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MAXIMUM PC

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Ed Word

Life After Vista

Please send feedback and plain M&Ms to ***will@maximumpc.com.***

Now that Vista has finally shipped, it's time to reflect on the last three years. In the middle of 2003, I began my preparations to cover Vista (back then, it was called Longhorn). First, I decided to familiarize myself with the competition: Linux and OS X. I spent 18 months immersed in them, which gave me a much better understanding of the strengths and weaknesses of the three major operating systems. Then, after a brief interlude back to Windows XP, I turned my attention to Vista.

During the last nine months, I've spent a ton of time testing, using, and writing about Vista. For testing and review purposes, I've run Vista on most of my rigs for the last half of 2006. Now that I'm wrapping up our first wave of Vista coverage, I'm not sure what to do next. If you read my Vista review in last month's issue or this month's "10 Reasons You Don't Need Vista Today" (page 34), you know I'm not particularly impressed with the fledgling OS. I'm sure that at some point in the not-too-distant future I'll install Vista—in order to play games and work on stories for the mag, if nothing else. I just don't need it right now.

But Linux is a different story. Since the time I regularly used Linux, a new power has risen: Ubuntu. Ubuntu's polished interface, easy-to-use applications, and Windows-switcher-friendly community have helped thousands of people learn Linux, and I want to give it another try. I expect the entire experience to be much easier than before, as three years is an eternity in the Linux world. And, just like last time, I'll blog about the reality of switching to Linux at Maximumpc.com.

So, what's *your* next OS move? Let me know, either by voting in our forum poll (**http://tinyurl.com/y3lndr**) or by emailing me at will@maximumpc.com.

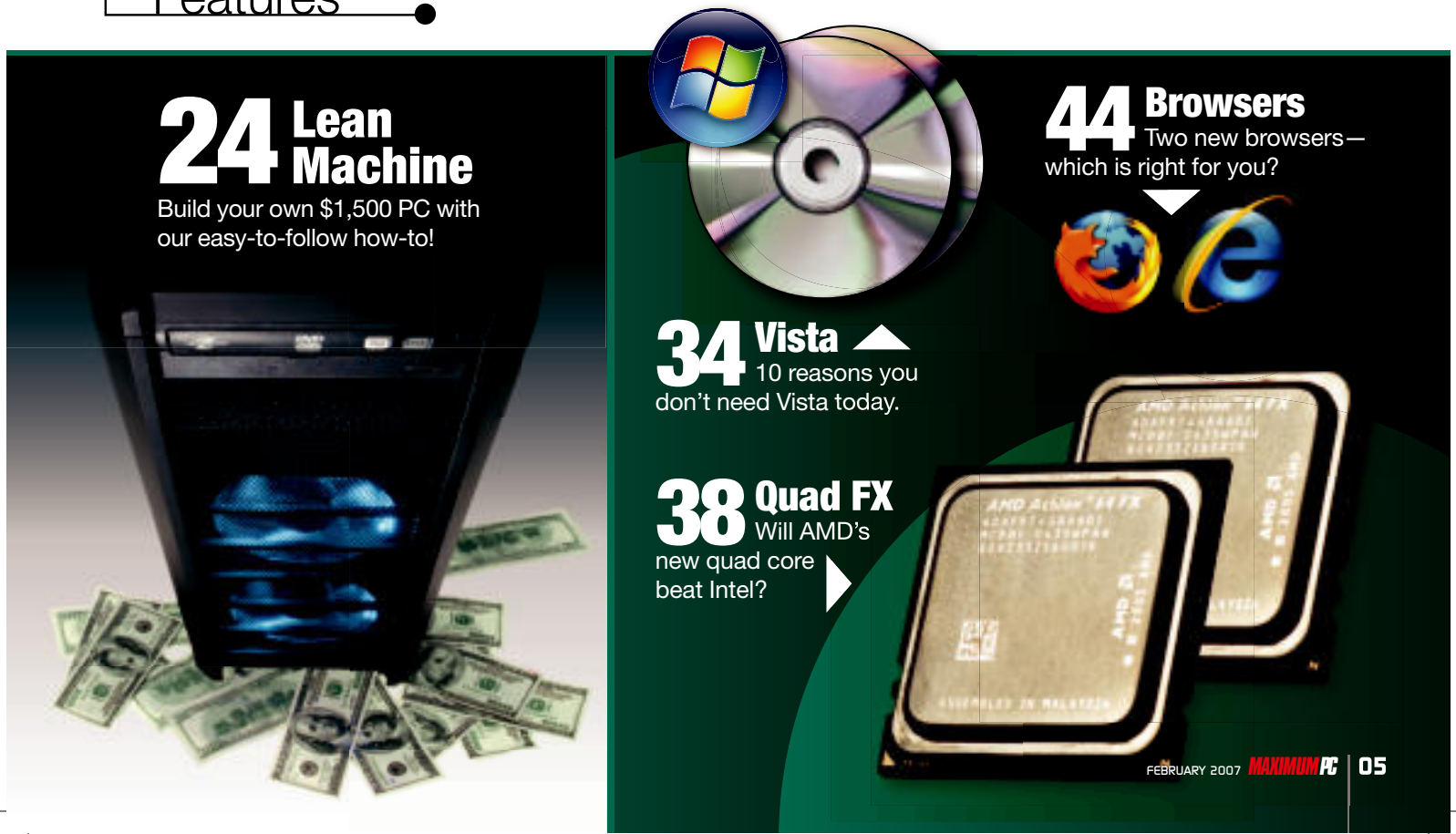
CH-CH-CH-CHANGES

It gives me great pleasure to announce a few changes at *Maximum PC.* First, I want to welcome two new members to the *Maximum PC* family—associate editor Dave Murphy and managing editor Tom Edwards. Dave will be covering several of our hardcore beats—cooling, cases, and storage, among others—while Tom has inherited the thankless (but ever so vital) task of keeping the rest of the staff in line and on schedule. I'd also like to congratulate Katherine Stevenson on her much-deserved promotion to senior editor. In addition to covering her tech beats, she'll be planning and editing the features in the magazine.

Congrats Katherine and welcome Dave and Tom!

Will Smith

Features



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ART
ART DIRECTOR **Natalie Jeday**
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PHOTO EDITOR **Mark Madeo**
ASSOCIATE PHOTOGRAPHER **Samantha Berg**
CONTRIBUTING PHOTOGRAPHER **Sandra Silbereisen**

BUSINESS
PUBLISHER **Anthony Danzi**
646-723-5453, adanzi@futureus.com
ASSOCIATE PUBLISHER **Rob Smith**
605-238-2503, rsmith@futureus.com
WESTERN AD DIRECTOR **Dave Lynn**
949-360-4443, dlynn@futureus.com
WESTERN AD MANAGER **Derek Johnson**
605-238-2327, djohnson@futureus.com
EASTERN AD MANAGER **Larry Presser**
646-723-5459, lpresser@futureus.com
EASTERN AD MANAGER GAMES **Kristin Kelleher**
646-723-5491, kkelleher@futureus.com
ADVERTISING COORDINATOR **Jose Urrutia**
650-238-2498, jurrutia@futureus.com
MARKETING COORDINATOR **Michael Basilio**

PRODUCTION
PRODUCTION DIRECTOR **Richie Lesovoy**
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CIRCULATION
CIRCULATION MANAGER **Peter Kelly**
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FUTURE plc
30 Monmouth St., Bath, Avon, BA1 2BW, England
www.futureplc.com
Tel +44 1225 442244

NON-EXECUTIVE CHAIRMAN: **Roger Parry**
CHIEF EXECUTIVE: **Stevie Spring**
GROUP FINANCE DIRECTOR: **John Bowman**
Tel +44 1225 442244
www.futureplc.com

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Contents

Departments

68

Reviews

70

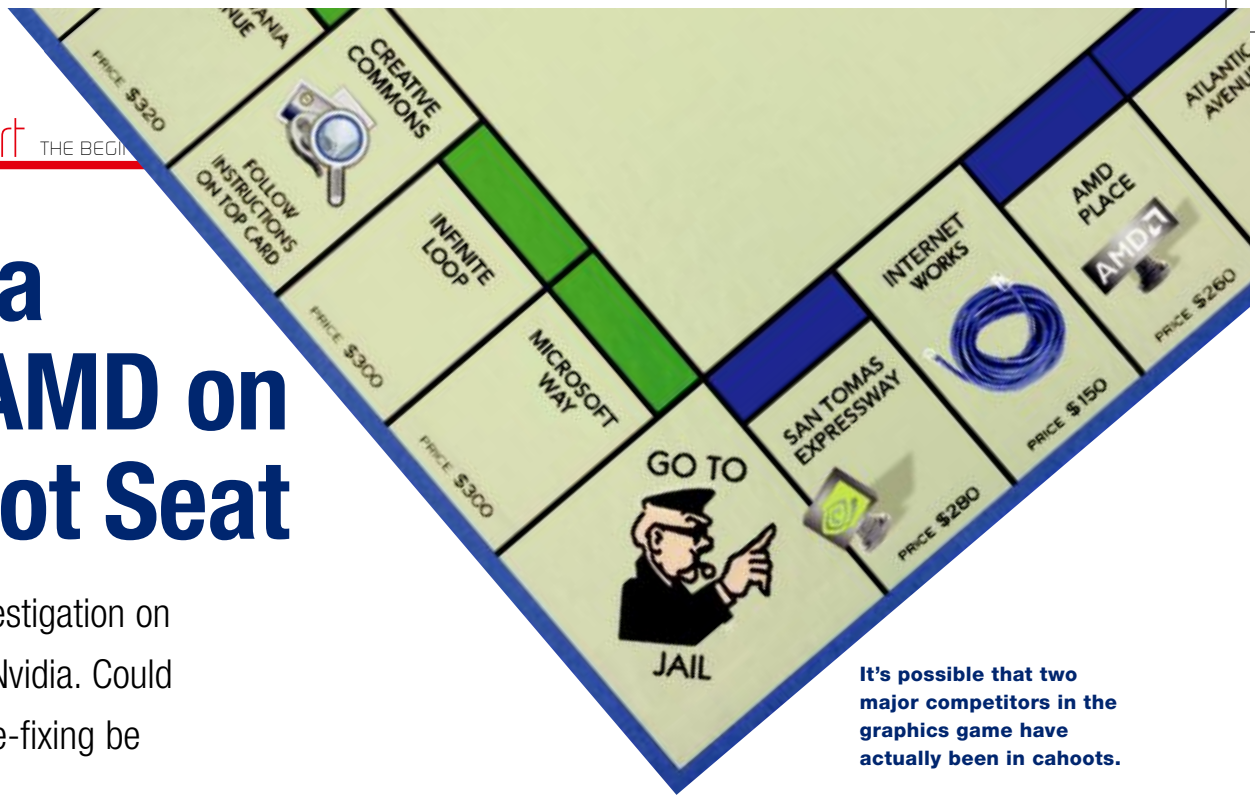
74

80

Gaming

Nvidia and AMD on the Hot Seat

Feds open investigation on AMD/ATI and Nvidia. Could videocard price-fixing be the cause?



It's possible that two major competitors in the graphics game have actually been in cahoots.

After recently sending a handful of DRAM executives to the pokey for price-fixing, the Department of Justice is now focusing its attention on graphics giant Nvidia and its primary competitor, ATI (now owned by AMD).

"The Antitrust Division is investigating the possibility of anticompetitive practices involving the graphics processing units and cards industry," a spokesperson for the DOJ said. Beyond that, the DOJ is keeping mum on the exact nature of its investigation, but many experts believe it has to do with price-fixing. While vendors may set similar prices independent of each other, getting in a room or making a phone call to fix a price is illegal.

Officials with Nvidia and AMD confirmed receipt of federal subpoenas seeking records, but would not elaborate further. Both companies' reps claim not to know what the feds are looking for.

Mike Hara, a spokesperson for Nvidia, said the DOJ has requested records from as far back as the 1990s, including market studies, volume price agreements, and other documents. "It's a pretty wide-sweeping set of documents," Hara said. He added that despite the scrutiny, the company takes a positive view of corporate regulations and believes they're generally good for the industry.

Although the records request dates back to the days of the Nvidia Riva 128 and ATI Rage 3D, the investigation is likely focused on modern discrete GPUs as opposed to integrated graphics, as the DOJ has not targeted Intel, the largest manufacturer in the integrated sector.

Industry analyst Jon Peddie said very little is known about the investigation, but it might have originated from one of two things: In the course of regularly watching industries and prices, the antitrust division decided that videocard prices were a little too close—and, indeed, ATI and Nvidia's cards consistently fall within the same price range—or a smaller system-builder or even a board builder complained to regulators.

And regarding conspiracy theories that AMD and Nvidia may have made a backroom deal to deep-six ATI products, Peddie said it's very unlikely: "That would be a waste of $5.8 billion [the price AMD paid for ATI]."

"The irony of this is that far from collusion by ATI and Nvidia, which would be like God and the devil getting together, [the close pricing] is more an indication of competition," said Peddie.

Maxwell Blecher, a former DOJ antitrust lawyer now in private practice, said that from the bits of information the feds asked for, it sounds like they are opening a price-fixing investigation. Blecher noted that these cases can be pretty difficult to prove without a paper trail. "That's what [DOJ lawyers] are looking for, and that's why they issue these dragnet-style subpoenas." Blecher said the bulk of DOJ antitrust investigations are started by a complaint from a competitor or by an insider who has decided to spill the beans. He explained that during his days at the DOJ, the antitrust division could have two dozen or more investigations underway, with few of them actually producing proof of illegal activities. But, Blecher said, you'd be surprised what people put down on paper.

GPU Price-Fixing? You Be the Judge

Product	Release Date	Launch Price (estimate)
Nvidia GeForce 8800 GTX	November 2006	$650
Comparable AMD product not yet released	TBA	TBA
Nvidia GeForce 7950 GX2	June 2006	$650
Radeon X1950 XTX	August 2006	$450
Nvidia GeForce 7900 GTX	March 2006	$500
Radeon X1900 XTX	January 2006	$650
Nvidia GeForce 7800 GTX	June 2005	$600
Radeon X1800 XT	October 2005	$550
Nvidia GeForce 6800 Ultra	April 2004	$600
Radeon X800 XT PE	May 2004	$500
Nvidia GeForce FX 5800 Ultra	January 2003	$400
Radeon 9700 Pro	August 2002	$400

Meet UniveRSS—the 3D RSS Reader

News feeds have never looked so interesting. Microsoft's UniveRSS RSS reader (http://tinyurl.com/yc8mjq) displays feeds on 3D cubes floating in space. The closer a cube is, the more recent its content. Click the cube to see a list of stories, then click a story to read it. The Vista-only app is still young, and kind of a system hog, but it looks cool and might actually become useful with further development.

AMD Acts to Close Process Gap

The CPU maker announces its 65nm processors and a new aggressive timeline for 45nm chips

Hoping to gain ground in its race with Intel, AMD said it is now successfully producing its first 65nm CPUs, something its competitor has been doing since December 2005.

Process size describes the size of certain parts on the CPU—a smaller size generally yields both power-efficiency savings and performance boosts. AMD's 65nm chips are considered optical shrinks with no major feature changes from the company's 90nm version. The first 65nm consumer chips will carry the Athlon 64 X2 badge.

The story is quite different on the server front, where AMD has showed off quad-core processors built on the new 65nm process as well. Code-named Barcelona, the quad Opterons occupy a single contiguous die and are expected this spring or summer, with a consumer version to follow.

AMD said it has also accelerated plans to have a 45nm fab up and running by the summer of 2008. Late last year, Intel said it had completed its 45nm CPU, code-named Penryn, and had sent it for testing at the company's new 45nm fab in Oregon. AMD's accelerated 45nm fab should put the company only six to eight months behind Intel, an improvement over the 12 months it took to catch up to Intel's 65nm CPUs.

Qualcomm and Airgo's Power Play

Cellular, meet Wi-Fi. Wi-Fi, cellular

If only Saruman had focused on MIMO Wi-Fi technology instead of orcs, and Sauron's ey had been turned toward the cellular marketplace instead of two little hobbits—then we could simply call Qualcomm's December acquisition of Airgo Networks "The Two Towers and be done with it.

While the business world might not be a fantasy, Qualcomm's patent-based dominati of the marketplace's CDMA standard is the ring that keeps the other industry players in lin And with Airgo now under its wing, Qualcomm is prepping for an integrated future. Dubbe Snapdragon, the company's future chipset will support a number of wireless protocols, including Bluetooth and Wi-Fi—the latter featuring Airgo's 802.11n-based MIMO technolo

Qualcomm's acquisition puts the company in the position of facing off against Intel-backed WiMax technology, but it wouldn't be *The Two Towers* without an awesome battl scene, right?

TOM
HALFHILL

Multicore CPUs: Homogenous vs. Heterogeneous

Watch for exciting new developments in multicore processors. There's much more going on than simply replicating identical processor cores in cookie-cutter fashion on a chip. CPU architects are exploring two different roads to future multicore processors: homogeneous and heterogeneous designs.

Today's multicore PC processors are strictly homogeneous. Each chip replicates the same basic processor core—twice for dual-core processors or four times for quad-core processors. Homogeneous multicore chips are usually easier to design because the integration is straightforward. All the cores have identical input/output interfaces and processing capabilities, and they all run at the same clock frequency.

Within 10 years, I expect to see homogeneous multicore PC processors with 12 or more identical cores. Server processors might have even more. But this road seems destined for a dead end if the diminishing returns of software parallelism fail to overcome the rising complexity and power consumption of higher integration.

In contrast, heterogeneous multicore processors combine two or more different cores, often running at different clock speeds. There aren't any examples among PC processors yet, but they are common in embedded systems. For instance, some cell phones have multicore chips that integrate a 32-bit general-purpose processor (GPP) with a digital-signal processor (DSP) or perhaps a GPP configured as a DSP. The GPP runs the application software and user-interface code, while the DSP handles the baseband processing for wireless communications.

Heterogeneous multicore designs show more long-term promise. AMD is already moving in this direction by acquiring ATI and launching its Fusion project to integrate graphics cores into PC processors by late 2008 or 2009.

In the future, I expect to see much more heterogeneity. PC processors may have multiple cores for decoding digital audio and video, running the network-software stack, managing security functions, and performing other specialized tasks. There's no need to dedicate large, complex general-purpose cores to those narrow jobs. Some cores will be large, some will be small, and some will run at different clock speeds. Some cores may not be x86 compatible.

Another avenue for exploration is multithreading—on a scale much greater than Intel's simple two-way HyperThreading, which is absent from most of Intel's latest processors. But that's a topic for another column.

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

HDMI FYI

What you should know about version 1.3 of the digital A/V interface

Short for High-Definition Multimedia Interface, HDMI is appearing on more and more consumer electronics devices, including those related to the PC. The 19-pin connector is capable of delivering uncompressed audio and video signals over a single cable to an HDMI-equipped device, making it an ideal interface for high-def content. Indeed, several videocard vendors now offer boards with an HDMI port alongside or as an alternative to DVI to accommodate the growing popularity of digital home entertainment centers.

Version 1.3 of the HDMI spec doubles bandwidth from 4.9Gb/s to 10.2Gb/s; adds Deep Color, which broadens the color spectrum; adds 10-bit color for increased image detail; and supports lossless uncompressed audio such as Dolby TrueHD. Sounds good, right? Trouble is, HDMI versions specify potential capabilities, not requirements, so make sure the device you buy has all the features you're looking for.

HDMI 1.3 offers a lot more than its predecessor, but the cable remains the same.

MPAA Saves Pretexting

By now, everyone's familiar with pretexting, the practice of masquerading as someone else to gain access to his personal information, such as phone records. While it might seem as though the world was blind to the practice prior to Hewlett-Packard's involvement in this less-than-legal activity, in actuality, California lawmakers were debating a bill to make pretexting illegal prior to the HP blowup.

So what put a stop to SB1668, which would have given victims of pretexting the right to sue for damages? It wasn't the California Senate, which passed the bill with a unanimous 30-0 vote. Recently released information points the finger at lobbyists for the Motion Picture Association of America, who allegedly pushed legislators to strike down the measure, claiming it would interfere with the organization's ability to target—who else?—file-sharers.

Fortunately, in its last session, the 109th U.S. Congress passed a measure outlawing pretexting nationwide. Take that California!

Altair 8800 Kit

Travel back in time by building your own PC predecessor

Now you can own the same Altair 8800 microcomputer kit—all 680 individual parts of it!—that *Popular Mechanics*, er, popularized in 1975. Visit Altairkit.com for details.

GAME THEORY

THOMAS **MCDONALD**

Warcraft Breaks Free

As imaginary worlds go, Azeroth was pretty thin gruel when Blizzard embarked upon *World of Warcraft*. Starting with a chunk of Warhammer, a heapin' helping of Dungeons & Dragons, and a soupçon of Tolkien, the designers did a good job of developing Azeroth into a world that could sustain a giant role-playing community. Now Azeroth has burst the bonds of computer gaming and migrated to new formats with the World of Warcraft Trading Card Game (Upper Deck Games) and World of Warcraft: The Board Game (Fantasy Flight Games). But what's left of a Warcraft game when you take the game world (the least original part) and the mechanics and remove them from the computer?

Plenty, it turns out. Both the card and board games succeed at two essentials: They re-create unique aspects of the original *WoW* experience, and they work well as games on their own terms. The card game uses standard Magic: The Gathering design elements as its bedrock but then incorporates quest cards (rewarding the player for completing a task) and heroes (each with a class, skills, etc.) to effectively evoke the MMORPG. The board game follows a similar quest/hero approach but includes 120 plastic monster figures and multi-hero parties, all spread across a vast play area of boards and hero cards.

The two games capture the core appeal of *WoW* (heroes and questing) and translate it into new media. It's fascinating to see gamers flocking to these conventional formats. Both are wildly successful, and board-game maker Fantasy Flight says WoW: The Board Game is its best seller. The company has already issued one expansion and is planning another. While this success proves that people just can't get enough of *World of Warcraft*, it's more than that.

Computer games struggled to be social. Card and board games are social by nature; they have a tactile, social quality that even the best MMORPGs can never capture, yet conventional gaming can never achieve the visceral, dynamic quality of the online experience. We now have three separate takes on *World of Warcraft*, and while all three share common elements, each is a completely different gaming experience, and each is rewarding in its own way.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

Wireless Power on the Way

Take out your tinfoil hats. MIT Assistant Professor Marin Soljacic's research into wireless energy transfer borrows a page from Nikola Tesla's playbook—minus the giant *Command and Conquer*–style tower.

While energy can already be transmitted through space, the waves dissipate as the distance between the two points increases. Soljacic's solution is fairly simple in its design: When an antenna emits electromagnetic waves by resonating at a particular frequency, any other antennas that resonate at a similar frequency will pick up the electricity.

The transfer range currently hovers around three-to-five meters, but if you're a cord-hater, that's all the space in the world.

Google Earth around the Globe

How the mapping app's satellite imagery can make a difference, or not

A Bahraini businessman is hoping Google Earth can bring about social change in his country. Via his popular blog, **http://mahmood.tv**, Mahmood Al-Yasif is exposing his fellow citizens to overhead views of Bahrain, which illustrate the royal family's vast land holdings—much of which were once public property—in relation to the cramped villages of the poor majority.

Indians in the Brazilian Amazon are using Google's mapping program to remotely monitor their ancestral lands, which have become prey to illegal gold miners.

Even U.S. President George Bush is known to use "the Google" in the course of governance: "I kinda like to look at the ranch. It reminds me of where I wanna be sometimes."

Satellite images of the Amazon can reveal areas of river-water discoloration—often a sign of nearby mining activity.

Making Friends and Influencing People—Online Edition

The 2007 Digital Future Report, part of the USC Annenberg School's ongoing study of Americans' online use, shows the Internet is having an increasing impact on social engagement.

Key findings include:

- **43 percent of Internet users who are members of online communities say they feel as strongly about their virtual community as they do about their real-world community.**
- **56.6 percent of members of online communities log in to their community at least once a day.**
- **70.4 percent of online community members say they sometimes or always interact with other members of their community while logged in.**
- **20.3 percent of online community members take actions offline at least once a year that are related to their online community.**
- **64.9 percent of community members say they are involved in causes that were new to them when they began participating on the Internet.**
- **40 percent of online community members say they participate more in social activism since they started participating in online communities.**
- **Internet users report having met an average of 4.65 friends online whom they have never met in person.**
- **Internet users report an average of 1.6 friends met in person whom they originally met online—more than double the number when the Digital Future Project began in 2000.**

FUNSIZENEWS

MIND YOUR MATTER

In December, Berkeley, CA became the first city to adopt an ordinance regulating work with nanomaterials. It's a risky move, as it could make Berkeley less attractive to the growing nanotechnology sector. But the city council felt it was more important to guard against the potential health hazards posed by the microscopic particles and fibers if inhaled or exposed to the skin. (Sim Bella Goth approved of the action, stating, "Cherrah frow shoolooma prash!")

