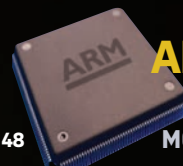


THE FASTEST,
RAREST, COSTLIEST
VIDEOCARD EVER! P. 78



TEST YOUR
PC GEEK IQ P. 48



ARM vs. X86
DEEP-DIVE
ANALYSIS ON THE
MOBILE THREAT P. 38



MAXIMUM PC

MINIMUM BS • SEPTEMBER 2011

4.8GHZ CPU • THREE VIDEOCARDS • THREE 30-INCH
DISPLAYS • 480GB OF LIGHTNING-FAST SSD STORAGE
PLUS ANOTHER 9 TERABYTES OF DRIVE SPACE!

YOU WON'T
BELIEVE
WHAT WE
PUT INSIDE!

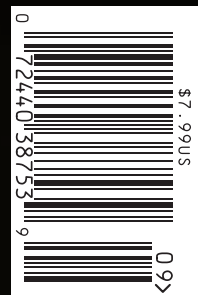
PLUS:
HOW TO BUILD
A KILLER \$340
BUDGET PC

DREAM MACHINE 2011

HOW WE BUILT THE
FASTEST, MOST
FULLY LOADED
PC EVER

EXCLUSIVE CASE!
PROTOTYPE
ENCLOSURE FROM
COOLER MASTER!

TURN THE PAGE
FOR GREATNESS



HOW TO DUAL-BOOT WIN7 AND THE ULTRA-EFFICIENT JOLI OS P. 62



**A great case is the foundation
of a great system**

Learn more at corsair.com/cases

inside

SEPTEMBER 2011



On the Cover
Photo by
Mark Madeo

FEATURES

24



24 DARE TO DREAM
It's that time of year when we throw caution to the wind and build a rig that most folks can only dream about.

38 ARM VS. X86
Does a growing proliferation of tablets spell doom for desktop PCs?

48 GEEK QUIZ
55 PC tech questions that will either make you feel really smart or really stupid. Hope you studied!

QUICKSTART

08 NEWS
Will Llano be the key to an AMD comeback? Plus, the arrival of terabyte hard drives for notebooks.

14 THE LIST
Our eight favorite things from this year's E3.

16 HEAD TO HEAD
Bigfoot Killer Wireless-N 1102 vs. Intel Centrino Ultimate-N 6300

R&D

58 WHITE PAPER
How autostereoscopic 3D will free us from the funny glasses.

59 AUTOPSY
We dissect a pair of 3D Vision active shutter specs.

61 HOW TO
Dual-boot into the speedy Joli OS; use Win7's Problem Steps Recorder to make easy PC guides.

66 BUILD IT
Build a \$340 ultra-budget PC.



Star Wars

LETTERS

20 DOCTOR

94 COMMENTS

IN THE LAB

74 GIADA 150 PC



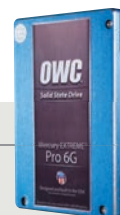
78 XFX RADEON HD 6990



76 SAMSUNG SERIES 5 CHROMEBOOK



82 OWC MERCURY EXTREME PRO 6G



MORE +

MAXIMUM PC

TECH GROUP

Vice President: Kate Byrne
Editorial Director: Jon Phillips

EDITORIAL

Deputy Editor: Katherine Stevenson
Senior Editor: Gordon Mah Ung
Senior Associate Editor: Nathan Edwards
Online Managing Editor: Alex Castle
Online Features Editor: Amber Bouman
Online Associate Editor: Alan Fackler
Contributing Writers: Seamus Bellamy, Michael Brown, Loyd Case, Brad Chacos, Paul Escallier, Ken Feinstein, Nathan Grayson, Tom Halfhill, Paul Lilly, Thomas McDonald, David Murphy, Quinn Norton, Bill O'Brien, Ryan Whitwam
Podcast Producer: Andy Bauman
Editor Emeritus: Andrew Sanchez

ART

Art Director: Richard Koscher
Contributing Art Director: Boni Uzilevsky
Photo Editor: Mark Madeo
Contributing Photographer: Patrick Kawahara

BUSINESS

National Sales Director: Anthony Losanno, 646-723-5493
Regional Sales Manager, West Coast: Greg Ryder, 650-745-9243
Regional Sales Manager, West Coast: Bryan Plescia, 650-238-2523
Account Executive, East Coast: John Ortenzio, 646-723-5492
Account Executive, East Coast: Samantha Rady, 646-723-5402
Marketing Associate: Robbie Montinola
Publishers Assistant: Jaime Dioli
Advertising Coordinator: Austin Park, 650-745-9207

PRODUCTION

Production Director: Michael Hollister
Production Manager: Larry Brisenio
Senior Production Coordinator: Dan Mallory
Print Order Coordinator: Jennifer Lim

CONSUMER MARKETING

VP / Director Consumer Marketing: Rich McCarthy
Circulation Director: Crystal Hudson
Newsstand Director: Bill Shewey
Consumer Marketing Operations Director: Lisa Rader
Renewal & Billing Manager: Mike Hill
Sr. Online Consumer Marketing Director: Jennifer Trinkner
Customer Service Manager: Mike Frassica

FUTURE US, INC.

4000 Shoreline Ct., STE 400, South San Francisco, CA 94080
 Tel: 650-872-1642, Fax: 650-872-2207, www.futureus.com

President: John Marcom

VP / CFO: John Sutton
VP / Sales & Marketing: Rachele Considine
VP / Internet & Mobile Products: Mark Kramer
General Counsel: Anne Ortel
Human Resources Director: Nancy Dubois

SUBSCRIBER CUSTOMER SERVICE

Maximum PC Customer Care,
 P.O. Box 5159, Harlan, IA 51593-0659
 Website: www.maximumpc.com/customerservice
 Tel: 800-274-3421
 Email: MAXcustserv@cdsfulfillment.com

BACK ISSUES

Website: www.maximumpc.com/shop
 Tel: 800-865-7240

REPRINTS

Future US, Inc., 4000 Shoreline Court, Suite 400,
 South San Francisco, CA 94080
 Website: www.futureus.com
 Tel: 650-872-1642, Fax 650-872-2207



Future produces carefully targeted magazines, websites and events for people with a passion. We publish more than 180 magazines, websites and events and we export or license our publications to 90 countries across the world.

Future plc is a public company quoted on the London Stock Exchange.

www.futureplc.com

Chief Executive: Stevie Spring
Non-executive Chairman: Roger Parry
Group Finance Director: John Bowman
 Tel +44 (0)20 7042 4000 (London)
 Tel +44 (0)1225 442244 (Bath)

©2011 Future US, Inc. All rights reserved. No part of this magazine may be used or reproduced without the written permission of Future US, Inc. (owner). All information provided is, as far as Future (owner) is aware, based on information correct at the time of press. Readers are advised to contact manufacturers and retailers directly with regard to products/services referred to in this magazine. We welcome reader submissions, but cannot promise that they will be published or returned to you. By submitting materials to us you agree to give Future the royalty-free, perpetual, non-exclusive right to publish and reuse your submission in any form in any and all media and to use your name and other information in connection with the submission.



Gordon
Mah Ung

WE'RE RIGHT, AND THEY'RE WRONG

THE FIRST DREAM MACHINE I ever helped build was Dream Machine '98. I was but a junior editor surrounded by the legendary *boot* magazine staff, including Big Daddy and Handy Andy. Our goal—then as now—was to build the fastest, most kick-ass PC we could muster.

The process started with a bunch of nerds sitting around a conference room table, tossing out hardware proposals and arguing why someone else's choice was right or wrong. There were raised voices, guffawing, furrowed brows, and the muttering of words that can't be printed here.

Since then, our staff and hardware options may have changed, but the process and goal remains the same: nerds picking their most dream-worthy hardware, and celebrating the greatness of a scorching-fast PC. This tradition has faced many challenges, but nothing has ever been able to stop our quest for uncompromised PC power.

In the late 1990s, there was an industry push for thin-client computing—remember the “Network Computer”? And then there was the “Free PC,” which a few misinformed suits in our own company smugly proclaimed to be the future. Yeah, right. Instead of paying for good hardware, consumers would happily accept crappy PCs—completely free, but we would have to suffer on-screen banner ads that subsidized the cost of the computer.

The PC even survived two self-inflicted wounds: Windows Millennium and the original iteration of Windows Vista. And the platform has

also outlasted all the pundits who've regularly pronounced PC gaming to be dead. Apparently those pundits discovered this thing called the Internet. It turns out that people play games on the Internet—and download games from it, too.

Well, the funeral march is sounding again. The same experts who wrongly predicted the death of the PC so many times before are now saying we live in the “post-PC” era. Sure, shiny new tech toys now share desk space with my mouse and keyboard, but anyone who thinks the PC is dead is a fool.

I'll say it again to all the naysayers: We're right and you're wrong. And this year's Dream Machine, revealed in detail on page 24, is our overclocked, multiterabyte, frame rate-spitting answer to all the haters. Whether you approve of our build, think it's crap, or completely disagree with everything I've written above, we want to hear about it. Send your thoughts to comments@maximumpc.com.

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

⇨ submit your questions to: comments@maximumpc.com

THE NEWS



The A8-3850 combines a quad-core chip equivalent of an Athlon II X4 with the power of a discrete GPU.

AMD Back in the Game

Is the future of x86 in graphics?

LET'S FACE IT, being an AMD fan waiting for good news is akin to being a Cubs fan. You've got a long wait, buddy.

But AMD's dry spell might finally be over if the company's latest launches are an indicator of things to come. AMD's first Fusion product, code-named Brazos, threw everyone for a loop by out-selling all expectations. In fact, AMD sold out of every Fusion E- and C-series chip it could make.

The follow-up to that, code-named Llano, might do just as well, or better, if all the positive press means anything. Noted hardware reviewer Anand Lal Shimpi of Anandtech.com heaped praise on the chip, saying,

"If you're looking to build an entry-level gaming PC, Llano is most likely going to be on your hit list this year." He added, "It took AMD spending half the transistors of Llano on its GPU to deliver the sort of performance we've been asking for from integrated graphics for over a decade; the question I have is whether or not Intel is willing to make a similar sort of move in its architectures?"

The buzz around the success of Brazos and Llano has been so good that some stock analysts have even upgraded the company's perennially battered stock from "market perform" to "outperform." One of the

same analysts, Craig Berger of FBR Capital, also downgraded Intel from "outperform" to "market perform."

Llanos will come in dual-core and quad-core x86-core configurations, with the GPU essentially a Radeon HD 6550 integrated into the chip. The top-end Llano APU for desktops will be the A8-3850 chip and will retail for about \$135. It will require motherboards using a new FM1 socket. The desktop Llano will likely find its way into mainstream budget builds and all-in-one configurations.

Where Llano needs to succeed most is in notebook PCs—an area in which AMD does particularly poorly

today.

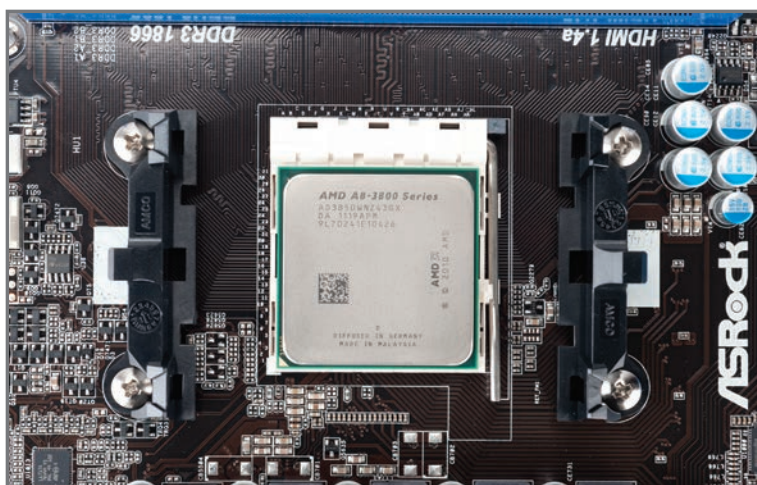
But notebooks are where most people think AMD's Llano will do well, given the messaging around a better graphics core and supposedly better battery life. AMD says a Llano notebook with the A8-3510MX offers more than 10 hours of runtime, while a Core i5-2410M clocks less than seven hours. The graphics message is appealing because Llano lets you run the integrated graphics core with a discrete controller in Hybrid CrossFire mode. With Intel, you get either onboard or discrete but you can't combine their power.

Despite the versatile graphics, however, Dean McCarron with Mercury Research says mainstream consumers rarely buy based on specs alone. "For most users, the equation usually comes down to 'this is my budget, what can I get for my budget?'" according to McCarron.

Still, McCarron says that for Llano to be a success it needs to compare well to the existing product, and that's where AMD seems to be hitting it out of the ballpark.

"Llano is a pretty big jump over the existing product," he adds.

—GORDON MAH UNG



AMD's new A-series APU chip will require the new FM1 socket.



Samsung Brings 1TB Drives to Laptops

Laptops are catching up to desktop PCs in a lot of ways, but they're still lagging behind in storage space. Terabyte hard drives aren't quite a dime a dozen on desktops, but you can easily find a decent one for less than \$100, and several PCs sport a 1TB drive in their basic configuration. Not so with laptops, which have been bereft of such generous options. Samsung's coming to the rescue of storage-deprived portable PC owners with the announcement of a new 1TB internal hard drive designed for use with laptops.

The 2.5-inch, 9.5mm-slim Spinpoint M8 features two 500GB platters for a 1TB total capacity. Samsung attributes the feat to advanced formatting technology, which allows more data storage per unit area, making the overall hard drive denser. The drive uses a 3Gb/s SATA interface and includes 8MB of cache. It will sell for \$130. —BC

MS VP Teases Win8 Release Date

As the weeks go by, we continue to learn more about the next major Windows release, Windows 8. We know, for example, that Windows 8 will integrate Xbox Live support, and that the new Start screen will look a lot like Windows Phone Live Tiles. It will run on regular desktops and tablets, and there will be versions for ARM processors. But one thing we don't know is exactly when it will ship. That's OK, because Microsoft Corporate VP Dan'l Lewin implied that we can figure it out by doing the math.

Speaking at the startup LAUNCH event at the Microsoft Silicon Valley campus, Lewin was quoted by TechRadar.com as saying, "If you look at the crystal ball and just say what happened in the past is a reasonable indicator of what our forward-looking timelines will be and just speculate... we've made the point about having a developer conference later this year, and then typically we enter a beta phase, and then in 12 months we're in the market, so let's make that assumption."

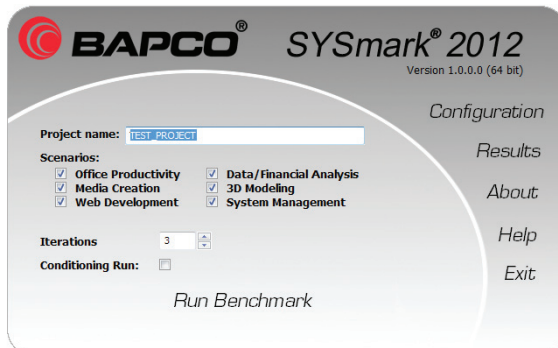
This year's professional developers conference (now called Build) is scheduled for September 13. If the first Windows 8 beta follows not long after, you can expect the final version to ship in autumn 2012, based on the hints Lewin dropped. —PL

AMD Burns Benchmark to Ground

AMD has quit its position on benchmarking organization BAPCo, saying the newly released SYSmark2012 is irrelevant and cooked to favor Intel's CPUs.

The company says the massive benchmarking suite simply doesn't exploit processor resources available today and that companies and governments using it to justify buying decisions overspend by \$8 billion because of it.

BAPCo officials deny the claims and say AMD had a lead role in developing milestones used to pick the workloads and even voted to support 80 percent of those tests. BAPCo's SYSmark has long been used to judge the performance of a computer in business applications and content creation tests. —GU



Tom Halfhill
Fast Forward

AMD AND ARM: GET A ROOM!

"THE ENEMY OF my enemy is my friend." That reasoning has led to many strange alliances among nations, but it also makes for some interesting business partnerships. For example, at AMD's recent Fusion developers' conference, AMD and ARM were practically flaunting their PDAs—public displays of affection, not personal digital assistants.

