't have permission to view those files. If that's the case, you can reset the file permissions: Microsoft's Knowledge Base KB308421 (http://tinyurl.com/mazp4) provides information on how to do this.

If that doesn't work, it's time to bring out the big guns. You don't want to risk screwing up the drive even more, so first remove it from the notebook and connect it to your desktop using a laptop-to-IDE hard drive adapter, which can be picked up at your local computer store or online for about $10. Both partitions should show up under My Computer, provided the drive isn't horribly corrupted.

Next, install File Scavenger (http://tinyurl.com/5dzds) on the desktop computer. We're not sure what file recovery software you tried, but we've had great success with File Scavenger in the past. Sure, it's $50, but it'll recover the data if it's recoverable at all. And that's a small price to pay to get out of the doghouse.

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.

REVIEWS

Tested. Reviewed. Verdictized

INSIDE

ONLINE

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

EVGA GeForce GTX 260 Core 216 Superclocked

A midrange G200-based card that delivers

VERDICT 9

EVGA GEFORCE GTX 260 CORE 216

+ WAX PAPER	– CLING WRAP
Good performance for a midrange card, especially in shader-heavy apps.	Less memory bandwidth than the 4870.

$370, www.evga.com

When Nvidia unveiled its G200 GPU, we were immediately drawn to the shiny, speedy GeForce GTX 280. Why wouldn't we be? With high core and memory clocks and 240 stream processors to churn through the toughest shaders, it was sexy and fast. We were less excited about the 260, which sported 192 stream processors and slower clocks speeds but cost about $100 less than the 280 (at the time). Since then, ATI has released its R700-based Radeon 4870, which outperforms the original 260 but costs the same amount.

And that's where the Core 216 edition of the 260 GTX comes in. With the same stock clock speeds but 24 more shader processors than the original, the new version of the 260 GTX delivers comparable performance to the 4870 at a similar price. The speeds and feeds are about the same as the original 260's, although EVGA clocked this card's core at 626MHz (up from 576MHz stock) and includes 896MB of GDDR3 running on a 448-bit bus at 1053MHz (stock is 999MHz).

Aside from the additional shader processors, the Core 216 version of the GTX 260 is identical to the original. The card features all the video decoding and playback power of the GTX 280, including hardware-accelerated H.264 decoding to accelerate Blu-ray playback. Performance was about what we expected; the card delivered scores that were slower than a GeForce GTX 280's but slightly faster than the 4870's in shader-intensive games such as Crysis. We're seeing significantly better performance with both Nvidia and ATI cards after recent driver releases, so we've rebenchmarked both the 4870 and GeForce GTX 280 to maintain an even playing field.

We've seen this card for less than $300 online already, which puts it firmly in the midrange category. You can find 512MB Radeon 4870 HDs, which are slightly faster, for less money online, but the GTX 260's extra memory will likely help the card do better than the 512MB Radeons with games released in coming years. Of course, the 1GB 4870 boards are available for about $300, but unfortunately, we don't have one in the Lab for comparison.

–WILL SMITH

BENCHMARKS

	GeForce GTX 260 Core 216	Radeon 4870 HD	GeForce GTX 280
Crysis (4xAA/aniso) (fps)	15.1	13.9	**17.4**
Crysis (no AA/aniso) (fps)	20.4	20.5	**20.8**
Call of Duty 4 (fps)	57.4	52.7	**68.3**
Unreal Tournament 3 (fps)	83.1	72.5	**124.0**
Grid (fps)	40.5	30.0	**46.0**
3DMark Vantage Game 1 (fps)	14.2	12.2	**17.6**
3DMark Vantage Game 2 (fps)	10.7	9.6	**12.1**

Best scores are bolded. All benchmarks run on a Core 2 Quad Q9770 Extreme with 4GB of memory running Vista Home Premium. Crysis and 3DMark are run at 1920x1200, all other benchmarks are run at 2560x1600.

Nvidia's new GeForce GTX 260 Core 216 board finally gives the Radeon 4870 HD some competition.

Velocity Micro Raptor Z90

We love the smell of fresh architecture in the morning

The Velocity Micro Raptor Z90 is the first production rig we've tested that boasts Intel's new Core i7 microarchitecture—and it really cooks. Velocity cranked the 3.2GHz clock speed on Intel's quad-core Hyper-Threaded Core i7-965 Extreme Edition to 3.6GHz with nary a hiccup, and cooled the dang thing with air. The machine also features 6GB of DDR3/1600 and dual 512MB Radeon HD 4870s.

The Z90 has a typical backup drive: a 1TB 7200rpm Hitachi Deskstar and a less typical C: drive: an 80GB X-25M Intel SSD mounted on a VelociRaptor IcePak heatsink. The drive enclosure in the front of the case isn't screwless, but the whole bay can be removed by loosening two thumbscrews.

Velocity's customized Lian Li aluminum chassis is long and low rather than tall (like most cases produced today), which leaves plenty of room between components and produces a clean, uncluttered look. And the wiring is equally fastidious, while still being accessible for component swaps. The Z90 is also one of the lightest rigs to enter the Lab: In an age of backbreakers, we thought Velocity had shipped us an empty chassis until we opened it up!

The Raptor Z90 blew through our benchmarks. It completed our Premiere Pro CS3 test in just 526 seconds. That's nearly 30 seconds faster than November's Digital Storm rig and nearly a minute faster than last month's AVADirect system, both of which packed 4GHz-plus QX9770s. The Z90 was similarly speedy in every test we threw at it—our zero-point took nearly twice as long to complete our MainConcept test.

In fact, the Z90 failed to set records in just two benchmarks: Crysis and Photoshop, where it was bested by the AVADirect and Digital Storm rigs. The former, however, was running two 4870 X2s, while the Digital Storm ran three GTX 260s, so the Z90's comparatively modest (though still respectable) Crysis performance is no surprise. The AVADirect and Digital Storm rigs were also clocked higher than the Velocity (4GHz and 4.2GHz, respectively), which explains their marginally better performance in Photoshop, a single-threaded app.

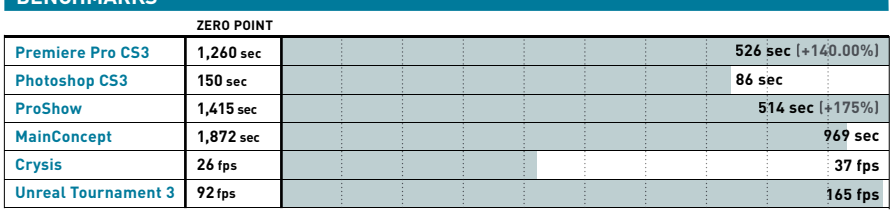
We have just one quibble with this rig. The snap-in front-panel bezels are hard to keep in place, and, in fact, were rattling around inside the case when we opened it for the first time. Fortunately, they're so light, they didn't cause any damage. We should also mention that the first unit Velocity Micro sent us suffered from instability issues likely due to shipping damage, but the second unit, the one tested here, was rock solid. Shoot, this $5,300 rig made mincemeat of much more expensive systems we've tested. —NATHAN EDWARDS

Don't let the bare-bones look fool you: The Velocity Micro Raptor Z90 is one of the fastest machines we've ever tested.