OOH LA LINUX

The French parliament is saying au revoir to Windows. Beginning June 2007, the government institution's 1,154 workstations will be running Linux, the OpenOffice.org productivity suite, the *Firefox* web browser, and an open-source email client.

THE LARGE AND SMALL OF IT

Toshiba has announced plans to start mass producing 1.8-inch drives that hold 100GB of data, a significant leap over the 80GB maximum of today's portable drives. The tiny drives won't be sold directly to consumers but are sure to appear in the next generation of handheld music and media players, so don't buy that new iPod just yet.

THE BLAME GAME

German lawmakers are calling for a ban on all violent video games (as well as aggressive offline activities such as paintball and laser tag) after an 18-year-old open fired on students and teachers at his former secondary school. Many were injured in the attack, but only the shooter was killed, by a self-inflicted gunshot wound. His known fondness for violent computer games and simulated war games is what has officials calling for the crackdown.

GAMING PLATFORMS

Consoles vs. PC

Now that the dust from the "next-gen" console launches has settled, it's time to take a good, hard look at how these three new platforms compare with our gaming system of choice, the classic, but underappreciated, personal computer.

On one side, we have Sony's PlayStation 3, Nintendo's Wii, and Microsoft's Xbox 360. Each is unique, delivering a surfeit of graphical power, an unusual controller scheme, and a comprehensive online experience, respectively. On the other side, we've got a quad-core, dual-GeForce 8800 GTX ~~console-slaying~~ machine.

We don't usually compare four different products in Head2Head, so rather than discuss the individual merits of each console we're going to focus on the leading console in each category and then give an idea of how the others stack up.

BY WILL **SMITH**

round 1 HARDWARE PROWESS

We've heard a lot of hooey from Sony about the raw, unadulterated power of the PS3, but with the launch of the first DirectX 10–compliant videocards from Nvidia last year, the PS3 as well as the Xbox 360 are now officially based on last-generation technology—Nvidia's NV40 for the PS3 and ATI's R500 for the 360. Lacking support for a unified shader architecture and other DX10-style goodies, these next-gen consoles are closer to last year's Dream Machine than next year's. Your GeForce 8800–equipped machine will have more graphical power under the hood than your buddy's PS3.

On the CPU front, the winner is less clear. The 360 sports a 3.2GHz triple-core PowerPC processor paired with a high-speed cache, while the PS3 features a six-way PowerPC-derived Cell processor running at 3.2GHz. However, when you look at the big picture, the PC is destined to prevail.

WINNER: PC

round 2 VALUE

This is always an unpleasant round for PC gamers. Let's face it, even our "cheap" $1,500 gaming rig (see page 24) is pricey compared to the most expensive console. A PS3 loaded with overpriced accessories will barely hit $900.

Of course, there's more to your PC than just playing games. As one particularly surly editor constantly points out, if you take away someone's Xbox, he won't be able to play games. If you take away his PC, he won't be able to do anything online—that's one helluva sacrifice. Of course, you could buy a $600 Dell and a game console and still have cash to spare, but you won't be playing *Crysis* in its full glory.

WINNER: CONSOLES

round 3 CONTROLS

We love the mouse and keyboard; they are the perfect controllers for everything from first-person shooters to strategy games to role-playing games. But they're not right for everything. There are tons of game genres—racers, platformers, fighting games, and others—that play much better with a gamepad than a keyboard. Luckily for PC gamers, there are a large number of good gamepads for the PC.

While the mouse and keyboard are unique, two of the new console controllers are equally distinct. The motion-sensitive controllers on the PS3 and Wii deliver new gameplay experiences that are difficult (or impossible) to duplicate on the PC. The Wii's Remote + Nunchuk control scheme is comfortable for long gaming sessions and works surprisingly well, but in the end it still lacks the flexibility of the mouse, keyboard, and gamepad. **WINNER: PC**

round 4 MULTIPLAYER

We discussed this last year around the Xbox 360's launch, and we'll discuss it again now. There's simply no real analog to the Xbox Live service for the PC (or the other consoles, for that matter). Several applications try, but thanks to buggy interfaces and spotty support, they just don't work well.

Let's run down what Xbox Live has to offer: a game-independent friends list, pervasive voice chat, the ability to send messages and game invites to friends (even if they're playing other games), matchmaking, and a fairly robust banning/preferred-player mechanism. Live isn't perfect—there's still a strong chance you'll meet 14-year-olds exploring the George Carlin sections of the unabridged dictionary—and it costs money. However, we'll happily pay a few bucks a month for the features Live delivers. **WINNER: CONSOLES**

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round 5 SOFTWARE

The software round focuses on two areas: platform-exclusive titles and backward compatibility. Backward compatibility is new for both Microsoft and Nintendo in this generation (the PS2 can also play PS1 games), which we think is pretty funny. The PC has been backward compatible since its inception. With a few handy utilities, you can run 20-year-old games on a modern gaming PC, and if you have a source for legal ROM software, you can even emulate arcade machines and other older hardware.

As for platform exclusives, the high cost of game development is making them much less prevalent this go-round. Expect to see previously exclusive third-party titles on multiple platforms, including the PC this generation. We wouldn't be surprised if the generation's only major platform exclusives are developed by Sony, Nintendo, and Microsoft, with everything else showing up on all four platforms. **WINNER: PC**

And the Winner Is...

If all you want to do is play games on the cheap, buy a Nintendo DS. It's the least expensive option for hardware and games. If you want the absolute best possible gaming experience, however, not even the "next-gen" consoles can compare to the experience of playing on a high-end gaming PC. When you see the first DirectX 10 games, such as *Crysis* and *Hellgate: London,* later this year, their graphical splendor will literally make your jaw drop.

Don't get us wrong: We're not anti-console at *Maximum PC.* There's absolutely nothing wrong with console gaming; without consoles, you'd miss out on great games like *Guitar Hero, Katamari Damacy*, and *Dead Rising.* But there's not a single editor at *Maximum PC* who'd choose a console over a gaming PC. MPC

Sully, ***watchdog of the month***

Our consumer advocate investigates...

✓AVG Free No More? ✓Dell Notebook Drivers ✓Hewlett-Packard Expiring Ink

BORN FREE AND STILL FREE

Several readers wrote to the Dog to complain about everybody's favorite free anti-virus program no longer being free. The concerns arose when readers' copies of *AVG Anti-Virus Free 7.1* began producing pop-up windows that read, "Your *AVG Anti-Virus Free 7.1* will be discontinued on 15 January 2007!" The pop-ups feature a link to a page on Grisoft.com's website that provides information on buying the updated, Vista-ready 7.5 version of *AVG*. One reader even speculated that a Microsoft purchase of Grisoft was the reason the program was no longer free. (Microsoft, however, has not bought Grisoft.) Another reader said, "*AVG* is going like the rest. It builds up a huge base of people using its free program and when it has millions of users, it kills the free program and starts charging money or has a 30-day trial and then starts charging."

The truth is, *AVG Anti-Virus Free* continues to be offered for, well, free. A spokesperson for Grisoft confirmed that there is, indeed, a free 7.5 version that is Vista ready. The Dog understands the confusion. Since the dialog box is so obtuse, the Dog wonders if someone wasn't creating this confusion on purpose... *hmmm*. But hey, you have to give Grisoft a break because it is providing the program at no cost. Grisoft, of course, won't guarantee that *AVG* will always be free, but how can you complain about it now, when it is. To download the 7.5 version, visit www.free.grisoft.com.

A TALE OF TWO LANGS

Less than a year ago, I bought a Dell XPS Gen 2 notebook PC, which has been great for the most part. Shortly after I bought it, you used a similar one as ***Maximum PC****'s zero-point reference, and around that time I saw many great reviews that I agreed with wholeheartedly.*

However, I wish you would take a look at the situation today. For me, the main selling points of this computer were that it was for enthusiasts and there would be specialty support and regular driver updates. Unfortunately, when I contacted XPS Premium Support some months ago about Nvidia adding H.264 decoding support to the driver, I got nowhere. The 91.31 driver from Nvidia's site won't install, and the drivers on Dell's site have not been updated in quite some time. What's the holdup?

— Jeremy Lang

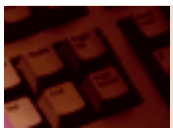
A poorly worded upgrade screen from Grisoft's popular *AVG Anti-Virus Free* program has confused many users.

The Dog pinged Dell for a response to Jeremy's problem and was told, "We have heard enthusiasts express interest in getting the latest graphics drivers and have developed a Rapid Driver Release Program for our current XPS gaming systems which incorporates both desktops and laptops. The Rapid Driver Release Program provides the latest graphics drivers to help ensure system compatibility and timely support for enthusiasts. Under the Rapid Driver Release Program, customers have the option to download three different versions of a graphics driver: a driver that has been fully tested and supported by Dell, a performance driver with limited compatibility and stability testing by Dell, or a reference driver, which is the latest driver available from the graphics card manufacturer, though it has not yet been tested by Dell."

In other words, Dell says it has since gotten more aggressive about its driver updates. The Dog must also note that the 91.31 drivers were not released for notebook graphics use, only for desktop GPUs. At this time, Nvidia's latest drivers for GeForce Go 7800 and GeForce Go 7900 parts are stuck at 84.63 and do not support PureVideo features. There is a way to get the PureVideo features and H.264 support without waiting for the drivers, though—visit www.laptopvideo2go.com. This site features unsanctioned mods of Nvidia's desktop drivers that can be installed on a laptop with a new GPU. If you choose to do this, however, the risks run the gamut from the drivers not working to their losing some mobilized functionality.

The issue isn't new, of course. Reader Daniel Lang (no relation to Jeremy) also ran into driver issues with his older Dell XPS Gen 1 notebook. Lang told the Dog that Dell has officially written off the notebook for driver support and that he also cannot run ATI's Catalyst Mobility reference drivers. Daniel asks, "If the mobile reference drivers from ATI can be installed in Alienware, Voodoo, and many other notebook PCs, why not Dell's?"

The Dog pinged ATI to find out why only certain vendors are allowed to use the drivers and was told that the mobile drivers are actually tested to work with individual notebooks' special features, so they install only on notebooks that are tested. A spokesperson said any company that uses ATI mobile parts may sign up but didn't comment on why Dell hadn't. The Dog suspects the answer is pretty basic: additional support costs. Consumers who download



Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic the Dog on them by writing **watchdog@maximumpc.com.** The Dog promises to answer as many letters as possible, but has only four paws to work with.

Hewlett-Packard is getting heat—and facing a lawsuit—for preventing some of its printers from using "expired" ink.

and install drivers from ATI won't call ATI for help, they'll call Dell. With each new driver rev, Dell would have to train all of its support people to handle issues related to the new drivers. On a new notebook, companies are willing to accept this cost, but on a three-year-old notebook? Dell isn't the only vendor guilty of this. Toshiba, Hewlett-Packard, Fujitsu, IBM, and many other first-tier notebook PC companies rarely bother to qualify drivers given to them by graphics vendors.

The real tragedy is that some of these vendors target their notebooks at gamers and enthusiasts who are used to regular driver updates and actually may need them to keep their games running. For a company to abandon these customers within two years is just pathetic.

There is a partial solution, however. Consumers with older ATI parts that are badly in need of driver updates can visit www.driverheaven.net. This site features a tool called the DH Mod Tool V4 that converts a desktop driver's INF file, so it can be installed on a notebook. The downside to the modded drivers is that they don't support the power-saving modes of a notebook or some special hot-key functionality. According to ATI, those functions are only part of the Mobility Catalyst drivers, and they cannot be hacked with a simple INF fix.

The Dog has a strong recommendation for PC makers who are targeting gamers and enthusiasts with expensive notebooks: Keep updating those drivers even after you can't squeeze more money out of the people who bought your products. It builds brand loyalty and increases the chances that a customer might actually come back to you the next time he buys a notebook. Woof.

WHAT'S NEXT, EXPIRING KEYBOARDS?

I've been meaning for months to write to you to ask what you think about the HP policy concerning expiring ink in its 7110 series of Officejet all-in-one printers. The machine warns me about 10 to 14 days before the ink's expiration date that it will no longer work if I do not replace the cartridge. The ink is good and in most cases half to two-thirds full. I've contacted HP about this and asked for an explanation, but they tell me I need to replace the ink or the printer won't work! Is this the definition of extortion? Any help in this matter will be appreciated.

— Kurtis

The Dog pinged HP to get its side and was told, "Certain HP ink cartridges utilize an expiration date; the expiration date is only used on inkjet products in which the print head and ink supply are separate (like the HP Officejet 7110), and this feature serves to protect the printing system and ensure ink quality, which degrades over time through air ingestion and water evaporation.

"Less than three percent of HP's inkjet printers utilize print heads with separate ink supplies. For these models, ink-cartridge expiration prevents, among other things, the degradation of printer components and print quality due to changes over time in ink properties, cartridge properties, and interactions between the ink and the cartridge.

"For many printing systems with ink expiration dates, the maximum cartridge lifetime is more than four years (54 months) and the in-printer life maximum is two and a half years, and in the other systems with ink-cartridge expiration the maximum lifetime is three years and in-printer life is 18 months, which exceeds the normal usage period for the vast majority of customers."

Sounds reasonable, but is it? Are you really going to keep a cartridge in your printer for 18 months? That's pretty unlikely, but what if you stocked up on ink and don't use some of the cartridges by their expiration dates? They're landfill. Although HP says it has your best interests in mind, others have suggested a different reason for the expiration dates: the refill guys. Print cartridges contain proprietary chips that let them work with a particular printer, and many ink-refill companies can obtain the chip only by buying used cartridges from office supply stores. Making these cartridges expire would effectively neuter how refill companies obtain their cartridges and drive consumers away from refilled products.

HP's expiration strategy could be just another sign of how hot the inkjet war has gotten. In 2005, Epson settled a lawsuit that claimed many of its printers stopped printing before the ink cartridges were actually empty. The same year, HP sued an ink-refilling company for not telling consumers they were purchasing used HP ink cartridges. HP also took two ink-refilling companies to court for violating its patents on ink. The suits were settled. MPC

BUILD THE WORLD'S BEST $1,500 PC!

SCREW THAT MICROSOFT VISTA–CAPABLE BADGE. WE SHOW YOU HOW TO BUILD A BUDGET BOX THAT GOES ABOVE AND BEYOND REDMOND'S REQUIREMENTS WITHOUT BREAKING THE BANK

Building a budget PC is similar to modern politics—it's nothing but compromise. You can't drop in a quad-core CPU and two GPUs to satisfy the power hungry without pissing off the penny-pinchers in the caucus. It's a game of horse-trading—megabytes and megahertz for dollars and cents—to achieve the ultimate PC while keeping the fiscal conservatives happy.

Still, party politics plays a factor, and *Maximum PC*'s Pure PC Power Party features a plank that dictates that performance matters, even in these leaner times.

To keep the hardcore party members in the tent, we decided that our lean machine absolutely had to—just had to—have DirectX 10 capability. That means a third of our budget went to the GPU—a trend sure to anger advocates of a "fair and balanced" platform.

Indeed, building a DX10 box for $1,500 is an amazing feat of budgeting prowess. Never built a machine before? Don't sweat it! Turn the page to see how you can configure and build your machine to take advantage of the next generation of games. Just follow our easy how-to guide and you'll be sitting pretty when *Crysis* and *Supreme Commander* ship.

BY GORDON MAH UNG

12 STEPS TO YOUR NEXT-GEN GAMING PC

Before starting, read over the steps to make sure you have all the necessary parts and understand the process

1 MOUNT THE PSU

Antec's TruePower Trio 650-watt PSU is affordable and certified to work with GeForce 8800 GTS cards, which means it's good for our configuration today and will even work should you drop in a second graphics card. Mounting the PSU in the Antec Nine Hundred case is the first thing you should do. Line up the four holes in the case with the holes in the PSU, then slide the PSU into the case and screw it down using the four coarse-thread screws provided. You can mount the PSU with its fan up or down in this case; we opted for a fan-up position to maximize airflow and cut down on wind noise.

2 INSTALL THE OPTICAL DRIVE

Guess what, man? You don't get Blu-ray or HD-DVD when your total system budget is $1,500. Instead, you get the Lite-On It Super AllWrite drive, which burns everything you could possibly want. To install this drive in the Nine Hundred, remove a front bezel, push the drive into the slot and fasten it down with two fine-threaded screws on each side. You'll have to remove both the port and starboard case doors to access the screw mounts. We recommend that you place the drive in the top-most bay if possible. This usually gets the drive up and away from the RAM slots, so you avoid any clearance issues.

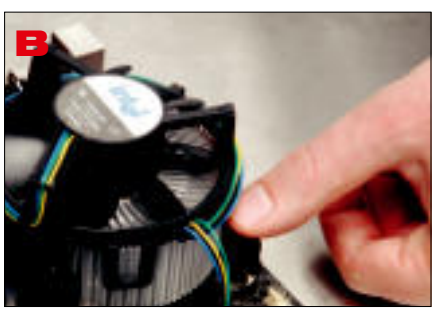
3 INSTALL THE CPU

When installing the CPU, use the strip-club rule: Don't touch a thing unless you are told to touch it, OK? Good. Land-grid-array sockets feature delicate pins that are protected by a plastic cover. To begin, pop off the cover and save it—some motherboard makers won't take returns or make repairs on a board without this cover (image A). Open the socket by unclipping the metal arm and flipping open the load plate (image B). To install the CPU, use your thumb and forefinger to grip the CPU on the sides with notches. Get the chip as close to the socket as possible and lower it in while keeping it parallel to the socket (image C). Do not lower one side before the other and do not slide the CPU around in the socket. Lower the load plate and lock the retention arm in place.

4 ADD CPU COOLING

If your heatsink came with a thermal pad or thermal paste preapplied to it, you won't need to apply additional thermal paste before mounting your heatsink. However, if you are reusing an older heatsink, you'll need to apply a small amount of paste to the CPU. This paste fills the gaps between the heatsink and CPU. Add too much or too little and you hurt the heat transfer. We recommend a BB-size bit of paste (image A). It should be just enough to cover the heat spreader and fill in the microscopic nooks and crannies.

Once you've pasted your core, you'll need to mount the cooler. Stock LGA775 heatsinks are the easiest to install. Make sure each latching mechanism is in its opened, counterclockwise position. Lower the heatsink into the four holes in the motherboard and push down on the top of the mounts until they lock into place with a snap (image B). You can do two at a time or snap them in one at a time using a cross-star pattern, similar to how you would mount a tire on your car.



5 INSTALL CHANNEL RAM

You'll need to install DDR2/800 RAM in pairs for best performance. On this particular board, install the RAM in the blue slots to enable dual-channel mode. If you're using a different board, read the manual to ensure you use the correct slots. Flip out the retention arms, then firmly push the RAM module into the slot with your fingers on the top corners until the arms lock into place (image A). The module features a key or notch in the center to prevent you from installing it backwards (image B). Once both modules are in place, you should move the arms for the empty slots to their closed positions, as though you have RAM installed. On some motherboards, arms left in the open position can actually hit the graphics card and damage it.

6 CAGE THE HARD DRIVE

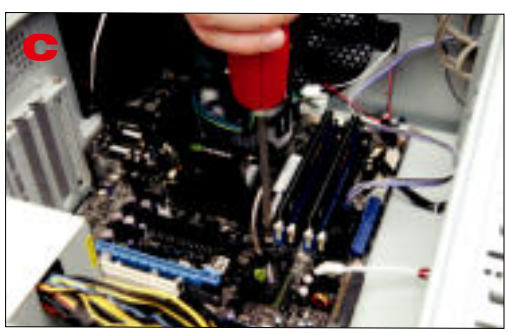
The basics of hard-drive installation haven't changed in more than a decade, but one thing has: Cases have gotten smaller. Today's midtower case would have been considered a compact in 1997. Combine a small tower with a long-board GPU and its requisite power cables and you can run into space issues. We chose to mount our hard drive as low as possible to keep it from bumping into the videocard.

The installation itself is simple enough; for the Nine Hundred, you should remove the hard drive cabinet by removing the four thumbscrews on either side of it. Put the drive in the cabinet and use four coarse screws to hold it in place. You can insert the drive cage back into the case now or wait until after the motherboard is in place.

7 MOUNT THE MOBO

Before you mount the board, you'll need to install the I/O shield into the case. This rectangular piece of metal prevents dust and stray electrical signals from entering or leaving the case and features punched-out holes for the mobo's USB, PS/2, and LAN ports. If your case has a generic shield, remove it by hammering at it with the back of a screwdriver, then carefully replace it with the shield that came with your mobo (image A).

You should now prepare the mounting points in the case for your board. You'll need a mounting point for each mounting hole in your motherboard. If you have to install brass mounts, make sure you torque them down enough, so they won't back out when you're trying to remove the screw, which could prevent you from removing your motherboard (image B). Count up the mounts and commit that number to memory. Now lower the board into place and screw it down (image C). (Make sure you use the same number of screws as you have mounts, or you'll risk shorting out the motherboard.) When screwing the board down, use a reasonable amount of torque, so the screws don't back out, but don't overtighten them or you'll damage your motherboard.

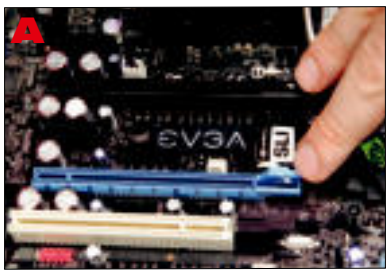


PARTS AND PRICE LIST

- **Videocard**
  BFG GeForce 8800 GTS
  $450, www.bfgtech.com
- **Motherboard**
  EVGA nForce 680i SLI
  $250, www.evga.com
- **CPU**
  Intel Core 2 Duo E6300
  $182, www.intel.com
- **Memory**
  1GB Corsair TwinX DDR2/800
  $150, www.corsair.com
- **Case**
  Antec Nine Hundred
  $140, www.antec.com
- **Power Supply**
  Antec TruePower Trio 650
  $125, www.antec.com
- **Operating System**
  Windows XP Professional OEM
  $99, www.microsoft.com
- **Hard Drive**
  250GB Maxtor DiamondMax 9
  $70, www.maxtor.com
- **Optical Drive**
  Lite-On It Super AllWrite SHM-165H6S
  $35, www.liteonit.com

Total: $1,501

8 DROP IN THE GPU



Graphics cards tend to be heavy and can slide out of their slots when a system is moved. To combat this, boards use retention clips to hold the cards in place. Unfortunately, many people forget about these safety clips and just start yanking on the videocard until either the card or motherboard breaks. Before you install your videocard, take a second to familiarize yourself with your board's retention mechanism (image A). When you need to use it, it will be hidden behind your videocard.

This particular motherboard features three full-length x16 PCI-E slots. You should insert your card into the slot closest to the CPU. If you add a second GPU, put it into the third slot. The blue slot is for a third graphics card, should GPU-based physics acceleration take off.

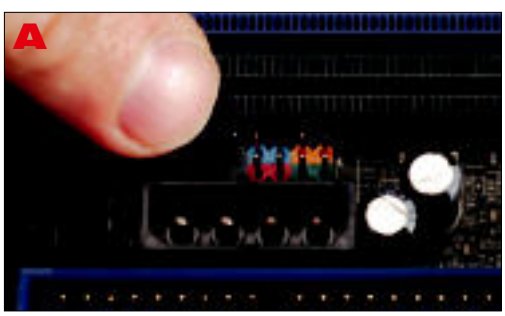
Installing the card is a snap. Simply align the PCI-E edge connector over the slot (image B) and then carefully insert the card until it is firmly seated in the slot. Use two coarse-thread screws to hold the card in place.

9 CONNECT YOUR DATA UMBILICAL CORD

Most new cases, including the Nine Hundred, feature an individual cable block rather than a loose jangle of wires to connect the USB ports on the front of the case to the headers on the motherboard (image A). These connectors are keyed, so you should be able to insert them only one way—just make sure you connect the USB to USB and FireWire to FireWire. Mixing these up will damage your peripherals. You should also use the included parallel ATA cable to hook the optical drive to the PATA port on the motherboard and run a SATA cable between the hard drive and the motherboard (image B). Generally, you should hook the SATA drive up to the ports closest to the south bridge chip, which is usually located near the top graphics card.

10 FINISH OFF THE FRONT PANEL

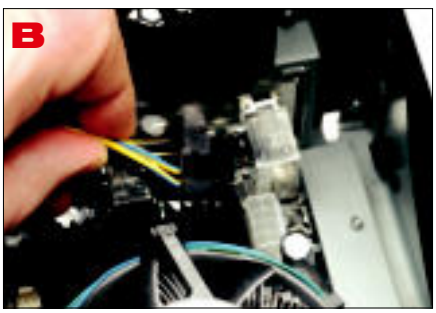
The case's power, reset, HD-activity light, and power-indicator LED all connect to the motherboard's front-panel headers (image A). It's safe to ignore the polarity on the power and reset switches; just plug them in. The orientation of the hard-drive-activity light and power LED does matter though (although the Nine Hundred does not have a power LED since the front fans light up when the system is on). Your manual will tell you which header is positive and which is negative. For the lights (image B), the negative wires are white. You can also just plug in the wires and figure it out later—there's no risk of damaging anything by reversing the polarity. No one in the recorded history of PC building has ever gotten the lights right the first time, so don't worry if you don't.