ARM is the world's leading supplier of 32-bit CPU cores for cell-phone processors, consumer electronics, and embedded systems. Lately, this relatively small British company has been irritating Intel, which is trying to muscle into ARM's low-power territory, so AMD and ARM share a common enemy. Their hugfest at AMD's conference has important implications.

AMD is panting over heterogeneous microprocessors, which integrate multiple processor cores of different architectures on the same chip. AMD's Fusion processors are heterogeneous, because they combine AMD's x86 CPU cores with an AMD Radeon GPU core. More particularly, AMD is lusting for heterogeneous processing—sharing general-purpose workloads among different cores, instead of dedicating some cores to specialized tasks.

Programmers are already using GPUs for general-purpose computing on AMD's ATI Stream and Nvidia's CUDA software platforms. Before Fusion, however, the GPU was a second-class citizen, relegated to the PCI Express bus. Fusion couples the GPU directly to the CPUs, making them peer processors. Now AMD is suggesting that ARM's CPU cores could make it a threesome.

ARM cores could appear in PC processors or in future AMD embedded processors. They could work alongside the x86 CPUs and GPU, offloading some chores that require better power efficiency. Programming becomes more complex, but the chip could save power and cost less. This union could also save AMD the trouble of developing very-low-power x86 cores.

If the flirting between AMD and ARM turns serious, maybe Intel will be the one who's hot and bothered.

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



Thomas McDonald
Game Theory

FOREVER WASN'T LONG ENOUGH

NOTHING IS LESS edgy than someone trying really, really hard to be edgy. I can imagine the Duke Nukem Forever team working late into the night in Red Bull-fuelled sessions trying to come up with lists: lists of offensive things, lists of gross things, lists of old action movie quotes, lists of ways to objectify and degrade women, lists of boob and penis jokes.

At some point, someone says, "Let's make a mini-game called Alien Abortion that's played on a picture of a naked, terrified rape victim!" and everyone thinks that sounds just grand.

All of it is in there, and all of it is so very tiring. Duke is over the hill, out of date, and completely skeezy. If this game was a person, he would be a paunchy middle-aged man with a bad comb-over and a silk shirt open to the waist to reveal the cornicello tangled in his matted, graying chest hair. It is so desperate to be Super-Alpha-Male-Plus-with-Extra-Testosterone-on-Top that it winds up merely sad and sickening. Duke has become the thing he once parodied.

Neither the gameplay (which is uniformly awful) nor nostalgia (which is a cheap coin quickly spent) kept me playing: only grim duty.

There is nothing edgy or even shocking about how far the game travels into the realm of bad taste. Bad taste is easy if you have no sense of shame. It doesn't take skill or courage: just a broken moral compass and a sexual development that was flash-frozen at the age of 14. It's nothing an adult should be proud of, but in our increasingly juvenile society, actual adults are getting hard to come by, and none of them worked on Duke Nukem Forever.

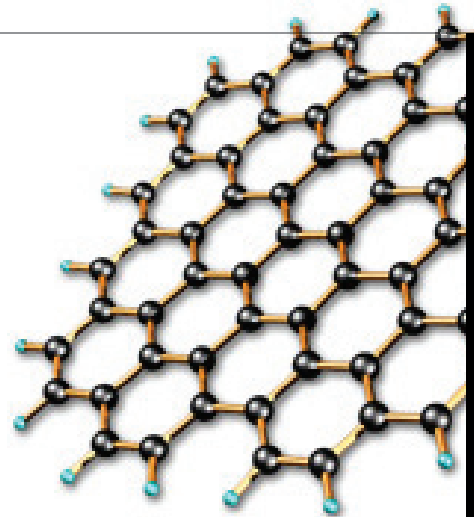
Thomas L. McDonald can be found online at stateofplayblog.com.

IBM Creates First High-Speed Graphene Circuits

Researchers at IBM have announced that they recently managed to create the first high-speed computer circuits out of a material called graphene. This process has possible applications in displays, processors, and high-speed communication. While this advancement is interesting, we're not quite ready to ditch traditional transistors quite yet.

Graphene is composed of a single layer of carbon atoms in a lattice structure. Researchers have created single graphene transistors in the past, but only now has an entire circuit been produced. At present, graphene does not behave like CMOS transistors in current CPUs. It does not have the same voltage conduction properties, meaning it cannot switch on and off like today's logic transistors do.

That hasn't stopped industry from investing heavily in the technology. Applications in communication and OLED displays are much closer to reality. DARPA has funded most of IBM's research on the substance. IBM, in addition to working on integrated circuits with graphene, is improving the production of the material. If graphene is as useful as many think, they're going to need a lot of it. **-RW**



investing heavily in the technology. Applications in communication and OLED displays are much closer to reality. DARPA has funded most of IBM's research on the substance. IBM, in addition to working on integrated circuits with graphene, is improving the production of the material. If graphene is as useful as many think, they're going to need a lot of it. **-RW**

Facebook, Apple to Square Off?

A war between Apple and Facebook may be brewing, if news reports are accurate. Facebook's Project Spartan could be an attempt by the massive social networking company to make an end run around Apple's iron-fisted control of its App Store. The idea is to create an HTML5-based platform that would offer the same experience as a native app on Apple's Safari browser. Since it will be browser-based, there's no need to deal with Apple's App Store or the rules it imposes on developers. Industry watchers believe the rift between Apple and Facebook has been building and point to extensive Twitter integration in the upcoming iOS 5, where Facebook is ignored. **-GU**

Hulu to Sell Itself?

A number of tweets from CNBC and *Wall Street Journal* reporters indicate that the popular TV streaming site Hulu may be on the verge of selling itself to an unknown party. Apparently, a large company approached Hulu with a buyout offer, and Hulu is currently considering its options. But who could it be?

According to CNBC's Julia Boorstin, it's not Google, but that's all we have to go on. Whoever it is must have a desire to gamble. Hulu doesn't have long-term rights to stream its content. This was the main sticking point to a possible IPO last year.

Hulu is jointly owned by Disney, News Corp, and NBC, along with Providence Equity. For the time being, they have an interest in keeping the service alive. If those media companies are no longer so intimately associated with Hulu, would the website still enjoy favorable content deals? **-RW**





Quinn Norton
Byte Rights

KILL -9 DUE PROCESS

AFTER MORE THAN 90 legally questionable domain seizures for the non-crime of criminal contributory copyright infringement, the Department of Justice is facing its first suit from Puerto 80, the Spanish owners of Rojadirecta. The complaint tells the disturbing story of trying to discuss the seizure with the government and being ignored for months. Only after filing suit did the DOJ start returning phone calls, but even then the government's compromise was the illogical and impossible request that Rojadirecta's users never post a link to U.S. content. The New York Department of Homeland Security needs to take some Internet classes at their local community college.

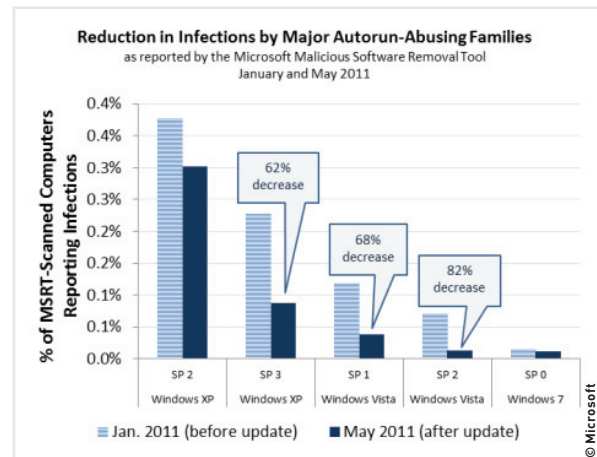
Puerto 80 says the seizures of the mostly forum, discussion-based website's domains count as "prior restraint," a form of censorship and violation of the First Amendment. Violating First Amendment rights requires a much higher standard of evidence than what DHS had in its warrants, which were issued in the first place for a crime that doesn't, and never has, existed in U.S. law. While they're down at the CC, they might want to look into a basic law class.

In the meantime, the same DHS requested the extradition of college student Richard O'Dwyer from the UK for running linking site TVShack, despite the fact that, as with Puerto 80, sites similar to his have been found legal in domestic courts. O'Dwyer never visited the U.S., never hosted servers here, and—I can't seem to say this enough times—he faces extradition for something that isn't even criminal here. The case is driving questions in the UK parliament about its whole extradition treaty with the U.S.—just one more way DHS is unloading a clip into its own foot. Are the paranoid whims of big media companies really worth damaging the First Amendment, our relationship with two allies, and the credibility of our law enforcement?

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

MS Defeats Autorun Malware

The dark corners of shady Internet bars just became a whole lot safer thanks to Microsoft. The boys and girls in Redmond noticed a disturbing trend toward the end of 2010; the rate of infection due to malware spread via Autorun was skyrocketing. Rather than shrugging their shoulders and telling Symantec to deal with it, the company released an update in February that disabled most Autorun functions on Windows PCs. Four months later, the results are in—malware authors looking to slip your computer a mickey via infected flash drives had better start looking at Linux instead. **—BC**



Is Ubuntu Ditching Firefox?

Longtime compatriots Ubuntu and Firefox might be parting ways, with signs pointing to the likelihood that the Linux OS will adopt Chrome as its browser.

The whiff of discontent comes courtesy of a Network World interview with Canonical founder Mark Shuttleworth. During the interview, Shuttleworth said the Ubuntu team considered making the switch with the next release of the operating system, and "it's a real possibility" that Chrome may displace Firefox in the future. For now, Firefox will be included in the upcoming Ubuntu 11.10 release. "That probably keeps us on Firefox for another year, at least, and we'll see from there," Shuttleworth added.

If the rest of the interview is any indication, the future of Firefox on Ubuntu doesn't look very bright. Shuttleworth spent much of the interview talking about Chrome and how awesome it is, especially in the Linux environment. Google's browser has been developed from the ground up to include Linux support—Chrome OS is a Linux variant—and Shuttleworth said that focus makes Chrome a performance powerhouse on the open-source operating system. **—BC**



Image credit: Joe Dragt

Making Art from Motherboards

There are lots of ways you can recycle your old PC parts. Turning your obsolete processor into a keychain is a classic example and one that's easy to do. Arizona artist Joe Dragt came up with a different way to breathe new life into old hardware, and his creations are full of win.

Dragt is a professional graphic artist and web designer, and a technology geek at heart. Combining his passion for tech with his skill for oil painting, he started using computer components as canvases for his artwork.

You can view his growing collection of painted circuit boards at his site, Tomorrow and Beyond (www.tomorrowandbeyond.com), where he also sells originals, 8x10 gloss prints, and 11x14 gloss prints. **—PL**

THE LIST

8 THINGS THAT MOST EXCITED US FROM E3 2011

8

STAR WARS: THE OLD REPUBLIC

It looks a little too WoW-ish for comfort, but we're still pumped for a good Star Wars MMO.



4

MASS EFFECT 3

The first two games were solid gold, and what we've seen of the third so far has us panting. There's no way that the Mass Effect trilogy isn't going to end with a bang.



3

SKYRIM

We're as sick of the glut of sequels as the next guy, but man, some franchises are just too good to end.



7

CURVED DISPLAYS

These were all over the place at E3. They look amazing, but when will regular consumers actually be able to buy one?



2

BATTLEFIELD 3

It's being hailed as the game that could end the stagnation caused by Call of Duty's continued, unchecked dominance.

6

RAGE

Great design, solid shooting action, and fantastic graphics prove id Software still knows how to get the most out of PC hardware.



BIOSHOCK: INFINITE

Lavish colors, an intriguing story line, and FPS-meets-rollercoaster gameplay have us salivating.

1

RAZER HYDRA

Motion control is almost everywhere these days, except the PC. We're not sure how much software support Razer's system will have, but the Hydra is a lot of fun to use.

5



HEAD TO

BY MICHAEL BROWN

Bigfoot Killer Wireless-N 1102 vs. Intel Centrino Ultimate-N 6300

Out-of-whack price/performance ratios snuffed our enthusiasm for earlier Bigfoot Networks Killer NIC products. Would that be the case with the company's first wireless NIC, too? To find out, we tested two otherwise-identical CyberPower X6-9300 gaming notebooks: one with Bigfoot's new Killer Wireless-N 1102, and the other with Intel's Centrino Ultimate-N 6300. The Intel part supports three 150Mb/s streams while the Atheros AR9382-based Bigfoot part supports two streams.

**BIGFOOT KILLER
WIRELESS-N**



Round 1: TCP Throughput

Bigfoot tells us it has optimized the software for latency-intolerant applications: multiplayer games, VoIP, video streaming, and so on. The trade-off, a company spokesperson said, is slightly lower TCP performance, which is used for email, web browsing, and other apps where packets can be reassembled out of order.

But our Jperf tests didn't reveal a yawning performance gap: Intel's part was 11 to 19 percent faster on the 2.4GHz band, with the bigger difference occurring at a longer distance (with the client on our outdoor patio). Bigfoot's part, on the other hand, delivered slightly faster performance when operating on the 5GHz frequency band, although the delta wasn't nearly as wide (just 5 percent). Intel's part was negligibly faster on the 5GHz band when the client was on the patio.

**Winner: Centrino
Ultimate-N 6300**



Round 2: UDP Throughput

Applications that can't tolerate latency—online games, VoIP, audio and video streaming apps, and similar programs—utilize UDP (User Datagram Protocol). UDP operates on the assumption that it's better to drop packets than to wait for them, and that the application will handle any necessary error correction.

When we configured Netperf to send 1,024-byte packets using UDP, we saw only negligible differences in throughput: Intel was 1 percent faster on the 2.4GHz band, and Bigfoot was 5 percent faster on the 5GHz band. But when we increased packet sizes to 1,472 bytes (the maximum size that will fit within an Ethernet frame, assuming a 20-byte IP header and an eight-byte UDP header), Bigfoot's part delivered UDP throughput eight to 10 times faster than Intel's.

**Winner: Bigfoot Killer
Wireless-N**



HEAD

BENCHMARKS

	Killer Wireless-N 1103 (2.4GHz)	Intel Centrino Ultimate-N 6300 (2.4GHz)	Killer Wireless-N 1103 (5GHz)	Intel Centrino Ultimate-N 6300 (5GHz)
JPERF TCP, KITCHEN (MB/S)	79.8	88.5	147.0	140.0
JPERF TCP, PATIO (MB/S)	49.6	59.0	44.4	44.9
NETPERF UDP (1,024-BYTE PACKETS), KITCHEN (MB/S)	102.1	103.2	163.4	155.5
NETPERF UDP (1,472-BYTE PACKETS), KITCHEN (MB/S)	29.0	3.3	36.3	3.4
2GB FILE TRANSFER (SEC)	179.0	187.3	139.0	188.7

Best scores are bolded. We used a Linksys E4200 router for these benchmarks, which supports two spatial streams on its 2.4GHz radio, and three spatial streams on its 5GHz radio. In the Kitchen test, the router and client are 20 feet apart and separated by one interior wall. In the Patio test, the router and client are 38 feet apart and separated by one interior and one exterior wall.



INTEL CENTRINO ULTIMATE-N 6300

Round 3: Latency

We used the Bigfoot-developed GaNE (Gaming Network Efficiency) benchmark for this test. We're naturally suspicious of vendor-developed benchmarks, but Bigfoot is opening its source code so we'll give it the benefit of the doubt here. GaNE measures the latency between two PCs on the same local network by sending a 100-byte packet over the network every 50 milliseconds (a scenario typical of online games).

The Killer Wireless-N 1102 absolutely crushed Intel's NIC on this benchmark, delivering average ping times of just 1.2ms on the 2.4GHz band, compared to 7.3ms for Intel's adapter. We saw similar results on the 5GHz band, with Bigfoot's card delivering average pings of 1.1ms compared to the Intel card's 10.9ms.

Winner: Bigfoot Killer Wireless-N



Round 4: Real-World File Transfer

For this test, we timed how long it took for each notebook to copy a 2GB file over the wireless network to a third computer hardwired to the router. We repeated the test three times on each notebook on each frequency and averaged the results. We expected these results to be relatively similar to the more synthetic Jperf test, but Bigfoot's card proved to be slightly faster than Intel's card on the 2.4GHz band—and it was significantly faster than Intel's card on the 5GHz band.