SPECIFICATIONS

PROCESSOR	Intel Core i7-965 Extreme Edition (3.2GHz @ 3.6GHz)
MOBO	Intel DX58SO (Intel X58 chipset)
RAM	6GB Corsair DDR3/1600 @1,500
VIDEOCARD	Two 512MB ATI Radeon HD 4870s in CrossFire
SOUNDCARD	Realtek ALC889 Onboard
STORAGE	80GB Intel X-25M SSD, 1TB Hitachi Deskstar 7K1000 (7200rpm)
OPTICAL	Lite-On Blu-ray DH-4B1S
CASE/PSU	Velocity Micro Signature LXe-W/ Velocity Micro 850W

BENCHMARKS



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

MAXIMUM PC KICK ASS!

VERDICT 9

VELOCITY MICRO RAPTOR Z90

+ Z-95 HEADHUNTER	− B-WING
Blazingly fast, aesthetically pleasing, and well made.	Front-panel bezels could be more firmly secured.

$5,300, www.velocitymicro.com

HP TouchSmart IQ506t

Everything you could ask for in a second PC

HP's TouchSmart line of all-in-one desktop computers has undergone quite a transformation since we examined the very first model, the IQ770, nearly two years ago. Not only is every change for the better, but HP has managed to slash prices by several hundred dollars.

The formfactor is the most obvious change to the TouchSmart line: The IQ770 was like a monitor stuck on top of a pizza box; the new series looks like an oversize picture frame. Apple, Dell, and Gateway have all taken this tack with their all-in-one offerings, but HP's engineers also designed the TouchSmart like an easel. By using three feet to support the computer, the company was able to carry over the IQ770's handy keyboard garage concept (providing a space below the CPU for keyboard storage), but it's impossible to casually adjust this display's tilt angle. We loved the fact that we could use the IQ770 while either sitting or standing, but you can't stand in front of the IQ506 unless it's on a bar-height counter.

HP sells three preconfigured TouchSmart models. We reviewed the middle offering—the $1,500 IQ506t—which features a 22-inch touchscreen, a 2.16GHz mobile Intel Core2 Duo CPU, a discrete videocard, and a 500GB hard drive.

The TouchSmart achieves its impressively thin profile (it's just three inches thick) by using many components that were designed for notebook PCs, including an external power supply. This helps keep the rig cool and extremely quiet at the expense of performance, at least when compared to a conventional desktop rig. You need to find a good hiding place for that brick, too.

The TouchSmart's main attractions, its touch screen and the user interface associated with it, have been radically improved. The screen supports multi-touch gestures, for instance, and the user interface can display an unlimited number of tiles (which serve the same function as shortcut icons in the Windows GUI). The silly three-slot limit on user-created tiles has also been eliminated. HP doesn't make much use of multi-touch features at this point, though; you can use two fingers to resize tiles, but that's about it. HP got rid of the stylus, but there's no need to worry about fingerprints smeared all over that huge LCD. The screen is covered by a sheet of protective glass that the documentation says can be cleaned with "typical household glass cleaner."

A light bar beneath the IQ506t's screen and above the speakers casts a glow upon your work surface.

The keyboard is a vast improvement over the one that shipped with the IQ770; it feels very solid and delivers excellent tactile feedback while being just a half-inch thick. HP augmented the Analog Devices SoundMax HD-audio chip with signal-processing software from Sonic Focus to deliver much-improved audio.

The TouchSmart application software is a mixed bag: The music and video programs aren't terrible, but the photo editor is far too basic and the calendar can't synchronize with a smartphone (it will, however, automatically sync with Windows Vista Calendar. Woo hoo!).

We'll sum up by repeating what we said about the first-generation TouchSmart: It would be a big mistake to make the IQ506t your one-and-only PC: It's just not powerful enough for gaming, heavy-duty photo or video editing, or many other enthusiast applications. But it is an absolutely fabulous family computer and media center. —MICHAEL BROWN

SPECIFICATIONS

PROCESSOR	2.16GHz Intel Core2 Duo T5850
MOBO	HP proprietary
RAM	4GB DDR2-667MHz (two 2GB sticks)
VIDEOCARD	Nvidia GeForce 9300M GS HD AVerMedia A327 NTSC/ATSC TV tuner
DISPLAY	22-inch touchscreen
STORAGE	500MB (7,200rpm SATA 3Gb/s)
OPTICAL	Slot-load SuperMulti DVD burner

VERDICT 8

HP TOUCHSMART IQ506T

+ TUSH	− TUSK
Awesome touch screen, tiny footprint, excellent value.	Too slow for hardcore gaming; TouchSmart applications are weak.

$1,500, www.hp.com

Western Digital Scorpio Blue 500GB

Think of it as the anti-SSD drive

Western Digital's Scorpio Blue uses just two platters to reach 500GB.

Sometimes it's OK not to take the medal stand in the race to get a product out first. Take the case of Western Digital's new 5,400rpm Scorpio Blue 500GB notebook drive. It's the fourth 500GB mobile drive to hit the market, after Hitachi's Travelstar 5K500, Fujitsu's MHZ2 BT, and Samsung's Spinpoint M6, but the Scorpio is, arguably, better than its competitors.

The Hitachi and Fujitsu products are 12.5mm-high drives, which makes them incompatible with all but the largest notebook computers. While Samsung's 500GB drive is 9.5mm (like the Scorpio), it's based on an older three-platter design. The 500GB Scorpio Blue features two 250GB platters to get to its 500GB capacity, which gives it the advantage in power and areal density.

The Scorpio did not disappoint—for what it is. While not capable of SSD speeds, it's quite fast for a notebook hard drive. We didn't have its contemporaries on hand, so we compared it to a 5,400rpm 320GB Samsung Spinpoint M6 and an older 7,200rpm 200GB Seagate Momentus 7200.2 (Seagate has since introduced a 7200.3). In our synthetic benchmarks, the Scorpio's greater areal density gave it an edge against the Spinpoint M6, which we expected. We were a bit more surprised to see the Scorpio outstrip the Momentus 7200.2. The Scorpio reported 63MB/s reads and writes in H2W Bench and 69MB/s reads and writes in HD Tach. The Spinpoint M6 and the Momentus 7200.2 hovered in the low 50MB/s range for reads in both tests, with the Spinpoint M6 actually dipping down to 35MB/s in H2W Bench.