11 POWER HER UP

It's time to supply power to your components. First, make sure your power supply isn't plugged into the wall. If it is, unplug it and wait a minute for the power to dissipate. Find the six-pin PCI-E power cable and plug it into your videocard (image A). These newfangled power connectors supply up to 75 watts of power—high-output graphics cards won't work properly without the extra juice. If your power supply doesn't have a PCI-E power cable, we recommend that you get a new PSU instead of trying to use an adapter cable. Your PSU may not have the power output for new hardware.

Next, locate the eight-pin power cable (image B), which supplies power for just the CPU, and plug it into the motherboard. Like the PCI-E connector, it's keyed and should fit only one way, so there's no risk of putting it in backwards. Finally, you'll need to power up the motherboard by connecting the 24-pin main power connector (image C). If you haven't already plugged in your optical drive's four-pin Molex and the hard drive's power, you should do that as well. Remember, if the hard drive has an old four-pin Molex *and* a new SATA power connector, use only one, not both.

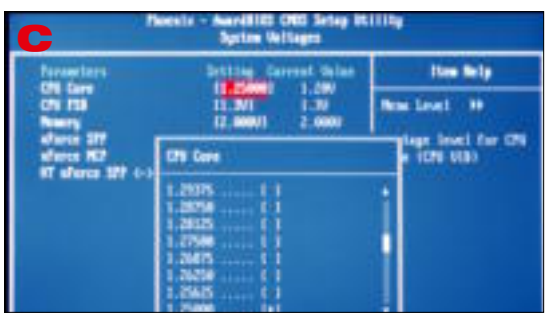


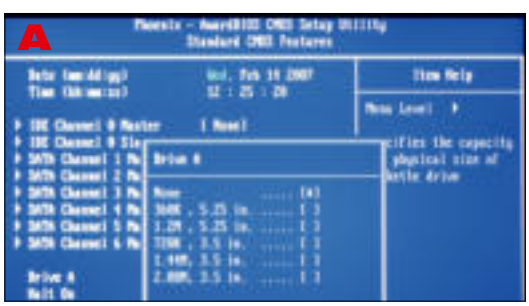
12 INSTALL THE OS

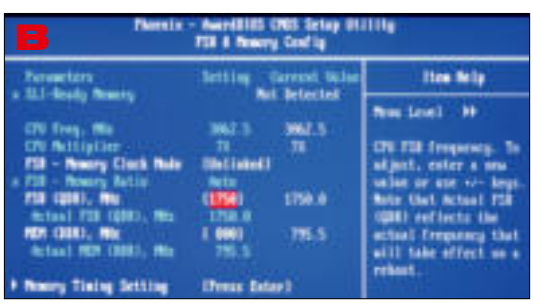
The BIOS on the EVGA 680i SLI board defaults to boot from the floppy drive, then the optical drive, and then the hard drive, so your BIOS tweaks will be minimal. One thing you may want to do is disable the floppy drive support if you didn't install a floppy (image A); otherwise, the board will show an error every time you boot.

Assuming everything went OK, your new rig should boot without a problem. Hook up your monitor, keyboard, and mouse and then hit the power button. When the machine is powering up, insert your OS disc and hit the space bar when you're asked if you want to boot from the optical drive. Install Windows XP, following the onscreen prompts. When you're up and running at the desktop, you'll want to first install your chipset drivers and other device drivers from the CD-ROM included with the motherboard before you install your graphics card drivers.

When you're finished, you should verify that the OS sees both cores by checking the Performance tab in the Windows Task Manager. You can also check clock speed by viewing System Properties. Stock clock speed should be 1.86GHz. We were able to overclock our CPU to 3.06GHz by simply cranking the front-side bus from its stock speed of 1,066MHz to 1,752MHz (image B). If we'd had the money for a better heatsink, we could have cranked the FSB up at least a few more notches. Our overclocking was aided by adding a tenth of a volt to the CPU (image C), RAM, and chipset, and we also set the RAM and front-side bus to unlinked mode, so we could keep the RAM at its stock speed of 800MHz. The overclocking utility included with the EVGA board lets you overclock from within Windows, but we opted for the old-school BIOS adjustments since we're, well, old school.







What $1,500 Looks Like!

A dual-core machine that will be able to run DirectX 10 and has a hell of a lot of upgrade possibilities

Got Quad?

We don't have a quad-core CPU—that would have broken the bank—but we're ready to drop one in when it's more affordable. For now, our Core 2 Duo overclocked to 3.06GHz serves us just fine, thank you.

Ready for SLI

We couldn't stomach spending $200 to $300 on a videocard that we knew wouldn't run DX10 content, so we paid big bucks for a single GeForce 8800 GTS card. Even better, our nForce 680i mobo accommodates a second GeForce 8800 GTS card, so we can run SLI down the road.

No Sound for Me Argentina

One of the most painful sacrifices we made to get a DX10-ready box was to forego a soundcard. Even worse, we're left with crappy Realtek onboard audio. In the end, DX10 capabilities took priority.

Nine Hundred Fans

You can't see the fans from this angle, but the Antec Nine Hundred is all fan. With a 20cm (!!!) fan on top and three 12cm fans, this case won't have temp issues in the summer.

Our First Upgrades

We made some compromises to get next-gen graphics today. Our first round of scheduled upgrades to this rig will probably include a second gig of memory, a soundcard, and Vista (if the DirectX 10 games have arrived).

BENCHMARK IT

We compared our $1,500 PC to Overdrive's $2,500 PC (the winner of our showdown in December), as well as our *MPC* standard zero-point system, which would have cost about $3,200 last spring when it was assembled. The result? Not bad when you consider the relative prices involved. Our OC'd Core 2 slams our zero-point Athlon 64 FX-60 to the pavement in the application tests but loses to the Overdrive PC, which features more L2 cache and RAM and a CPU overclocked to 3.46GHz. In gaming, the single GeForce 8800 GTS can't beat the outdated GPUs in our zero-point, nor can it touch the overclocked GeForce 7950 GX2 in the Overdrive PC. However, our leaner machine does take the top spot for visual quality—the GeForce 8800 series can't be beat. When you factor in the ability to run DirectX 10 games, we're pretty happy with the result, and we can pocket a cool grand in savings. MPC

	LEAN MACHINE 07	ZERO POINT SYSTEM	$2,500 OVERDRIVE PC
CPU	3.06GHz Core 2 Duo E6300	2.6GHz Athlon 64 FX-60	3.46GHz Core 2 Duo E6600
GPU	GeForce 8800 GTS	GeForce 7900 GTX in SLI	GeForce 7950 GX2
Hard drive	250GB Maxtor 7,200rpm	400GB Western Digital 7,200rpm	250GB Seagate 7,200rpm
RAM	1GB DDR2/800	2GB DDR400	2GB DDR2/800
Premiere Pro 2.0 HDV (sec)	1,923	3,000	**1,564**
Photoshop CS2 (sec)	220	295	**202**
Nero Recode 2.0 AVC test (sec)	1,984	2,648	**1,669**
FEAR 1.07 (fps)	65	80	**83**
Quake 4 (fps)	89	110.5	**133.7**
3DMark06 Deep Freeze (fps)	33	**39.7**	37.7

Best scores are bolded.

10 REASONS

YOU DON'T NEED VISTA TODAY

You're sick of Windows XP. We are too, but Vista isn't a panacea for your PC problems. We have some compelling arguments for waiting a few months before you upgrade

BY WILL SMITH

Brace yourself. The largest Microsoft marketing campaign ever is gearing up to try to convince you the time is right to switch to Vista. But for most people, there's no reason to rush out on January 30 to buy the fledgling operating system. Even though Vista is ready for people with relatively simple machine configurations, the more components your rig has, the more likely you are to encounter trouble.

Vista isn't perfect right now, but it will improve with time. Hardware and software vendors will introduce better drivers and compatibility patches. New applications will be written with Vista in mind. After several months, you'll be able to get new versions of crucial software, such as antivirus apps, as well as updates to your current products. In fact, you'd probably be better served by doubling up your upgrade and moving to new hardware and the new OS at the same time. Still not convinced you should wait? Read on.

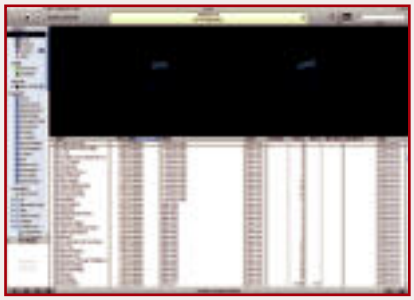
1 VISTA REQUIRES A FAIRLY POWERFUL MACHINE

This probably won't be a problem for most *Maximum PC* readers, but many folks who don't play games will find their machines challenged by Vista's system requirements. That Dell laptop Aunt Edna bought for $500 last year is going to struggle with this OS. While a simple RAM upgrade will probably get the machine running, it almost certainly won't be sufficient to enable Vista's bells and whistles.

For once, Microsoft's published minimum requirements for a new OS are reasonably accurate. The recommended system has a 1GHz or faster CPU with 1GB of RAM and a 128MB Pixel Shader 2.0–compliant graphics card, which is a fairly realistic minimum spec to get a decent experience with Vista. At *Maximum PC*, we aren't going to bother installing Vista on anything slower than 2GHz; we'd rather have a fast XP install than a slow Vista machine. In short, if your machine isn't up to snuff, take the next couple months to get it there before installing the new OS.

2 APPLICATION INCOMPATIBILITIES

Even as we speak, there are literally dozens of applications that don't work properly with Vista. And we're not talking about garage-developed apps but high-profile programs such as *iTunes*, disc-burning apps, and pretty much anything that has to do with DVD ripping or viewing. And virtually any Java-based app that bundles the Java runtime automatically kicks the desktop back to Vista's Basic mode, obviating the performance benefits you get from running Aero.



3 VISTA IS CRAZY EXPENSIVE

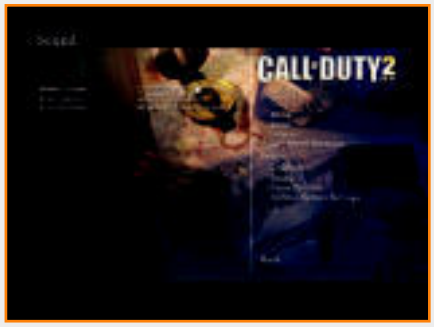
Vista is the most expensive consumer operating system we've ever seen. Let's take a look at the pricing. Home Basic, which doesn't include the fancy Aero Glass interface, costs a whopping $200 for a full version. Home Premium costs $40 more, and Ultimate costs an astounding $400. Why spend that much today on a less-polished product when you can wait a few months and have a much better experience for the same money?

The good news is that Ultimate has a bunch of features that the majority of power users won't need; the Premium version should include everything most people will require for home use—at least if you don't run Group Policies on your home domain.

Naturally, in Home Basic and Home Premium there are plenty of ads for Windows Anytime Upgrade, which will let you upgrade your "inferior" version of Windows to the obscenely overpriced (and unnecessary) Ultimate version.

4 NO HARDWARE AUDIO

During development, Microsoft removed a couple crucial gaming-audio-related features from Vista, including DirectSound 3D (hundreds of games use DS3D to deliver positional 5.1 audio) and support for hardware-accelerated 3D sound. This isn't a problem for new games going forward, as most developers have embraced the alternative OpenAL technology, which will continue to work in Vista. It is, however, a problem for legacy DS3D games, such as *Call of Duty 2* and *Max Payne*. When you run a DirectSound 3D game on Vista, it won't give you the option to enable 3D sound or features that require hardware acceleration, such as EAX.



Unfortunately, there's no easy solution. Creative will release its *Alchemy* application, a workaround to a problem that shouldn't exist in the first place. *Alchemy* is basically a wrapper program—it intercepts DirectSound 3D functions and converts them to OpenAL functions using a custom DLL. *Alchemy* works OK, but we'd much rather have a less-kludgy solution from Microsoft. Hopefully, they'll hear our cries and include hardware support with Vista's first service pack.

5 VISTA DOESN'T WORK WITH A LOT OF BLEEDING-EDGE HARDWARE

The BIOS on the laptop you bought in March doesn't work with Vista. Nor does your high-end USB microphone. And you can kiss that joystick-port-based Thrustmaster flight stick goodbye, too. With any new operating system, it's safe to assume there are going to be some compatibility problems. However, we experienced more issues with our hardware just plain not working during the Vista run-up than we did with any Microsoft OS since Windows 2000.

The lesson here? Make sure your hardware is actually compatible with Vista before you purchase it. You can check by using the Vista Upgrade Advisor (**http://tinyurl.com/o5bq4**).

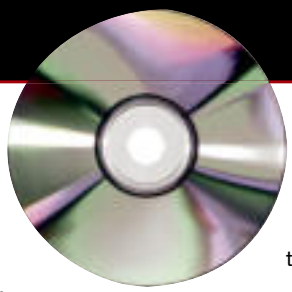
6 VISTA DOESN'T WORK WELL WITH SOME GAMES

We've already talked about the excision of 3D sound from the operating system, but there's a larger problem. It turns out that many online games that use PunkBuster to limit cheating require Administrator access in order to work properly. The problem is that neither the game, PunkBuster, nor Vista actually tells you that. You just get kicked from the server every time you try to join a game. The solution is relatively simple: All you have to do is set the offending game to always run as an Administrator in its Properties window, but the entire process needs to be more user-friendly. Please get to work on this, Microsoft.

10 REASONS YOU DON'T NEED VISTA

7 VISTA INCLUDES CONSUMER-UNFRIENDLY DRM

On the DRM front, we're pretty much convinced that Microsoft hasn't actually integrated anything more insidious than *Windows Media Player 11* into Vista, at least not for current standard-definition content. (Blu-ray and HD-DVD content are protected in a similar manner as on XP and will require a full HDCP path for high-def playback.) But the fundamental underpinnings to completely lock down the video-rendering pipeline to prevent ripping of next-gen content are present in the OS.



That's not the least of it. Because of content-protection concerns, Vista won't support CableCard for the vast majority of users. CableCard, in theory, allows users to access high-def content from their cable or satellite providers, without being tied to the device supplied by the TV provider. The thought was that CableCard would let you view HDTV on your PC without resorting to an over-the-air signal. Unfortunately, for CableCard's protected video path to work, your machine must be certified, and only large OEM manufacturers like Dell and HP will be eligible for certification. Pretty awesome, right?

The fundamental problem is that for certain key low-level operations, such as video rendering, Vista has been designed to give third parties—the content providers—veto rights over crucial aspects of your system. Do you trust a company like Sony, which infected millions of PCs with a malicious rootkit, with low-level access to your rig?

8 POOR DRIVER SUPPORT

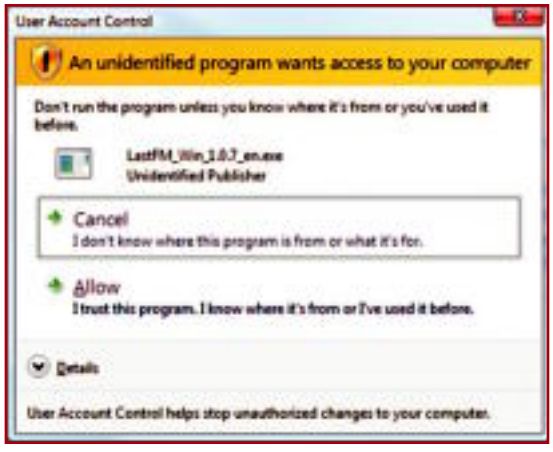
The big vendors like ATI and Nvidia should have drivers ready for Vista's launch (although there weren't any GeForce 8800 drivers at the corporate launch on November 30), but expect really big problems to arise with all that other hardware attached to your system. It's going to be tough to find drivers for older hardware, and we've even encountered problems getting drivers for brand-new gear. Sure, your mouse and keyboard will work, but will you have access to the cool sensitivity-changing and macro software that works with it? Even if your hardware is supported, are the drivers fully baked?

If the Vista launch follows the timeline of past Windows launches, drivers will be scarce for the first few months while vendors slowly certify their products to run on the new OS.

9 VISTA IS KIND OF ANNOYING

User Account Control is part of Microsoft's fix to prevent malware applications from taking advantage of Administrator privileges on infected PCs to install more malware. Every time an installer runs on your Vista PC, a prompt will ask for your permission to install the software in question. That's a great idea, but we think the implementation is pretty poor.

The problem is the frequency of prompts. They come up so often that people will quickly learn to auto-click them, thus risking malware infections. Even worse, instead of forcing you to take any action that would require thought, the prompts don't even ask you to reenter your password (by default); all you have to do is click a button and the app will install itself. UAC is the PC equivalent of taking your shoes off in the airport security line. It makes you feel as though something's being done to protect you, but ultimately it doesn't do much to improve security. This isn't likely to change, but it should.



10 YOU CAN WAIT

You should be asking yourself if you need Vista today. The only people who should answer yes are the folks who already have a DirectX 10 videocard and are anxiously awaiting their *Crysis* preorders. For everyone else, it certainly won't hurt to wait for the bugs to be worked out, the drivers to be released, and your machine to be in optimum condition to handle the new OS. Indeed, it can only help. MPC

Quad FX Files

AMD goes on the offensive with its new ultra-enthusiast quad-core platform and promises eight cores by fall 2007

BY GORDON MAH UNG

Of all the things you can accuse AMD of being, timid isn't one of them. With its dual-core CPUs wheezing for air behind Intel's Core 2 Duo and its competitor to Intel's quad-core chip still on the drawing board, AMD is going for broke with a unique dual-processor platform for consumers.

Dubbed Quad FX, the platform pairs the newly minted Athlon 64 FX-70 series CPUs with a designed-for-consumers dual-socket motherboard. The maneuver is audacious and represents AMD's Hail Mary attempt to retain the ultra-high end of PC computing. No CPU company has ever pushed dual-processor systems on consumers, even the ultra-enthusiast types who AMD says it's targeting.

By going the dual-processor route, the company takes a massive shortcut—getting four Athlon 64 cores into a PC much sooner than it would have otherwise. And maybe, just maybe, the same machine will be able to run two quad-core chips—or perhaps, something even crazier—this summer. AMD's trying to get its user base fired up about Athlon CPUs once again.

What We Know About Quad FX

Q What's the difference between Quad FX and Intel's quad-core Core 2 Extreme QX6700?

A The main difference is in the way each company packages its four execution cores. Intel essentially packs a pair of dual-core CPUs into a single CPU package. AMD's dual-core CPUs are larger, so two won't fit in a single CPU package. Instead, AMD takes two dual-core processors and puts them on the same motherboard. In other words, Intel's quad core describes the CPU, while AMD's quad core describes the PC.

In the end, however, the results are similar. Pull up the Task Manager in Windows XP or Vista and you'll see four green graphs—one for each execution core. Your applications have access to four discrete CPUs.

Quad FX refers to the entire platform of motherboard and CPU; the processors themselves are called Athlon 64 FX-70, FX-72, and FX-74, which clock in at 2.6GHz, 2.8GHz, and 3GHz, respectively. Each dual-core processor features 1MB of L2 cache per core and is almost identical to its Socket AM2 sibling.

Q Isn't calling Quad FX "quad" a misrepresentation?

A If you define quad as a four-core CPU, then yeah, AMD's moniker is misleading. If you define quad as four cores in a PC, AMD is technically accurate, although we'll say that this is probably the loosest way ever to define a quad-core machine. To CPU-architecture snobs who think Intel's trick of joining two dual-core CPUs together is just a hack, the Quad FX platform rates as an even greater affront.

Q Why doesn't AMD just introduce its quad-core single-socket processors sooner?

A While Intel took the shortcut to quad cores by mounting two 65nm dual cores on a single CPU package, AMD is handcuffed by its current 90nm process. AMD simply can't create a multichip module like Intel's because the sheer physical size and the thermal and electrical constraints of its 90nm-based dual-core CPUs make it impossible. AMD is stuck until it gets its own 65nm process off the ground. Adding to the dilemma is the fact that AMD has significantly fewer engineering and assembly resources than Intel. While Intel boasts 15 fab lines, AMD owns just two and contracts out for its third.

Q What are the advantages of dual-processor motherboards?

A Dual-processor mobos are firmly in the realm of the workstation class, and generally, they're built to the higher specifications and standards of mission-critical work. In the Quad FX platform, AMD has a couple advantages over the single-socket Intel boxes. Because there's a memory controller embedded in each Athlon 64 proc, a Quad FX box with two CPUs gets two memory controllers, which can offer a performance boost in certain memory-intensive situations. A dual-processor rig will also offer an upgrade advantage you won't get with a single-CPU box. Come this summer or fall, for example, you should be able to upgrade your machine to two quad-core CPUs and have yourself a nice octo-core rig. If you want eight cores in a PC with a single CPU socket, you'll have to wait until at least 2008. Even then, it's quite possible the octo core won't work in your single-proc board—chipset architectures will likely change between now and then.

Q What are the disadvantages of Quad FX?

A The main disadvantage is price, since you will have to purchase both a more-expensive motherboard and two CPUs. There are also greater power requirements for two CPUs, which in turn leads to additional heat that must be addressed.

For example, the quad Core 2 Extreme QX6700 has a 130-watt thermal design profile (TDP). Each Athlon 64 FX-74 has a TDP of 125 watts, for a total of 250 watts. Even though Intel and AMD define TDP differently, the Quad FX platform will be hotter and use more power than a single-processor rig. And while you might get away with a cheapo power supply for a single-processor PC, using anything less than a high-quality, high-output PSU on the Quad FX platform is asking for trouble.

Oh, and don't forget to kiss your mid-tower case goodbye. To accommodate a dual-CPU rig's larger mobo and hefty PSU, and the greater thermal loads of two procs, you'll need a big, fat full-tower case.

Let's not forget the memory either. To get the best memory performance from a Quad FX machine, you'll have to populate two channels per CPU, which means you'll have to fill four DIMM slots instead of the two you'd fill for a single-processor machine.

Q How different are the Quad FX Athlon 64 FX CPUs than the Socket AM2 versions? Can you use Opteron CPUs with a Quad FX platform?

A The Quad FX and AM2 CPUs are almost identical beneath their heat spreaders, but the physical CPU packages are totally different. The Athlon 64 FX-62 fits into a single-processor Socket AM2 board using a traditional pin-grid array package. The new Athlon 64 FX-70, FX-72, and FX-74 use Socket 1207, which the Opteron also uses. Socket 1207 is a land-grid array that does away with the pins in the CPU, à la Intel's Socket 775. Like the 775, the 1207's pins are embedded in the motherboard and dig into the grid on the bottom of the CPU for better and more reliable contact.

The Quad FX and AM2 cores themselves are almost identical. Both are 90nm and boast 64-bit support, NX protection, and hardware-virtualization support. The only real difference between the two cores is in their HyperTransport implementation. All desktop Athlon 64s, even the original FX-51 that was based on the Opteron, sport only one HyperTransport link. On the Athlon 64 FX-70 series, however, two HyperTransport links are active. One connects the CPU and chipset and the second connects the CPUs with each other. The second HT link likely accounts for the slightly larger die area of the 70 series over the 60 series.

Unfortunately, you cannot use Opteron CPUs in a Quad FX motherboard, nor can you run Athlon 64 FX-70 series CPUs in an Opteron board.

Q Does this mean the FX will no longer be supported for Socket AM2 boards? Is AM2 going to die?

A AMD insists the Quad FX is only for uber-enthusiasts and that it will continue to fully support the AM2 platform. The company never discusses its future products, but it did say that you will absolutely be able to buy a quad-core processor for Socket AM2 this year. The company won't say, however, whether FX-labeled CPUs

PHOTOGRAPHY BY SAMANTHA BERG AND MARK MADEO

will continue to be offered on the AM2 platform. If Quad FX is a success, Athlon 64 FX could become strictly a dual-processor part. We can certainly imagine a dual-processor quad-core Athlon 64 FX-99 and a single-processor quad-core Athlon 64 X4 coexisting.

Q You said Opteron won't work with Quad FX motherboards; what happens to my future CPU upgrades if Quad FX craters?

A One major way that an Athlon 64 FX-70 series CPU differs from an Opteron is in its ability to use nonregistered RAM. Registered RAM features a controller chip that ensures the reliability of the memory's contents. This is crucial in servers and workstations, especially when 16GB or more of memory is common.

Of course, a desktop machine, with just 2GB or 4GB of RAM, doesn't need registered memory. By doing away with registered RAM, AMD picks up from 5 to 10 percent in memory performance and lowers the cost of system RAM. But that difference renders the Athlon 64 FX-70 series incompatible with Opteron motherboards and Opteron CPUs incompatible with Quad FX motherboards.