Winner: Bigfoot Killer Wireless-N



And the Winner Is...

It's actually a double win for **Bigfoot's Killer Wireless-N 1102**. The adapter scored resounding wins in three of our four categories, and it's significantly less expensive than Intel's part—at least in CyberPower's configurations. You can't buy the part at retail, and Bigfoot can't dictate how much OEMs charge their customers, but CyberPower charges \$15 to upgrade to Bigfoot's part, versus \$26 for an upgrade to Intel's Centrino Ultimate-N 6300. ☺



DOCTOR

THIS MONTH THE DOCTOR TACKLES...

- > Tiny Boot Drives
- > Event ID 41
- > Motherboard Swaps

No Space on Das Boot

I recently ordered a new computer with a 30GB solid-state drive as a boot drive. My problem is that while most programs give an option of where to install them, some default to the C: drive and can't be changed. Between Microsoft automatic updates and software that can't be installed elsewhere, my drive is filling up.

I feel I have been duped into using an SSD. The consequences far outweigh the benefits. Is there a simple way to change the BIOS to designate the secondary drive as my primary drive, but still boot from the SSD? Is there software that will transfer programs installed on my C: drive to my G: drive? I, for one, am very sorry I ever elected to have an SSD installed.

—John Dalton

THE DOCTOR RESPONDS:

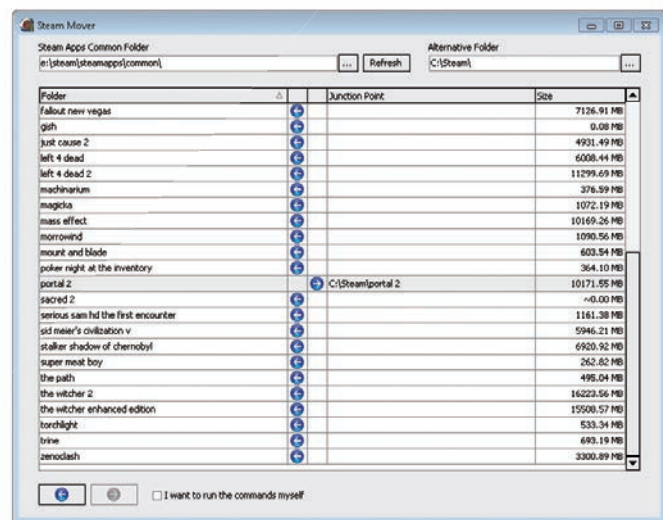
30GB is pretty damn cramped for a boot drive. We're not surprised you're having space problems. We wouldn't recommend a boot drive smaller than 60GB with Windows 7, and of course, bigger is even better. Not that that helps you right now. That said, there are a few things you can do to minimize stress. Use symbolic links to offload some directories

to your storage drive. Steam Mover, though primarily used to move (yep) Steam games to and from an SSD, can in fact move any files and folders if you change the source location. This is helpful if you want to move your entire Documents folder to your G: drive but have Windows still think it's on C:. You should also disable System Restore and Hibernation, as those both write large amounts of data to your C: drive.

You didn't say which motherboard you are running, but if you happen to have Intel's new Z68 platform, one option would be to use the 30GB SSD as a cache drive via the Intel Smart Response Technology option in the Intel Rapid Storage Technology drivers. You can also achieve similar functionality using Silverstone's HDDBOOST adapter. Both techniques require the use of a hard drive as well, but can give you some of the benefits of running an SSD while eliminating the worry of filling your drive.

Event ID 41

A few months ago I put together a new desktop system with a Gigabyte P67A-UD7 motherboard, which I purchased prior to the chipset recall. For three



Although designed for Steam games, SteamMover can help automate the symbolic-linking process to free up room on your SSD.

weeks, everything ran wonderfully. Then I got my replacement mobo from Newegg, a P67A-UD7-B3. As soon as I installed it, I started getting random hard lockups in Windows 7 Ultimate 64. The only code I could find in the event log was "Event ID 41, Task 63."

I RMA'd the board, but the replacement P67A-UD7-B3 had the same problem. I've scoured forums looking for solutions. I've done a completely clean install of Windows 7. I've unplugged my second HDD from the motherboard. I've updated the motherboard's

BIOS and also made sure I used the drivers directly from Gigabyte's website. I don't really have any other idea what could be causing the problem, since that particular code is so generic. There were no minidump files, since it appears the system isn't BSOD'ing, simply locking up.

—Scott McAllister

THE DOCTOR RESPONDS:

Event ID 41, Task 63 simply means the machine has been restarted improperly. Translation: It freaking hard-locked. Since you have done a clean

submit your questions to: doctor@maximumpc.com

install of Win7 with base drivers (and we're assuming no additional software), it's probably not a software issue. Since you're on board number three, it's also highly unlikely that your motherboard is at fault. If the PC ran fine before, that means something was possibly damaged during the board swap. First up: Run memory tests. It's pretty rare to kill RAM from static discharge, but maybe you're just that lucky. Run a test using Memtest+ (www.memtest.org). If it passes, you might still want to double-check the RAM by removing one of the DIMMs and seeing if the computer still locks up. If it runs fine with one DIMM, remove that DIMM and put the other in to see if the lockups come back.

If the system locks with each of the DIMMs, then it's likely not the RAM. The next suspects are the PSU, the power cable, and your CPU and cooling. Of these, cooling should be the easiest to check first. Run the system with the side panel off and perhaps an auxiliary fan blowing into the system. If the lockups remain, it's likely not a cooling issue. Of course, that's assuming that you have applied enough thermal paste to the CPU cooler. The Doctor is sure, but just in case, you did reapply thermal paste to the CPU when you swapped boards, right?

Moving on, make sure that you are using the power cable that came with your PSU. Some people simply use that 15-year-old printer cable they had sitting around, which may not be able to carry the power load of your system. Next, the Doctor would look at the PSU. Unfortunately, there is no easy way to gauge a failing power supply except to remove it and replace it with a known good one. Since we don't know the condition or age of

your PSU, it's possible that it's just decided to go daffy on you. This can be exacerbated by summer heat.

The last suspect is the videocard. It's pretty unusual that a GPU is damaged by handling, but it does happen. If you have a spare card, you should swap it in to see if the random lockups go away. One thing you need to remember: If you put in an old GPU that only uses the PCIe slot power, and the lockups stop, it may not mean your GPU's at fault. Your issue is probably more indicative of an overloaded PSU, especially if your card is a higher-wattage model that uses two connectors or is a dual-GPU card.

Mobo Swap Causes Instability

I'm 11 and I built a computer with a BioStar TH55B HD motherboard, Core i7-870 CPU, Sapphire Radeon 5770 GPU, 4GB of Transcend RAM, and a GX750 PSU. I recently changed my motherboard to a used MSI P55A-G55. The machine has been acting weird since the mobo swap. On startup, it gives me a message saying that it couldn't find the hard drive, reboots, then loads into Windows (Windows 7 Professional, OEM version). It used to take a minute or two to boot with the BioStar mobo; now it takes three or four minutes. Help!

—**Jacky Z.**

THE DOCTOR RESPONDS: Jacky, you should reinstall Windows whenever you change motherboards. Even if Windows doesn't deactivate as a result of the hardware change, driver incompatibilities can cause instability like you're seeing. It's best to start from scratch. Or at least uninstall all your old motherboard drivers and download the drivers for your current motherboard from the manufacturer's website. If

“USE SYMBOLIC LINKS TO OFFLOAD SOME DIRECTORIES FROM YOUR SSD TO YOUR STORAGE DRIVE.”

your Windows install won't reactivate after the motherboard swap, give Microsoft's support line a call and the company should be able to issue an activation code.

Can't Stop the Signal

I have a Windows 7 Ultimate PC that refuses to turn off. The screen turns off but the fans and lights do not. I have to turn it off via the power strip. The motherboard is a PCChips A13. I have not flashed the BIOS. I reinstalled Windows to no avail.

—**Dr. Steven Hyleck**

THE DOCTOR RESPONDS: Your problem is likely either due to your BIOS settings, your motherboard's hardware, or your power supply. You should first reset the board to its default configuration

by going into the BIOS and selecting "load defaults." Note: This may or may not change the boot order on your machine. If you have multiple hard drives, note which one is the OS drive and place that as the first boot device. Other settings unique to your configuration, such as AHCI (not an option on your nForce board) will also have to be changed for the system to boot. If the problem persists, it's possible that your power supply is going bad and has a problem with its 5-volt standby rail or your motherboard has a problem with its power circuit. If you can borrow a power supply from someone, or you have a spare, consider swapping it out to see if the issue clears up. ☺

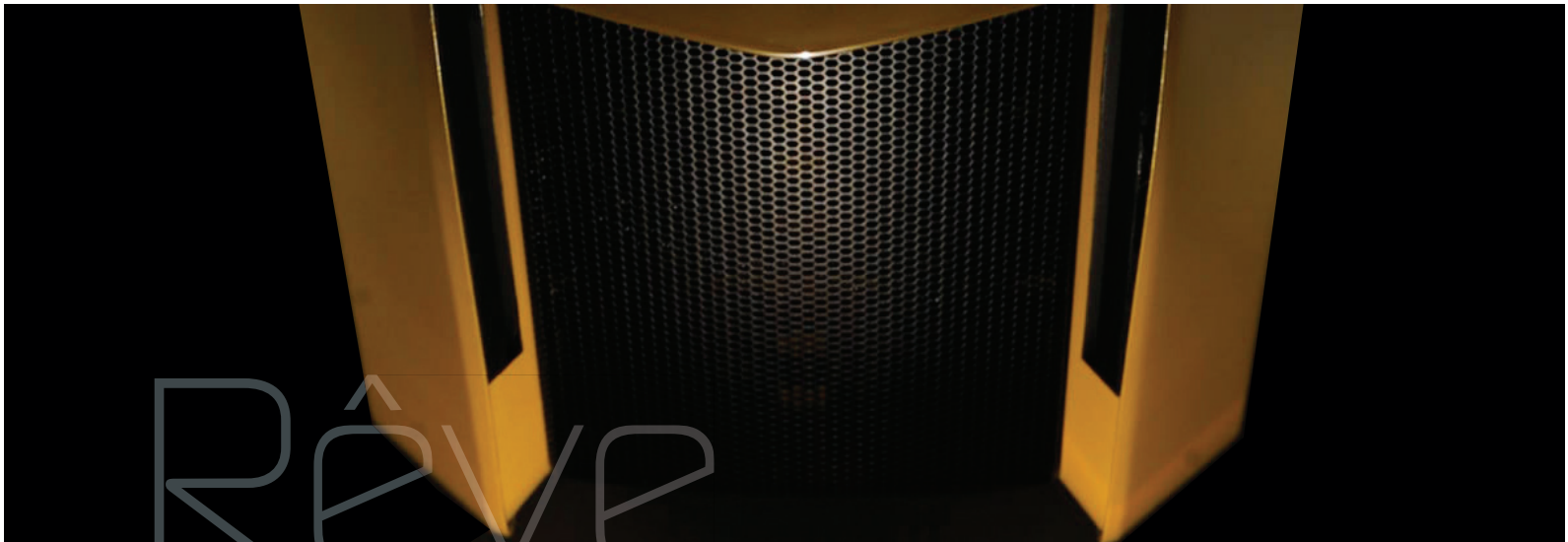
[SECOND OPINION]

EASIER MAIL SYNC

In the May 2011 issue the Doctor responded to a letter from someone who was trying to sync his POP3 email on two different computers using Outlook 2003. The guy's issue was that "each PC has a different set of emails, depending on which computer was used when the email was downloaded from the Comcast server." The Doc then devoted almost an entire page to explain how to sync them up using Gmail. Is the Doc working for Google now? An easier solution would be to open Outlook, click tools > Email Accounts > View or Change Existing Account. Then select the Comcast account, click Change, then the More Settings button, go to the Advanced tab, and then put a check next to "Leave a copy of messages on the server." Do the same thing on both computers and you have local copies of your email without owning or creating a Gmail account or futzing around with Gmail's account settings. I timed it, it took me 18.5 seconds. —**Matt Adams**



Dream



Dare to

Traum

JOIN US AS WE
CELEBRATE ANOTHER
YEAR OF PURE PC POWER!

In an age of overly synthesized catch-phrases ginned up by some suit to commercialize new soda pop or body spray, the term “pure PC power” was never intended to be marketing hype.

Instead, it was conceived to describe our obsession with performance computers and it has withstood the test of time. Who would have known that 16 Dream Machines later, the pursuit of all-out computing power could still be viable?

But that’s just what this year’s Dream Machine again proves: Despite pundits predicting the PC’s death many times over—speed still matters. For this year’s Dream Machine, we decided to build a

rig that balances top-notch performance with the style and elegance of an exotic sports car. The overall package is well-behaved and even fairly modest at power consumption, considering the amount of performance it packs.

As always, it’s not just about the PC proper, though. For our Dream Machine, we tracked down the best hardware available, such as NEC’s freaking-awesome PA301W panels and the wireless Cyborg R.A.T. 9 mouse, to make a lust-worthy setup that any of us would kill to have grace our desktop. So join us as we celebrate another year of the PC’s supremacy.

By the Maximum PC Staff



Under the Hood

The only thing missing from Dream Machine 2011 is the sweet smell of exhaust





- 1
- 2
- 3
- 4
- 5

1 Corsair Hydro Series H100

Even the most risk-averse person can admit that coolers such as Corsair's super H100 pose very little chance of leaking. And the fact that it's easy to install and requires zero maintenance makes it a win for even those of us who aren't plumbers.

2 Gigabyte GA-Z68X-UD7-B3

To run SLI, we needed a motherboard that features Nvidia's nForce 200 chip. The GA-Z68X-UD7-B3 has that and is also chock-full of cool features such as the ability to charge your phone via USB while your PC is off.

3 Intel Core i7-2600K

We've read figures that 50 percent of all 3.4GHz 2600Ks will overclock up to 1GHz past stock—and those are the "bad" ones. The rest will run well past 4.5GHz. Our D2-core chip is older, but even so, runs quite stable at 4.8GHz.

4 EVGA GeForce GTX 580 Superclocked—Times Three

After much soul searching, we decided that EVGA's Superclocked GTX 580 cards in tri-SLI were the right option because they offer better scaling than four GPUs for most games, and hell, the next version of Unreal Engine 3 was demoed using three GTX 580s.

5 OCZ Vertex 3

Intel's native SATA 6Gb/s implementation is simply awesome, and with the right drives, you're in storage nirvana. With two Vertex 3s in RAID 0 on the Intel PCH's SATA 6Gb/s ports, we hit in excess of 1,000MB/s read speeds. Need we say more?

Category	Part	URL	Price
CPU	Intel 3.4GHz Core i7-2600K	www.intel.com	\$317
Motherboard	Gigabyte GA-Z68X-UD7-B3	www.gigabyte.com	\$350
GPU	Three EVGA GeForce GTX 580 Superclocked	www.evga.com	\$1,557 (\$519 each)
Case	Cooler Master Cosmos II Prototype	www.cooler-master-usa.com	\$350
Custom Paint	Super Fly Yellow	www.smoothcreations.com	\$300
RAM	Corsair 16GB Vengeance	www.corsair.com	\$180
PSU	Silverstone Strider ST1500	www.silverstonetek.com	\$380
Cooler	Corsair Hydro Series H100	www.corsair.com	\$120
SSD	Two 240GB OCZ Vertex 3	www.ocztechnology.com	\$1,080 (\$540 each)
HDD	Three 3TB Seagate Barracuda XT	www.seagate.com	\$600 (\$200 each)
ODD	Plextor B940SA	www.plextor.com	\$169
Speakers	Corsair SP2500	www.corsair.com	\$250
Mouse	Cyborg R.A.T. 9	www.cyborggaming.com	\$130
Keyboard	Razer BlackWidow Ultimate	www.razorzone.com	\$80
Monitor	Three NEC PA301W	www.necdisplay.com	\$6,900 (\$2,300 each)
OS	Microsoft Windows 7 Professional	www.microsoft.com	\$125
TOTAL COST			\$12,888

Intel 3.4GHz Core i7-2600K

The cheapest CPU we've ever used in a Dream Machine—and perhaps the fastest, too

Winston Churchill once said, "Never in the field of computing was so much power given so cheaply." OK, we're making that up, but if Churchill had access to Intel's Core i7-2600K part, such a proclamation would be inevitable. And it's not just that the Core i7-2600K is so freaking cheap, it's also freaking fast! An overclocked quad-core Sandy Bridge chip will give even Intel's Big Kahuna, the Core i7-990X, a run for its money in many benchmarks.