Switching over to 3DMark Vantage and Windows Vista Home Premium, the tables were turned. 3DMark Vantage more closely resembles real workloads by using trace patterns of common tasks for its test. In 3DMark, the Momentus 7200.2's better random access times put it ahead of the Scorpio by about 25 percent. The Scorpio's score, though, was about 15 percent higher than the Spinpoint M6's.

The Scorpio's idle power consumption is a bit lower than that of the other 500GB units—thanks to its two platter design—with idle power rated at 0.65 watts and reads/writes at 1.6 watts. Other 500GB drives have slightly higher idle power and reads/writes in the 2-watt range.

The Scorpio Blue 500GB isn't just about performance though, since magnetic-based drives will likely always be slower than SSDs. It's all about capacity. While a drive such as Intel's 80GB X-25M will raise eyebrows with its 200MB/s-plus read speeds, fitting your life into 80GB is the difficult part. With the Scorpio Blue, even the most demanding data packrats will be satisfied. –GORDON MAH UNG

BENCHMARKS

	Western Digital Scorpio Blue 500GB	Samsung Spinpoint M6 320GB	Seagate Momentus 7200.2 200GB
PC Mark Vantage Overall	3,080	2,652	**4,104**
HD Tach AVG Read (MB/s)	**68.9**	55.1	54.6
HD Tach AVG Write (MB/s)	**69.2**	49.7	52.9
HD Tach Access (ms)	19.1	20.7	**14.3**
H2WBench Read (MB/s)	**63.2**	50.2	50.3
H2WBench Write (MB/s)	**63.6**	35.7	49.1
H2WBench Access Read (ms)	16.9	22.0	**14.3**
H2WBench Access Write (ms)	**8.0**	18.9	11.0

Best scores are bolded. Our test bed consists of an Intel Core 2 Quad Q6700, 2GB of DDR2/800 RAM, a GeForce 8800 GTX, and a 500GB WD 7,200 rpm drive. We used both Windows XP Pro and Windows Vista Home Premium in our benchmark tests.

VERDICT 9

WESTERN DIGITAL SCORPIO BLUE

+ MILES DAVIS
Never run out of space on your notebook again!

– JEFFERSON DAVIS
SSDs and 7,200rpm drives outrun it.

$220, www.westerndigital.com

Sonos Bundle 150

The world's best multiroom audio system just keeps getting better

You know a product is uncommonly designed when each of its successors looks and functions pretty much like the original. Such is the case with the latest revamp of the Sonos multiroom audio system. All the latest changes are inside the product or the software or are related to third-party services linked to the product. But that doesn't mean they're insignificant.

The Sonos mesh network is independent of any other Wi-Fi network you might be operating, so you don't need to worry about music clogging up the pipes of your data network. The new hardware is backward-compatible with older Sonos products: We merged the new ZP120 (the self-amplified model), the new ZP90 (the passive model), and a second controller into our existing Sonos network without a hitch.

We've always considered the amplified ZonePlayer to be the system's weakest link, but the new ZonePlayer 120 does much to change our mind. It produces only 55 watts per channel (five more watts per channel than the original), but when paired with a set of high-quality speakers (we used TBI Audio Systems's Diamond IRs), it more than adequately filled a small room with sound. There's a subwoofer output if you crave more bottom end, and since the amp supports a 4-ohm load, you can connect two pairs of 8-ohm speakers. And we're pleased to report that the spring-loaded binding posts now accommodate banana plugs.

The system still requires at least one module to be hard-wired to your network, but now that you can plop the ZoneBridge BR100 ($100) next to your router, you won't feel as though you're wasting a ZonePlayer just to achieve connectivity. The bridges are also handy in larger homes where the mesh network can't quite reach every corner.

Support for FLAC and Apple Lossless has been added, but the system still can't handle WMA Lossless. You can stream playlists from iTunes, WinAmp, Windows Media Player, and Rhapsody, but the system still can't play DRM-protected iTunes tracks (is anyone still buying those?).

The system already makes it supremely easy to sample the riches of Internet radio, but Sonos is now in the midst of overhauling the software to incorporate elements of the RadioTime service, which helps you find Internet radio stations that suit your musical tastes (those changes weren't finished in time for this review). And now Sonos owners get to enjoy free subscriptions to the music-discovery services Last.fm and Pandora (we're not talking about free trials—the services are now free to Sonos customers).

At this point, the only way the Sonos controller could get any better is with a tricked-out multitouch interface reminiscent of Apple's iPod and iPhone. Well, if you own one of those devices, you can now download a free utility from the App Store that renders it capable of controlling the Sonos system.

We consider the Sonos the gold standard in music streaming. But we do wish the company offered more bundle choices. Buying the ZP90, ZP120, and CR100 controller in this package provides a $250 discount over buying the pieces separately, but if you already have powered speakers and would prefer to have two ZP90s and a controller, you must buy the pieces a la carte—at a $100 premium over this bundle (money that would be better spent on a bridge—or music!). —MICHAEL BROWN

MAXIMUM PC KICK ASS!

SONOS BUNDLE 150

VERDICT 9

+ RAIN STICK	− RAIN SLICK
Easy to set up and expand; free subs to Pandora and Last.fm; awesome controller.	Bundle pushes you into buying an amplified ZonePlayer you might not want.

$1,000, www.sonos.com

Sorry, folks, the cradle the controller is sitting in here is not included in the bundle; it's a $40 accessory.

Lenovo IdeaPad S10

Surprising performance, with a surprising omission

For the most part, the Lenovo IdeaPad S10 is your standard netbook. It's small, lightweight, and sturdy and runs on Intel's Atom platform. We like that our review unit shipped with a 160GB 5,400rpm hard drive—as opposed to the small budget SSDs found in some netbooks. We also like the S10's sturdy hinge, bright matte screen, and decent-size keyboard. It's not the roomiest keyboard we've ever seen on a netbook; it's bigger than the Asus Eee 901's cramped quarters, but slightly smaller than those found on the MSI Wind or Acer Aspire One.

Because of the S10's small chassis, we found that our palms hung off the end of the machine, making it uncomfortable to use for long periods of time—like when writing this review. And like the MSI Wind, the Function and Control keys on the S10 are reversed, which we hate.

We're also not thrilled by Lenovo's decision to ship this machine with just two USB ports instead of three, the standard on nearly every other netbook. Worse, the ports are on opposite sides of the case, so some external drives that require multiple connectors, like our OWC Mercury OnTheGo, are left cold.