Which bring us to our biggest concern about Quad FX. If the platform doesn't do well, will AMD have the wherewithal to support it long enough to keep enthusiasts happy, or will it be orphaned and the entire project written off? AMD officials assure us you will be able to get quad core for Quad FX mobos this summer or fall, so it's a safe bet you'll get that far. We do have to point out, however, that AMD also pledged that it would fully support enthusiasts who embraced the original Socket 940 Athlon 64 FX-51 CPU. That pledge lasted through one more CPU, the FX-53, and then Socket 939 was introduced and Socket 940 was abandoned.

Q What is the pricing for Quad FX CPUs?

A AMD originally set the pricing for a pair of Athlon 64 FX-74s at $1,200, the FX-72s at $900, and the FX-70s at $600, but at the last minute, the company had a change of heart. Pricing for the top-end 3GHz FX-74s was cut to $1,000—the same wholesale price as Intel's quad-core Core 2 Extreme QX6700. AMD also whacked a hundred bucks off the price of two 2.8GHz FX-72s but left the 2.6GHz FX-70s at $600 per pair.

By the Numbers: A CPU Comparison

	ATHLON 64 FX-70	ATHLON 64 FX-72	ATHLON 64 FX-74	ATHLON 64 FX-62	INTEL CORE 2 QX6700
CLOCK SPEED	2.6GHz	2.8GHz	3GHz	2.8GHz	2.66GHz
L1/ L2 CACHE	128KB/ 2MB	128KB/ 2MB	128KB/ 2MB	128KB/ 2MB	64KB/ 8MB
EXECUTION CORES	2	2	2	2	4
PROCESS TECHNOLOGY	90nm	90nm	90nm	90nm	65nm
TRANSISTORS	227 million	227 million	227 million	227 million	582 million
DIE SIZE	235mm²	235mm²	235mm²	230mm²	286mm²
PRICE PER 1,000	$600 (per pair)	$800 (per pair)	$1,000 (per pair)	$713	$1,000
INTERFACE	Socket 1207	Socket 1207	Socket 1207	Socket AM2	LGA775
THERMAL FOOTPRINT	125 watts (per CPU)	125 watts (per CPU)	125 watts (per CPU)	125 watts (per CPU)	130 watts (per CPU)

Q Can I buy one Quad FX CPU now and get the other later?

A We know you're already working the angles on this one: If a single 2.8GHz AM2 FX-62 costs $700 and a *pair* of 2.8GHz Athlon 64 FX-72s costs $800, who wouldn't be tempted to buy just one of the latter for around $400, right? AMD hasn't said yet whether the FX-70 series CPUs will be sold individually, but we suspect the company won't offer the chips that way because it would eat into sales of its single-processor chips. Of course, that won't stop you from teaming up with a buddy and buying a set of Quad FX procs and two motherboards. The only way AMD could prevent this activity is if it mandates that motherboard vendors program the BIOS to work only with two procs. As we see it, most people who buy into the Quad FX platform will want two procs anyway.

Q Are there many applications and games that can actually take advantage of Quad FX?

A Unfortunately, no. In general, the majority of games and apps are optimized for one core, and even the multithreaded consumer applications and games that are currently available are optimized for just two execution cores. It's rare to find a consumer application that can take advantage of a quad-core machine, but that's all changing as more quad-core PCs become available. Upcoming A-list games such as *Alan Wake* and *Crysis* will utilize up to four cores, and Valve is promising that Episode 2 of *Half-Life 2* will fully utilize multicore configs. And even now, many workstation apps, such as 3D rendering and some photo-processing programs, support four or more cores. We recommend that you get on the multicore train.

Q Does Quad FX support AMD's Torrenza technology?

A Yep. In fact, this is one of the most exciting aspects of the Quad FX platform. AMD's Torrenza technology originally allowed third-party vendors to develop special coprocessors and plug them into the empty sockets of multisocket Opteron boards. Because Quad FX is based on Opteron, Torrenza technology will be supported. Theoretically, if the AMD/ATI merger goes smoothly, you could build a machine with a single quad-core CPU in one socket and a superspiffy GPU in the other. This would offer lower latency and greater bandwidth than a PCI-E 1.0 graphics card.

Q What's Intel's response to Quad FX?

A Intel has two responses to the Quad FX platform. The first is a big yawn. The company says that eight-core machines are already available to consumers and have been for months, via Intel's own quad-core Xeon 5300 CPUs, which operate in a dual-socket environment, albeit at workstation pricing.

The second response is more realistic. Intel plans to have a 45nm CPU on deck by the time AMD's 65nm quad cores are released. In fact, the new chip's design was finalized in November and has already been sent to Intel's new 45nm fab in Oregon for trial runs. Code-named Penryn, the 45nm CPU is no mere die shrink. Intel says it is building in further microarchitecture enhancements and a full complement of new instruction sets called SSE4 that should speed up media chores as well as high-performance computing tasks. When you factor into that Penryn's expected peppy clock speed (thanks to the die shrink) and chunkier cache sizes, the CPU battle this summer should be epic.

Benchmarking the Quad FX

Both Intel and AMD scoff at the use of single-threaded applications to test quad solutions, but in doing so, they're ignoring the obvious: The majority of today's games and consumer apps are single-threaded. To disregard a machine's performance with existing software is shortsighted at best. To give you an idea of how the quads stack up, we ran both single- and multithreaded tasks. Some of the benchmarks are able to exercise the quad cores properly: Valve's particle test and map-compiling benchmark, for example, work all four cores, as do the workstation apps Newtek's *Lightwave 9* and Maxon's *Cinebench*. Bibble Labs' *Bibble Pro* running simultaneously with PictureCode's *Noise Ninja* also works over all four cores pretty well. Others, such as *Premiere Pro 2.0, Quake 4,* and *Nero Recode 2.0,* are optimized for dual cores but don't really stress all four CPUs. As a final test, we also tossed in some "mega-tasking"—a term AMD coined for the Quad FX—in which we ran two multithreaded applications simultaneously.

THE FINAL ANALYSIS

Fire up the Quad FX and your heart warms with the sound of all that hardware spooling up. If you're of the belief that noise equals power, then the sound of the Quad FX rig's two CPU fans and two chipset heatsink fans certainly connotes muscle—that is, until you see the benchmark numbers. While the pair of dual-core 3GHz Athlon 64 FX-74s are indeed fast, the single 2.66GHz Core 2 Extreme QX6700 eats their lunch in the majority of our tests. From single-threaded games and applications to multithreaded programs to even mega-tasking, Intel's QX6700 pulled out ahead, and generally by a sizeable 10- to 33-percent margin.

At face value, that amounts to a defeat for AMD, especially when you consider the physical aspects: Two Athlon 64 FX-74s are slower than *one* Intel Core 2 Extreme QX6700? That's just not a good message to send.

Still, we have to admit as power users that AMD is on to something. Just as we're drawn to the concept of two videocards or two hard drives, two CPUs has sex appeal to us. Of course, if we had our druthers, we'd run two Core 2 QX6700 CPUs, not two Athlon 64 FX-74s.

What the Quad FX is really about, though, is faith. Faith that AMD will have a competitive quad-core CPU next summer. Faith that AMD can somehow integrate an ATI graphics chip into the platform. And faith that, well, AMD has the attention span to continue the platform even if it's not a huge success. You have to ask yourself whether you'd rather have faith or a faster system right now. MPC

Benchmarks

	3GHZ AMD ATHLON 64 FX-74 (PAIR)	2.66GHZ INTEL CORE 2 EXTREME QX6700	PERCENT DIFFERENCE
SYNTHETIC GAMING			
3DMARK06 OVERALL	10,293	**11,268**	-8.7%
3DMARK06 CPU	3,678	**3,895**	-5.6%
3DMARK05 CPU	8,390	**8,964**	-6.4%
VALVE PARTICLE TEST	73	**83**	-12.1%
GAMING			
FEAR AT LOW RESOLUTION (FPS)	180	**198**	-9.1%
QUAKE 4 (FPS)	153	**176.3**	-13.2%
COMPANY OF HEROES AT LOW RESOLUTION (FPS)	82	**83**	-1.2%
WORKSTATION			
SCIENCEMARK 2.0	**1,507**	1,496	0.7%
PREMIERE PRO 2.0 HDV (SEC)	1,935	**1,454**	-24.9%
NOISE NINJA (SEC)	**1,783**	1,831	2.7%
NEWTEK LIGHTWAVE 9.0 (SEC)	28.6	**26**	-9.1%
CINEBENCH 9.5 (SEC)	**1,361**	1,412	3.8%
VALVE MAP COMPILE TEST (SEC)	182	**160**	-12.1%
BIBBLE & NOISE NINJA (SEC)	2,283	**1,830**	-19.9%
ENCODING			
NERO AVC ENCODE (SEC)	**1,837**	1,896	3.2%
MULTITASKING			
QUAKE 4 W/VALVE MAP BUILD (FPS)	121	**145**	-16.6%
VALVE MAP BUILD W/QUAKE 4 (SEC)	228	**191**	-16.2%
PREMIERE PRO W/NOISE NINJA (SEC)	2,979	**2,845**	-4.5%
NOISE NINJA W/PREMIERE PRO (SEC)	2,165	**1,974**	-8.8%

Best scores are bolded. Both systems were outfitted with two GeForce 7900 GTX cards running in SLI, 2GB of Corsair DDR2/800, a Western Digital 400GB 7,200rpm hard drive, and Windows XP Pro with Service Pack 2 installed.

BATTLE OF THE BROWS

We pit brand-new versions of *Firefox* and *Internet Explorer* against each other in a head-to-head deathmatch to determine which is right for YOU!

BY PAUL LILLY

ERS

Some of the greatest fights are never televised on pay-per-view. Veteran enthusiasts still talk about the knockout punch that abruptly ended 3dfx's career, and who can forget a younger, leaner Sound Blaster thumping AdLib to take the audio crown? But lest we get caught reminiscing, we're now witnessing a fight more than 10 years in the making! That's right, we're talking about the browser battle between Mozilla's *Firefox* and Microsoft's *Internet Explorer*.

This isn't the first time *IE* has been in a high-profile scuffle. *Netscape* proved to be a formidable opponent in the early 1990s, and while neither contestant gnawed anyone's ear off, many accused Microsoft of hitting below the belt when the company integrated *IE* with Windows. Knocked to the canvas, *Netscape* offered one final haymaker by releasing its source code to the public, which eventually gave birth to the *Firefox* browser.

Combining improved security, open-source support, and tabbed browsing, *Firefox* has firmly established itself as a legitimate threat to *IE*'s crown. With the release of version 2.0 and an ever-growing user base, Mozilla would like nothing more than to solidify the *Fox* as the people's browser and reap the advertising rewards. But you can't count Microsoft out. Finally responding to the challenge, Microsoft has thrown a much-improved *IE7* into the ring. So pull up a chair ringside as we determine which browser will take home the title!

Mozilla Firefox

With unlimited support from the open-source community, *Firefox* offers almost endless customization options that make it the 'do anything' browser

The advent of tabbed browsing changed the way we surf the web, and *Firefox* helped blaze the trail. *Firefox 2* adds close buttons to each tab, as well as tab-bar scrolling.

Search engines pay big bucks for search queries originating from a browser, and while Google remains the default in *Firefox*, many other engines are available.

If it ain't broke, don't fix it. *Firefox 2* retains the original's navigation toolbar placement, with only minor cosmetic touch-ups for the icons.

Part of *Firefox*'s appeal originates from its extensive menu of add-ons, which allows users to customize the browser's form and function. There are literally thousands of extensions offering just about any feature you could possibly need!

Initially developed by Netscape and now overseen by the Mozilla project, *Firefox* utilizes the Gecko rendering engine, which boasts widespread compliance among the various Internet standards, although it does have some difficulty rendering pages designed specifically for *IE*.

Internet Explorer 7

It's been ages since Microsoft released a major update to *Internet Explorer,* and *IE7* brings to the table several features that separate it from earlier versions

Microsoft's redesigned navigation bar takes some getting used to and feels less intuitive than the previous version, but the end result is more space for viewing web pages and browser windows that are less likely to be spoofed.

***IE7* comes with a search box, just like *Firefox.* Like its competitor, you can choose from a variety of providers to use as your default search engine.**

Tabbed browsing finally makes its way into *Internet Explorer*, and the quick tabs feature gives you a thumbnail image of each tab that's currently open.

***IE*'s familiar padlock has been moved to the top of the screen and will appear on a red background if a URL's security certificate seems suspect.**

Along with a pop-up blocker and phishing filter, *IE7* now supports third-party add-ons that allow you to customize your browsing experience.

One, Two, Three… Fight!

Now that you've met the contestants, let's see how they perform in real-world web-browsing tests

Mozilla Firefox 2

Firefox 2 didn't take the technological leap *IE7* did, but it didn't have to. Mozilla already reinvented the wheel (traditional web browsing used to be so square!), and this time around the focus was on fine-tuning the overall package. And fine-tuned it's been, with nearly every aspect of the browser receiving a shiny coat of lacquer.

Having popularized the concept of tabbed browsing, *Firefox 2* makes some subtle changes to the way tabs are used. Links now open in new tabs by default, and if you open more sites than there's room for on the toolbar, arrows let you scroll across the bar, rather than squishing the tabs until they are illegible. Should you close a tab (accidentally or on purpose), you can undo the process in the History menu or by right-clicking the tab bar.

PROS
- **More than 2,000 extensions available**
- **Session Restore rocks**
- **Integrated spell-checker**
- **No ActiveX support**

CONS
- **Some pages optimized for *IE* don't look right in *Firefox***
- **No quick tabs feature (without an extension)**
- **No ActiveX support**

Extensions and themes are consolidated under a single Add-ons window—previously, each was in a separate section. We wish there were more themes to choose from, or at least more good ones, but with 2,000-plus free extensions cataloged, *Firefox* satisfies our jones for customization. We're miffed that you still need to restart *Firefox* every time you install an add-on, but Session Restore placates us by remembering which tabs we had open, even restoring text we'd already input.

In the past, *Firefox* could boast improved security over *IE6*, which was exploited and patched on an almost weekly basis. With *IE7* making great strides in this area, the playing field is more level. Pop-up blocking remains in *Firefox*, and Mozilla, too, has implemented a phishing filter that's turned on by default. Blacklisted sites are stored and updated on your computer, or you can opt to automatically check sites' legitimacy through Google instead.

After a long slumber, Microsoft realized *Firefox* had grown too large to ignore, and you shouldn't ignore it either. If you've never used *Firefox*, you're in for a treat. And if you have, the best just got better. **www.mozilla.com**

Microsoft Internet Explorer 7

We're not sure if Microsoft's update to *Internet Explorer* can still be considered fashionably late at this point, but one thing's for sure: It's about damn time! Shedding its old duds, *IE7* introduces a slimmer, streamlined interface meant to simplify the browsing experience and give more space to the main window. And while it succeeds on the latter point, the browsing experience is anything but simplified. The navigation buttons are smaller and sleeker, but now they're inconveniently spread out. The back and forward buttons remain on the left side of the main URL bar, but refresh and stop have been whisked all the way to the opposite side, with the home button residing on a different bar entirely. Worse yet, you can't rearrange the buttons to your liking, so you're stuck with the task of adapting to an unintuitive interface.

Our favorite addition to *IE7* comes in the form of tabbed browsing, which gives you the ability to load multiple websites in one window without cluttering the desktop. And should you want to catch a glimpse of all open sites, the quick-tab feature lays out thumbnails of all your open windows (*Firefox* requires an extension to provide similar functionality). We also love the integrated RSS reader. Its category filters and sorting options make it one of the better browser-based news readers we've tested, and it's far superior to the RSS functionality in *Firefox*. That said, the add-ons manager needs a lot of work. A quick jaunt to **www.ieaddons.com** lists a modest number of extensions for download, and half of them carry a price tag, anywhere from $1 all the way up to 400 smackeroos! *Boo, hiss.*

PROS
- **Tabbed browsing**
- **Great RSS reader**
- **Anti-phishing protection**

CONS
- **Not many good add-ons, and even fewer free ones**
- **Unintuitive nav button placement**
- **No cross-platform support**

From a security standpoint, *IE7* makes strides over *IE6* in protecting web surfers. Along with better ActiveX handling and disabled SSL 2.0 support, *IE7* comes bundled with an integrated pop-up blocker and a phishing filter. Should you unwittingly navigate to a blacklisted or suspicious site, *IE7* will issue a warning and urge you to reconsider, and do so without incurring a perceptible performance hit.

There's no doubt Microsoft succeeds in delivering a browser that is significantly better than *IE6*, but it still needs some polishing before it can tempt us away from Mozilla's *Firefox*, and the lack of cross-platform support limits its appeal. **www.microsoft.com**

Extensions Extraordinaire!

Here are five customization options for each browser that put the *grrr* in groovy!

Firefox

To download and install extensions in *Firefox*, go to Tools, then Add-ons, and click Extensions, or visit **addons.mozilla.org/firefox/extensions/.**

1) IE TAB: One of the most common laments about *Firefox* is that some *Internet Explorer*–specific pages don't look work right. IE Tab solves this problem by using *IE* to render pages inside one tab (Windows only).

2) MOUSE GESTURES: There's really no reason to use the buttons on the browser when you've installed this extension, which lets you move forward and back, close tabs, and reload with a flick of your mousing wrist.

3) DIIGO: If you're like us, you often find yourself with more open tabs than you know what to do with. Diigo keeps us organized with its ability to highlight portions of text and even add sticky notes!

4) RELOADEVERY: Whether you're trying to snipe an eBay auction or prevent your favorite forum from logging you out, this nifty extension will oblige by refreshing web pages at any set interval.

5) TIMETRACKER: Ever been accused of spending all your time online? Install TimeTracker and you'll have proof that you've been surfing for only 18 hours and 37 minutes straight!

Internet Explorer 7

Install *IE* extensions via the Tools icon (then Manage Add-ons) or by heading over to **www.ieaddons.com.**

1) KEYSCRAMBLER PERSONAL: Have reason to believe "the man" is watching your PC activity with a keylogger? KeyScrambler Personal will encrypt your keystrokes when you type in a username and password. Tinfoil hat not included.

2) CALLINGID: Caller ID for the Internet? Brilliant! Now you can verify a site owner's name and address just by hovering your mouse over a link.

3) BAYDEN IETOYS: Right-clicking has never been so useful! Look up dictionary definitions and encyclopedia entries, highlight text before printing, delete site images, and more.

4) BAGGLE: Every online shopper needs a Baggle. Create a detailed, customized wish list of items from all around the web, complete with pics, links, and prices.

5) INLINE SEARCH: We've been babied by *Firefox's* search feature, which highlights text as we type. Inline Search gives this same functionality to the Microsoft faithful.

RUNNERS-UP!

Winners always receive the most recognition, but these alterna-browsers sport unique talents that separate them from the pack

TORPARK

Budding secret agents take note: *Torpark* will get you from point A to point B in covert fashion. *Torpark* uses what's basically a modified version of *Firefox 1.5* but encrypts and routes your browsing activity through the Tor network, so sites you visit won't know that you are you. It's small enough to fit on a USB key for missions on the go. Just don't go too fast, because you'll spend a lot of time waiting for web pages to load. **www.torrify.com**

FLOCK

Flock lives up to its billing as the social web browser by interacting with all your content online. Configure your blog, photo sharing, and social bookmark info during installation, and then use the built-in editor to make blog posts and replace the traditional *Firefox* bookmarks with del.icio.us bookmarks. You can even drag and drop photos from the photo bar into your blog. *Flock* shows a lot of promise, but it begs the question, why not add much of same functionality to *Firefox* with extensions? **www.flock.com**

OPERA

A year ago we would have scoffed at *Opera*, a browser that dared to carry a price tag, but today it's a free download packed with features. Tabs, RSS feeds, integrated BitTorrent support, mouse gestures… it's all here. And website compatibility has grown by leaps and bounds. Add-ons are supported too, in the form of *Opera* widgets. If they ever grow in number and functionality to equal *Firefox's* array of extensions, *Opera* could be a serious contender. **www.opera.com** MPC

Get More from Google

Google delivers pretty good results when you type your query into the search box and mash Enter, but our power-user tips will make anyone a Google master in just 15 minutes!

TIME 00:15 HOURS:MINUTES

Google has an answer for everything these days. Even its humble search box is stocked with exciting capabilities that can be unleashed by learning a few simple tricks. If you need to do simple math or convert a currency, distance, or weight, the search box should be your first port of call.

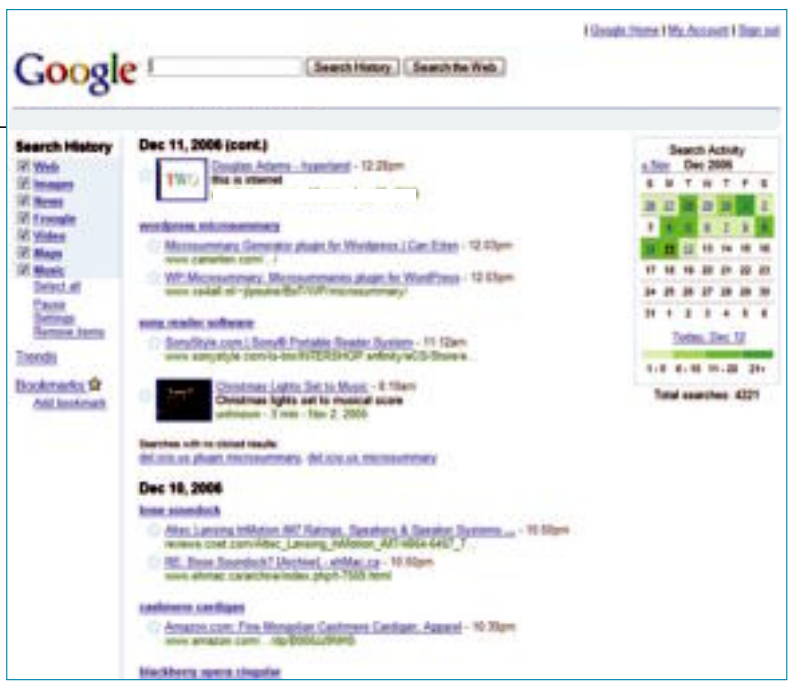
Yet there's so much more to Google than the familiar search screen, and best of all, everything's free. If the website you need is down, Google can help. A vast, searchable library of books is available for your perusal. *Docs and Spreadsheets* is an online office package that enables you to chat with others in real time while working collaboratively on documents—and your work can be saved on Google's servers, so you can access it from anywhere.

Many of the new projects Google is working on are available for anyone to try out in the Labs section of the Google site, **http://labs.google.com/**. Two of the most entertaining are Trends, which enables you to look at search trend data, and Suggest, which comes up with suggestions about what you might want to search for as you type in the search box. A Google account is necessary to play with a lot of these things, but all you need to do to get one is provide an email address and password.

Personalized Search Trends

Google Personalized Search tries to make your search results more relevant by taking into consideration what you've searched for in the past and what results you've clicked on. Go to **http://google.com/psearch** to try it out. You need a Google account to use it, and your search history will be stored inside your account so that Personalized Search can work whenever you're logged in. If you want to remove any sensitive items from your search history, log in to your account and click Search History, which is at the top of the Google homepage.

Also on this page, you can attain a deeper understanding of your Web behavior—and thus your inner self—by clicking Trends to display some revealing statistics. You can also browse through things that you've searched for and clicked in the past and make bookmarks for your favorite sites.

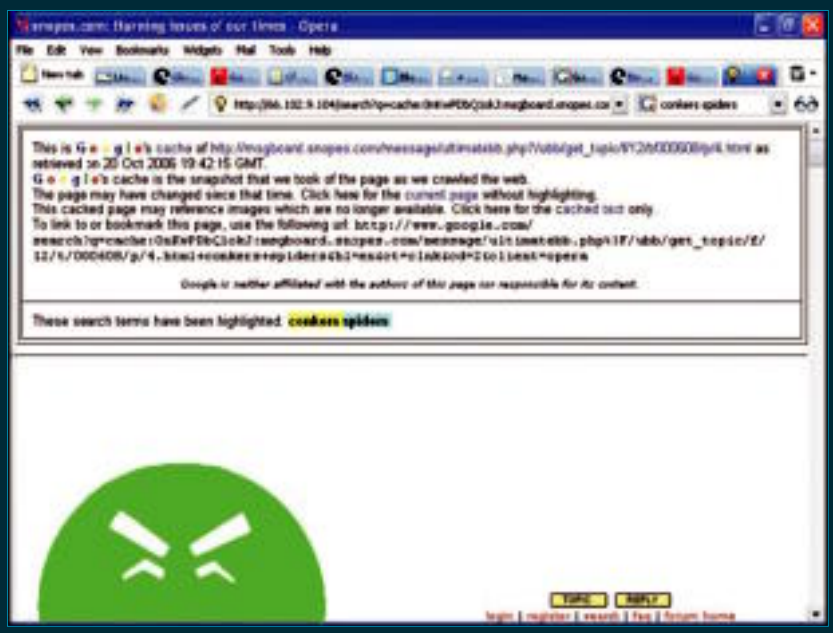


Using Personalized Search, you can tweak your search history to deliver more accurate results.