Even better, the chipset for the 2600K is modern, not the old fogey still powering LGA1366 motherboards, and if all goes as planned, it offers an upgrade path to the 22nm-based Ivy Bridge CPUs next year. For DM2011, we overclocked the 3.4GHz part to 4.8GHz, which appears to be the limit of our D2 core sample. That's fine with us. For \$317, we'll take it and smile too.



Gigabyte GA-Z68X-UD7-B3

Run tri-SLI while you charge your tablet

We'll admit that for our purposes, Z68 gives us no performance advantage over P67. We're not, after all, going to run SSD caching since we have two big, fat Vertex 3 SSDs in place. With three GPUs, we're also unlikely to run the integrated graphics. Still, there's no reason to use the end-of-life P67 if Z68 is here. And that's what Gigabyte's GA-Z68X-UD7-B3 gives us. It's pretty much the same as a GA-P67-UD7 board, but with the updated chipset. The board itself has everything we need: the ability to charge high-drain devices via USB, even when the board is powered off; a crapload of SATA connectors; USB 3.0 internal headers; and not just SLI and CrossFire X, but also tri-SLI. Tri-SLI is accomplished by using an nForce 200 chip to balance the load from the single x16 PCIe 2.0 in the Sandy Bridge CPU.

Three EVGA GeForce GTX 580 Superclocked Cards

Tri-SLI is ready and raring to run Unreal Engine 3



For our GPU selection, we had two possible routes to take: three-single GPU cards or two dual-GPU cards. Dual dual-GPU cards are sexy, but many games simply don't scale to four GPUs. And getting multiple GPUs to behave on a single card often requires clocks to be scaled back. That's not the case with individual GPUs in three-way mode. It's this thinking that led us to select three of EVGA's GeForce GTX 580 Superclocked cards. The cards run fairly cool, even with the factory overclock, and thus don't pump heat into a case.

Two 240GB OCZ Vertex 3s

Squeeze the most out of that 6Gb/s SATA controller

What's faster than one SF-2281-powered SATA 6Gb/s solid-state drive? Two of 'em, in RAID 0. A single OCZ Vertex 3 can hit sustained read speeds of 550MB/s and writes of over 250MB/s; we hit nearly twice that using Intel's onboard RAID: 1,000MB/s reads and 500MB/s writes. Two 240GB drives give us 480GB of storage for our OS and any game we care to play or app we care to install.



Gordon Mah Ung
Senior Editor



YOU HAVE TO BUILD IT OR GET OFF THE POT

THE CLASSIC DILEMMA in technology hasn't changed in the 16 years we've been building our annual Dream Machine: Build now or wait for the next big thing?

In our case, it's never been so glaringly apparent as this year. That's because the worst-kept secret in the industry is Intel's Sandy Bridge E chip that's coming out in about two months. Sandy Bridge E (for either Enthusiast or Extreme) is a rebadged Xeon chip and is screened to hit high clock speeds. The accompanying X79 chipset will feature no fewer than 12 SATA ports—six of them at 6Gb/s speeds—PCIe 3.0, and quad-channel RAM support, on the new LGA2011 socket.

Yeah, your mouth is probably watering already, so why not "wait" for this new CPU and chipset combo? And at the same time, we should probably also wait for the next-generation GeForce or Radeon card. Oh yeah, and while we're at it, let's see what the next round of SSDs, coolers, motherboards, cases, speakers, and mice brings us, too.

You see where this gets you? Pretty soon you're waiting for the "next big thing" while driving a Pentium 4 box in the slow lane while your fellow gamers scream at you to get the hell off the server and quit dragging down the pings.

In the end, you have to go with the components you have, not the components you wish you had. In the here and now, Dream Machine 2011 is the best PC you can build, and it even has a logical upgrade path as Intel's upcoming 22nm Ivy Bridge chips will drop right into this beauty.

Cooler Master Cosmos II (Prototype)

You saw it here first, folks

The case for this year's Dream Machine is so new you can't get it in stores. In fact, we barely got ours in time for this month's issue. Cooler Master's Cosmos II isn't supposed to be revealed at all for another month, but given our fondness for the Cosmos S (the chassis for our 2007 Dream Machine), the company snuck us a preproduction model of the Cosmos II. Since it's not a production model, it still has some kinks to work out, but it's a beaut nonetheless.

The Cosmos II is fully 20 percent larger than the Cosmos S, and takes full advantage of four years' worth of improvements in chassis tech. The PSU and six drive bays are sequestered in a compartment at the bottom of the case, while the motherboard compartment features cable-routing cutouts, hot-swap docks, more toolless drive enclosures, and room for a 360mm radiator up top. The result is a roomy, well-ventilated chassis with plenty of space to accommodate our tri-SLI setup, five hard drives, a 240mm radiator, and more, while still looking classy. And that's before we added the custom Smooth Creations paint job (see below).



THE CROWNING GLORY: A CUSTOM PAINT JOB

ACQUIRING A PREPRODUCTION model of the majestic Cosmos II was plenty special in its own right, but this being Dream Machine, we had to kick it up a notch. Enter Smooth Creations. The company, which was founded in 1999, is the originator of custom graphics on boutique PCs. Smooth's case-painting masters got their start on automobiles and custom bikes before their love of hardcore PC gaming led them to their present calling.

With any case-painting job, preparation is no small matter. A case has to be completely disassembled to properly prep all the different substrates. But our Dream Machine case presented its own unique challenges. As Smooth Creation's CEO

Jim Saling recounts, "We had never gotten a Cosmos II before and it was sent overnight from Taiwan... giving us only two days to paint it and send it out to [*Maximum PC*]." He adds, "Taking it apart, with all its moving parts, and putting it back together to function properly after paint required a few notes during tear down."

As for the paint itself. It's an automotive paint from Germany called Glasurit, which is used on high-end European sports cars. Our Dream Machine is painted Super Fly Yellow, a true Lambo color. Saling adds, "Will it make the PC faster? That's up to the DM builders."

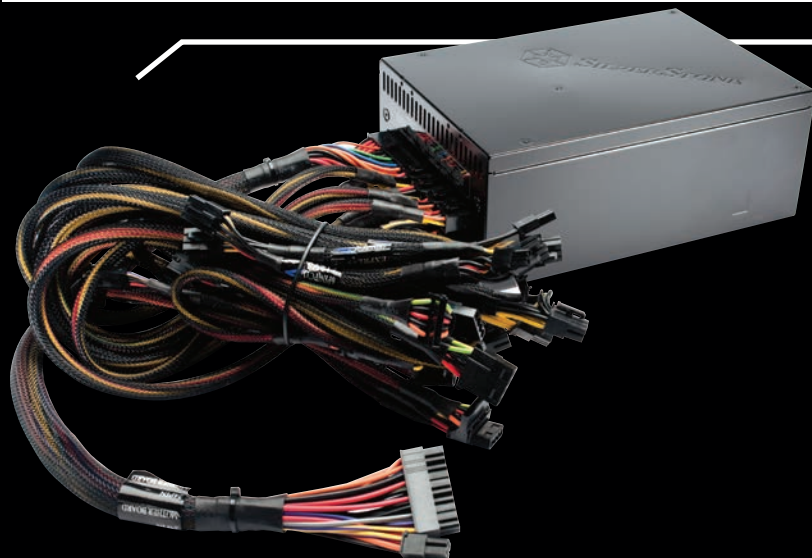
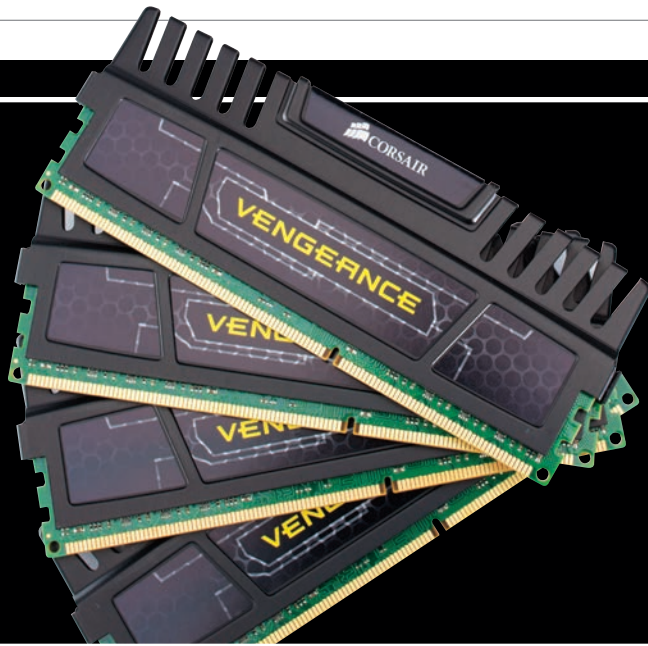
Well, Jim, we think you'll find that we did justice to your handiwork.



Corsair 16GB Vengeance

We say fill all the slots and let God sort 'em out

How much RAM do you need? Hell, given today's prices, why not max it out? That's what we did with Corsair's 16GB DDR3/1600 Vengeance kit. As you can tell from the name, this set of 4GB DIMMs runs at DDR3/1600—no need to stress out the integrated memory controller with additional voltage. So it's no surprise that it's the only XMP-rated RAM at 1.5 volts.



Silverstone Strider ST1500

Enough power to run two PCs or 300 tablets

If you've ever built a fast computer, you know how much of a pain it is to size your PSU for all of the hardware you'll stuff inside. With Silverstone's Strider ST1500, we don't have the slightest worry, even with three GPUs, five drives, and a zesty overclock loading up this 1,500W PSU.

Corsair Hydro Series H100

The power of a dual-fan radiator with the ease of an all-in-one loop

We've long been impressed by Corsair's Hydro series liquid coolers, and the H100 promises to continue the trend. We mounted the H100's 240mm radiator at the top of the Dream Machine's case to leave the rear exhaust unobstructed, with two 12cm fans pulling air through the radiator and out the top of the case. We'd have added two more fans for push/pull cooling, but didn't quite have room, thanks to the fat voltage-regulator module heatsinks.



Three 3TB Seagate Barracuda XTs

9TB of mass storage, because we can

With three 3TB 7,200rpm drives, we're not running out of storage space any time soon. Rather than run one big array, we've dedicated one drive to backups, one drive to high-def video, and one drive to everything else. Why? Why not?!



Plextor B940SA

Last year's BD burner is still the best, in our book

Yes, it seems wrong to be outfitting Dream Machine 2011 with the same Blu-ray burner we used last year, but we have yet to encounter a drive that offers better overall performance than the Plextor B940SA. With write speeds of 12x for BD-R and 16x for DVD+R, it handles all our optical chores quickly and reliably.

SEXIEST RIGS IN DREAM MACHINE'S HISTORY

While unadulterated power and performance are a given in any Dream Machine build, aesthetics play an important part in setting our annual homage to excess apart from the pack. Still, some stand out more than others in looks.



Dream Machine 2002

This DM was inspired by BMW's famous 2002 Turbo, which audaciously featured its moniker in reverse to kindly let shepherds in the fast lane know to get the flock out of the way. Besides mimicking the 2002 treatment, this box famously featured the GPU that brought ATI back in front with a vengeance: the Radeon 9700 Pro.



Dream Machine 2004

Jim Saling of Smooth Creations is no stranger to the Dream Machine, having custom painted four of our premiere builds, including this year's. DM2004 marked paint job number two in that history, rendering a Silverstone Nimitz SST-TJ03 case all the more impressive.

Corsair SP2500

Bring the noise

You probably wear a headset when you game, but sometimes you just gotta go loud. Fortunately, that's what the Corsair SP2500 system can do in spades: Get freaking loud! Yes, it will also sound awesome with Schubert, while you sip white wine, but the SP2500 set is best suited for making your neighbors pound on the walls until their fists are bloody.



Mouse and Keyboard

Cyborg R.A.T. 9 and Razer BlackWidow Ultimate

In gaming peripherals, we look for a mix of maximum-quality construction and extra features that give us an edge. That's exactly what you get with the Cyborg R.A.T. 9, a wireless gaming mouse with heavy-duty construction that can be customized to fit your hand perfectly. We also love the Razer BlackWidow Ultimate, a keyboard with top-notch mechanical switches, a full set of gaming-grade features, and excellent software to back it up.



Dream Machine 2006

The 11th annual Dream Machine couldn't fail to be noticed with its orange, white, and black motif. Its distinctive side grilles fed cold air to the GPUs and hard drives, but perhaps the most distinctive feature of DM2006 was its CPU, Intel's then-new Core 2 Extreme, aka "Conroe."



Dream Machine 2008

The year 2008 saw the most expensive case ever used for a Dream Machine. We managed to pull off an incredible deal to procure an HP Blackbird 002 case (\$1,000) and then had the entire sucker chromed by Computer-choppers.com, which cost well north of \$5,000 to do. It was the epitome of bling.



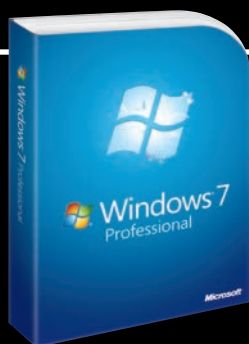
Dream Machine 2012

We want to hear from you! How should Dream Machine 2012 look? What should it include? Send your ideas to comments@maximumpc.com.

Three NEC PA301Ws

Games never looked so good

The professional-grade PA301W not only offers exemplary color and detail, but it also has the unique ability among 30-inch screens to go into portrait mode. This allows us to position three of them vertically for a combined resolution of 4800x2560—and a gaming experience that's unparalleled. In fact, it was the overwhelming favorite in our Multiscreen Challenge (July 2011).



Microsoft Windows 7 Professional

The only real choice

You know what we like about Windows 7? It served up a supersize cup of STFU to that no-talent assclown Justin Long, aka the Mac Guy.

BUT IS IT OVERKILL?

Three GTX 580s is a lot, we'll admit. You're not going to find any games out right now that'll push Dream Machine '11 to its limits, but that doesn't mean this system is overkill—far from it. Here's what's going to take advantage of the Dream Machine's power:

BATTLEFIELD 3

The scion of one of PC gaming's greatest brands, Battlefield 3 will be both the first true PC shooter to come along in 2011 and (hopefully) the first game to really take advantage of the graphics hardware in a cutting-edge PC like ours. Though it's being released on consoles simultaneously, the PC version of BF3 is clearly superior, with



better graphics, larger maps, and more players per dedicated server.

RAGE

We've got a few misgivings about Rage. We hate to see a great (arguably *the* great) PC developer creating a game with a console as a main focus, but we've got enough faith in Carmack that we be-



lieve the game will still be able to take advantage of a PC's extra power. Rage also marks the first use of the id Tech 5 engine, practically guaranteed to power some monster titles going forward.

UNREAL ENGINE 3

Unreal Engine 3 is hardly new (it's been around since the first Gears of War game launched), but it's been evolving all along. The latest batch of updates, announced at GDC 2011, includes some advanced features like deferred rendering, subsurface scattering, and image-based reflections. There aren't any games that have officially committed to taking advantage of the new features yet, but we expect to see some soon. In the meantime, check out the amazing technical trailer (which takes three GTX 580s to run at 1080p resolution) at bit.ly/gLNMXo.



Dream Machine 2011 Hits

Can it pick up where last year's 12-core monstrosity left off?

Dream Machine 2011 looks great, runs fairly quiet, and its parts list is to die for. But it's not just about looks and specs, it's also about performance. Can this machine outpace its predecessor? After all, if technology can't march forward in 12 months, something is drastically wrong.