The S10 offers some small surprises in terms of performance. We ran our standard netbook suite (described in full in our December 2008 netbook roundup feature) and found the Lenovo S10's Photoshop scores best in class, beating the MSI Wind and Acer Aspire One by nearly half a minute, and coming in at less than half the time of the Asus Eee 901's abysmal run.

Like the other netbooks, the S10 wouldn't play Quake Live, but it had no problems displaying H.264-encoded video. In our battery-rundown test, the S10 performed as well as the other three-cell netbooks we've tested, shutting down at just a hair under two hours.

The S10 shows a lot of promise, and its style and performance are nothing to sneeze at. At $470, it's a serious challenger to the $500 Wind and even boasts twice the hard disk space. But two USB ports are one too few. And we still maintain that the $350 Acer Aspire One offers the best price/performance ratio in netbooks today. —NATHAN EDWARDS

SPECIFICATIONS

DISPLAY	10.2" TFT WSVGA @1024x600
PROCESSOR	Intel Atom N270 @ 1.6GHz
CHIPSET	Intel 945GSE
GRAPHICS	Intel GMA50
RAM	1GB DDR2/667
STORAGE	160GB WD Scorpio
PORTS	2 USB, VGA-out, audio in/out, multicard reader
WIRELESS	Bluetooth, 802.11b/g
OS	Windows XP
LAP/CARRY	2lbs 11oz /3lbs 7oz

BENCHMARKS

Photoshop (sec)	700
Battery (hrs:min)	1:59
H.264	Yes
Quake Live	WNR

VERDICT 7

LENOVO IDEAPAD S10

+ BLUE ANGELS	– BLUE DEVILS
Nice bright matte screen, roomy hard drive, decent looks.	Only two USB ports, and they're on opposite sides of the machine.

$470, www.lenovo.com

The IdeaPad S10 is nearly everything we could want in a netbook. Nearly.

ZeeVee Zv-100

An innovative solution, despite its limitations

Plenty of boxes will stream video from your PC in one room to a TV in another, but they all have two things in common: You need to provide the network, and you need to buy one box for each TV you want to stream to. ZeeVee has a better idea: One Zv-100 will stream video from your PC to all your HDTVs by using your home's existing coaxial wiring as a network.

But here are five limitations you should know about up front: First, the Zv-100 will stream only to digital TVs equipped with digital QAM tuners—it can't stream video to a simple monitor or an analog television set. Second, ZeeVee does not currently recommend the Zv-100 for use in households with satellite TV service (only cable TV is supported). Third, the Zv-100 is limited to streaming video at 720p resolution. Fourth, the Zv-100's $500 price tag is justified only if you're interested in streaming to more than one HDTV. A media center extender is a much cheaper solution otherwise. And finally, the box takes over the host PC while streaming—the computer can't be used for any other purpose during this time. Still interested?

The Zv-100 bundle consists of the ZvBox, which captures your PCs audio and video; the ZvRemote, for controlling your PC from afar; and the ZvReceiver, a RF USB dongle that serves as the interface between your PC and the remote.

The Zv-100 bundle consists of the fanless ZvBox (while we appreciate the silence, you can fry an egg on its surface while it's in use), the ZvRemote (an RF/IR combo model that can control a PC anywhere in your house, plus up to three TVs), and the ZvReceiver (which sends and receives commands from the remote and relays them to your PC via USB).

The ZvBox captures your PC's audio and video output (carried over USB and VGA cables, respectively), encodes it in real time to MPEG-2, and "broadcasts" it on a private channel on your coax network. When you tune your HDTVs' QAM tuners to this channel, they receive this private broadcast. So while you can stream to multiple HDTVs, they'll all receive the same content (which can be a problem if you want to watch *Dexter* but would prefer that your children watch something that won't cause nightmares).

The RF remote enables you to control every aspect of your PC as if you were sitting in front of it. It's extremely well designed, with the exception of one blunder: It has a notebook-style track pad that doesn't recognize finger taps (left and right mouse buttons are placed beneath the track pad, which means you have to look at the remote to find them).

The remote has all the other buttons you'd expect, including transport (play, pause, fast forward, etc.), a telephone-style numeric keypad (for entering both numbers and letters), volume control, and so on. It even has keyboard-style arrow keys that make it very easy to scroll web pages. A large button in the center of the remote calls up a rudimentary 10-foot Zviewer interface (with preset links to sites such as Hulu, YouTube, Netflix, ABC, and a few others) that makes it easier to manage the system from your couch. Another button calls up Windows Media Center, if your version of Windows is so equipped.

The quality of the streamed video is excellent, but you're completely dependent on your HDTV's speakers when it comes to sound (unless your set has an audio output that you can connect to an A/V receiver or powered speakers). The fact that the ZvBox is limited to analog VGA (received from your PC and passed through to your monitor) is a major problem if your rig's videocard has only one output (as many home-theater and notebook PCs do) because it compromises your desktop experience and prevents you from connecting a 30-inch LCD.

We've listed a lot of limitations in this review; if none of them bothers you, the Zv-100 is a great solution. With the exception of the satellite TV issue and the fact that the ZvBox takes over the host PC while streaming, we think the ZeeVee team has done just about everything possible to create a fabulous no-new-wires, multi-client video-streaming system at a reasonable price.

—MICHAEL BROWN

ZEEVEE ZV-100

VERDICT 7

+ THE WIRE	− LAW & ORDER
Streams to multiple HDTVs using existing wiring.	Streams to multiple HDTVs; limited to 720p; touchpad doesn't recognize finger taps.

$500, www.zeevee.com

Haier Rhapsody Ibiza

Got Rhapsody? This is the media player for you

You navigate the Ibiza's nested menus using a touch pad and four buttons at compass points surrounding the pad.

When talk turns to digital media players, Apple's iPod and Microsoft's second-generation Zune (with its third-gen firmware) dominate the conversation. But if you're a Rhapsody-to-Go subscriber ($15 per month), there's only one media player you should consider: Haier's Rhapsody Ibiza.

The Ibiza is available in three configurations: flash memory models with 4GB and 8GB capacities (priced at $200 and $230, respectively) and the 30GB hard-drive model ($300) reviewed here. All three play videos and display digital photos as well as play music; they also support Bluetooth headphones.

The Ibiza can connect to 802.11g Wi-Fi networks, which means you can stream and download songs from Rhapsody (and listen to Rhapsody's Internet radio channels) without plugging the player into your PC. Synchronizing the Ibiza to your PC, on the other hand, requires a hardwired connection.

This device leverages everything that we like about the Rhapsody service. If you're online while listening to a song, for instance, a menu displayed next to the album art gives you the choice of downloading the track (or the entire album) to the player, purchasing and downloading the song or album to the player, sampling other tracks from the album, or calling up a biography of the artist. Choose "more by this artist" and the player will open a submenu with choices that include an artist sampler, a list of all the albums the artist has recorded, a "top tracks" list, and a list of similar artists.