ACCESS THE GOOGLE CACHE

Google doesn't search the actual Web. Instead, it searches a copy it has made of the Web. The copy is continuously being updated but always remains a few steps behind the actual Web. This fact can be useful in a number of ways. First, if you turn up a long document and can't find the bit that's relevant to you, click the Cached link underneath the result. Your search terms will be highlighted, so you can scroll through and spot them easily. If a link doesn't work, click Cached to see Google's copy.

A particularly crafty means of exploiting Google's cache is to use it to search a site that's down. To do this, type in your search terms followed by the site:www.siteyouwanttosearch.com modifier to limit the results to that site. Now click Cached under the result you want to bring up the page.



Even when a website is offline, you can view the most recent version of it in Google's cache.

Explore Search Trends

You're no doubt aware that most search engines, including Google, keep a database of all the search queries they receive. While this may pose a threat to users' privacy, the upside is that Google is developing a tool that enables anyone to do their own statistical analysis of the company's search query database. With a little imagination you can turn up some superbly entertaining discoveries. Go to **http://trends.google.com** and type in up to five search terms separated by commas to compare how often those terms have been searched for.

To obtain an idea of the fun that can be had with this tool, enter "good, evil" into the search bar. If you look at the searches from all countries in all years, you'll see that people search for a lot more good things than evil things. Now use the drop-down boxes on the top right to limit the results by country. By choosing the United Kingdom, we can see that the Brits are close to the global average—for each evil search, they conduct about four or five good searches.

However, if we click to see the same results for the French, there are only two good searches for each evil one. In early 2004, evil searches in France outnumbered good ones. We'll leave it up to you to reach your own conclusions on this particularly interesting finding….

The Trends graph often links news stories next to spikes in search queries to try to give an understanding of why certain searches occurred, but unfortunately, some trends remain unexplained. For example, in Sweden, circa August 2005, we find that David Hasselhoff was a hair's breadth from being as popular as Jesus. Globally and at all times, Paris Hilton is nearly as popular as God. These, and a wealth of other fascinating revelations about the human condition, are just a few clicks away.

Using Trend Search, you can see what people are searching for on popular topics.

Google Books

Google Books is an amazing resource. The Google Books project seeks to get as much book content online as is allowed by copyright law and make it searchable. Books that are out of copyright are viewable in full, and varying amounts of other books can be viewed.

Go to **http://books.google.com** and click Advanced Search. From this page you can specify whether your search terms refer to the title, author, or main text of a book. It's often possible to view a surprisingly large portion of a book that's still under copyright, but you need to have a Google account to do so. You might get to leaf through just the first few pages of a text by using the Arrow buttons, but you can see much more of a text by using the Search in This Book box. Click the Table of Contents or Index links next to the page to see what's in the book and then do a search for the part you want to read. Many books can be downloaded as a PDF for reading offline.

Don't just search for books, search inside books. All of them.

CALCULATOR AND CONVERTER

Here are some examples of conversions that Google will understand—type them into the normal search box:

- **currency of France in Malaysian money**
- **400 yen in U.S. dollars**
- **12 pounds in kilos**

The search box also works as a calculator. Use the normal operators on the numeric keypad for simple math and the following operators for more complicated sums:

- **Parentheses ( ): Anything put inside parentheses will be calculated first.**
- **^ : This symbol raises the preceding number to the power of the number following it. For example, write three squared as 3^2.**
- **log, ln, sin, cos: All understood, use as normal.**
- **% of: The percentage sign by itself provides the modulo (the remainder after division), so be sure to use "% of" if you want a percentage. For example, "20% of 300."**

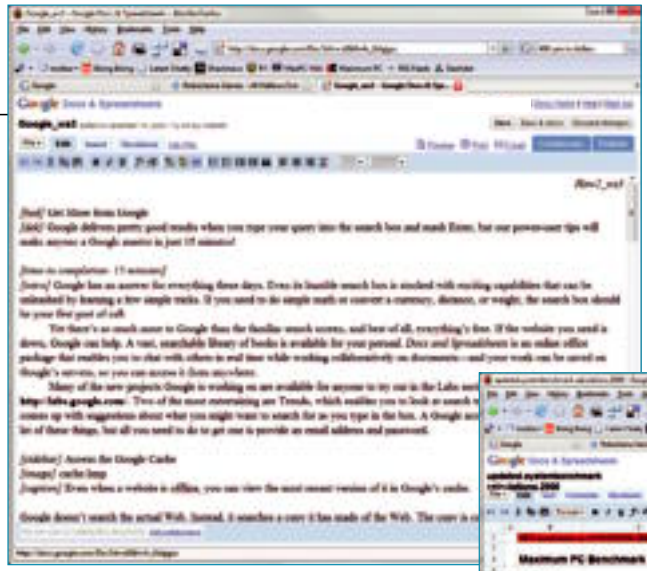
Google won't just help you "write" that book report, it will also help with your math homework.

Want to know how much that Japanese eBay auction is going to cost you? Use Google!

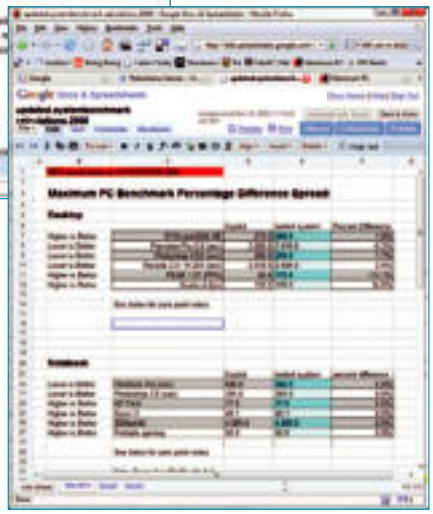
Google's Hidden Tools

If you do a lot of work from different PCs, Google's *Docs and Spreadsheets*, an online office application with a word processor and spreadsheet, might be useful. Go to **http://docs.google.com** and sign in to your Google account to use it. You can save all your documents to Google's servers, so if you're working on the move, you only need to log in to access your documents. This also means important files are safe should you lose your flash drive or if your hard drive fails. You can upload work that you've created in a variety of formats, including *Word*, *Excel*, and OpenOffice.org, and download copies to your PC. It's perfect for collaborative work because you can invite others to edit documents with you and even chat with them in real time as you work. Recent edits are saved, so you can roll them back if you make a mistake.

If you're looking for a free program to edit and organize your photos, try *Picasa* (**http://picasa.google.com**). It's a standalone application you install on your PC that works independently of the Internet. It automatically finds all the photos on your PC and has some nifty features to help you organize them, such as the facility to add memorable tags. All the most common visual effects are there, such as red-eye removal and auto contrast, as well as some other features—one of our favorites lets you slice up a picture so that individual sheets can be assembled to let you print a photo that's up to 10 times larger than the original image.



Even if you're on a machine without a word processor, you can use Google's *Writely* editor online.



Like a JV version of *Excel, Google Spreadsheet* will let you perform basic spreadsheet tasks inside your browser.

INSIDE THE SEARCH BOX

It's worth remembering a few basic things about how Google looks at your search terms. If you enter more than one word into the search box, Google will, by default, search for pages that contain all the words; articles, conjunctions, and prepositions are generally ignored; however, a plus sign can be placed in front of such words to force their inclusion in the search.

You can improve the relevancy of your results by using the minus sign to exclude terms that will appear in irrelevant pages. For example, you might put "-dancing" in a search about salsa to get results about food only. Also remember that Google isn't case sensitive, so there's no need to worry about capitalization.

These are the most useful Google modifiers. Use your imagination and then mix and match for the best results.

site:www.siteyouwanttosearch.com	**Restricts search to that particular site.**
define:word	**Brings up a selection of definitions from various sources.**
intitle:word	**Searches for pages with your word in the title.**
"my phrase"	**Searches for a set phrase. If you don't put a phrase inside quotes, Google will look for pages with the words present in any order.**

Ask the Doctor

Diagnosing and curing your PC problems

WAIT FOR IT…

I have a Shuttle XPC that I built using an Athlon XP 2600 about three years ago. I use this rig as a kitchen computer to store recipes, keep a grocery list, send email, and edit photos.

The problem started about a month or so ago: When I hit the power button, nothing happens for a while. In other words, the little machine has developed a bad habit of ignoring the on switch for several minutes before coming to life. It never fails to ultimately turn itself on, but sometimes the time elapsed between hitting the button and the computer coming to life can be five to 10 minutes. What does this mean?

—Emery Borsodi

The Doctor has a similar machine, but it boots just fine. The delayed power up could be related to a problem with the power supply (a common problem with small formfactor machines, which must use reduced-size, underpowered PSUs). When you turn on your PC, the motherboard tells the PSU to turn on, then the mobo waits for a Power Good signal from the power supply. The Power Good signal tells the motherboard that all the voltages are correct and it's safe to boot up the motherboard. It's possible that your PSU is starting to fail and taking an excessively long time to send that Power Good signal. This could very well cause the several-minute delay in startup.

A less-likely problem could be related to the motherboard itself, which might be reading the Power Good signal improperly. That's extremely unlikely though. If you want to do a quick check of the power supply, buy a power supply tester such as Frozen CPU's (frozencpu.com) $28 Ultimate LCD Power Supply Tester. In addition to telling you what voltage your unit is putting out, it'll tell you what the unit's Power Good signal is.

IT'S GETTING HOT IN HERE

I've been through about four different nForce4 SLI boards from Asus. I thought the random problems I was having with the system might be heat related, so I stuck a thermal probe on the heatsink for the northbridge chip. It registered 97 C. Do all newer nForce chipsets run this hot? What's the melting point of silicon? How can a system be stable at these extreme temperatures?

—Scott

As a general rule, trying to read a chipset's temperature from the heatsink leads to inaccurate results. Since you're not reading from the die or even under the heatsink, the heat from other components can throw your readings off. If you want a more accurate temperature reading, download Nvidia's nTune utility, which should correctly read the chipset temps directly from the on-die sensor.

With that said, you should know that Nvidia chipsets actually run quite a bit hotter than competitors' chipsets. In the nForce4 days, the Doc was told Nvidia's chipsets could produce twice the heat of a comparable Intel chipset. Even so, the 97 C you're seeing (if verified using nTune) is way too hot and may be indicative of other cooling issues within your case. You should add additional fans in your case to keep the air moving through it. If adding more fans doesn't get your temps down, you may want to consider mounting a small fan directly on the chipset with the air blowing directly onto the heatsink.

Also, the melting point of silicon is 1,414 C, so it's unlikely you'll have a problem with that.

JUST CAN'T STOP THE U-S-BEAT

I have several different USB devices, thumb drives, and some external hard drives. When I right-click on the Safely Remove Hardware icon in the system tray and then select the device I want to remove, I usually get the message "The device 'Generic Volume' cannot be stopped right now. Try stopping the device again later." Which part of Windows is annoying me this time and how do I fix it?

—Dan Hunter

The Doctor is glad you don't take the easy route and just yank the thing from your system—actually, in trying to come up with ways to fix your problem, the Doc did just that. Oops!

You should first try stopping any processes that might be accessing the drive in some capacity—this could be a virus scanner, an audio program, or just an open Explorer window. For a good way to see what's using the device, grab Unlocker (http://ccollomb.free.fr/unlocker/), install it, and then right-click on your USB devices in Windows Explorer and click Unlocker. Ideally, it should tell you if anything is accessing the drive, so you can kill the offending application.

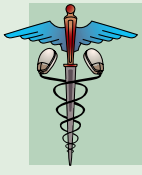
Sometimes Unlocker doesn't find the offending app. If that's the case, you'll need to grab Process Explorer (http://tinyurl.com/sjzno). You should be able to use this little app to find out what's accessing your drives; you can then kill it yourself by pressing Ctrl-Alt-Delete and clicking over to the Processes tab.

Of course, if you have Optimize for Fast Removal checked in the Policies tab of the Drives Properties window in Device Manager, you can remove the drive without bothering with Safely Remove Hardware.

IT HERTZ, IT HERTZ

I have an ATI Radeon 9800 Pro videocard connected to a ViewSonic PT813 CRT monitor. For some reason, the monitor will display only at a 60Hz vertical refresh rate. I know this because my monitor has a built-in "view meter" that tells

Disabling the EDID is the easy part. Just don't set the values incorrectly, or you can kiss that monitor goodbye!



Love is in the air, and there's no greater gesture of geeky romance than fixing that special someone's biggest computer issue. But if you don't think you have the answers, the Doctor is more than happy to provide that little spark. Send a detailed description of the issue to **doctor@maximumpc.com**, and he'll set his team of Cupids to work on finding the lovely solution to your needs.

me the exact refresh rate. Now here's the real weirdness: It displays at 60Hz even though the videocard driver lists it at 75Hz. Plus, if I connect the monitor to a different computer, I can display at multiple refresh rates just fine. Is it possible for a functioning videocard to lose higher refresh rate capability?

—Michael R. Matheson, M.D.

From one doctor to another, your monitor has what's known as Extended Display Identification Data (EDID) stored inside it. Your videocard interrogates the EDID to determine the monitor's capabilities, including its maximum resolution and refresh rate. If this information is faulty or the videocard can't access it or just misreads it for some reason, the videocard might set itself to incorrect defaults.

There's an easy workaround, but you need to be careful because you risk permanently damaging your monitor if you set an incorrect value. Open ATI's Catalyst Control Center and click on Monitor Properties in the Graphics Settings tab. Now look in the second box, which is labeled Monitor Attributes. Remove the checkmark next to the item that reads "Use Extended Display Identification Data (EDID) or driver defaults."

Now here's where you need to take care: Select your desired maximum resolution and maximum refresh rate from the corresponding lists in the box labeled Monitor Attributes. You can choose any values your monitor supports, but you should make absolutely certain that your monitor is capable of performing at those levels, or you'll risk damaging your display.

I WANT WINDOWS TO REBOOT

I connected my Windows XP Media Center to an extender that feeds my cable to the HDTV in my living room. After a week, my computer locked up. I am assuming it has run out of system resources. Is there a way to program Windows Task Manager to do scheduled restarts of Windows, like maybe every night at midnight?

—Michael Spaeth

There sure is! Open up the Windows Task Scheduler from your Start menu (Accessories > System Tools) and add a scheduled task. The program you'll want to run is conveniently called shutdown.exe, and you'll find it in your \windows\system32\ folder. Set the rate of occurrence or the exact times and dates you want your computer to restart. If you're entering a username and password at your Windows logon, be sure to input them on the next screen. At the final menu, check the Open Advanced Properties line before you hit Finish.

In the Run field, add `/r` to the end of `shutdown.exe`; hit OK and you're done! You've now set Windows to reboot at a set frequency—possibly even more often than it does by itself. The Doctor kids, he kids….

WHERE THE ICONS AT?

*I'm running Windows XP Home Edition Service Pack 2; suddenly, some of the graphics on my desktop icons went missing. Many are now the default icon of a white box with a blue border on the top and three white dots on the right in a blue border. Other icons are still the way they should be, as are the icons for a few programs I've installed since this problem occurred. Additionally, if I go to the Start menu, icon graphics for some programs (**Excel, Internet Backgammon**) are missing but others, such as the one for **Firefox,** are as they should be. It's driving me crazy!*

—Tamara Miller

That's a weird problem, but the Doctor thinks he has an equally weird solution. First, try rebooting the computer in Safe mode: Restart the system and jam on F8 after the BIOS loads up. You should then be given the option to start Windows in a variety of modes; pick safe mode, let Windows load up, and then restart your computer again. This should bring back your normal version of XP, and ideally, your icons will look fine.

But if that doesn't do the trick, try this: Right-click on your desktop and then click Properties. Click on the Appearance tab and then click on the Advanced box. Now select Icon in the drop-down Item menu and change the icon size to 31. Hit OK and click Apply. Windows will reload the icons in a different size; check your desktop to see if that's done anything, just for curiosity's sake. Now go back to the same menu and change the size back to 32. Hit OK and click Apply. Your icon problem should be solved. MPC

White Paper: Electronic Paper

We've been jonesin' for electronic paper ever since we read Neal Stephenson's 1992 sci-fi novel *The Diamond Age.*

BY MICHAEL **BROWN**

HOW IT WORKS **E Ink technology**

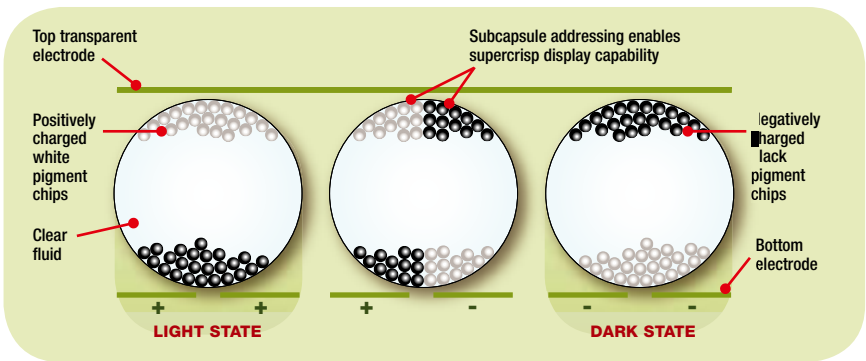
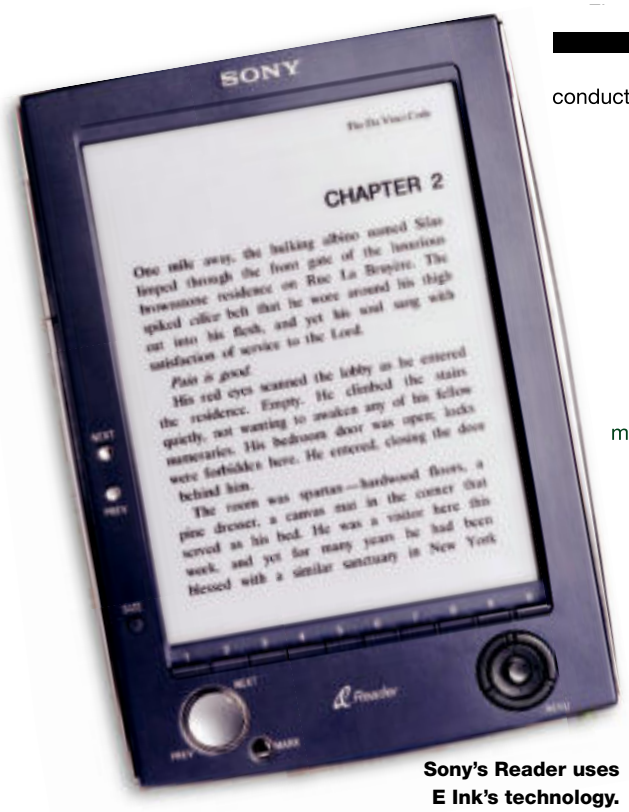


ILLUSTRATION COURTESY E INK CORPORATION

Each 50-micron microcapsule contains organic oil and approximately one million negatively charged black-pigment particles and positively charged white ones. When a positive charge is applied to the electrodes, the white particles float to the top and become visible, while the black particles sink to the bottom and are hidden.

But Stephenson doesn't get all the credit for this idea: The technology—formally known as electrophoretic display—was conceived of in the 1970s. Research efforts were pretty much abandoned in the face of what seemed to be insurmountable challenges, however, until a group of MIT students under the tutelage of Professor Joseph Jacobson made a key breakthrough in the 1990s.

Jacobson later founded E Ink to commercialize the technology. Today, E Ink's product can be found in everything from Sony's Reader (a handheld electronic book) to Motorola's new Motofone (a cell phone that's thinner and lighter—by half—than the company's Razr, yet delivers 500 minutes of talk time).



Sony's Reader uses E Ink's technology.

trophoretic displays operate by
tiny electrically charged particles of
in a liquid sandwiched between two conductive plates. When voltage is applied
he two plates, negatively charged
s migrate to the plate exhibiting
e polarity, while positively charged
es migrate to a negatively charged
on the opposite side. If the white-
ented particles bear a negative
ge and a negative electrical charge
plied to the bottom plate, the white
icles will move to the top (view-
plate and become visible. Black
rticles bearing the opposite charge,
meanwhile, are drawn to the bottom
late and become hidden. Reversing
he charge has the opposite effect.

FAILURE ANALYSIS

Three phenomena were responsible for the failure of earlier prototypes: gravity, adhesion, and fluid convection. Since the particles are denser than the liquid they float in, gravity would eventually overcome electrical attraction and the particles would sink to the bottom of the display. Some particles would inevitably adhere to the surfaces of the conductive plates, resisting the forces of both gravity and electrical attraction. And fluid convection—the dynamic of some particles boiling up to the top when voltage is applied to the plates, while others migrate to the bottom—rendered the displays too slow.

EUREKA!

The breakthrough came when the MIT students encased ceramic pigment particles in microcapsules. Microencapsulation has been used for timed-release drug delivery and other purposes for decades, but most microcapsules are designed to break down over time. E Ink's microcapsules act as durable containers in which the pigment particles are suspended in organic oil; the black particles are made of the pigment used in newspaper ink, while the white particles are made of the pigment used to create white paint. Since each microcapsule is less than 50 microns in diameter, the particles don't settle because they can migrate only as far as the bottom of the microcapsule; they don't stick to the surfaces of the microcapsule, and the microcapsules are so small that the particles contained within them are not subject to fluid convection.

The next step in the process is to mix the microcapsules with additional polymers to create a paste. E Ink rolls out a flexible plastic substrate with an adhesive backing, applies the paste to the other side, allows it to dry, and then rolls it up on a second

spool. Each three-foot-wide roll of finished product can contain up to two miles of material that looks remarkably like paper.

A manufacturer like Sony creates an active-matrix display by laminating E Ink's product to a thin-film-transistor (TFT) backplane. A protective layer of either glass or plastic is laid on top (plastic is thinner, lighter, and cheaper). These displays typically offer resolution of 170 dots per inch, but they have the potential to deliver up to 375 dpi. Smaller screens, such as the one Motorola created for the Motofone, utilize a direct-drive display. In place of a matrix of pixels, direct-drive displays create images using a limited number of addressable points—similar to an old-school digital watch display.

BLACK AND WHITE AND GREEN

Electrophoretic displays are incredibly energy efficient, whether they're deployed in an active-matrix or direct-drive configuration. Once the pigment particles are arranged a particular way to create an image, the display is inherently stable and draws absolutely no additional power until its particles need to be rearranged to create a new image. LCD and OLED displays, by contrast, must be constantly powered to maintain an image. And since the particles in an electrophoretic display are made from the same type of pigments used to produce paper and ink, electronic paper is nearly as reflective as conventional paper: It doesn't require an energy-consuming backlight, it's perfectly legible in bright sunlight, it exhibits great off-axis visibility, and it causes much less eyestrain.

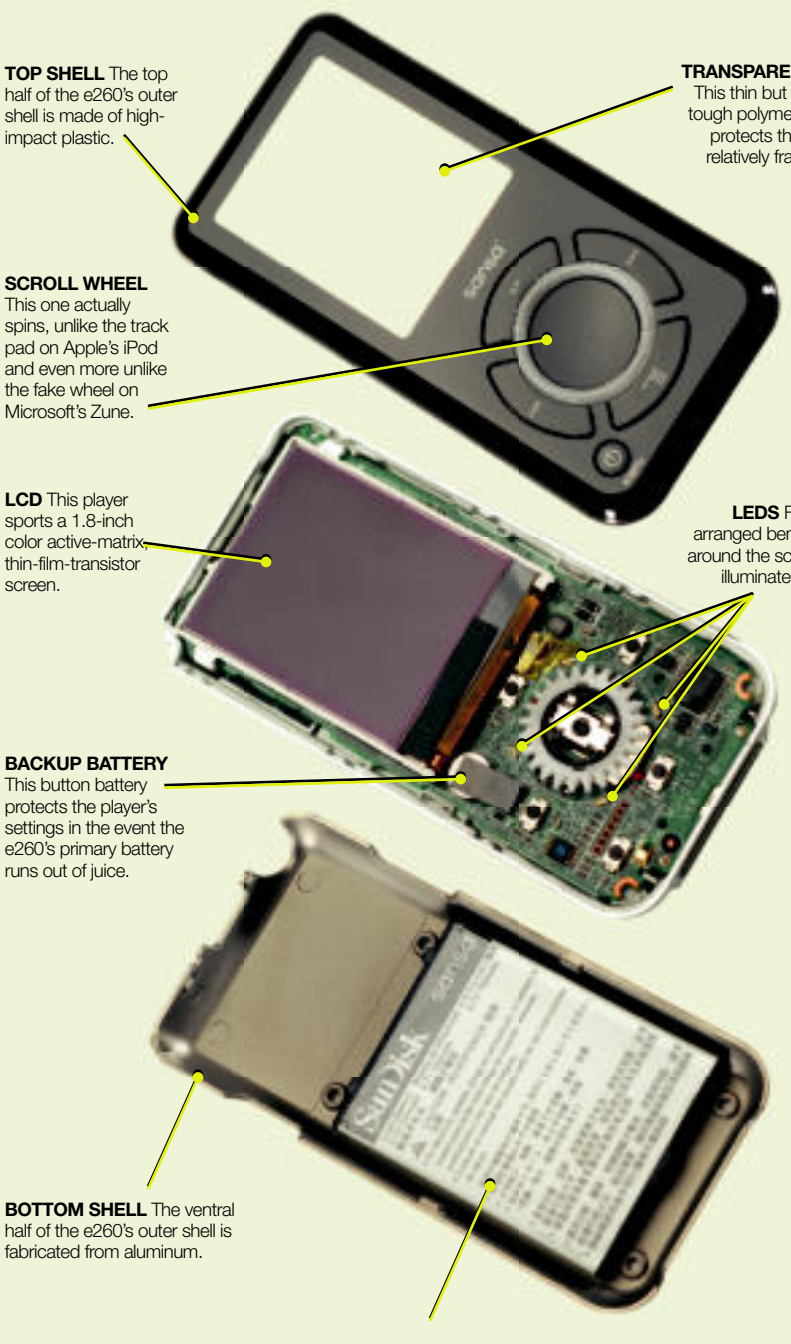
ROLLIN' ROLLIN' ROLLIN'

Each of today's commercial products based on E Ink's technology features a rigid display, but flexible and roll-up displays are not far off. In fact, a company known as Polymer Vision (a spin-off from European electronics giant Philips) has been demonstrating a roll-up prototype for more than a year. Devices with roll-up displays could appear at retail in less than two years.