And we don't say that without first taking a really long, Jim Kirk-style pause to seriously ponder whether Dream Machine 2011 can beat Dream Machine 2010. That's because Dream Machine 2010 was an especially monstrous King Kong of a PC. Just recalling the specs of last year's Dream Machine is enough to make us pucker up in fear: not one, but two 3.3GHz hexa-core Xeon X5680 CPUs overclocked to 4GHz. Three EVGA GeForce GTX 480 Superclocked cards in tri-SLI, 24GB of DDR3/1600, and two 200GB OCZ Vertex 2 SSDs in RAID 0. Dream Machine 2010 was so mean, we had to feed it five netbooks for breakfast and then sweep up the tablets it crapped out all day long.

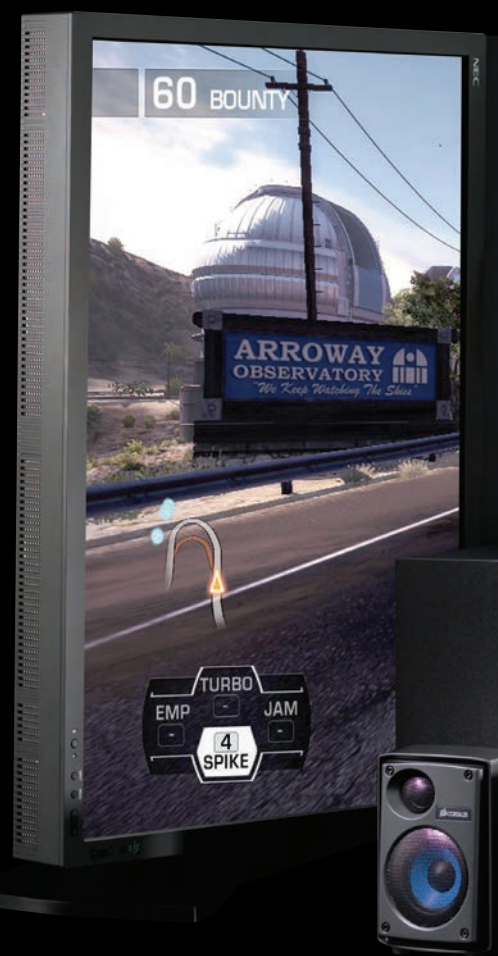
What can a lone Core i7-2600K do against that? A lot more than you'd expect. DM2011's first victory came in our Lightroom 2.6 test where we convert a folder of raw photo files from a Canon 5D Mk II to Adobe DNG format for archival purposes. Fairly limited in threading, the benchmark favored the higher clocks of DM2011, which trounced the older DM2010 by 27 percent. That score is also a new benchmark record in the Lightroom test. We suspect that part of the win is due to the RAID 0 Vertex 3 drives. In some storage benchmarks we ran, the Vertex 3s were pushing in excess of 1GB/s read speeds and 500MB/s write speeds. No, that's not a typo—in excess of 1GB/s read speeds! You can thank the SandForce 2 controller in the OCZ drive and the excellent SATA 6Gb/s implementation in the Z68 chipset.

ProShow Producer 4 also gave the nod

to DM2011, by 16 percent, surprisingly, despite the application support for more compute threads. Clock speed and disk I/O couldn't help this year's Dream Machine beat last year's in our MainConcept Reference encoding test, however—but the loss wasn't as bad as you'd think. The dual-proc Dream Machine 2010 bested DM2011 by roughly 10 percent. Unfortunately, we were unable to run our Vegas Pro 9 benchmark on last year's Dream Machine because of a bug in one of the app's plugins that affects 12-core machines, but we're pretty sure DM2010 would be favored. Once we moved to graphics, DM2010's tri-SLI 480s ate dust from this year's tri-SLI 580s, with STALKER favoring DM2011 by 24 percent and Far Cry 2 (mostly a CPU test at this point) also taking 15 percent. In 3DMark Vantage, the two machines split wins. In the graphics portion, DM2010's tri-SLI 480s ate dust from this year's tri-SLI 580s, with STALKER favoring DM2011 by 24 percent and Far Cry 2 (mostly a CPU test at this point) also taking 15 percent. In 3DMark Vantage, the two machines split wins. In the graphics portion, DM2010's tri-SLI 480s ate dust from this year's tri-SLI 580s, with STALKER favoring DM2011 by 24 percent and Far Cry 2 (mostly a CPU test at this point) also taking 15 percent. In 3DMark Vantage, the two machines split wins. In the graphics portion, DM2010's tri-SLI 480s ate dust from this year's tri-SLI 580s, with STALKER favoring DM2011 by 24 percent and Far Cry 2 (mostly a CPU test at this point) also taking 15 percent. In 3DMark Vantage, the two machines split wins. In the graphics portion, DM2010's tri-SLI 480s ate dust from this year's tri-SLI 580s, with STALKER favoring DM2011 by 24 percent and Far Cry 2 (mostly a CPU test at this point) also taking 15 percent.

We're happy to report that we're mostly vindicated on our choice of the tri-SLI cards over quad-SLI. Using the brand-new 3DMark 11 test, DM2011 was able to ace all of the machines from our small form factor roundup in the July issue, three of which featured either quad-SLI or quad-CrossFireX, using two dual-GPU cards as well as overclocked processors.

In the end, Dream Machine 2011 accomplishes what we wanted. It's the best PC you can build at this moment and it's even fairly well-mannered. It doesn't spool up with the sound of 1,000 fans and it uses less than 180 watts (sans monitors) while idling. We'll call that a win. ⏻



the Test Track



DM2011 VS. DM2010

	DM 2010		
VEGAS PRO 9 (SEC)	WNR	2,191	
LIGHTROOM 2.6 (SEC)	296	233	
PROSHOW 4 (SEC)	932	801	
REFERENCE 1.6 (SEC)	1,394	1,546	(-10%)
STALKER: COP (FPS)	101.9	125.9	
FAR CRY 2 (FPS)	177.5	203.3	
3DMARK VANTAGE OVERALL	47,179	45,360	(-4%)
3DMARK VANTAGE GPU	40,601	53,511	
3DMARK VANTAGE CPU	91,806	31,648.0	(-66%)

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



ARMED AND DANGEROUS?

ARM-based mobile devices have reached a golden age of development. Do they threaten the survival of our beloved desktops? *Maximum PC* investigates **BY PAUL ESCALLIER**

The desktop computer as we know it could be in danger! Our hobby is doomed!

Let's face it. We're all going to be reading these words a trillion times during the next 12 months. So we decided to head this one off at the pass. Is the onset of ARM a real threat to desktop computing, or is it more of an evolutionary force?

Over the past several years, the demand for desktop computers in the home has been steadily shrinking, displaced by notebooks and all-in-one systems. In fact, 69 percent of PCs sold last quarter were notebooks, compared to the falling 22 percent that were desktops. This has been the trend ever since notebook sales caught up to desktop sales back in 2008. (Hey, it could be worse.) These days, all-in-one systems and notebooks are capable of offering near-desktop performance (so long as you don't mind giving up the ability to play modern games and upgrade in an affordable, modular fashion).

Something a bit more worrisome is the recent explosion of ultra-mobile products, specifically smartphones and tablets. In just a few years, smartphones and tablets have made

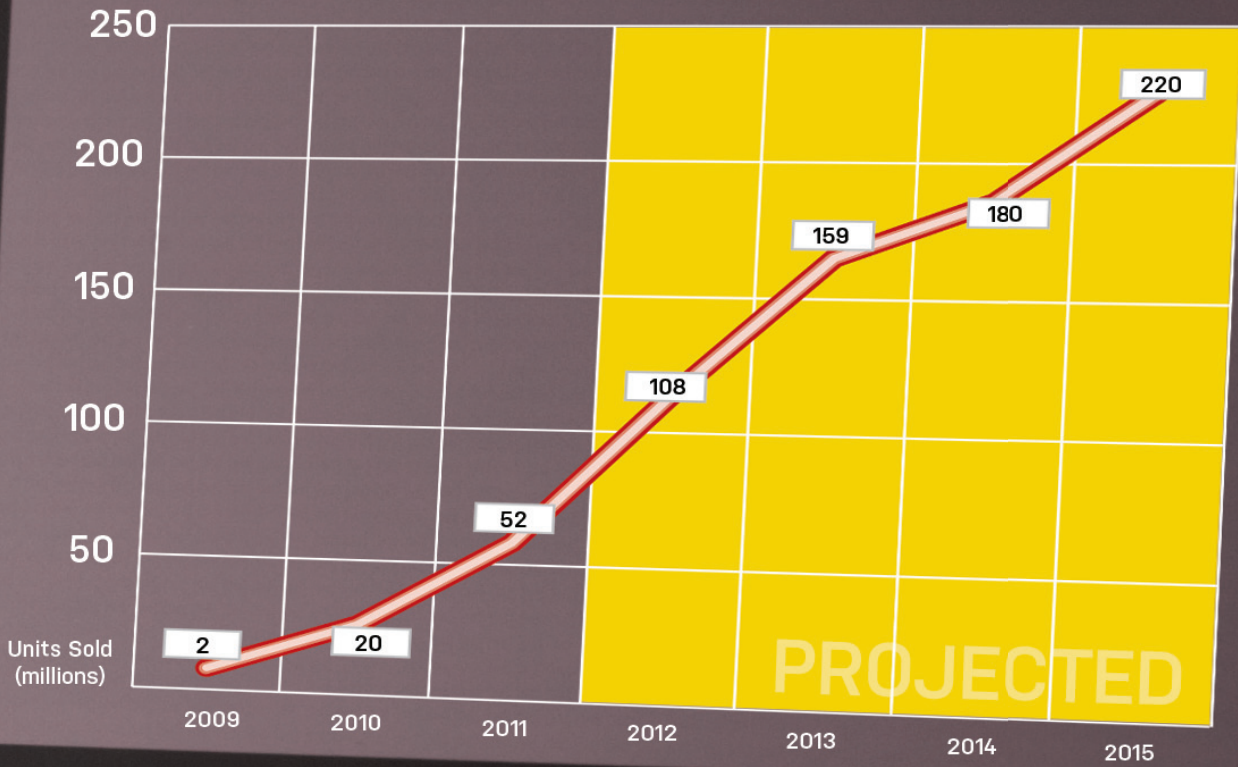
stupendous jumps in performance. Formerly pokey computing devices have become pocketable powerhouses capable of many of the same basic functions as an ordinary desktop. The kingpin behind all of this development? ARM, a versatile processor microarchitecture that emphasizes power efficiency, yet is surprisingly high in performance.

What's the impact of these ARM devices' ascendancy over PC desktop and desktop component sales? It's not 100 percent clear, but it's theoretically possible that ARM could migrate up to the desktop level. Principal analyst Rob Enderle of the Enderle Group agrees, noting, "If current trends hold, there should be at least one credible ARM player in the [desktop] space in five years." One thing is clear, however—other mobile devices such as laptops and netbooks are suffering. Notebook sales have already fallen 11 percent compared to last year.

But how likely is it that ARM's success will exact blood from traditional desktops? We're going to take a long, hard look at all the facts to try to settle the question once and for all.

GLOBAL TABLET SALES

MAXIMUMPC



Global tablet sales are on the rise and expected to experience the most growth over the next year.

[Source: Gartner and iSuppli]



Nvidia's Tegra chips are among the fastest ARM processors on the market.



Motorola's Atrix in the 11.6-inch laptop dock.

A (VERY) BRIEF HISTORY OF ARM

In the beginning, the ARM architecture was specifically developed for use in a PC—the Acorn Archimedes to be precise. In 1987, the Archimedes hit the market, powered by the ARM2 processor with up to 4MB of RAM and a 20MB hard drive. With only 30,000 transistors (less than half of the Motorola 68000's 68,000), the ARM2 was one of the simplest 32-bit processors of its time. This lower transistor count, paired with the efficient reduced instruction set computer (RISC) architecture, allowed ARM2 to outperform Intel's 80286 while consuming less electricity.

ARM's inherent power efficiency and embedded-system approach made it ideal for mobile devices. Toward the end of the 1980s, ARM Ltd. partnered with Apple, and the result was the ARM6 architecture, which, in the form of the ARM 610, powered the world's first PDA, the Apple Newton.

ARM also licensed the ARM6 architecture to DEC, which led to the development of StrongARM in the mid-1990s. Its purpose was to provide a faster ARM processor for high-end, low-power embedded systems, such as set-top boxes and PDAs. In 1996, the first StrongARM processor, the SA-110, was released. Capable of speeds up to 200MHz and performing at about

1.0 DMIPS/MHz, it was the fastest available processor for portable devices throughout the entire year (until the StrongARM SA-1100 came out). StrongARM became so overwhelmingly popular in mobile devices that Microsoft eventually dropped support for all other architectures in its Pocket PC software. Shortly thereafter, Intel was able to purchase intellectual rights to StrongARM and developed the XScale architecture, which still exists today in many Marvell products.

This initial licensing contract with DEC pushed ARM Ltd. to continue licensing the ARM architecture on a much larger scale, resulting in the widespread proliferation of ARM applications we see today, from routers and NAS devices to smartphones and MP3 players.

You know the rest of the story. Advancements in ARM processors, such as dedicated graphics chips, multimedia instruction sets, and embedded flash memory, have allowed smartphones to evolve into the high-end multimedia devices they are today.

WHERE DOES ARM GO FROM HERE?

Modern desktops and laptops still hold a hefty lead over smartphones in

performance as well as functionality, with features that make them suitable for server operation, home theater use, and high-end gaming. But for the mainstream user, who only uses his computer to get online, send emails, and watch the occasional YouTube video, a lot of that functionality is overkill. Herein lies the potential threat; these are all things that smartphones can already do; the biggest limitation is the awkwardly cramped interface. But even this is starting to change as new interfacing options enter the market.

Earlier this year, AT&T launched the Atrix 4G. The smartphone uses one of the most powerful ARM processors to date, Nvidia's dual-core Tegra 2, and comes with a plethora of accessories. One accessory, the Laptop Dock, literally turns the Atrix into a netbook-caliber laptop, complete with an 11.6-inch display and full keyboard. Another, the Media Dock, allows you to connect an HDTV or monitor and several USB devices (such as a mouse and keyboard), effectively turning the Atrix 4G into a super mobile desktop. (For our review of the Atrix, point your browser to bit.ly/ijjZpm.)

INTEL, AMD, AND THE ULTRA-MOBILE MARKET

ARM ISN'T THE ONLY company plotting to mobilize the world and liberate people from their desks. Intel has plans to enter the smartphone and tablet market with its latest version of the Atom processor. The Z6xx series is a system-on-a-chip (SoC) design that takes the Atom's processing core and combines it with the system's memory, memory controller, and graphics processor.

Early results indicate that this, combined with newly designed processor components may allow the Atom Z6xx to compete with, and even outperform most current ARM offerings, all while consuming significantly less power than previous versions of the Atom. Intel is predicting a peak TDP below 3W, which is still significantly higher power consumption than competing ARM processors. The Z6xx also has the added benefit of x86 compatibility, making it possible to run more advanced applications and even full-fledged versions of Windows on tablets and smartphones featuring the Z6xx processor.

While Intel's intentions in the ultraportable field are clear, AMD is still on the fence. It wants (perhaps even needs) a share of the smartphone and tablet market, but to do so, it needs viable chips, and soon. According to both Rob Enderle and industry analyst Tom Halfhill, AMD has two options: license the ARM architecture and develop its own ARM chips (like Nvidia's Tegra line) or follow Intel's lead and scale down its current x86 architecture. AMD has publically stated that it intends to develop its own APUs, much like Intel's Z6xx processors. It's a risky move, considering Intel's deeper pockets, but AMD's previous acquisition of ATI could prove useful here. Nvidia's Tegra platform utilizes an advanced graphics core, while Intel benefits from x86 compatibility. AMD's unique situation allows it to combine both of these traits. We should see the end results with the company's rumored "Desna" APU.



Intel's Z6xx series processor puts it on more equal footing with ARM.

The A5 is a powerful dual-core SoC that powers the Apple iPad.



We found that while snappy in a smartphone, Tegra 2 struggled a little bit in powering a netbook platform. This fall, however, Nvidia's quad-core Tegra 3 (code-name "Kal-El") will up the ante with performance estimated to be close to that of an Xbox 360. That includes graphics. It's easy to speculate that, within a year or two, we'll see many Atrix-like devices on the market. It's also not hard to imagine that the sales of these systems will negatively impact desktop sales.