The Ibiza's software is excellent—in stark contrast to Rhapsody's absolutely dreadful PC software—but we do have one complaint: Drill deep down into its nested menus and the only way to get back to the home screen is to repeatedly stab the back button.

"Tethered" tracks, of course, remain available only as long as you maintain your subscription, but we're disappointed that the player doesn't inform you whether the tracks you purchase are infested with DRM (Rhapsody sells both encrypted and DRM-free tracks).

The Ibiza is close to being the perfect portable companion for Rhapsody customers, but there's very little to recommend to folks outside that circle. Its total lack of support for lossless audio codecs, meanwhile, is a major disappointment.

—MICHAEL BROWN

SPECIFICATIONS

WI-FI SUPPORT	802.11b/g
STORAGE CAPACITY	30GB
DISPLAY	2.5-inch, 320x420 pixels
WEIGHT	4.9 ounces
AUDIO FORMATS	AAC, MP3, VBR, WMA, WAV
VIDEO FORMATS	H.264, MPEG-4, WMV
PHOTO FORMATS	JPEG, PNG

VERDICT 8

HAIER RHAPSODY IBIZA

+ IGGY POP	− IGGY KOOPA
Awesome integration with Rhapsody's subscription music service; built-in Wi-Fi and Bluetooth.	No support for lossless codecs.

$300, www.haier.com

Pinnacle Video Transfer

Capture video without a PC

You'll trade image quality for convenience with the Pinnacle Video Transfer.

We still remember when capturing video—even standard-definition resolutions—was a Herculean task. Today, you can do it with a stand-alone black box hooked directly to a USB 2.0 memory stick. Such is the story of the Pinnacle Video Transfer device. Simply plug in the wall wart, plug a memory stick or hard drive into the standard USB A port (the square USB B port is currently not supported), and plug standard composite video and stereo RCA jack inputs into the other side. The device also supports S-video input for slightly higher-quality captures.

Once your USB 2.0 hard drive or memory stick is connected to the device, a blue light turns on indicating that the PVT is ready to capture video. You can select from three quality levels: good at 320x240, 512Kbps; better at 320x240, 768kbps; or best at 640x480, 1.5Mbps. The good setting records audio at 96kbps while better and best bump it up to 128kbps. On the best setting, the PVT turned an hour's worth of Hi-8 tape into an 800MB file. You simply press record and it goes.

The end result isn't stellar, but it's not as bad as you might expect. It's certainly good enough for the web or an iPod. But would we use the PVT to archive our treasured memories from the glorious 1990s? At first we said no. The device produced too many compression artifacts for our taste. But then again, are you really ever going to capture that stack of moldering family videos if you have to haul your VCR to the computer? Hell no.

The PVT is stupid-easy to operate and ultraportable, which means you're more likely to use it. As much as image quality matters, in our book, it's better to have flawed video than no video at all, and the PVT makes it a breeze to capture those old video sources.

—GORDON MAH UNG

VERDICT 8

PINNACLE VIDEO TRANSFER

+ LASER DISC	− DVD
The device is easy and convenient to use.	Creates too many compression artifacts.

$100, www.pinnaclesys.com

Logitech Squeezebox Boom

Here's an alarm clock you won't mind waking up to

The Squeezebox Boom is another solid entry in a long line of great audio streamers. Logitech has mastered the art of building inexpensive, good-quality powered speakers, and the ones integrated into the Boom are no exception.

The Squeezebox Boom's closest competition is Roku's SoundBridge Radio, but it's not much of a contest. Both devices can function as an alarm clock, waking you with music streamed from your PC or Internet radio stations (and both have an all-important snooze bar), but the Boom sounds better, supports more audio formats, and consumes much less room on your nightstand.

The speakers utilize a two-way design consisting of a pair of three-quarter-inch soft-dome tweeters and two three-inch long-throw woofers. Listening to the opening of "Fortune Teller," from the Robert Plant/Alison Krauss collaboration *Raising Sand* (which we'd ripped from CD and encoded to WMA Lossless), we were pleasantly surprised by the small woofers' ability to reproduce the boom of the traditional bass drum (which sounds distinctly different from a drummer's kick drum).

If you want even more low end and have a powered subwoofer lying around, the headphone jack in the back of the device can be reconfigured as a subwoofer output. The tweeters, meanwhile, deliver pleasingly crisp highs. Logitech doesn't disclose the amplifier's output, but it delivers enough power to fill a moderate-size bedroom with sound. Push the amp too hard, however, and it will shred your eardrums with unpleasantly grating highs. There's also a line-in jack in the back, which is handy for plugging in an MP3 player.

Given the proliferation of 802.11n Draft 2.0 routers, we're disappointed that this Squeezebox remains limited to 802.11g. It's not that music requires the extra throughput, it's just that having a Squeezebox on your network prevents you from running the network in 802.11n-only mode.

The Squeezebox Boom echoes the design of the Squeezebox 3, but with a smaller display, a collection of buttons, a large knob on its face, and, of course, those built-in speakers. Most of the buttons perform typical playback functions (play, pause, skip forward/back, and volume control), while the knob and a few buttons are used to navigate the onscreen menus (the knob can also be used to adjust the volume). You can store favorite tracks, radio stations, or albums in six preset buttons beneath the display, so they can be recalled with a single button press.

One thing that's sorely missing from the front panel (it's on the infrared remote) is a Home button that takes you to the device's root menu. The only way to get there using the front-panel buttons is to repeatedly mash the Back button. You can also control the Boom using the remote that comes with the Squeezebox Duet, which is outfitted with a color LCD.

If you're looking for a general-purpose audio-streaming box, as opposed to an alarm clock, you'll be better served by the Squeezebox Duet or the Squeezebox 3 paired with high-quality self-powered speakers (Axiom Audio's Audiobyte and Audioengine's A2 or A5 are good choices). One reason is that the Boom lacks a digital output, so you can't use an outboard DAC or integrate the Boom into your hi-fi system. And if it's a multiroom system you're after, no one does it better than Sonos. **–MICHAEL BROWN**

VERDICT 8

LOGITECH SQUEEZEBOX BOOM

+ MAIN SQUEEZE	– SHAMELESS TEASE
Great alarm clock, great user interface, comprehensive audio-format support.	No digital outputs and limited to 802.11g networks.

$300, www.logitech.com

One of the Squeezebox Boom's few shortcomings is that you can't detach the speakers from the cabinet.

Verbatim PhotoSave DVD

Backing up your photos has never been so easy

All it takes is an errant foot strike or a power spike and *poof*—you've lost gigabytes of photos and memories in a single hard-drive crash. Let's face it, few of us ever actually take the time to copy those photos to a backup drive. And if you don't do it, do you really think your mother-in-law will? Verbatim's PhotoSave DVD aims to solve this problem with a solution that even your newbiest relatives can handle.