Color displays using this technology aren't far off, either. The first wave of products will produce color using a multicolored filter—operating in much the same fashion as the red, green, and blue subpixels in an LCD. These products will require a small amount of power to operate the filter, but the images they display will be just as stable as the black-and-white products. And they'll arrive sooner than you might think. Throw in a persistent wireless broadband Internet connection, and we'll be very close to the *Young Lady's Illustrated Primer* that Neal Stephenson dreamed up. MPC

Flash-Memory Digital Media Player

You discover the most interesting things when you take a product apart. Who'd have guessed that the SanDisk Sansa e260's circuit board was actually designed by MSI?



GORDON **MAH UNG**

Plays Memory Roulette

And discovers the best way to configure the dual dual-channel RAM in AMD's Quad FX

If you can't figure out which way to configure your single-processor motherboard to take advantage of dual-channel memory, you'll truly be stumped by AMD's Quad FX, which gives each of its dual-core Athlon 64 CPUs its own memory bank. In other words, dual dual-channel RAM.

With four DIMM slots available and a host of ways to configure them, I sat down with a box of memory modules to discover how to set up the platform for optimal performance.

First, I populated our Asus L1N64-SLI with four 512MB DIMMs of DDR2/800. With the RAM timings manually set, I ran through a handful of benchmarks, shut the box down, and swapped the four 512MB DIMMs for two 1GB DIMMs. I put these two DIMMs in the memory bank for the primary CPU, which meant both procs were sharing RAM, but the RAM was running in dual-channel mode. When I went for the third configuration—a single 1GB DIMM for each processor, which should have given each CPU 1GB of RAM in single-channel mode—the machine spit up a hairball. Interestingly, the board also balked when I put only two DIMMs into the slots assigned to the second CPU.

I was surprised to find that the machine performed slightly better with the pair of 1GB DIMMs running in dual-channel mode than when each proc had its own RAM pool. Why? One reason could be that our benchmarks just aren't that memory-bandwidth intensive, so they may not actually need the extra bandwidth that running dual dual-channels gives you. Another factor may be how the memory controller works with double-sided DIMMs (the larger 1GB sticks) versus the single-sided DIMMs (the 512MB modules). Additionally, AMD has already said that Windows XP's Non Uniform Memory Access capability is gimped and that Vista yields higher performance when the OS has to reach across different buses to get to RAM. We'll test that theory when Vista's drivers stabilize.

The four DIMM slots in the Quad FX platform feed two independent memory controllers in the CPU cores.

In the end, if you have the budget, I recommend that you configure your board with four double-sided DIMMs. If you don't have the budget, go with two double-sided DIMMs in the first CPU's bank until you can afford the other two. I'd avoid using low-density single-sided DIMMs since this configuration hurts your upgrade path, and your performance too.

Michael Brown

Shops at Microsoft's Zune Marketplace

Did someone forget to stock the shelves before opening the store?

In order to evaluate the Zune, it's necessary to also assess the Zune Marketplace, Microsoft's online music store. The Zune isn't a bad digital media player, but the Zune Marketplace is an absolute embarrassment.

Who else but Microsoft could cook up a semi-half-assed DRM scheme like PlaysForSure; convince a big slice of the record industry, oodles of subscription services, dozens of manufacturers, and an assload of consumers to go along with it; and then bring out its own incompatible product to compete against it.

We despise DRM no matter what guise it comes in, but at least PlaysForSure doesn't handcuff us to a single brand of player and a single online music service the way the Zune (and iPod, for that matter) does. With PlaysForSure, we can gorge ourselves at Rhapsody's smorgasbord, nosh on the ultra-high-bitrate fare from Music Giants, or nibble at Napster, Yahoo, Virgin, or a number of other online services. But we can't do that with the Zune, because Microsoft has cooked up a completely new and incompatible DRM scheme for the device.

Anyone considering buying a Zune should first stroll through the empty aisles of the Zune Marketplace. Come on, Microsoft, just *one* release from the Cramps?

Microsoft shackles Zune buyers to the Zune Marketplace in much the same way Apple enslaves its online music buyers to its iTunes Store—and for the very same reason: greed. Like Apple, Microsoft wants to reap all the profits from the sale of both its player *and* the music that will be put on it. But after perusing the shockingly spare inventory at the Zune Marketplace, we're left wondering if Microsoft forgot to stock its shelves, or if the music industry collectively told the kids in Redmond to take a hike.

How We Test

Real-world benchmarks. Real-world results

Computer performance used to be measured with synthetic tests that had little or no bearing on real-world performance. Even worse, when hardware vendors started tailoring their drivers for these synthetic tests, the performance in actual games and applications sometimes dropped.

At *Maximum PC,* our mantra for testing has always been "real world." We use tests that reflect tasks power users perform every single day. With that in mind, here are the six benchmarks we use to test every system we review.

SYSmark2004 SE: This is an update of the *SYSmark2004* benchmark, which uses a suite of such common applications as Microsoft *Word, Excel, PowerPoint*, Macromedia *Dreamweaver*, *Flash,* and *Winzip* to test general performance. It isn't heavy in multithreading, but it does feature multitasking tests.

Adobe Premiere Pro 2.0: We finally ditched our old standard-def *Premiere* test for one that uses high-def source material. The test is multithreaded, uses the GPU for transitions, and is brutal. It takes about an hour on our zero-point to render a two-minute 46-second benchmark movie in the program.

Adobe Photoshop CS2: We start with a RAW photo shot with a Canon EOS 20D, and apply a crapload of filters and other tasks from *CS2* to see just how fast a rig can chew through the workload. Because we use every filter we can, the test is more fair and balanced than the usual cherry picking of *Photoshop* tests.

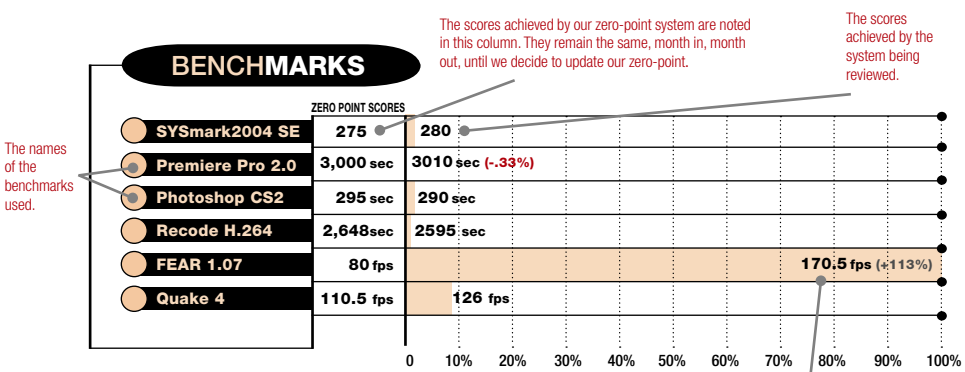
Ahead Nero Recode 2.0: *Nero Recode 2.0* is one of the fastest video-transcoding utilities. We copy unencrypted VOB files to the hard drive, then convert the movie to an H.264 file formatted for the Apple iPod's screen. The version included with *Nero 7.5*, is the only multithreaded H.264 encoder we've found thus far and is optimized for dual-core CPUs.

Quake 4: Based on the *Doom 3* engine, *Quake 4* is a popular OpenGL game. We run our test at 1600x1200 with 4x antialiasing and 4x anisotropic filtering. Generally, more robust OpenGL drivers yield better performance. We use a custom timedemo recorded using the 1.2 patch, which supports HyperThreading and dual-core processors.

FEAR: Monolith's *FEAR* is a cutting-edge DirectX game that pushes PCs and graphics hardware to the limit. We run *FEAR* at 1600x1200 with soft shadows, physics, and audio acceleration enabled, using the 1.07 patch.

How to Read Our Benchmark Chart

Maximum PC's test beds double as zero-point systems, against which all review systems are compared. Here's how to read our benchmark chart.



Our current desktop test bed is a Windows XP SP2 machine, using a dual-core 2.6GHz Athlon 64 FX-60, 2GB of Corsair DDR400 RAM on an Asus A8N32-SLI motherboard, two GeForce 7900 GTX videocards in SLI mode, a Western Digital 4000KD hard drive, a Sound Blaster X-Fi soundcard, and a PC Power and Cooling Turbo Cool 850 PSU.

Every month we remind readers of our key zero-point components.

The bar graph indicates how much faster the review system performed in respect to the zero-point system. If a system exceeds the zero-point performance by more than 100 percent, the graph will show a full-width bar and a plus sign.

BEST OF THE BEST

Our monthly category-by-category list of our favorite products. New products are in red.

High-end videocard
Asus EN8800 GTX

Midrange videocard:
Sapphire Radeon X1900XT (256MB)

Soundcard:
Creative Labs X-Fi Xtreme Music

Hard drive:
Seagate Barracuda 750GB 7200.10

External backup drive:
Western Digital Dual-Option Media Center 320GB

Portable USB drive:
Maxtor One Touch III 100GB

DVD burner:
Plextor PX-755SA

Widescreen LCD monitor:
Dell 2407FPW

Desktop LCD monitor:
NEC 90GX2

Socket AM2 Athlon 64 mobo:
Gigabyte GA-M59SLI-S5

Socket 775 Core 2 Duo mobo:
EVGA nForce 680i SLI

Portable MP3 player:
Apple iPod

5.1 speakers:
M-Audio Studiophile LX4 5.1 (LX4 2.1 with 5.1 Expander System)

2.1 speakers:
M-Audio Studiophile LX4 2.1

Midtower case:
ThermalTake Armor Jr.

Full-tower case:
Silverstone TJ07

Games we are playing: Gothic 3, Medieval II: Total War, Anno 1701, Battle for Middle-earth II: Rise of the Witch-King, Battlefield 2

ABS Ultimate X8 III

A BS experience—the X8 promises so much, yet delivers so little

Looks are certainly deceiving. Everything about the system is perfect, right up until the moment you boot.

One of our favorite scenes in *Pulp Fiction* takes place when Samuel L. Jackson's character, the ever-so-eloquent Jules Winnfield, describes the wonderful gourmet taste of his friend Jimmie's coffee. Of course, Jules and his partner have just pulled up to Jimmie's house with a body blasted all over the backseat of their car. But for the briefest of moments, nothing else mattered, save for the sweet flavor of something that wasn't freeze-dried Taster's Choice.

ABS's Ultimate X8 III might not be a splattered corpse, but it's hard to appreciate the machine's deliciousness when the rig comes with problems of such unbelievable proportions. On paper, the X8 looks amazing; in reality, this rig is far from it.

In that context, writing about the specs and performance of the machine just makes us feel bad. Thinking about the guts of the X8 reminds us of that time—so long ago—when we opened the box and got our first glimpse of the system's potential.

We're really not trying to taunt you, but you have to understand our predicament. Who *wouldn't* be excited by the chance to put an Intel QX6700-based quad-core system—overclocked from 2.6GHz to 3.47GHz—that's also paired with two GeForce 8800 GTX cards in an oh-so-sweet SLI configuration through its paces. While the cards are at stock-clock speeds, that's probably a good thing—any faster, and this rig might catch on fire. Two sticks of 1GB Corsair RAM round out the equation on the gaming end, and two 140GB 10,000rpm hard drives give you a lot of space (and speed) to work with. This system isn't just a great cup of coffee; it's a Big Gulp. You can only imagine our surprise when our initial round of benchmarks registered scores we'd expect from a much less worthy machine.

Our first *FEAR* test pulled in a whopping (not!) 32 frames per second. That's less than a single 8800 card should be capable of, let alone two working together. Something was clearly amiss. When *Quake 4* showed similar performance peculiarities, we resorted to Maximum PC Fix-It Technique #1: reseating hardware. We plugged and replugged, seated everything, and made sure that every possible connection was as connected as it could be. And all was well.

Or so we thought. Our second run of *Quake 4* yielded double the performance of the first, capping out at an average of 191fps. That's the kind of result we expected to see on a machine of this caliber, which made us all the more excited to see what the rig would score in the more-punishing *FEAR* benchmark. And we weren't disappointed; we've never seen *FEAR* crash with such an interesting display of black graphical artifacts, and the psychedelic light show, which replaced the familiar BIOS load screen, was unexpected but neat looking. Not so good for ABS though.

ABS suggested we restore the image and assured us that the system it shipped was pulling scores of near 17,000 in *3DMark06*, and 256fps in *Doom 3.* And we believe it—after we swapped the videocards and finished a second round of cable-jiggling, we were getting comparable results in *3DMark06*. Our *FEAR* benchmark capped

We don't know why you need a fan this big on top of your water block, although it does do a nice job of keeping the electronics around your CPU socket cool.

UNDER THE HOOD

BRAINS	
CPU	Intel Core 2 Extreme QX6700 (OC'd to 3.47GHz)
MOBO	EVGA Nvidia nForce 680i SLI
RAM	2GB Corsair (two 1GB sticks) DDR2/800
LAN	Dual Gigabit LAN
HARD DRIVES	Two 140GB Western Digital (10,000rpm SATA) in a Raptor RAID-0 configuration
OPTICAL	Sony 16x DVD-ROM, Samsung 18X SuperMulti Dual-Layer DVD Burner w/ Lightscribe
BEAUTY	
VIDEOCARD	Two GeForce 8800 GTXs in SLI (576MHz core/900MHz RAM)
SOUNDCARD	Integrated RealTek Audio
CASE	Gigabyte
BOOT: 37 sec	DOWN: 22 sec

The X8 had one of the nicest wiring jobs we've seen in a while. Unfortunately, we butchered it while attempting repairs on the rig.

out at an average of 147fps, *Quake 4* was a few frames faster at 193.8fps, and our *Photoshop*, *Premiere*, and *Nero Recode* benchmarks actually ran to completion. We patted ourselves on the back and started an overnight run of *SYSmark*.

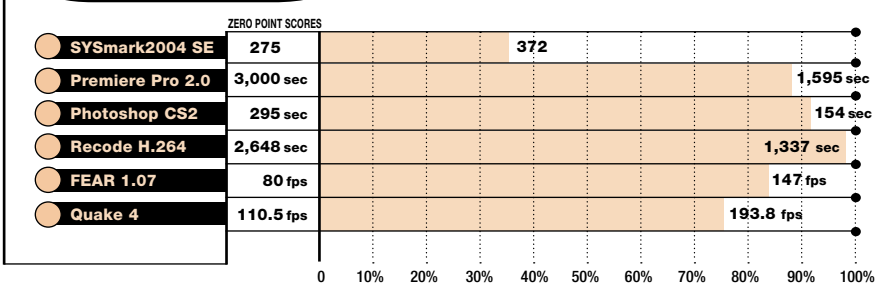
And when we walked into the Lab the next morning, we were once again greeted with a chorus of graphical anomalies—not only did the system crash, but this time, it refused to display anything *but* a trippy collage, even after a cold boot. We clocked the system back to stock values, pointed a house fan at the graphics cards, and crossed our fingers. Go figure, *SYSmark* ran perfectly.

But this was more an exercise in futility than anything else. We could talk all day about the X8's noteworthy performance and its amazing specs. We could write up a storm about its beautiful Gigabyte case and its water-cooling setup, which complements the case's blue-lit theme. And we're still salivating over the price. The X8 is nearly $2,000 cheaper than last month's Maingear, with performance equitable to—and in some cases topping—the machine we dubbed "the fastest ever benchmarked."

Unfortunately, the X8 left both us and ABS, which was given multiple opportunities to troubleshoot the system, completely dumbfounded. The X8 just goes to show that even the best of the best are fallible without a little foresight.

—DAVID MURPHY

BENCHMARKS



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ABS ULTIMATE X8 III

THE WOLF

One of the fastest (if not *the* fastest) machines we've tested.

MARVIN

Does. Not. Work. In fact, it doesn't work in ways an average user would likely never notice; that's even worse.

4

$4,635, www.abs.com

EVGA e-GeForce 8800 GTS

Sometimes you gotta pay to play

The prices for 8800 GTS cards are creeping down, but the absence of competition in terms of DirectX 10 compliance continues to slow their descent.

New toys arrive in the Lab as frequently as political scandals erupt in Washington, D.C., a phenomenon that renders the *Maximum PC* staff a fickle, jaded bunch. But in the absence of any competition from AT—er, AMD—we remain intrigued by videocards based on Nvidia's 8800 series GPUs. And so this month, we take a close look at EVGA's e-GeForce 8800 GTS.

The 8800 GTS is the less powerful of the two DirectX 10 GPUs that Nvidia introduced last November, but we need to put the phrase "less powerful" in context because both parts are based on the same G80 chip. In other words, the 8800 GTS is basically a hobbled 8800 GTX: It offers 96 shader processors (floating-point units that Nvidia refers to as "stream processors"), compared to the GTX's 128; 640MB of memory, compared to the GTX's 768MB frame buffer; a 320-bit memory interface, compared to the GTX's 384-bit interface; and 20 rasterizers, compared to 24 on the GTX.

The 8800 GTS also runs at slower clock speeds than its pricier sibling: The GPU on the card EVGA sent us was clocked at 513MHz, compared to 500MHz stock, but the memory was ever-so-slightly underclocked at 792MHz, compared to 800MHz stock. Compare these specs to the GTX's 575MHz core and 800MHz memory. And if you're interested in dropping an HD-DVD or Blu-ray drive into your rig, EVGA's implementation includes the HDCP CryptoROM that Nvidia's NVIO chip needs to display Hollywood movies at their full resolution.

The upside to the 8800 GTS's downsized speeds and feeds is a significantly lower price tag compared to cards based on the 8800 GTX. At press time, the e-GeForce 8800 GTS was selling for $440 before taking a mail-in rebate into account. The least-expensive 8800 GTX board we could find, meanwhile, was fetching a princely $610. But if you want a videocard that's capable of delivering DirectX 10 and Shader Model 4.0, there's currently nothing cheaper than 8800 GTS-based products.

If you're willing to stick with DirectX 9 games—and who's to argue, since currently there aren't any DX10 games—the dual-GPU 7950 GX2 is significantly faster. But it looks as though these cards are not long for this Earth: We found only three SKUs in stock at New Egg as we were going to press—and all three were priced higher than cards based on the 8800 GTS. And, as with all of Nvidia's 7 series GPUs, the 7950 GX2 is incapable of performing antialiasing and high-dynamic-range lighting at the same time.

If you *are* willing to limit yourself to DX9, on the other hand, boards based on AT—, ahem, AMD's ATI Radeon X1950 XTX—also outperform the 8800 GTS. These cards *can* do AA and HDR at the same time, and some vendors are selling them for less than 8800 GTS cards. But it bears repeating that the X1950 XTX is incompatible with DX10 and Shader Model 4.0, and then there's the whole PITA factor of CrossFire and its external dongle to consider, should you decide to build a dual-GPU rig.

Returning to the matter at hand, the e-GeForce 8800 GTS is no slouch: It delivered *Quake 4* scores of 65.5fps at 1920x1200 resolution, with 4x antialiasing and 16x anisotropic filtering enabled. While that's nearly 33fps slower than the tonier 8800 GTX-based Asus card we reviewed in January, running two of EVGA's cards in SLI boosted our *Quake 4* benchmark to 111fps—12.6fps faster than a single GTX. We obtained similar results with our *3DMark06*, *Company of Heroes*, and *FEAR* benchmarks. The 8800 GTS is a helluva GPU, but its DirectX 10 performance—to paraphrase former Secretary of Defense Donald Rumsfeld—remains an unknowable unknown.

—MICHAEL BROWN

SPECS

NUMBER OF SHADER UNITS	96
CORE CLOCK SPEED	513MHZ
FRAME BUFFER	640MB (GDDR3)
MEMORY SPEED	792MHZ
MEMORY INTERFACE	320-bit
NUMBER OF RASTERIZERS	20

BENCHMARKS

	SINGLE EVGA 8800 GTS	EVGA 8800 GTS IN SLI
3DMARK06 GAME 1 (FPS)	18.6	35.2
3DMARK06 GAME 2 (FPS)	17.2	32.5
QUAKE 4 (FPS)	65.5	111.0
COMPANY OF HEROES (FPS)	57.4	109.5
FEAR (FPS)	51	99.5
HQV VIDEO	113	113

3DMark06 benchmarks run with 4x AA and 16x aniso; FEAR run with soft shadows on, 4x AA, and 16x aniso; Company of Heroes run with all settings at max and AA enabled. Tested with an EVGA nForce 680i SLI motherboard with a 2.93GHz Intel Core 2 Extreme X6800 CPU and 2GB of Corsair DDR2 RAM.

EVGA E-GEFORCE 8800 GTS

STALAG 17

Cheapest DX10 videocard on the market; plus, AA and HDR—at the same time!

ABU GHRAIB

Expensive, and in the absence of DX10, no one really knows how fast it will actually be.

9

MAXIMUM PC KICKASS

$440, www.evga.com

Samsung's YP-K5 features built-in speakers, an FM tuner, PlaysForSure support, an alarm clock, and a great display. But it's much too expensive for a 2MB player that doesn't support video.

Samsung YP-K5 MP3 Player

Wee speakers don't justify a giant price tag

The MP3-player landscape is littered with me-too merchandise, so a new product needs a little something extra if it's to rise above the noise. Samsung's YP-K5 succeeds with clever slide-out speakers and a 1.7-inch OLED screen; unfortunately, its $210 asking price is much too steep for a player with just 2GB of flash memory.

Samsung's pricing strategy is regrettable because the YP-K5 looks great and sounds terrific with headphones. While we'd never classify its diminutive speakers as "hi-fi" (drivers measuring just one-half-inch wide can push only so much air), they're better than some of the portable add-on jobs we've auditioned. They slide out from the bottom of the player on a sturdy set of rails to form a convenient stand. You wouldn't want to subject your ears to these speakers for any length of time, but they come in handy when you want to share a tune with a friend.

All but the crappiest earbuds sound better than the YP-K5's microscopic speakers, but we were impressed by the audio quality and uniquely comfortable design of Samsung's earphones: Their bodies fit snugly outside your ear canals, while pliable rubber tips protrude ever so slightly into them. They're much more comfortable than most models we've tested, and when paired with the YP-K5, they serve up plenty of punchy bass without compromising the middle and high end of the dynamic range.

We found the player's touch-screen controls to be just slightly twitchy, but Samsung puts the OLED to good use with an intuitive user interface for browsing your music and photo collections and changing the player's many settings. The display, which automatically changes to fit the player's horizontal or vertical orientation, defaults to a graphic EQ with the current song title scrolling beneath it. This is eventually replaced by a programmable screensaver (choices include an analog clock, animated graphics, and digital photos). The player doesn't support video at all.

The speakers accomplish their goal of rendering Samsung's YP-K5 unique, but we expect a lot more than a gimmick for this kind of money.

—MICHAEL BROWN

YP-K5 MP3 PLAYER

NEIL DIAMOND
Rhapsody and PlaysForSure support, great sounding earphones, excellent display.

BLOOD DIAMOND
Doesn't play video, and the built-in speakers don't justify the high price tag.

6

$210, www.samsung.com

MEDIA PLAYER

MICROSOFT ZUNE

If you still want to buy a Zune after reading our review, you'd better not count on filling it with music from Microsoft's Zune Marketplace. While our view of the 30GB player is a matter of opinion, the tiny inventory of music that Microsoft has on tap is a sad matter of fact.