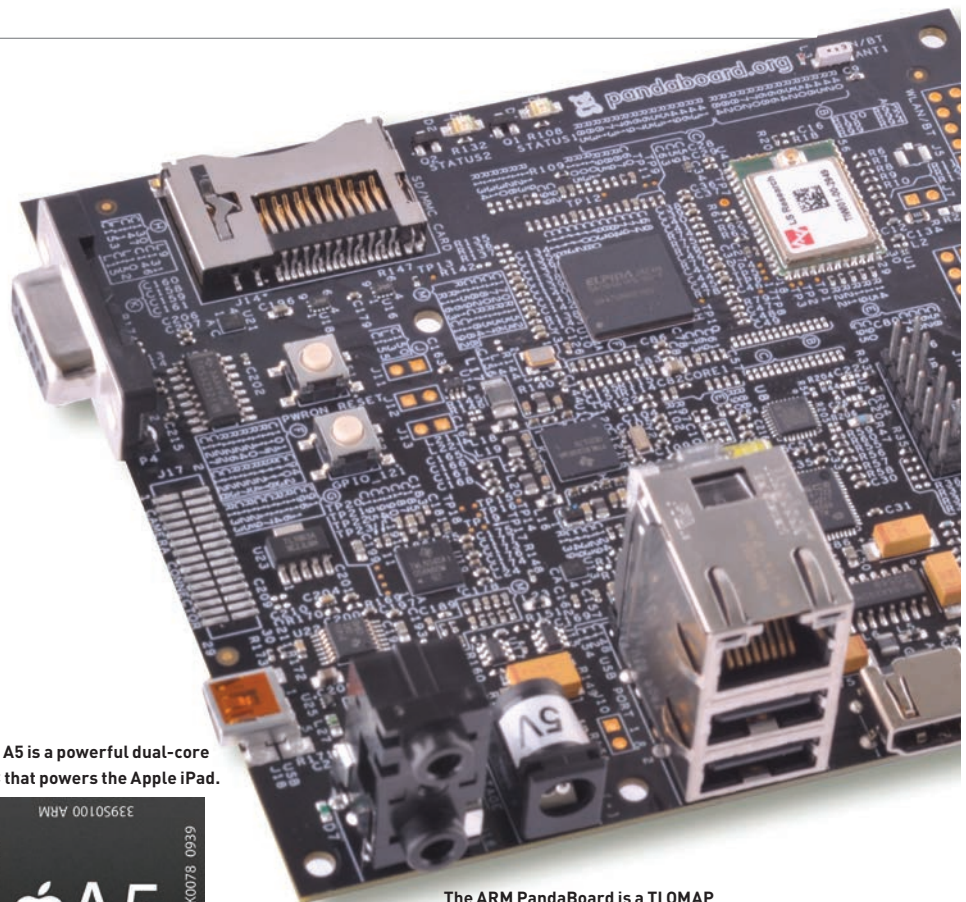
The truth is that neither Intel nor AMD have anything that can quite match this combination of mobility and performance. Not yet, at least. In the meantime, ARM appears ready to take the battle to Intel and AMD by penetrating the desktop and laptop market.

IS AN ARM DESKTOP STILL A DESKTOP?

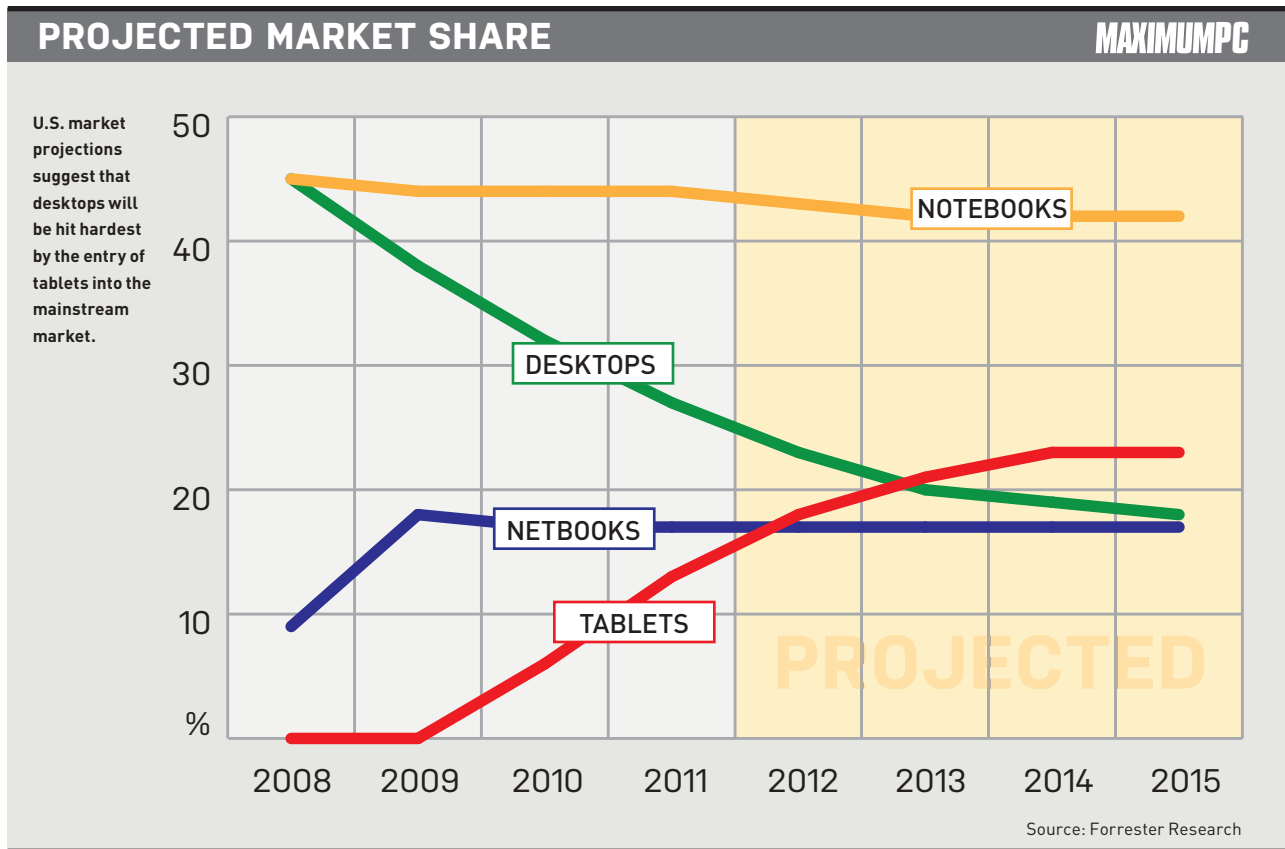
Rumors are swirling that by the second half of 2013, Apple will switch to ARM in its MacBook and MacBook Pro lines, and possibly even its desktops. As Enderle puts it, "This would follow Apple's strategy to own the technol-

ogy they use." Assuming price/power/performance ratios work out, it's easy to imagine other PC manufacturers following suit for their lower-end systems, such as all-in-ones and net-tops. Appearing to confirm this migration, research firm IDC's quarterly forecast in May 2011 predicted that ARM will hold a 13 percent share of the PC market by 2015.

Obviously, this will be an uphill battle. And how to measure success? *Maximum PC* CPU columnist Tom Halfhill, who is also a senior analyst with The Linley Group and senior editor of *Microprocessor Report*, says, "Intel will do everything it can to keep x86 processors in Macs, but Apple has a history of switching CPU architectures when it's advantageous to do so. Each time, critics predicted doom. Each time, Mac sales went up. But the professional graphics market is still important to Apple, so high-end Macs won't switch to something less powerful than the x86. It's possible that low-end Macs—especially notebooks—will switch to ARM in the future."



The ARM PandaBoard is a TI OMAP 4330-powered prototyping and development board.



WILL WINDOWS PAVE THE WAY?

Since ARM processors are RISC based and don't feature full x86 or x64 instruction sets, there's no chance of getting any current versions of Windows to run properly on an ARM platform. This will change when Microsoft releases Windows 8. Microsoft plans to include ARM support with the release of its next OS, expected to launch in 2012. At CES this year, Microsoft had a rough, but working version of Windows running atop ARM processors.

Given the dominance of Windows in home and corporate settings, it's likely that the presence of Windows tablets—Microsoft is even rumored to be working on its own proprietary model—will send sales figures rocketing. But just like Apple's transition to ARM, this doesn't come without some headaches (and conflict). According to Halfhill, "Legacy Windows apps simply won't run on an ARM processor without emulation. Apple has proven—twice—that software emulation can ease the difficult transition to a new CPU architecture. But each time, the new processors were more



powerful than the old processors, making software emulation practical. That probably won't be the case with an ARM-based Windows PC. At best," he says, "the ARM processors will be equally powerful."

Enderle agrees, expecting legacy application compatibility to be "pretty poor" and goes on to say that "the

ARM version [of Windows] is likely not where you'd want to run [legacy applications] anyway."

THE DESKTOP IS TOO STRONG TO DIE

The million-dollar question is this: Will Microsoft's involvement with ARM benefit the desktop crowd? It's a mixed

bag. While the downwards migration of Windows will certainly cannibalize some of the desktop market, it won't eat into the high-end market share *Maximum PC* users care about. The other way of looking at it is that this migration could result in a proliferation of purpose-specific ARM-based PCs.

In reality, ARM may seem like a threat, but it still has a long way to go before it will be a suitable desktop platform. And even then, it won't be capable of meeting the graphics demands of gamers, the processing demands of video and graphic specialists, and the flexibility demands of programmers.

Should the day come that ARM (or Intel or AMD) manages to create a mobile platform that can match the

performance of desktop computers of the time, people will welcome it with open arms, but the transition won't happen overnight. Despite the inroads laptops have made, desktops are still more powerful than their notebook counterparts.

"The lines between ARM and x86 will blur in the middle ground," Rob Enderle says. "But ARM will sustain smartphones, and x86 will have high-performance PCs and workstations." For the short- and mid-term, ARM appears to be an additive dimension of computing rather than a substitute. ⏻

How could something as awesome as Thermaltake's Level 10 chassis possibly go extinct?



ARM'S PROCESSOR ROADMAP

IF ARM PLANS ON providing an adequate platform for devices like Apple's MacBook line, it has a few performance gaps to fill. Currently in the works is the Cortex-A15 core, which, clock-for-clock, is up to 40 percent faster than the Cortex-A9 found in the latest smartphones and tablets. That alone isn't enough of a boost to compete with Intel in notebooks; however, the Cortex-A15 can house up to eight cores, sharing a total of 8MB of L2 cache, and can even be clocked up to 2.5GHz.

Although the specifications call for a maximum of eight cores (four cores per cluster, two clusters per chip), a specialized AMBA4 interconnector can be used to connect two chips together, potentially running 16 cores together, at the full 2.5GHz.

Unlike ARM's other cores, the Cortex-A15 is tuned for performance, rather than power efficiency, though it will still achieve a healthy balance of both, suggesting that ARM intends it to be used in more than just handheld devices. Cortex-A15 chips are expected to reach the consumer market by the end of 2012. This syncs up nicely with Apple's predicted switch to ARM by 2013, but as of yet, there is no evidence that Apple has licensed this new core.

Thus far, Texas Instruments, ST-Ericsson, and Nvidia are among the licensees, and TI actually already has a chip in the works: the OMAP 5430. As just a dual-core chip, the OMAP 5430 doesn't appear to push the limits of the Cortex-A15's potential, but at 2GHz, it does boast a 3x performance boost over TI's previous OMAP 4330. If anything, Nvidia will be the one to watch for high-performance, desktop-potential Cortex-A15 chips.

MAXIMUM PC'S 11TH ANNUAL

GEEK

QUIZ

ARE YOU A PC KNOW-IT-ALL OR A
NEWB? IT'S TIME TO FIND OUT!

By the Maximum PC Staff

WITHIN THE SPAN OF A GENERATION, ONE NEW TECHNOLOGY RADICALLY changed society, propelling many folks into the realm of the well-connected and well-educated. It was expensive, especially at first, but economies of scale soon brought this technological advance into the homes of millions instead of just an elite few. That's right: We're talking about the book.

The Internet has largely replaced the book as a tool for democratizing access to information, but one thing remains true: knowledge is power. And you'd better have some significant knowledge at your disposal if you hope to fare well on the 11th annual Geek Quiz. We've collected 55 questions from the easy to the mind-burning to test your knowledge of technology more advanced than deadtreeware. If you've been zoned out, it's OK, but you'd better hit the books. Go ahead. We'll wait. The Geek Quiz will still be here, mercilessly taunting you until you give it a go.

THE QUADRA

CACHE 22

**Everything You Always Wanted to Know About Hard Drives
(But Were Afraid to Ask)**

LORD OF THE PINGS

Catcher in the RAM

**What to Expect
When You're Expecting
a New PC**

A Tale of Two GPUs

The Joy of SSDs

**THE ART
OF WARD**



1. IBM's Personal System/2, released in 1987, flopped, but did introduce several new technologies. Which of the following was *not* one of them?

- A. VGA connector
- B. 3.5-inch floppy disk
- C. Micro Channel Architecture
- D. MMX graphics

2. According to AMD, the abbreviation APU stands for:

- A. Advanced Processing Unit
- B. Accelerated Processing Unit
- C. Accelerated Processor Union
- D. Advanced Physics Unit

3. The term "interlacing" refers to:

- A. Video transmitted by scanning odd-numbered lines in one frame, and even lines in the next
- B. Video transmitted by showing one film frame twice, and the next frame three times
- C. Lacing your sneakers in a train track fashion
- D. Blurred images caused by poor response time

4. During development, Microsoft's Windows Home Server 2011 was code-named:

- A. Veal
- B. Vulcan
- C. Vail
- D. Valencia

5. Which of the following is *not* a feature of Nvidia's upcoming "Kal-El" Tegra chip?

- A. Quad-core ARM Cortex A9 CPU
- B. 1.5GHz clock speed
- C. Video output up to 2560x1600
- D. 16nm manufacturing process

6. Which of the following is *not* a standardized motherboard size?

- A. Mini-ITX

- B. microATX
- C. EATX
- D. XL-ATX

7. The default player skin in Minecraft is nicknamed:

- A. Markus
- B. Notch
- C. Steve
- D. Mojang

8. Near Field Communication (NFC) support was introduced in which version of Android?

- A. Eclair
- B. Froyo
- C. Gingerbread
- D. Honeycomb

9. Which of the following specs is *not* true of Jeopardy-winning supercomputer Watson?

- A. 120TB disk storage
- B. Complete text of Wikipedia
- C. 2,880 POWER7 processor cores
- D. 16TB RAM

10. Introduced in DirectX 11, this new feature makes in-game textures appear to be rounder and better defined:

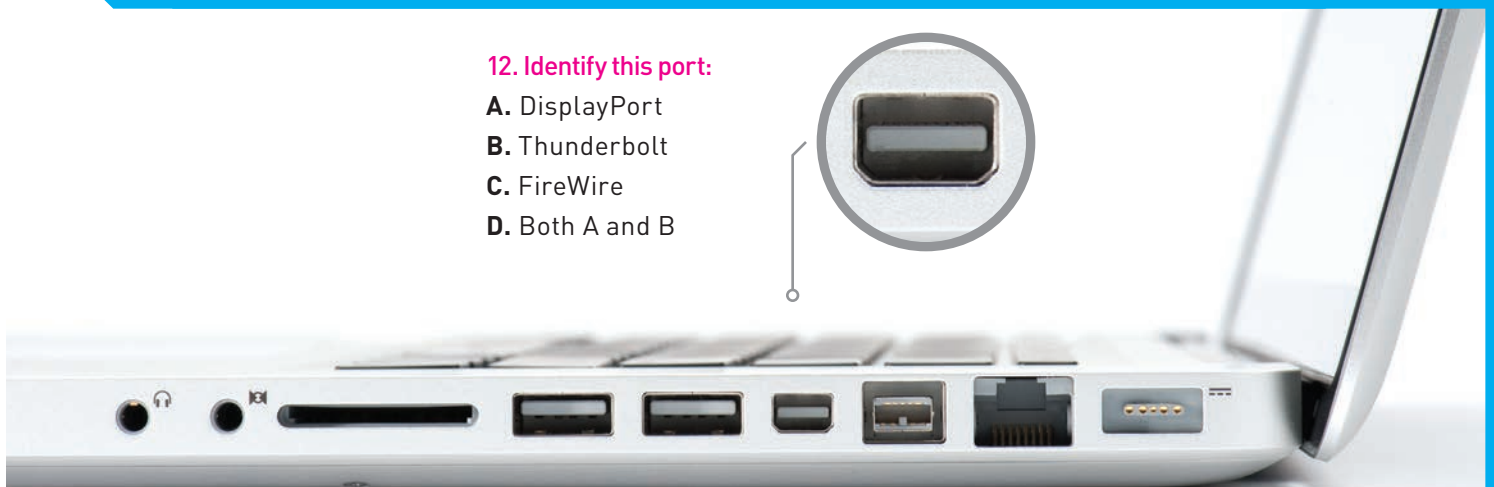
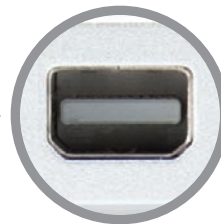
- A. Tessellation
- B. Transparency antialiasing
- C. Ambient occlusion
- D. Bokeh