Each disc contains an executable that auto-launches once the disc is in a drive. The app is Forest Gump simple. You can order it to scan one drive or all drives for JPEGs. Once it's found all the files, a button push will burn the files to the disc. If your files exceed 4.5GB, the app will span multiple discs. Once the backup is done, you'll find the files neatly arranged in the same folders they were in on your hard drive, accessible from any DVD drive. A second option lets you import files directly from a digital camera that's mounted as a drive in the PC. The software is based on SoftR's Self Recordable Media technology. SoftR has other versions tweaked to back up Outlook files or your My Documents folder, or back up and encrypt these files as well.

The cheapskates in our office wondered why they couldn't simply use their own blank DVDs to back up to after filling the first PhotoSave DVD. While we're all for saving a few bucks, we don't begrudge Verbatim the right to actually turn a profit on these discs. The company simply couldn't make any money if you bought a single disc for $2. People who think otherwise would probably also like a new, crisply folded 10-dollar bill with each disc. It's capitalism, get used to it.

The DVD's app executes from the disc and no software is installed, making it near foolproof.

By default, the disc backs up only JPEG files, but the app can be customized to also pick up videos and RAW files. If a backup fills only part of a single disc, you can continue to add files until the disc is full, but the same rule doesn't apply when a job spans multiple discs. For example, in a three-disc backup that we performed, the third disc was only partially filled. When we tried to add additional files to the disc, the app no longer appeared on the third disc and there was no way to add files to it.

That's a minor kvetch though. Overall, the software is dummy-proof. Is it for a power user? Probably not. Is it for a power user's gramps? Hell yeah. At $10 for three discs or $15 for five, it's one heck of a great gift—something the receiver will truly treasure after his or her hard drive implodes. **—GORDON MAH UNG**

VERDICT **8**

VERBATIM PHOTOSAVE DVD

JHP	FMJ
The backup process is so easy, even an idiot could do it.	Can't add files to spanned discs that aren't full. Why no dual-layer?

$10, www.verbatim.com

Far Cry 2

Go on an African safari to hunt the world's deadliest prey: man

Fifty square kilometers of African terrain. That's how much open space you have to accomplish Far Cry 2's primary objective: Kill the weapons dealer known as the Jackal, who has been supplying both sides of a bloody civil war in the game's fictional setting. If the sheer size of the game world sounds daunting, just consider the fact that it's densely occupied with dozens of towns, numerous encampments, and a whole population of NPC characters (potential allies and enemies alike). Far Cry 2's expansive environment is undoubtedly its most notable asset, but what's really impressive is that the game is filled with enough compelling action to actually make use of it.

Outnumbered and outclassed? Sounds like the perfect time to bring up the rocket launcher.

As a stranger in unfamiliar territory, it's clear that you can't just shoot your way across the country to find your target. Getting to the Jackal requires you to form allegiances with mercenaries and guerrilla factions to earn enough prestige and currency (in the form of diamonds) to work your way through the loosely scripted story to the climatic showdown. A buddy system helps you along the way—you befriend a cast of NPCs that become both your quest givers and sidekicks in the inevitable shootouts. In fact, the game is structured a lot like Grand Theft Auto, but with GTA's urban jungle swapped out for a real one. This role-playing-lite experience was definitely enjoyable and let us progress at our own pace. Our only gripe is that the NPCs' voice delivery sounded rushed at times.

Your tasks are varied enough to facilitate different gunplay styles. Though tasks typically fall into the "assault the enemy base" or "retrieve a valuable package" categories, the range of mission locations—walled fortress, riverside swamp, oil pipeline, to name just a few—gave us plenty of opportunities to experiment with tactics. The guns-blazing strategy indeed works, but we preferred the more stealthy approach, especially since we could complete any mission under the shroud of the midnight sky.

In fact, many of the thrills come not from the shootouts, which are pretty challenging given the smart enemy AI, but from the planning we had to do before making our assaults. Scouting out the mission area, planting explosive traps, and picking out easy targets before executing a plan added tension to each firefight. The anticipation of carrying through a well-thought-out strategy—whether everything goes according to plan or not—is a huge part of what makes this game fun. And even when nothing goes according to plan, we were given plenty of opportunities in later missions to try similar approaches (the missions do get somewhat repetitive by the end).

Over time, wear and tear on your weapons will cause them to lock up and jam. Talk about poor craftsmanship!

And in between missions, we loved being able to drive around and explore the country, looking for new safe houses and scenic vistas that show just how much effort was put into designing such an amazing world. A functional river system with motorboats, rickety bridges, and gorgeous waterfalls makes the game world very believable. But we also had to prepare ourselves for a fair amount of walking if our vehicles were destroyed after a battle.

Far Cry 2's level of immersion goes beyond what any first-person shooter has ever achieved. From the lack of a HUD to the streaming level content (meaning no load screens), we at times forgot that we were playing a game. It also doesn't hurt that this is one of the best-looking games ever made—if your system can support it. But with its fully realized game world and the exciting combat scenarios, Far Cry 2 is one of our favorite shooters of the year. **—NORMAN CHAN**

VERDICT 9

FAR CRY 2

+ SUNTAN	− HEATSTROKE
Massive detailed environment, intense combat missions, open-ended play.	Some repetitive tasks, high system requirements, weak vehicle combat.

$50, www.farcry2.com, ESRB M

Crysis: Warhead

Elegant design or good, old-fashioned fun? We prefer both

We liked Crysis. Despite its less-than-stellar AI, annoying alien baddies, and flawed final mission, we liked it. We liked the game for its wide-open jungle combat and the power and flexibility the nano-suit gave us to approach combat any way we wanted. Whether we wanted to skulk through the jungle, shooting enemies half a klick away with a silenced rifle, or get up close and personal by throwing our enemies through the nearest wall, the game accommodated pretty much any play style.

What was the secret sauce? It's simple. While Crysis was essentially a linear game that pushed the player down a straight path from one battle to the next, this path was incredibly wide, giving the player a drastically different experience from one play-through to the next. While there were definitely choke points in the game, generally, you could choose when and where you wanted to fight the bad guys. Stalking the enemy and choosing the time and place of every fight was a blast—our major complaint was that there weren't enough ambush-type weapons such as Claymore mines and detpacks.

Crysis: Warhead finally gives the player the tools to set up elaborate ambushes, but at the same time, the player's path through the game seems significantly narrower. This limits your options as you play through the game and transforms something that was special into a run-of-the-mill shooter—albeit a very pretty one.