Aside from its large, excellent display, the Zune's most prominent physical feature is a control mechanism that looks remarkably like the iPod's scroll wheel; unfortunately, Microsoft's "wheel" doesn't spin. It's actually four buttons arranged at compass points, with a fifth button in the center, but as you've probably guessed, the very first thing every person did when we wordlessly handed them the Zune was try to spin that nonexistent wheel.

One of the Zune's most hyped features is its ability to wirelessly transfer tracks (and pictures) to another Zune. Don't get too excited about the music-sharing half of this equation: You can transfer tracks you've purchased or ripped, but the recipient can play them just three times; the tracks expire after three days whether they've been played or not, and they can't be resent to the same player (although we've heard of a hack that disables this limitation). The Zune's wireless-networking capabilities are more interesting, but you're limited to streaming digital audio, video, and photos to Xbox 360 consoles sitting on your wireless network.

The Zune's not a terrible first effort—it sounds good and Microsoft outfitted it with a fine screen—but it seems to us that the features that could have set it apart from Apple's iPod are really designed only to tie the Zune's users into buying other Microsoft products.

—MICHAEL BROWN

MICROSOFT ZUNE **6**

$240, www.zune.net

Ultrasone iCans

Tommy, can you hear me?

Ultrasone's iCans feature the same S-Logic technology that prompted us to name the company's Proline 750 headphones to our 2006 Best of the Best list. However, as wonderful as they sound with an iPod, they can't displace the Shure E4g earbuds in their respective Best of the Best category.

Yes, we're comparing apples to oranges, but both sets of phones are designed to be paired with personal music players. And if you find in-the-ear phones like the E4gs uncomfortable, we would strongly encourage you to check out the iCans: They're light, they're comfortable, and they're considerably cheaper than Shure's pricey earbuds. They also sound great; they just don't sound as great—or as loud—as the E4gs.

Instead of piping music directly down your ear canal, Ultrasone's S-Logic technology uses an array of transducers inside the ear cup to bounce sound off the folds in your outer ear. The result isn't exactly surround sound, at least not in the sense that you'll perceive audio events to be originating from specific locations in three-dimensional space, but the effect is much more natural than what you get from conventional headphones.

Typical headphones—and this goes for earbuds, too—tend to overemphasize stereo separation. Musical instruments and voices come from the extreme left or extreme right; if they're perfectly centered in the mix, they sound as though they're originating from smack in the middle of your head. With Ultrasone's S-Logic, sound waves bounce off your pinnae before traveling down your ear canal, just as they would in a normal listening environment. They arrive at your eardrums microseconds apart, enhancing your perception of depth and separation. Instead of hearing the band on either side of your head, you hear it all around your head.

We found the iCans comfortable for long listening sessions, but the fact that they fit on top of your ears might render them uncomfortable for folks wearing earrings.

In light of the valid concerns about headphone-induced hearing loss, it's probably unwise for us to wish for louder headphones. But we will anyway: The iCans just didn't rock our casbah—or should we say our cabeza? Hmm… maybe it's time to invest in a headphone amp.

—MICHAEL BROWN

ULTRASONE ICANS **8**

$129, www.ultrasoneusa.com

Etymotic Research ety8 Bluetooth Earbuds

Get your geek on

Thanks to Apple's ubiquitous advertising, you can walk around town with wires hanging out of your ears without getting strange looks from passers-by. Etymotic Research's ety8 Bluetooth earphones shorten the wires, but these anything-but-discreet earbuds are guaranteed to draw a few sets of eyeballs your way.

If you don't mind the attention, you'll get to enjoy a great set of noise-isolating earphones that don't need to be tethered to your iPod. The ety8s aren't entirely wireless—a shoelace-like cord links the left and right modules—but they use Bluetooth technology for wireless two-way communication via a small transceiver plugged into the iPod's docking port. The lanyard is just long enough to allow you to turn your head without tugging either module, and when you're not listening to music, you can drape the ety8s over your neck.

Five tiny buttons on the right module control the iPod's volume up/down, track selection, play/pause, and previous/next track functions. As small as the buttons are, it took us just moments to blindly locate them and memorize the function of each one—the all-important pause button was the easiest to master. And each button press updates the iPod's display. The more we used the ety8s, the more we appreciated the convenience of going wireless, whether we were bundling up for a cold-weather outdoor excursion, working out indoors on an exercise bike, or just sitting at our desks.

Only one aspect of the system gave us pause: The transceiver you plug into the iPod is small (1 inch high by 1.5 inches wide) and sturdy, but friction is the only force that keeps it mated to your iPod. We're just unsure of how well it and the iPod's docking port will stand up to repeated jostling and knocking around inside a jacket pocket.

Etymotic also offers a version of the ety8 without the iPod adapter for $200, if you'd like to pair the earbuds with a cell phone or other Bluetooth-enabled device.

The ety8s come with a wide selection of ear tips and do a fabulous job of blocking out background noise; more importantly, they sounded marvelous with everything from Mozart symphonies to Paul Thorn's wry, whiskey-soaked blues. Yeah, they're a little geeky, but they're definitely worth suffering a few stares for.

—MICHAEL BROWN

ETYMOTIC EARBUDS **8**

$300, www.etymotic.com

HDTV Hootenanny

These portable HDTV tuners let you view TV anywhere!

You pay the man for Internet access, and you pay the man for cellular service. But thankfully, it looks like the days of paying for HDTV are over. With a USB HDTV tuner on your notebook PC, you can watch *Lost* or *Dancing with the Stars* without giving the man a single red cent.

—GORDON MAH UNG

OnAir apparently got a deal on surplus Russian army remotes to include with the USB HDTV-GT.

PINNACLE PCTV HD PRO STICK

Pinnacle did one thing right with the PCTV HD Pro Stick: It sized the device for notebook PC users. The bus-powered tuner is only slightly larger than a USB flash drive. Even better, the IR remote is just as small. Combined with the small telescopic antenna, this truly portable package lets you watch normal NTSC broadcast analog TV as well as ATSC signals, better known as terrestrial HDTV.

We installed the Stick on a notebook and ran into an odd problem: The audio was automatically configured to output over Bluetooth audio and we were unable to change the configuration. Strangely, the stream could be heard through the normal speakers, just not very loudly.

Why watch video on your pathetic cell phone when the PCTV HD Pro Stick lets you use your laptop instead?

On a second notebook, the application installed correctly. While we've heard reports of high CPU utilization for HDTV playback and recording, our dual-core notebook didn't break a sweat.

The tuner worked as expected. We were able to watch static-filled analog TV as well as digital signals, although on some channels the closed-caption encoding showed up on the top of the frame. Pinnacle said it's working on the issue.

Moving from channel to channel is a tad slow, but acceptable. Although we did experience a lockup, it seemed to be an isolated experience. The included software supports basic PVR functionality, such as pausing and fast-forwarding, and you get a free one-year subscription to electronic program guide info.

One weakness of the Stick: It doesn't work with unencrypted QAM signals, the HDTV broadcast standard that most cable companies use. We were also concerned about the magnetic base on the antenna, but Pinnacle says it has used the device on other products and has never received any reports of scrambled data; the official statement: "Don't worry about it." Your comfort level will depend on how strongly you feel about computers and magnets mixing.

PINNACLE PCTV HD PRO STICK

HAPPY DAYS
Damn, it's small, and it does HDTV.

JOANIE LOVES CHACHI
Magnetic base on antenna cannot be removed.

7

$130, www.pinnaclesys.com

ONAIR USB HDTV-GT

OnAir Solution's bus-powered USB HDTV-GT has more features than Pinnacle's PCTV HD Pro Stick, but it comes at the cost of bulk.

About the size of a portable USB hard drive, the HDTV-GT has a key advantage over the Pinnacle device: its "in the clear" QAM capability. This allows the HDTV-GT to display the programs of cable TV systems that broadcast unencrypted signals. Many cable companies broadcast local stations over their networks, which you'll receive even if you pay only for basic cable.

In head-to-head reception comparisons with the antennas about three feet apart from each other, both units were able to pull in the same channels. Like the Pro Stick, the HDTV-GT offers basic time-shifting and electronic program guide capabilities, as well as video capture modes.

One complaint, however, concerns the size of the HDTV-GT's remote; it's freakishly huge—a misstep for a device intended for notebook users. But despite its bulk, the HDTV-GT remote worked far better than the Pro Stick's, which didn't always connect with the tuner.

The HDTV-GT's tuner application is also more polished and allows you to do such things as schedule the thread priority for the tuner above other applications. The HDTV-GT even includes support for Nvidia's PureVideo Decoder for cleaner video display. We couldn't see a difference when comparing the output, though.

It's a tough choice between the two, but we have to lean toward the HDTV-GT for its QAM support. Even though we're against paying for HDTV signals, we're not against paying for basic cable, because you have no choice when the man has you over a barrel.

ONAIR USB HDTV-GT

WELCOME BACK, KOTTER
QAM decrypting gives the HDTV-GT the edge.

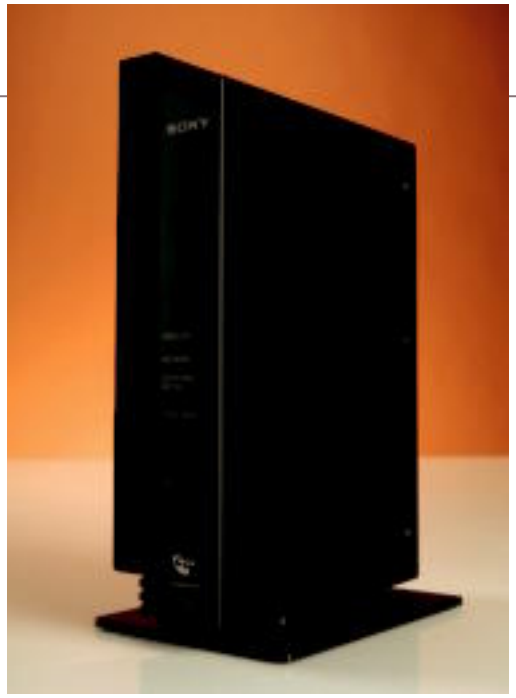
ROOM 222
Remote is too big and the tuner's a little chunky, too.

8

$180, www.autumnwave.us

TV Streamer Standoff

Sony's LocationFree TV takes on the Slingbox



The LocationFree TV LF-B20 is better than Sony's previous effort, but Sling Media has moved the goalposts.

Sony and Sling Media have both made significant improvements to their first-generation streaming products. We favored Sony's first effort, but can the company maintain its advantage?

—MICHAEL BROWN

SLING MEDIA SLINGBOX PRO

The original Slingbox was housed in a goofy ingot-shaped box. The Slingbox Pro is only slightly more attractive, but it's eminently more capable. Unfortunately, you'll need to spend one-third more than its $250 base price to enable some of its cooler features.

As with the original product, the Slingbox Pro must be hard-wired to your router. This renders the device inconvenient to deploy if your cable or satellite set-top box isn't near your router. Sling Media offers the SlingLink power-line Ethernet adapter ($100) to address this problem, but we conducted our tests over a hard-wired connection.

The Slingbox Pro is equipped with one composite-video input and one S-video input, with analog stereo inputs for each. It also has a high-definition input that looks just like an HDMI connector—but it's covered with a sticker warning you *not* to plug in an HDMI cable. Dumb. This connection is actually useless unless you drop another $50 on the company's HD Connect dongle. Dumber. The picture quality you get at the other end is admirable, but we're hard-pressed to say it's worth an additional 20 percent on top of the base system's price—image quality with an S-video connection is very good.

The Slingbox Pro looks almost as goofy as the original, but it's a vast improvement in every other respect.

Since Sling Media's PC software is free, we don't understand why the company expects you to cough up an additional $30 for each Windows Mobile smartphone and Pocket PC device you own. The presence of a built-in tuner, however, addresses one of our biggest complaints about the original Slingbox; now, whoever is home doesn't have to watch the channel being streamed. The built-in tuner is only analog, so it's limited in the number of channels it can receive, and it can't descramble encrypted channels, either, but we think these are worthwhile trade-offs.

SONY LOCATIONFREE TV LF-B20

The LocationFree TV LF-B20 offers a number of improvements over Sony's earlier video-streaming effort. A few of the new model's features are superior to the Slingbox Pro's, but this product is no match for Sling Media's latest release.

Surprisingly, considering the source, the LF-B20's two biggest shortcomings are its video quality and the convoluted process you must go through to set it up. The latter problem can be attributed to the LF-B20's flexibility: It can operate as either a wireless client to a wireless router (meaning you don't need to hard-wire it to your router) or a wireless 802.11a/b/g access point in its own right. But there's just no excusing the inferior quality of the LF-B20's streaming video.

There's also no excuse for Sony's continued expectation that consumers should pay $30 for each additional PC on which they wish to install the company's LFA-PC2 player software. And despite the claim of "Windows Mobile" compatibility advertised on the LF-B20's box, no such software was available at press time. (Third-party developer Access has announced, but not shipped, a $20 Pocket PC client.)

On the other hand, the LF-B20 boasts a few features we'd like to see on the Slingbox Pro: We dig the fact that we don't necessarily have to hard-wire it to our router, of course, and we also like the infrared port that can learn commands from any IR remote. And Sony's device has two IR emitter ports to the Slingbox's one—although Sony provides only one IR blaster in the box. And if you want to watch TV on your PSP, Sony's LocationFree TV products are your only choice. But without a built-in tuner, homebound and remote viewers have to watch the same channel.

SLING MEDIA SLINGBOX PRO

9

HIGH-DEF
Built-in analog tuner, easy installation, and great video quality.

LOW-DEF
Only one IR emitter port; HDTV dongle and handheld-device-client software both cost extra.

$250, www.slingmedia.com

SONY LOCATIONFREE TV LF-B20

7

BROADBAND
Supports Sony's PSP; can function as a wireless access point.

DIAL-UP
Cables not included; each additional client costs extra; PDA and smartphone support not yet enabled.

$250, www.sony.com

Casing out the Cases

And here you thought it's what's on the inside that matters…

Case aesthetics are largely a matter of personal taste. Some folks love lit-up LED fans, engraved windows, crazy logos all over their cases, and other additions. Because everyone has a different opinion about what a good case should look like, we base our review verdicts more on a case's usability and mechanics than look and feel. We'll take a solid design and good airflow over a blinged out but dysfunctional case any day.

—DAVID MURPHY

ZALMAN FATAL1TY FC-ZE1

The Fatal1ty-branded FC-ZE1 case is one heckuva sturdy container for your electronic essentials, but it'll take a railgun to your bank account. We're just a little hesitant to recommend the FC-ZE1 to everyone: The case is covered with logos and labels, and accessing the internals is somewhat awkward. But if you're shopping for a new case, Fatal1ty's design comes pretty close to flawless.

There's a lot of branding on Fatal1ty's case, but it's still a sleek looker with a durable design.

Getting your gear into the FC-ZE1 couldn't be easier—sort of. While the left side of the case features an easy-access toolless door, in order to access the right side you must bust out the included Allen wrench. It's a hassle when you want to access the 5.25-inch bays.

Irritating as that is, we pepped up after seeing that our hard drives would rest in the case's snug, noise-reducing chassis. Three aesthetically pleasing red fans round out the deal, sucking air in and out of the case while giving the insides a smooth, ambient light.

ZALMAN FATAL1TY FC-ZE1

9

+ OWNING
Looks sharp and spacious for a midtower; pretty durable.

– PWND
Mounting components in the 5.25-inch bays is a pain in the ass. You'll love or hate the logoed exterior.

$370, www.zalmanusa.com

COOLER MASTER ITOWER 930

Mix the joys of Lego construction with a scene from any of the *Hellraiser* movies and you'll have a pretty good idea of what it's like to work with Cooler Master's iTower 930 case. The multilayered front panel is ugly enough, but that's just a taste of the true monster lying underneath: a plasticky nightmare of "configurable" features that we really see no need for.

You could practically open a Greek restaurant with all the PITA that come with assembling a computer using this case. For starters, nearly everything you do requires that you first remove something plastic, something gimmicky, or something useless—our biggest battle came with the case's CPU fan duct, which wouldn't even fit on top of a standard AMD heatsink.

After breaking a tab trying to install a videocard into the case's toolless PCI mount and desperately trying to squeeze in an oversized power supply—which fit in the other two cases—we admitted defeat. The iTower 930 is a cramped, convoluted case; Godspeed to anyone who attempts to pack an enthusiast's rig into it.

Run! Run for the hills! This Cooler Master case dreams big but is really just a nightmare.

COOLER MASTER ITOWER 930

3

+ WOOT
The hot-swapping SATA enclosure is pretty cool.

– TOOT
Everything else about this case is a drag.

$139, www.coolermaster.com

NZXT ADAMAS

Latin poets used the word "adamas" to refer to the hardest substance imaginable. Although it's a bit overdramatic, this definition neatly sums up our experience trying to stuff a motherboard into NZXT's Adamas midtower case.

By itself, the case is pretty solid; the Adamas' aluminum chassis is smooth and classy and has a reasonable weight for its size. The case comes with as many 5.25-inch drive bays as 12cm fans (four). The included fans are surprisingly quiet, especially for a case in this price range. The interior of the case is about as standard as standard gets, save for a large 12cm fan mounted on the rear wall. We mention this only because it was quite a wiggle to get a standard-issue ATX motherboard into the case because of said fan. Add in an annoying toolless door-mounting mechanism and the Adamas left us with a sour taste in our mouths—not enough to spoil the entire experience, but there are definitely better midtower options for the same money.

The exterior of the Adamas looks just fine, but you'll want to throw the unfriendly side door through a wall.

NZXT ADAMAS

7

+ GR8
Lots of fans, lots of ventilation. Pleasantly plain exterior.

– H8
Tight fit on the inside. Forcing the side panel shut is not fun.

$200 street price, MSRP unavailable, www.nzxt.com

Asus WL-700gE Wireless Storage Router

All that and a built-in BitTorrent client, too!

Asus's WL-700gE is a wireless router, but it can function as a wireless print server and BitTorrent client, too.

Asus has solved one of the most common problems download junkies face: By marrying a Wi-Fi router with a hard drive and built-in BitTorrent client, the company has eliminated the need for you to leave your power-hungry PC running 24/7.

Asus doesn't limit you to BitTorrent, of course; the device is capable of using ftp or http for file transfers, too. It's also a decent solution for anyone interested in hosting their own website, blog, or online photo album. But with the wide availability of free solutions for the latter, peer-to-peer file sharing is this router's obvious *raison d'être*.

It's equally obvious, however, that Asus didn't spend much time designing the client software—optimistically called *Download Master*—which comes preloaded on the router's 160GB PATA hard drive: The user interface is crude and there's virtually no documentation. It's easy enough to figure out if you know the basics, but green-peas will be lost.

Asus's *Photo Album Exporter* is only slightly more refined: It allows you to create a crude online photo site by transferring digital photos from your PC or a USB memory key onto the router's hard drive. Once there, you can add captions and then organize the images into albums. You can't add borders or anything else, but the software does automatically rotate and resize every photo. In fact, you don't need to fire up your PC to transfer files from a USB thumb drive, either—plug a thumb drive into one of the router's three USB ports, push a button, and the router automatically sucks up the drive's contents. Upgrading the router's built-in hard drive voids the product's two-year warranty, but you can plug in a USB drive or two to create a rudimentary array.

As a router and wireless access point, the WL-700gE is a solid, no-nonsense part. Asus shunned the shifting sands of Draft 802.11n in favor of the more predictable performance of 802.11g, and it installed a staid four-port 10/100Mb/s switch in the back instead of a sexier gigabit switch. One thing the WL-700gE is *not* is cheap: At press time, we found it street priced at $235.

—MICHAEL BROWN

ASUS WL-700GE ROUTER **7**

$235, www.asus.com

Zalman CNPS9700 LED

Baby, it's definitely cold inside

It's hella big and can get hella loud, but the CNPS9700 will cool your CPU better than a "hot" spring on Hoth.

Around this time last year, we were able to get our hands on the predecessor to Zalman's CNPS9700 LED CPU cooler—cleverly titled the CNPS9500. The blooming, copper-finned device not only rocked our socks off but also beautifully cooled them as they went sailing through the air. Kick ass, indeed.

It comes as no surprise that the 9700—more than 200… well, somethings… greater than last year's model—is just as noteworthy a cooling unit.

Installing the device is a breeze. For AMD folk, the 9700 clamps right on to your chip's stock mounting bracket. Intel lovers have to mess with back plates and clip supports, which will necessitate a motherboard removal, but the installation isn't any more difficult than it is with similar products. The only potential pitfall is in airflow direction. Make sure that the 2,800rpm blue LED-lit fan is pushing your case's air in the correct direction and you'll be OK.

Said fan is moderately loud at its top setting, which is the default speed if you plug the 9700 directly into a motherboard. But Zalman must care about your ears because the company includes a fan-speed-adjuster knob in the box. While the knob will look goofy if you tape it to the side of your case, at least you won't go deaf.

BENCHMARKS

	STOCK COOLER	ZALMAN CNPS9700
IDLE (C)	29.5	**20**
100% LOAD (C)	53.5	**39.5**

*Idle temperatures were measured after 30 minutes of inactivity, and full-load temps were measured after running **CPU Burn-in** for one hour.*

We cranked the fan to the max during testing, and go figure: The 9700 performed flawlessly, showing a slight improvement over its predecessor's cooling marks. Even at its lowest setting, the 9700 delivered acceptable cooling on our Athlon FX-60-equipped test bed. Our only, ever-so-slight, hesitation with the 9700 comes from the sheer size of the device; it's almost twice as heavy as the maximum cooler weight that Intel and AMD specify.

But really, that's an almost meaningless consideration for someone who just wants a cooler CPU. And in that sense, the 9700 fulfills the prime criteria for a CPU cooler—it's easy to use and works great, with the added bonus of looking "cool" while doing so.

—DAVE MURPHY

ZALMAN CNPS9700 LED **10**

$80, www.zalmanusa.com

MAXIMUM PC KICKASS

Speaker Spelunking

Down-and-dirty explorations of three new PC speaker systems

The Bose Companion 5's volume control is in a wired puck, which also has a headphone output and a line input for an MP3 player.

It's been some time since we've had any new PC speakers to test—manufacturers' assembly lines seem to be stuck in iPod mode—but the market has finally shifted, and now we have PC-oriented models coming out of the ductwork.

—MICHAEL BROWN

ABIT IDOME D500 DIGITAL 2.1

We subjected our eardrums to the mediocrity of Abit's iDome D500 Digital 2.1-channel speakers so you won't have to.

Seriously, the audio that emerged from this milquetoast system was so blasé it made the laid-back Bose Companion 5 system throb with vitality in comparison. Shoot, we had to check the iDome's subwoofer to make sure it was warm.

Listening to games, CDs, and MP3s on the iDomes is like eating doughnut holes: You get a lot of soft middle and not much else. We couldn't detect the subwoofer's contribution until we cranked it all the way up, and then it only muddied the waters.

Abit built a 24-bit/192KHz DAC into the iDome system, along with SPDIF inputs and outputs—a curious design decision on a number of fronts. First, the only commercial CDs released in this format are DVD-Audio and SuperAudio CD, but DVD-A and SACD players output only to analog—and to 5.1 channels, to boot. The same goes for surround-sound game audio. Additionally, the DAC sounds no better than what you'll hear coming from most motherboards. The built-in DSP effects didn't float our boat, either. Next!

Abit's satellites look ready to kick sand in the face of other speakers, but they're really just 25-watt weaklings.

BOSE COMPANION 5 MULTIMEDIA SPEAKER SYSTEM

Bose's Companion 5 system puts ease of use ahead of pure audio performance.

To deliver one-cable convenience, Bose taps your PC's audio capabilities via USB, rendering your soundcard impotent. And the Companion 5's stylish satellites plug into the powered subwoofer via 7.5-foot hard-wired cables, but you're screwed if they're too short because their connections are nonstandard.

The "5" in Companion 5 alludes to Bose's promise to deliver 5.1-channel surround sound using just two satellites and a sub. The system does present a wide soundstage, but it fails to truly position audio events in a 3D space.

The Acoustimass bass module, meanwhile, sounds oddly muffled—it lacks the in-the-chest thump we crave while gaming, watching action movies, and listening to music. The satellites deliver crisp, sparkling highs but wallflower mids that fail to support the upper spectrum. Disappointing.

ALTEC LANSING FX5051

Altec Lansing, like Bose, taps USB for surround-sound audio, but Altec's FX5051 system is a true six-channel surround-sound system. And unlike the Bose system, the FX5051 has discrete analog inputs, so you can connect it to an add-in soundcard.

How we wish Altec Lansing's FX5051 speaker system sounded as exciting as its subwoofer looks.

Unfortunately, we were even less impressed with the FX5051's audio quality than we were with the Companion 5's. While we prefer the Altec's six-channel setup over Bose's pseudo surround sound while playing surround-sound content, we found the Altecs easy to overdrive into distortion.