11. Intel's QuickSync is:

- A. A universal cloud-based synchronous play to compete with iCloud
- B. Hardware acceleration for faster synchronous backups of your data
- C. Hardware acceleration for GPU-based encoding in Sandy Bridge CPUs
- D. A new method to synchronize data across cores in the upcoming 22nm Ivy Bridge CPUs

12. Identify this port:

- A. DisplayPort
- B. Thunderbolt
- C. FireWire
- D. Both A and B



ANSWERS: 1-D, 2-B, 3-A, 4-C, 5-D, 6-D, 7-C, 8-C, 9-A, 10-A, 11-C, 12-B

13. Microsoft developed a 3D graphics architecture in the late 1990s. This architecture was called:

- A. Talisman
- B. Lucifer
- C. Lightspeed
- D. Panorama

14. Both 4G technologies (3GPP LTE and Mobile WiMAX) rely on this to make efficient use of the available wireless spectrum:

- A. Orthogonal frequency-division multiple access (OFDMA)
- B. CDMA (code-division multiple access)
- C. IPv6
- D. IMT (International Mobile Telecommunications)

15. She was the first American woman to be awarded a PhD in Computer Science:

- A. Barbara Liskov
- B. Jean E. Sammet
- C. Sister Mary Kenneth Keller
- D. Admiral Grace Hopper

16. The difference between the new GeForce GTX 560 and the GTX 560 Ti is:

- A. The number of shader processors
- B. The number of texture units
- C. The core clock speed
- D. All of the above

17. Google's social networking site, which is very popular in Brazil and India, is called:

- A. Orkut
- B. Buzz
- C. iGoogle
- D. Youle

18. In what way do AMD's Zacate and Ontario Fusion APUs differ?

- A. Number of processing cores
- B. Number of GPU nanocores
- C. Power consumption
- D. Both B and C

19. Which socket does *not* take an Intel CPU?

- A. LGA1155
- B. LGA1366
- C. LGA1974
- D. LGA2011

20. The IEEE 802.11ad standard promises to deliver:

- A. Free wireless hotspots worldwide, supported by advertising
- B. Tri-band routers and client adapters capable of wireless networking using the 2.4-, 5-, and 60GHz frequency bands
- C. Supremely fast wireless TCP throughput using the 60GHz frequency band no matter where the router and client might be inside your home
- D. 60 KHz VLF support

21. Which of the following is *not* a real Intel code name?

- A. Ivy Bridge
- B. Ivy Trail
- C. Moorestown
- D. Cougar town

22. The maximum theoretical throughput of a SATA Rev. 3 connection is:

- A. 3Gb/s
- B. 3GB/s
- C. 6Gb/s
- D. 6GB/s

23. Which of the following features does HDMI 1.3c support?

- A. Ethernet Channel
- B. Audio Return Channel
- C. 4k-by-2k support
- D. Auto lip-sync

24. On a keyboard, which of the following is *not* a type of keyswitch mechanism?

- A. Membrane
- B. Dome
- C. Lever
- D. Scissor

25. Which of the following solid-state drives does *not* use a Marvell 9174 controller?

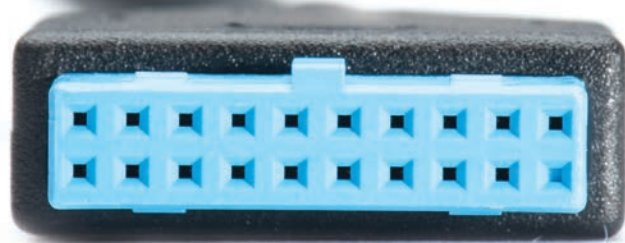
- A. Crucial M4
- B. Plextor M2
- C. Intel 510
- D. Intel 320

26. When was the Microsoft IntelliMouse—the first successful optical mouse—released?

- A. 1989
- B. 1993
- C. 1999
- D. 2003

27. What motherboard header does this cable connect to?

- A. FireWire
- B. USB 3.0
- C. HD_Audio
- D. Power/HDD LEDs



ANSWERS: 13-A, 14-A, 15-C, 16-D, 17-A, 18-C, 19-C, 20-B, 21-D, 22-C, 23-D, 24-C, 25-D, 26-C, 27-B, 28-A, 29-D, 30-D, 31-A, 32-D, 33-C, 34-B, 35-B, 36-C, 37-A, 38-B, 39-C, 40-A, 41-B



28. Which of the following games would be most accurately described as "rogue-like"?

- A. NetHack
- B. Thief 2
- C. The Witcher 2
- D. Minecraft

29. AMD's new eight-core CPU, code-named "Zambezi," will retail under the name:

- A. Quad FX
- B. Athlon FX
- C. Core FX
- D. AMD FX

30. If the theoretical data rate of a 1x Blu-ray drive is 36Mb/s, approximately how long will it take for a 2x drive to fill a single-layer Blu-ray disc with data?

- A. 120 minutes
- B. 90 minutes
- C. 60 minutes
- D. 45 minutes

31. Using a strobe to illuminate a subject while keeping the background properly exposed is a technique known as:

- A. Fill flash
- B. Counter lighting
- C. Long exposure
- D. Bounce flash

32. In audio terms, "three-way" typically describes:

- A. A ménage a trois in your home theater
- B. A speaker design consisting of a tweeter, a midrange, and a woofer
- C. A binding post capable of accepting bare wire, a banana plug, or a spade lug
- D. Either B or C

33. Which of the following was supported by Chrome OS laptops when they officially launched in June 2011?

- A. Java Virtual Machine
- B. Microsoft Silverlight
- C. Adobe Flash
- D. Blu-ray playback

34. Convert 11100 from binary to hexadecimal:

- A. 28
- B. 1C
- C. B8
- D. G1

35. As of June 2011, which of the following software is open source?

- A. Android Honeycomb
- B. Mozilla Firefox
- C. Red Hat Linux
- D. Internet Explorer

36. On a standard U.S. keyboard, which number key is used to enter the ^ character?

- A. 1
- B. 4
- C. 6
- D. 8

37. Skynet became self-aware on:

- A. August 29, 1997
- B. December 21, 1948
- C. October 14, 1996
- D. March 1, 1994

38. An emergent micro-cooling solution that operates similarly to conventional heat pipe tech is known as:

- A. Nanochamber
- B. Nanowick
- C. Nanotransference
- D. Nanocycle

39. Can a Z68 motherboard run two GPUs in SLI mode (Nvidia) or CrossFireX mode (AMD) if two x16 physical slots are built onto the board?

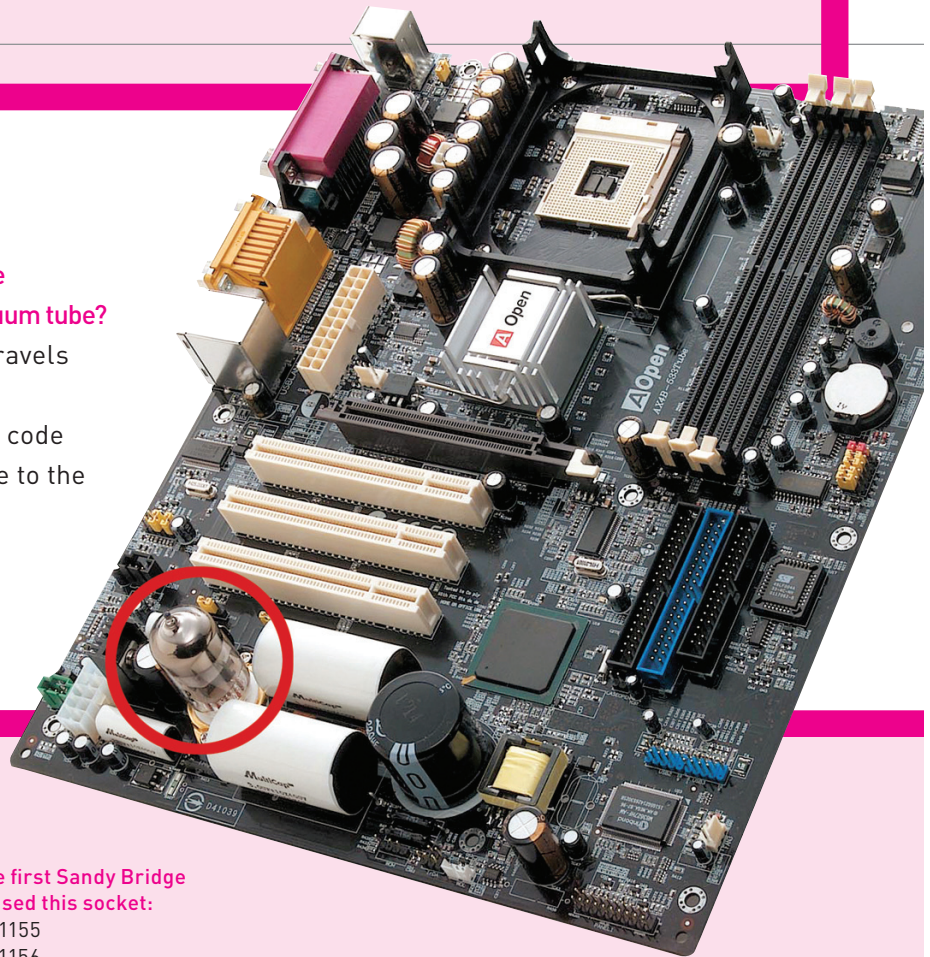
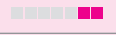
- A. No, the Z68 doesn't have enough PCI Express lanes
- B. No, Intel prohibits SLI
- C. Yes, but the two cards will run in dual x8 mode
- D. Yes, but only if the motherboard maker has added an NForce 200 or other PCI Express switch

40. Early CGA (Color Graphics Adapter) displays gave the user these two graphics choices:

- A. Two-color 640x200 or four-color 320x200
- B. Four-color 640x200 or two-color 320x200
- C. 1920x1080 or 1024x768
- D. Green or amber phosphors

41. This type of memory was used in the Nintendo64 (and some SGI workstations):

- A. SGRAM
- B. RDRAM
- C. (EDO) DRAM
- D. RAMDAC



42. Why did the AOpen AX4B-533 Tube motherboard (pictured) contain a vacuum tube?

- A. To speed up the system—data travels fastest in a vacuum
- B. To send POST signals via Morse code
- C. To introduce a warm analog tone to the onboard audio
- D. To reduce chassis dust

43. When reading speaker specifications, "sensitivity":

- A. Defines the degree of efficiency with which a speaker converts electrical power into sound
- B. Describes the speaker's ability to make you weep when playing sad songs
- C. Is measured in decibels (dB), with higher numbers indicating a louder performance when driven by a given input signal
- D. A and C

44. Which of the following Internet companies had *not* filed for an IPO as of June 2011?

- A. Twitter
- B. Groupon
- C. LinkedIn
- D. Google

45. What best describes the Windows project code-named Quebec?

- A. Windows cloud services platform
- B. Windows embedded 2011 platform
- C. Windows 8
- D. Windows 9

46. What's the transistor count of Intel's Core i7-2600K?

- A. 995 million
- B. 1.07 billion
- C. 654 million
- D. 1.77 billion

47. The first Sandy Bridge chips used this socket:

- A. LGA1155
- B. LGA1156
- C. LGA1366
- D. LGA2011

48. Nvidia's SLI stands for Scalable Link Interface. What were the words that made up 3dfx's original SLI acronym?

- A. Superior Loop Integration
- B. Scan Line Interleave
- C. Shader Link Interconnect
- D. Shell Layer Illumination

49. The current highest-speed Blu-ray burners for retail write to BD-R at:

- A. 8x
- B. 10x
- C. 12x
- D. 16x

50. What is the code-name of Nvidia's desktop-caliber ARM chip that will run in data centers?

- A. Project Boulder
- B. Project Denver
- C. Project Greeley
- D. Project Pueblo

51. Which of these APIs is used for CPU and GPU computing?

- A. OpenAL
- B. Direct3D 10
- C. OpenGL
- D. OpenMP

52. The upcoming 22nm Ivy Bridge CPUs will feature:

- A. 3D tri-gate transistors
- B. Hi-C metal ceramic gate technology
- C. Fully depleted silicon-on-insulator transistors
- D. Thin optical FTL interconnects

53. Which will you *not* find on the upcoming Sandy Bridge Enthusiast platform?

- A. Quad-channel RAM support
- B. Native USB 3.0 support
- C. 10 6Gb/s SATA ports
- D. A new LGA2011 socket

54. Which of the following is *not* a 3D game engine?

- A. Dunia
- B. Frostbite
- C. Crytek
- D. Source

55. Which of these CPUs has the most cores?

- A. Opteron 6180 SE
- B. Xeon E7-8870
- C. Core i7-990X
- D. Phenom II X6 1090T



THE MOMENT OF TRUTH

IF YOU'RE NOT AS SMART AS YOU THOUGHT YOU WERE, THERE'S ALWAYS NEXT YEAR

0-14 CORRECT:

Either you need to invest in *Computing for Dummies*, or you're a dog who has found your master's copy of *Maximum PC* on the floor. In which case, we greet you. Woof. Woof.

15-30 CORRECT:

Your knowledge of PC tech and history might not be the stuff of legend, but you still know more than 90 percent of your peers. The dumb 90 percent.

31-45 CORRECT:

Truly you are wise in the ways of the Force. We can't help but feel that if you went outside a little less often, you'd have done better on this quiz.

46-55 CORRECT:

You've absorbed everything we've been teaching you and more. Heck, you could probably write next year's Geek Quiz by yourself. Which is good, because we need a vacation. ☹



WHITE RAP

BY BILL O'BRIEN

Autostereoscopy

When will we get 3D without the dorky glasses?

One of the first (if not *the* first) 3D motion pictures was called *Power of Love*, released in 1922. A mere 89 years later, 3D technology continues to intrigue and yet struggle to gain widespread consumer acceptance. Three-dimensional production techniques have changed, theater screen designs have changed, and TV and home-theater video projectors have changed to incorporate 3D. In spite of all this progress, most modern 3D technology still requires viewers to don a pair of dorky glasses.

A new technology saddled with the ungainly, but technically accurate, name of "autostereoscopy," promises to change all that and finally allow us to see 3D video with our naked eyes.

CLASSIC 3D TECHNOLOGY

Power of Love was produced using an anaglyphic process. The film was produced by simultaneously shooting each scene from two different angles (about 2.5 inches apart, roughly the distance between the centers of the average person's eyeballs). The black-and-white film was then printed in two colors, red and green, and combined into a layered film on a single reel.

When the film was screened, everyone in the audience was given a pair of special glasses outfitted with red and green lenses. The red lens canceled out the red version of the film and allowed the green version to pass through, while the green lens did just the opposite. The combination produced the illusion of depth of field. Unfortunately, the anaglyphic process induced headaches in some viewers; it also proved to be incompatible with color movies.

Some 30 years later, with the movie studios desperate to find a means of luring people away from their television sets, the film *House of Wax* hit theaters in 1953 and did sensational box office. *House of Wax* was filmed using Edwin Land's Polaroid 3D system (it also featured the very first stereophonic soundtrack). The Polaroid 3D system used two lenses that captured light waves passing in perpendicular planes.