While we're disappointed by the shrinking game world, we love the greatly improved performance of the stand-alone expansion pack. This is partially due to the inevitable march of progress on the hardware side; Crytek has made some serious optimizations to the default settings as well as the auto-configuration tool. The game automatically chose default settings that produced a good mix of performance and eye candy on all the systems we tested. Naturally, the highly configurable engine lets tweakers crank up the visual quality as high (or low) as they want.

Vehicles still bring the big explosions, but beware of baddies with rocket launchers.

Aside from these changes, the core of the single-player game is essentially the same as the original. The weapons are almost all the same, the nano-suit's the same, and the bad guys are the same. In Warhead, you play one of your squadmates during the events of the first game. This let Crytek reuse most of the assets and even some of the events from the first game. However, while we appreciate any scriptwriter trying to add depth to our videogame characters, the voice-over flashbacks were more confusing than entertaining, and ultimately unnecessary.

Our least favorite part of the game is fighting the alien hordes.

Crytek has also polished and rebranded the multiplayer component of Crysis as Crysis Wars. The framework is an interesting blend of Enemy Territory–style gameplay with traditional team deathmatch. Unfortunately, whether it was the fault of the servers or the game's large scale, every time we went online, we faced lag bad enough to render the game unplayable, even on servers that registered low pings.

While Crysis: Warhead is a step toward a more mass-market-friendly game, it's a step back in innovation and fun. Warhead strips many of the amazing design elements that made Crysis fun despite its flaws, and we're not willing to let them go. While Warhead brings back a lot of the fun of Crysis, especially on the higher difficulty settings, it's closer to a straight run-and-gun shooter like Call of Duty than it is to the original. **—WILL SMITH**

VERDICT 7

CRYSIS: WARHEAD

+ KIERKEGAARD	− NIETZSCHE
Improved weapon choices and better performance.	Smaller game world; bad lag on multiplayer matches.

$30, http://crysiswarhead.ea.com, ESRB: M

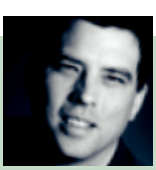
LAB NOTES

A PC Dunk Tank

A new computer bets big that enthusiasts are ready to ditch conventional cooling

GORDON MAH UNG
SENIOR EDITOR

Submersible computing is nothing new; people have been sinking whole systems in mineral oil for at least a decade, but you've never before been able to buy a prebuilt submerged system. At the very least, the oil-submerged Reactor that arrived in our Lab this month (page 58) promises top-tier performance at far reduced acoustics, and taken to its logical conclusion, it may offer cooling above and beyond anything else available today. But what if you don't have $4,500 or more to spend on a Reactor? Puget Systems has been experimenting with sinking a PC in a fish tank, and the results are quite interesting. Puget has posted the results of its long-term testing on its website at www.pugetsystems.com/submerged.php.



TOM EDWARDS
MANAGING EDITOR

Do you regularly carry around nuclear-missile launch codes, the *Chinese Democracy* demos, or the Colonel's secret recipe? If so, Kingston's BlackBox 8GB flash drive is the product for you. The drive utilizes the Federal Information Processing Standard, ensuring your data is safe. Check out my full review at http://tinyurl.com/6fnpkk.

NORMAN CHAN
ONLINE EDITOR

In Left 4 Dead (page 50), surviving the zombie apocalypse requires cooperation and watching your teammates' backs. But if that disaster were to happen in real life, I'm pretty sure distrust and self-preservation would eventually undermine any teamwork efforts. In other words, I would leave everyone at the magazine for dead.

NATHAN EDWARDS
ASSOCIATE EDITOR

Whew, my first edit cycle as a real live magazine editor! Most of my Lab time this month was spent reviewing the Lenovo IdeaPad S10 (page 90)—my fourth netbook—and Velocity Micro's new Core i7 machine (page 82). And I started learning the ropes on my new beats: cases, cooling, and hard drives.

WILL SMITH
EDITOR-IN-CHIEF

This month, Norm and I got to take a backstage tour of the amazing Morrison Planetarium at the California Academy of Arts & Sciences. Once there, we got a behind the scenes look at the hardware used to power the most advanced digital planetarium in the world. You can find the full story at http://tinyurl.com/planetarium-tech.

KATHERINE STEVENSON
DEPUTY EDITOR

My PC was experiencing an intermittent booting problem. I would think I had discovered the cause and a month or so later the issue would pop up again. This led to the discovery of a handy app: Windows Reboot Utility (http://tinyurl.com/4okxkh). By running this continuous loop of reboots I was able to quickly isolate the culprit—a persnickety soundcard.

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Win Rig of the Month

IF YOUR MODDED PC IS CHOSEN AS A RIG OF THE MONTH, IT WILL:

1 **Be featured before all the world in *Maximum PC***
2 **Win you a $250 gift certificate**

SO WHAT'S STOPPING YOU?

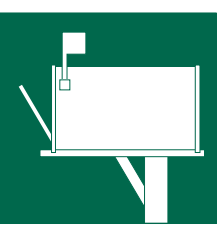
TO ENTER: Your submission packet must contain your name, street address, and daytime phone number; no fewer than three high-res JPEGs (minimum size 1024x768) of your modified PC; and a 300-word description of what your PC represents and how it was modified. Emailed submissions should be sent to **rig@maximumpc.com.** 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...

- Belated Photo Credit
- Money Found
- Down on Spore's DRM



Giving Credit Where It's Due

I'm responding to the Design Your Own Papercraft tip in your "35 Amazing Things" article (November 08). The tip is accompanied by a photo of two papercraft characters—Tim and The Creature from the game Braid—the models for which are available on my website, www.cubeecraft.com. The majority of the article is about creating your own paper models using Google Sketchup. My models are created solely in Adobe Photoshop, and all the graphics are done "by hand" within the program. Cubeecraft visitors can even download a free template to create their own models (and I regularly post guest artist submissions).

I have not used Google Sketchup, but I have tried Pepakura, and as your article suggests, I've found that more often than not the results are overly complicated. Cubeecraft was designed for ease, and therefore, the models use mostly straight cuts, fit on a standard piece of printer paper, and (most importantly) do not require glue or any other adhesives to assemble.

It just seems silly that you would write about an overly complicated way of creating your own papercraft and then show an example of what I feel is one of the "easiest" methods, a way not at all associated with what the article was about.

—Christopher Beaumont

Online Editor Norman Chan Responds: Christopher is right about the photo we used—it's based on a papercraft model he designed using Photoshop (see his site for more great models). We actually came across it at a game launch party. While his "by hand" method certainly produces some great-looking creations, not everyone has the spatial-visualization skills to conceptualize and manually draw out a papercraft design. We recommended the Pepakura app because it automatically generates all of a design's cut and fold lines without giving you a headache. It's by no means the only way to make your own papercraft; it's simply an elegant solution for beginners.