The double-barreled subwoofer features an isobaric design in which two 6.5-inch drivers are horizontally mounted in a clamshell configuration. But the drivers get just 28 watts of power from the integrated amplifier, so they don't deliver much oomph.

The FX5051's speaker cables are hard-wired to their cabinets; the front-channel cables are six feet long and the rears are just 12 feet long. This doesn't provide much flexibility, but since the cables end in RCA plugs, you *can* couple them to longer cables.

ABIT IDOME D500 DIGITAL 2.1

+ APPLE FRITTER
MDF cabinets. Not much else to say.

– FRENCH CRULLER
Lacking in fidelity, definition, and power.

4

$270, www.abit-usa.com

BOSE COMPANION 5

+ CRUMB
Loud and drop-dead sexy.

– RAISED
Muffled bass, proprietary cables, USB audio.

6

$400, www.bose.com

ALTEC LANSING FX5051

+ BUTTERMILK
Six discrete speakers, conventional analog inputs, wireless remote.

– MAPLE BAR
Easily pushed to distortion.

5

$250, www.alteclansing.com

Logitech ChillStream Gamepad

Solving the problem gamers don't like to talk about

The ChillStream's design mirrors that of the Xbox 360 for Windows gamepad—aside from its cooling fan, of course.

We've played games on just about every console that's ever come out and pretty much all the big PC games of the last 15 years. We can't remember a *single* time when sweaty hands—caused by prolonged, intense gaming bouts, of which we've experienced many—have caused us to lose our grip on the action for even a split-second (what a great excuse that would make for losing a tight game of *Madden*!).

Nevertheless, Logitech has stepped in with a new controller equipped with a built-in three-speed fan aimed at solving the "great sweaty palm" syndrome that's apparently afflicting gamers. (The short-lived Nyko Air Flo tried to do the same thing a couple years ago.) The ChillStream does work as advertised—it definitely felt cool in our hands, and we didn't get sweaty palms when using it. Heck, vents on the top of the handles mean that even our thumbs stayed cool. However, as stated earlier, we don't have a sweat problem—and the dang fan is distractingly loud on even the lowest setting. Thankfully, you can turn it off.

Fan aside, this is still a pretty "cool" gamepad: It's comfortable to use and lightweight but durable, and its design mirrors the Xbox 360 pad's, which is pretty much the blueprint for developers to support from now on. The ChillStream works out of the box with Games for Windows–labeled games that include support for simple gamepad setup. The fan—in reality a two-speed fan, as the third speed is "off"—is clearly Logitech's way to differentiate its me-too design. Personally, we'd rather the fan was left out and the pad carried a lower price tag, which would make the ChillStream easier to recommend over the 360 pad.

As it stands, the annoyingly loud fan delivers only negligible benefits and isn't enough to make up for the lack of rumble feedback—unless, of course, you are a very sweaty gamer.

—STEVE KLETT

CHILLSTREAM GAMEPAD **6**

$40, www.logitech.com

Olympus SP-510 UZ

Stepping over dollars to pick up nickels

The SP-510 UZ has a generous stable of features but one glaring omission: optical image stabilization.

When you take all of the SP-510 UZ's pseudo-SLR features and quality glass lens into account, it's hard to believe how small and light (11 ounces) it is. However, despite the drop in size and increase in features when compared to previous Olympus cameras, the 7.1-megapixel 510's image quality is not up to the level we're accustomed to—so smaller and lighter ain't necessarily better.

The 510 is simply more sensitive to noise, and one reason for this may be that Olympus elected to leave out optical image stabilization, choosing digital image stabilization instead. Essentially, this does little more than automatically boost ISO speeds, which enables you to shoot at faster shutter speeds—while also increasing noise sensitivity. (Many competing cameras offer optical stabilization, which adjusts the lens to compensate for camera movement.) With the 510, we saw evidence of noise in soft shadows at ISO speeds as low as 200, with more obvious issues at ISO 400 and above. Also, while the 2.5-inch LCD is plenty big enough, its resolution is less than impressive.

The 510's 10x optical zoom lens has high-quality construction, is fast, and delivers very good images under ideal shooting conditions, and the digital image stabilization *does* help in low-light conditions. However, several other cameras in this segment offer 12x zooms.

Still, at this price, which is at the lower end of the super-zoom segment, the 510 has a lot going for it. The full-manual controls are a nice option and there's a generous stable of preprogrammed scene modes, 21MB of built-in memory, burst and continuous shooting modes, a built-in guide that steps you through the camera's features, solid macro performance, and excellent automatic white-balancing that compensates nicely in natural and artificial lighting conditions. Then there's the ability to shoot in RAW image mode, which most cameras at this price point do not offer—shot-to-shot performance is extremely slow (10 seconds) even with a fast flash xD card. Still, we'd rather have RAW support than not. The video mode—640x480, 30 fps—is also better than average.

The 510 is extremely easy to use, its controls are well placed, and it's affordable, making it a solid choice for beginning photographers who want a camera that will give them room to develop their abilities.

—STEVE KLETT

OLYMPUS SP-510 UZ **7**

$300, www.olympus.com

Gothic 3

An *Oblivion*-killer wannabe misses the mark

Fighting the orcs and human mercenaries is a hoot! Fighting *Gothic 3*'s overly aggressive and overly lethal wildlife is another story.

The open-ended nature of *Gothic 3*'s gameplay and world can't help but evoke comparisons to one of the biggest hits of 2006, *Oblivion*. In some ways, *Gothic 3* is the better RPG. Unfortunately, when it comes to the most important aspects of a game—polish and stability—*Gothic 3* falls well short and wastes much of its considerable potential.

In *Gothic* and *Gothic II* you work to save the island of Khorinis from the infamous forces of evil. In this installment, you at last travel to the mainland of Myrtana, where you find a nation of people enslaved by invading orcs. As you visit various towns and talk to NPCs, you discover a growing rebellion of humans who lack only a hero to lead them to overthrow their captors. You must decide whether to help the humans or join the orcs and follow the path of evil. Your choice will ultimately decide the fate of humanity—the game offers multiple endings, and your actions determine which one you see.

Myrtana is incredibly vast and densely populated with cities, towns, camps, caves, and ruins to explore, as well as plenty of NPCs to interact with. The environment is rich with detail—grass and trees bend and sway in the breeze, the weather changes, the land cycles between day and night, and all manner of wildlife flits about. In fact, there's almost too much fauna. Battling scores of wild animals while traveling from point A to point B gets tedious, especially when the herky-jerky combat system and damage modeling make it harder to fight a wild boar than a massive, heavily armored orc wielding a ginormous ax.

***Gothic 3*'s Myrtana can be a beautiful place—if you've got the PC muscle to run it, that is. We experienced chugging frame rates on PCs vastly exceeding the game's recommended requirements.**

As in *Oblivion* you can decide to play a ranged- or melee-combat expert, thief, or mage, or any combination therein. And you can develop subskills, such as hunting and blacksmithing. Unlike *Oblivion*, each time you level up, you get 20 experience points that you can spend with trainers to increase your skills in a given area. The points come slowly and require a great deal of money to use—trainers don't work for free, you see, but this system gives you more control over your character's development. Getting buffed up can take quite a long time, which we actually prefer to *Oblivion*'s fast-track leveling system.

The orcs don't take kindly to humans who don't follow orders. Will you join them... or kill them?

The legions of new RPG fans who completed *Oblivion* may get a bit lost in this game, thanks to *Gothic*'s kludgy quest-log system. It doesn't direct you to the exact location of a particular quest, which is fine, but it is needlessly difficult to track quests and backtrack to places in order to complete tasks.

Unfortunately, we also experienced a mind-numbing number of bugs—corrupted save games, random reboots, system lockups, and crashes—while running the game on a dual-core Athlon system. Switching to a single-core P4 system solved many of the more severe issues, but we still had a few crashes, and the game is filled with minor problems—some subquests were broken and lines of voice-over dialogue were dropped. And the combat AI has a bug that makes it possible to kill powerful enemies from long range with a bow or crossbow. Shoot them and back away, and then watch them run in your direction only to give up the chase and go back to where they were standing. Rinse and repeat ad nauseam. D'oh!

If JoWood and Piranha Bytes can come up with the patches to really finish this game—fix the bugs and address the balancing issues—*Gothic 3* could be the *Oblivion* killer serious RPG fans want. Until then, it's fit for only the hardest of the hardcore who are in desperate need of a fix.

—STEVE KLETT

GOTHIC 3

HUMANS
Huge, detailed game world; deep, engaging story with multiple endings; interesting leveling system.

ORCS
Game does not play nice with dual-core systems; lots of bugs; extreme system hog.

6

$40, www.gothic3.com, ESRB: T

Medieval II: Total War

Rotting cows + boiling oil + flaming arrows = hours of fun!

***Medieval II: Total War* takes the series back to its roots, with even bigger armies, more glorious visuals, and more splendiferous castles to lay siege to.**

Put your standard RTS in a blender with *Civilization* and you've essentially got the *Total War* series of strategy games, which combine equal parts turn-based play and real-time point-and-click fare to give you a strategy experience unlike any other.

Medieval II's epic campaign spans the years 1080 to 1530, which encompasses the First Crusade and the dawn of the Renaissance. Unlike in the first *Medieval*, this time you get to play with gunpowder, which means your army can field rifle/missile infantry, cannon, and even rocket artillery. There are 21 playable factions representing hundreds of units in the game, ranging from the core English, French, and Spanish factions to the Turks, Byzantines, Moors, and Egyptians. Whichever group you choose, the goal is the same: Become the most powerful country in the world!

This task may be accomplished through sheer brute force on the battlefield, savvy diplomacy, or a bit of both. The game plays out at the macro level on the turn-based adventure map, where you must decide which buildings and units to construct in each of your cities, as well as where to send diplomats, priests, traders, and—naturally—conquering armies. The AI then gets to do the same, and when two opposing forces decide to lock horns, you can elect to take control of things at the micro level—down in the trenches commanding your troops. (Or you can let the AI auto-resolve the battle, based solely on strength of numbers, but what fun is that?)

Battles may involve literally thousands of troops, which you command in typical RTS fashion, and great effort has gone into making them all look different on the battlefield (whereas in the original, armies looked like hordes of zombie clones). When two large armies clash, the resultant carnage is truly something to behold!

Overall, the AI puts up a decent challenge, more so on the world map than the battlefield, however. Our only other complaint is that the naval aspect of the game blows—it is essentially unchanged from *Rome*'s lackluster effort in this area.

But don't let that stop you from experiencing what is the biggest, most visually stunning, and deepest *Total War* game yet—and that's saying something.

—STEVE KLETT

MEDIEVAL II: TOTAL WAR **9**

$50, www.totalwar.com, ESRB: T

Marvel: Ultimate Alliance

Incredible comic-book action without any onomatopoeia

Assembling special squads like the Avengers, Fantastic Four, or X-Men gives team bonuses.

Marvel: Ultimate Alliance scrapes every corner of the Marvel universe for an all-encompassing comic-book adventure that's a pleasure to play—even if you can't tell the difference between Thor and Beta Ray Bill. For those who can, this game is guaranteed to give you a nerdgasm.

Earth's mightiest superheroes band together to combat Dr. Doom's alliance of villains, dubbed the Masters of Evil. The Latverian monarch has plans to steal cosmic powers that will grant him the powers of a god, and your quest to stop him takes you from the depths of Atlantis to the gates of Valhalla, punching and smashing multitudes of minions along the way. We were impressed by how well the epic comic tale translated into the game, which rivals Marvel's *Infinity Gauntlet* saga in scale.

In each mission, you lead four heroes—selected from a roster of 20—most of which are unlocked throughout the game. Familiar characters like Spider-Man and the members of the Fantastic Four are suitable for the uninitiated, but diehard comic fans will get a kick out of using more obscure champions like Ms. Marvel and Deadpool. We were even more impressed by the number of villains that make cameos as minibosses. The Winter Soldier (Captain America's sidekick turned evil), Scorpion, Bullseye, and the dragon Fin Fang Foom all stand in your way, and that's only in the first level! The game boasts over 140 characters—a marvelous achievement in its own right.

Even though the "dungeons" that make up each level are straightforward and filled with simplistic puzzles, the variety of environments and enemies kept us sucked into the button-mashing gameplay. Manageable RPG elements grant you cool new abilities and skills, while plenty of unlockable skins and bonus materials extend the already lengthy lifespan of the single-player game.

The PC version is $20 cheaper than the Xbox 360 edition but looks and plays the same as its next-gen console counterpart. The only differences are the lack of two bonus characters (Colossus and Moon Knight) and a less-polished multiplayer interface. Firewall and router settings may need some tweaking before you can jump into a co-op game.

It's not often that the two sects of geekdom come together so flawlessly for such an enjoyable gaming experience. Hopefully, *Marvel: Ultimate Alliance* will give gamers reason to venture into the comic-book world, and vice versa.

—NORMAN CHAN

MARVEL: ULTIMATE ALLIANCE **9**

$40, www.marvelultimatealliance.com, ESRB: T

Win Rig of the Month

AND WIN BIG!

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 $500 gift certificate for Buy.com

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) February 1, 2007, 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. The final winner in this contest will be announced in the April 2007 issue. 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...

✓Virtual Machines ✓Vista ✓CRTs ✓Desks ✓Linux ✓Mobos

THE FUTURE OF VIRTUAL MACHINES

*In Paul Lilly's article "Virtuality" (January 07), he compares Microsoft's **Virtual PC 2004**, Parallels' **Workstation 2.2**, and VMware's **Workstation 5.5**. He complains about the cost of VMware's product but neglects several pretty big issues.*

*First, his complaint about the 4GB max RAM limit is being addressed with the upcoming **Workstation 6**. Individual virtual machines will have a limit of 8GB, and the total RAM for all running guest VMs is unlimited (up from 4GB).*

*Second, VMware has two free products, **VMware Player**, released in December 2005, and **VMware Server**, released in July 2006. I would have expected him to at least mention those offerings before dismissing the more expensive **Workstation** product and opting for the Parallels solution. True, **Player** does not have the utilities to create or edit a VM, but there are several tools available around the Internet (including my own **VMX Builder**, available at **http://tinyurl.com/kdl5u**) that give users the ability to do so, again for free.*

*I do hope Mr. Lilly takes a closer look at the other offerings from VMware before merely dismissing its **Workstation** product as being too costly. Most general users of virtualization products, who appear to be the target audience of Mr. Lilly's article, can be aptly served by the free **VMware Player** product.*

—Robert D. Petruska

EDITOR IN CHIEF WILL SMITH RESPONDS: Our official policy at *Maximum PC* is to review only current, shipping products, which is why we didn't test VMware's *Workstation 6* or *Virtual PC 2007.* Software changes during the testing phase, and this can affect the final verdicts given to products.

While we were aware of VMware's free *Player* software, its inability to create custom virtual machines precluded it from the story. I haven't had a chance to fully test *VMX Builder* yet, but it does look like a promising fix for *Player's* shortcomings. While your app might make VMware's *Player* an alternative to Parallels' *Workstation* or *Virtual PC*, it wouldn't have affected the score *Maximum PC* gave VMware's *Workstation 5.5*.

WILL VISTA BE VAPID?

Your analysis of Vista has left me a little wary. You stated that only the Business and Ultimate editions will be able to connect to Windows domains. So where does that leave home users? Will they still be able to create an adequate home network with the Basic or Premium editions?

Will Smith also comments that Vista may not be worth it for machines more than a year old. Would disabling things like Aero Glass lessen the load for older machines? Is Microsoft seriously thinking we're all going to go out and buy new systems just for its new OS?

—Peter Zunitch

EDITOR IN CHIEF WILL SMITH RESPONDS: Home users will be able to create and connect to network shares, they just won't be able to join a domain. That's not a huge deal, outside of managed corporate environments, where your IT department controls every PC on its network.

Disabling Aero Glass will help the operating system's performance, but you also will lose one of the main benefits of running Vista. Even with Glass disabled, you'll probably still have a better experience using XP than Vista on older hardware. And yes, Microsoft does expect that a large number of people will buy new systems just to run Vista.

SAYONARA, CRT!

*I'm finally thinking about retiring my CRT and upgrading to an LCD. One of the things that has kept me from getting an LCD is that the refresh rate is too slow for most games (something I seem to recall reading in **Maximum PC**). Is this still the case? Has LCD technology finally caught up to gamers?*

—Jay Hellman

SENIOR EDITOR KATHERINE STEVENSON RESPONDS: First, you should be aware of the distinctions between the two technologies. A CRT's picture is produced when phosphorescent material in the screen is activated by an elec-

Doting on a Desk

I just moved and was looking for a decent desk. I play games and edit photos, you know, hobby stuff. I had a hard time looking for a desk online that was right for me. Maybe you guys could put together a computer desk review for regular users and gamers. Heck, it could create advertising revenues for your company. I found a cheap desk for now from Staples that I'll use until I find the right one.

—John Swiczkowski

EDITOR IN CHIEF WILL SMITH RESPONDS: We don't really have a favorite desk at *Maximum PC*. Each editor has a slightly different solution, ranging from an Ikea computer desk to a converted kindergartner's table to an antique vanity. The important thing is to find a solution that allows you to maintain proper posture while seated at your PC. You should be able to sit with your knees and hips at a right angle and your back ramrod straight. The desk should be high enough so that when you assume the proper position, your elbows are at a right angle and your hands rest slightly above the keyboard. Depending on your height, a desk that allows this can be difficult to find, so you might need to invest in a keyboard tray or footrest.

Former editor Josh Norem at his favorite desk.

tron beam. The beam must continually sweep the screen from top to bottom to keep the phosphors from fading and maintain a stable picture. A refresh rate of 75Hz means the whole picture is refreshed 75 times a second.

With an LCD, the picture is made up of individual pixels (illuminated by an ever-present backlight); pixels change independently and only when new image information is received. The speed at which these pixels can change is referred to as a display's pixel response time. In a fast-action game, new information is received at a rapid rate, so a slow pixel response time can result in image ghosting. While this was a fairly common problem with early LCDs, it has all but ceased to be an issue these days. Pixel response times have dropped dramatically, with 8ms and lower being common. Note, however, that there's no standard way of measuring and reporting these times, so they're not a reliable means of comparison among brands. Nonetheless, over the last couple years, most of the high-end monitors we've reviewed have been perfectly acceptable for gaming. See our Best of the Best list on page 63 for recommendations.

WE NEED MORE LINUX!

Could you guys give your recommendations for more Linux stuff? I wondered which desktop environment performs better according to your benchmarks and which you preferred based on ease of use and included software, Gnome or KDE? What other versions of Linux besides Ubuntu do you like and what are your thoughts about them? SUSE Linux seems to be a popular choice, for example, and so is Freespire. Are there any others you'd recommend?

—Mike

EDITOR IN CHIEF WILL SMITH RESPONDS:
We haven't done any formal Gnome or KDE performance testing, so I can't comment on benchmarks. For purely aesthetic reasons, I use Gnome. While I love the customizability of KDE, I prefer the more integrated UI design that permeates Gnome apps.

I haven't actually tested distros other than Ubuntu, Knoppix, Mepis, and Gentoo recently, so I can't really make any distro recommendations. My main requirement for a good, user-friendly Linux distro is support for a robust, easy-to-use package-management application. Beyond that, I usually recommend whatever version of Linux most people seem to be using, so I'll have a better chance of finding people who can help me. Until something better comes along, it seems that would be Ubuntu.

We'll definitely be doing more Linux coverage in the coming months, since the Linux-on-the-desktop movement seems to be picking up steam.

MOTHERBOARD MISADVICE?

*I love **Maximum PC**'s reviews of hardware and software and applaud your attention to benchmarks, which is why I am mystified with regard to your recent reviews of motherboards. In October, you raved about the features of the Asus P5W DH Deluxe and added it to the Best of the Best list. However, your review included only a scrimpy set of benchmarks. Then, in the Holiday Issue you reviewed three Conroe mobos, but nowhere in the entire article was there any mention of the Asus P5W DH Deluxe. Nor were there any benchmarks for it against which to baseline these new boards. The same thing happened again in January! The best motherboard of 2006 has been dethroned by a first-time manufacturer (EVGA) without so much as a mention. You owe us an explanation.*

— Jon Norris

SENIOR EDITOR GORDON MAH UNG RESPONDS:
Because motherboard BIOSes, chipset drivers, and graphics drivers often shift from month to month, we are very reluctant to make direct comparisons without digging out the old board, downloading the latest chipset drivers, and essentially building yet another system. Making a direct comparison between boards without current benchmarks would just be wrong. And unfortunately, we can only reproduce a subset of our benchmarks in the magazine.

The real problem is the amount of time it takes to test a motherboard. Assuming there are no problems, each motherboard reviewed in the magazine represents about a day and a half of time spent on benchmarking alone. When faced with tight time constraints, we're always going to choose to spend that time covering new products rather than revisiting already-reviewed gear that's nearing the end of availability.

That said, to me features such as insane overclocking abilities and support for SLI trump onboard Wi-Fi and driverless RAID. The P5W DH Deluxe stayed on the list while we waited for the chipset situation to stabilize for Intel CPUs, but as soon as an SLI-capable, overclocking-friendly board became available, bumping the older P5W DH was an easy decision. MPC

LETTERS POLICY: ***MAXIMUM PC*** invites your thoughts and comments. Send them to **input@maximumpc.com.** Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

COMING NEXT MONTH

MAXIMUMPC's NOT-FOR-SALE-IN-NEW YORK MARCH ISSUE

VISTA STARTER GUIDE

In time, we'll all end up moving to Vista. It's inevitable. Learn the proper way to take the plunge: how to back up your data, prep your PC, and tweak the OS for an optimum experience.

PC TOOLKIT

When trouble strikes your machine or the machine of a loved one, you want to be armed and ready with the right tools for repair. Follow our guide for putting together the ultimate PC first-aid kit.

2006 GAMING AWARDS

Has it really been a year since the last batch of games arrived in their limos, walked the red carpet, and cracked wise about each other's attire? Join us as we celebrate the games of 2006 and honor the best they had to offer.

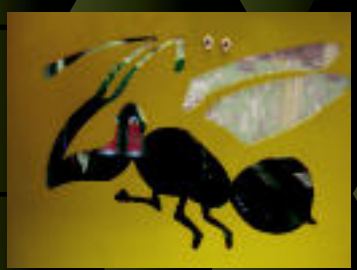
TON KHOWDEE'S

Super Hornet

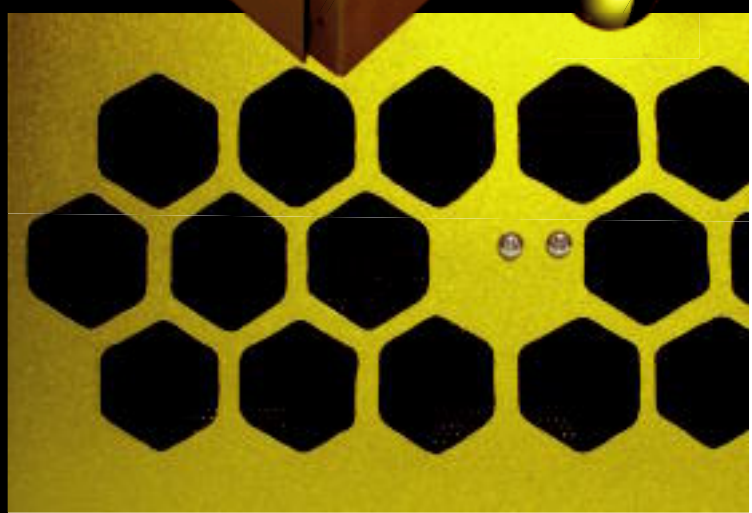
Ton Khowdee had specific goals in mind for the Super Hornet. It had to be small enough for easy transport to LAN parties, it had to be powerful, it had to be water cooled, and it had to be pimped out. And we'll be damned if that's not what he ended up with.

Small is one thing, but a single Monarch Hornet SFF case would have been a bit too cramped, so Khowdee cut another Hornet in half, attached it to the bottom of the first, and stuffed it with much of the PC's hardware. That way, his performance parts—including two EVGA 7900 GTX cards in SLI and an AMD FX-60 CPU (all water cooled, natch)—are proudly displayed free of distracting clutter in the rig's upper half. Appearances are important when the top and sides of your case swing out 90 degrees on friction hinges!

Hand-cut hornet and hive patterns adorn both sides of the enclosure, a smoked acrylic window on the front provides a peek into the rig's innards when the lights are on, and an embedded PSOne LCD just plain looks cool.



Khowdee used rivets to connect the two frames, then he fabricated a unified front panel out of aluminum and affixed it to the case with epoxy. After everything else was said and done, he applied multiple coats of sparkly Lemon Yellow Candy automotive paint.



For his winning entry, Ton Khowdee wins a $500 gift certificate for Buy.com to fund his modding madness! See all the hardware deals at www.buy.com, and turn to page 92 for contest rules.

If you have a contender for Rig of the Month, e-mail **rig@maximumpc.com** with high-res digital pics and a 300-word write-up.

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