Missing Money No More

After reading the "35 Amazing Things" feature in the November issue, I decided to check out MissingMoney.com as suggested in the Claim Money That's Rightfully Yours tip. Much to my surprise, I found that I had $550 waiting for me in Colorado. The money was in an escrow account from a home I sold more than seven years ago. I filled out the online form on the Colorado Department of the Treasury website and once the state of Colorado finishes the verification process they will send me a check for the full amount. Thanks guys, now I can afford to renew my *Maximum PC* subscription.

—Joseph Jamison

SSDs Have Fewer Writes

I was excited to see an SSD roundup in your magazine (November 2008), but you didn't address an issue with

NOW ONLINE

Stellar Technology

We've seen some cool examples of visual computing, but nothing quite compares to the California Academy of Science's Morrison Planetarium in San Francisco—the most technologically advanced planetarium in the world. We went behind the scenes at this incredible facility to uncover what hardware makes the stars come to life. Find out more at http://tinyurl.com/planetarium-tech.

SSDs that most people who haven't researched them are unaware of. You say that an "advantage to SSDs is their relatively long life span," without addressing their write-cycle limits. SSDs are far more physically robust (making them ideal for notebooks) but can endure considerably fewer rewrites. For the vast majority of users, approximately 10,000 rewrites (for MLC drives) or 100,000 to 1 million rewrites (for SLC drives) is more than sufficient, but for systems with a lot of erasing/rewriting activity, SSDs could prove less reliable than hard drives. I'm sure this will improve by orders of magnitude over time, but for now, it's still a likely concern for some users.

—Erik Harris

Senior Editor Gordon Mah Ung Responds: Certainly there are heavy-access situations that could indeed betray an SSD's limitations over many years of use, but considering that Intel's MLC-based SSD can withstand writing 100GB of data per day for five years straight—and SLC versions can write 100 times that—the hardware is likely to be antiquated before the SSDs reach the end of their operational life. Still, your point is valid: How many companies continue to run Pentium Pro servers because they're too afraid to move applications off of them?

Spore Judgment

I was surprised to open the December issue today and find Spore receiving a 9 out of 10 verdict, especially given the game's use of SecuROM DRM. It would be nice if future software reviews mentioned the presence of any DRM.

—Jeff Pierfelice

Editor in Chief Will Smith Responds: I think it's safe to say that PC games that omit some form of DRM are the exception rather than the rule. Whether it was CD checks that didn't work with high-end drives, system scanners that disabled the game if you were using "pirate" apps like Daemon Tools, or secret code words you had to get from the manual, DRM on PC games isn't a new development—we just used to call it copy protection. While I appreciate the sentiment behind the protests against the new version of SecuROM DRM, I actually find SecuROM pretty mild in comparison to other encumbrances we've endured in the past. Even though the new SecuROM limits the number of PCs you can install the app on before you have to call an 800 number, you don't need to actually have the Spore disc in the drive to play the game. That's a trade I'll grudgingly make.

As for our game reviews, our stated policy is that we review games, not distribution methods. With most games shipping on multiple platforms (disc, Steam, Direct2Drive, EA Downloader, etc.), we simply can't test or devote space to the flaws of all of them. However, if someone does invent a new DRM scheme that we find insidious, you can rest assured we'll raise hell about it.

> ***"MUCH TO MY SURPRISE, I FOUND THAT I HAD $550 WAITING FOR ME IN COLORADO."***

He's Calling Us Out!

You gave the Digital Storm Benchmark Crusher (November 2008) a 9 verdict only because it was priced at $9,255? Oh! Come on! Don't you think that was kind of weak—especially since you built the 2008 Dream Machine for a whopping $17,285? Let's be fair and do the right thing. Mano a mano! Pit the two rigs against each other and see which one comes up with the better benchmarks. Don't go whiny baby on me, either. The Dream Machine should whup the butt of this newcomer Digital Storm machine. Right? Or not?

Or are you scaredy cats? Let the readers see....

—Norbert Meyer

Senior Editor Gordon Mah Ung Responds: Actually, the Digital Storm failed to receive a 10 verdict because it was "monstrously heavy, noisy, *and* expensive" (italics added). And the system provided only a marginal performance gain over the CyberPower Gamer Ultimate PC, which was, oh, $4,000 cheaper.

As far as Dream Machine 2008 versus the Digital Storm (or other top-end machines), it depends on the benchmark. With its eight 4GHz cores, the Dream Machine 2008 will crush almost anything in applications that are threaded for eight cores. DM does pay a penalty in latency for its FB-DIMMs though. We don't want to get whiny, but the last time we compared our Dream Machine to other rigs, people were yowling at us for being unfair.

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

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FATHER&SON

Kaypro PC

In the '70s and '80s, John Brady and his father built a number of PCs together. Now John and his son, Lucas, share this hobby. Not long ago, Lucas found one of John's old projects, a Kaypro 2X, in his grandfather's basement and thought it would be fun to put a modern computer inside it.

First, the team stripped everything out of the Kaypro—the original CRT alone took up almost half of the original case. The Bradys then spent four months searching for and installing components that would fit within the rig's Lilliputian interior. We can't wait to see what Lucas finds the next time he rummages through gramps's house!

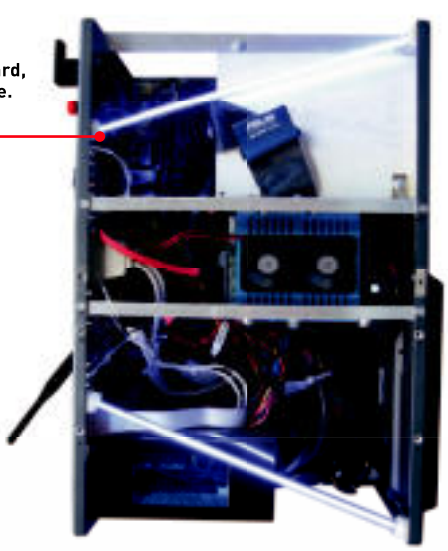
John and Lucas found a new keyboard that would fit the Kaypro's tray; they even created a background that includes the Kaypro logo and a fake assembler listing.

BE A WINNER!

For submitting this month's winning entry, John and Lucas have won a $250 gift certificate. To enter the Rig of the Month contest, see the official rules on page 109.

Within the Kaypro's 12"x18"x8" frame, the Bradys were able to install an ATX motherboard, a new screen, a power supply, and a DVD drive.

The Kaypro 2X rocked a 4MHz Z80A processor and 64K of RAM; this revision features a bit more power.



Those '80s-era rigs were built solid. John and Lucas burned out a Dremel while drilling holes for the power supply.

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