Moviegoers wore polarized glasses that functioned like anaglyphic lenses.

The 3D movie craze sparked by *House of Wax* petered out just a few years later, and Hollywood largely lost interest in 3D until the early 1980s. A string of schlocky "event" films—*The Treasure of the Four Crowns*, *Jaws 3-D*, and *Amityville 3-D*—passed through theaters, but the mania didn't last long and not even the release of 1983's science-fiction 3D classic *Metalstorm: The Destruction of Jared-Syn* could resurrect the popularity of the genre. The 3D glasses caused a viewer to watch a movie with his or her eyes slightly crossed, giving some people headaches.

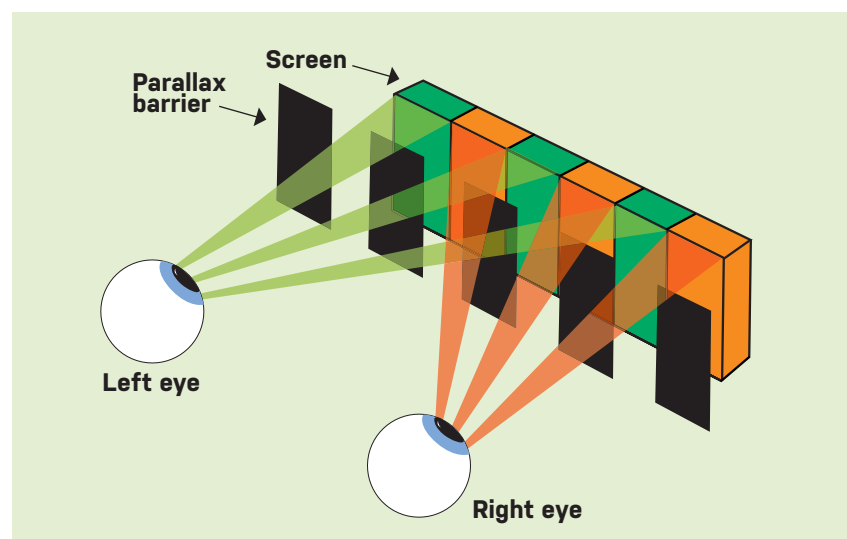
AUTOMATIC STEREOSCOPIC IMAGING

Despite all the known problems with 3D glasses, most modern film studios, cinemas, and TV and video-projector manufacturers still rely on either active shutter glasses (that alternate between darkening

the left and right lenses in sync with the display) or passive glasses (that filter light through polarized lenses).

Autostereoscopy (the creation of stereoscopic images automatically at the source, obviating the need for glasses) could be the ideal solution, although it's not entirely perfect either. The three most common autostereoscopic solutions available or in development today are parallax barrier, lenticular lens, and integral image.

A parallax barrier screen, such as is deployed in the Nintendo DS, is fabricated by facing a display—such as an LCD—with a layer of material with slits that partially obscure each pixel. The left eye is able to see only the pixels intended for the left eye, and the right eye is able to see only the pixels intended for the right eye. When the brain combines both fields of vision, it perceives depth. A parallax barrier screen depends on the viewer sitting in an ideal position—a sweet spot—to deliver maximum effective-



With parallax barrier technology, slits in the barrier between the viewer and the screen present a different view to each eye. It causes the same image separation that 3D glasses would. Unfortunately, because the 3D effect is generated at the source, you can't move your head very much without spoiling the illusion.

ER

ness. Another problem is that the 3D illusion will collapse if the viewer moves his or her head too much. And finally, the parallax barrier blocks much of the light emanating from the display, significantly reducing its brightness.

These restrictions aren't major issues for a single-user, handheld gaming device like the Nintendo DS. TVs, on the other hand, are designed for multiple users in brightly lit rooms sitting far from the display. It's not unusual for none of the viewers to be in the sweet spot. Even the most sedentary couch potato will have difficulty sitting relatively still while watching TV. And TVs need to be as bright as possible to overcome the ambient lighting conditions.

Another autostereoscopic technology is the lenticular lens display. This type of display effectively puts the 3D glasses on the TV itself, with a series of very small lenses that refract light to the left and right, so each eye sees only the pixels intended for it. As with other technologies we've discussed, the brain combines the two fields of view and perceives depth.

Since lenticular lens technology doesn't place an opaque physical barrier on the display, it doesn't reduce image brightness. It can also be viewed from a wider angle without losing the 3D effect, and it's more tolerant of viewer movement. Unfortunately, lenticular lens displays remain difficult and very expensive to manufacture.

Integral imaging is similar to the lenticular lens concept in that it places an array of micro-lenses—one lens for each pixel—in front of the display panel, so that each lens produces a different perspective on the image depending on the viewing angle. With this technique, the eye can see not only right and left views of an object, but top and bottom views as well. The downsides to integral imaging are that it reduces contrast, and no one has come up with a cost-effective means of manufacturing the lens array (a feat nature has already accomplished and bestowed on the eyes of house flies and honeybees).

THE CURRENT STATE OF RETAIL 3D

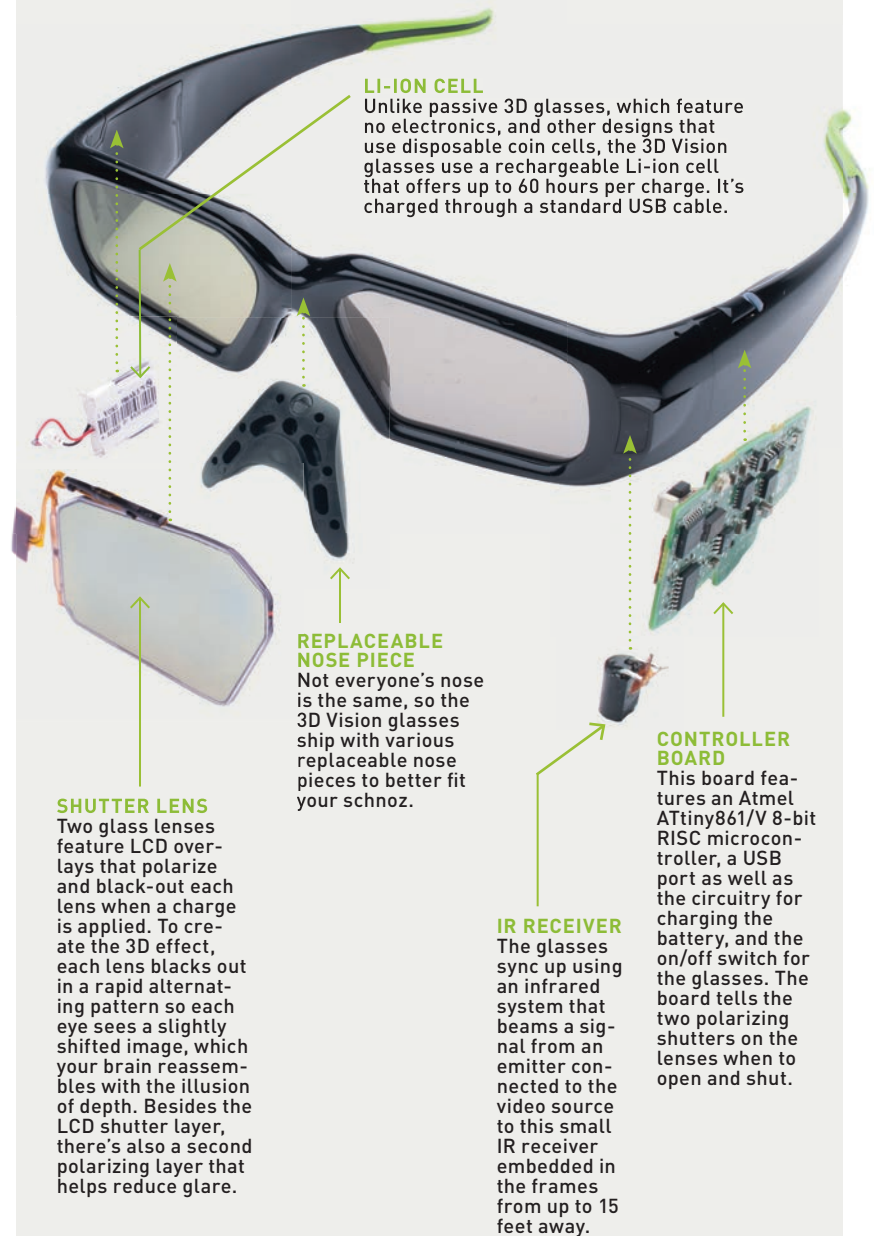
If you can perceive 3D—not everyone can—and you're willing to accept its shortcomings, you can jump into the market now, confident in the knowledge that it's unlikely a major autostereoscopic breakthrough is right around the corner.

That doesn't mean companies will cease their research and development efforts, but we wouldn't be surprised if another decade passes before "glasses-free" 3D becomes a retail reality. And then we'll all start waiting for the first demos of holographic TV. ☺

autopsy

Nvidia 3D Vision Glasses

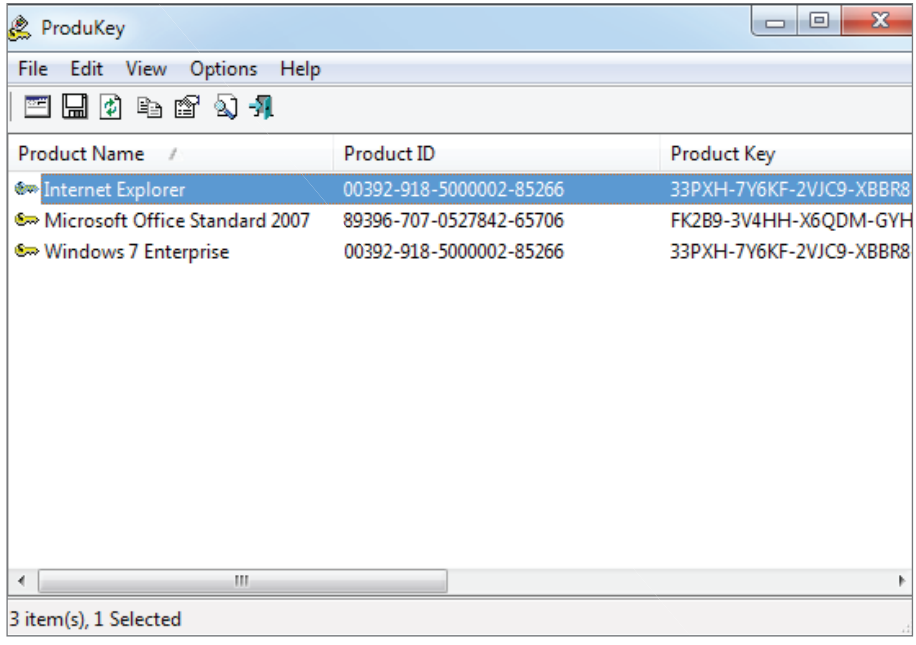
If you've never seen 3D using active shutter glasses, you should. It's a country mile better than 3D seen through passive, polarized glasses, like those used in theaters, and a quantum leap ahead of the old anaglyph variety. To find out the magic behind active shutter specs, we took apart a set of Nvidia 3D Vision glasses to see what's inside.



HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP OF THE MONTH



ALEX CASTLE
ONLINE MANAGING EDITOR

BEING A BETTER TEACHER

A COMMON REFRAIN among PC nerds is how much of a pain it is to be treated like a personal tech-support line for your friends and family. It can be tough, sure, but it comes with the territory, and it *is* nice to be able to help the people we care about. One of this month's how-tos deals with using the Problem Steps Recorder as a teaching tool. Here are three other programs that can help others help themselves.

LogMeIn: The free version of this remote-control app is more than enough to remotely help friends out with most PC problems.

Jing: This free screen-casting tool makes it easy and fast to capture and host how-to videos. There are limitations with the free version, but for informal sharing, it should be fine.

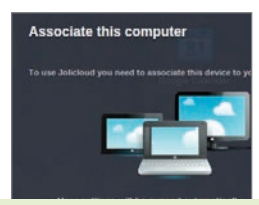
YouTube: When in doubt, YouTube. You'll find how-to videos for most everything on the video juggernaut.

RECOVER YOUR WINDOWS PRODUCT KEY

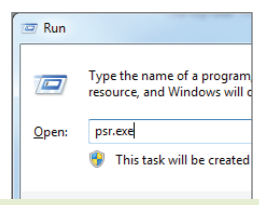
MICROSOFT DOESN'T MAKE IT EASY TO FIND YOUR WINDOWS PRODUCT KEY—A NECESSITY WHEN IT COMES TIME TO REINSTALL. FORTUNATELY, A UTILITY FROM NIRSOFT CALLED PRODUKEY MAKES IT EASY. IT'S FREE, AND IT'LL FIND YOUR KEYS FOR WINDOWS, OFFICE, AND MORE.

bit.ly/9OR9rp

MAKE - USE - CREATE



62
DUAL-BOOT INTO THE SPEEDY JOLI OS



64
USE WIN7'S PROBLEM STEPS RECORDER TO MAKE EASY PC GUIDES

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

DUAL-BOOT INTO THE SPEEDY JOLI OS

Having your computer run Windows 7 is great. Having your computer dual-boot into Windows 7 and a speedy thin client like Joli OS? Even better –
Seamus Bellamy

JOLI OS HAS BEEN MAKING LOW-POWERED NETBOOKS, PCS, TABLETS, AND WEB BROWSERS MORE PRODUCTIVE SINCE 2009.

GOOGLE'S CHROME OS has gotten a lot of ink lately, and for good reason: It's easy to install, zippy, and—insofar as thin-client operating systems go—powerful. But as ubiquitous as Chrome is in the news these days, it isn't the only web-based operating system in town. Jolicloud, or as Jolicloud developers prefer to call it these days, Joli OS, has been making low-powered netbooks, PCs, tablets, and web browsers more productive since 2009.

Savvy users who opt to install Joli OS as a secondary operating system to complement their existing Windows 7 installation will find that booting into the thin client is so fast that they've already logged on, fired off an email, and moved on with their lives in the time it would take for Windows 7 to load to its boot screen. Setting up your PC to dual-boot into Windows 7 and Joli OS couldn't be easier, with the whole process taking no more than 45 minutes and a single download. Here's how it's done.



Jolicloud, aka Joli OS, is a free, cloud-based OS that gives you lightning-fast access to all your favorite online apps and services.

1 DOWNLOAD JOLI OS

If you're going to install Joli OS, you'll have to download it first. The thin client's developers offer the operating system in a variety of flavors. The easiest way to install Joli (and the one we're going to use for this tutorial), is the Keep Windows option, presented prominently on the Jolicloud download page ([image A](#)), located at www.jolicloud.com/download. Click it and download the OS's installation package to your desktop.

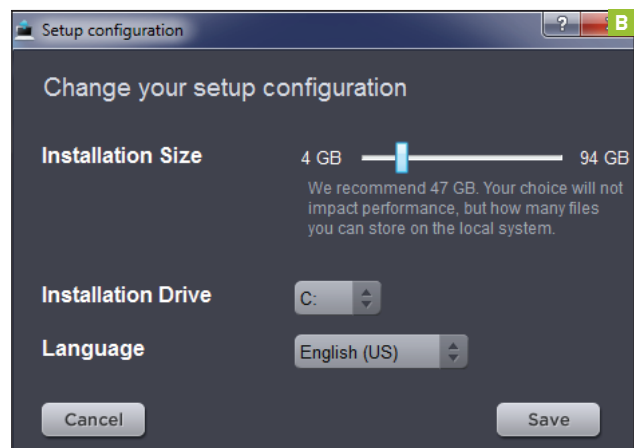


2 DOWNLOAD JOLI OS

It's time to get this thin-client installation show on the road. Double-click the Joli OS Installer and tell Windows to back off when it warns you that it doesn't recognize the package's publisher. After taking a few moments to extract, the package will greet you with an installation dialog.

» Click the Get Started button. You'll be asked to select a username and password for your Joli OS installation. Select something easy to remember, while at the same time giving truck to the importance of strong password protection. Once you've noodled out your new thin client's login credentials, click Next.

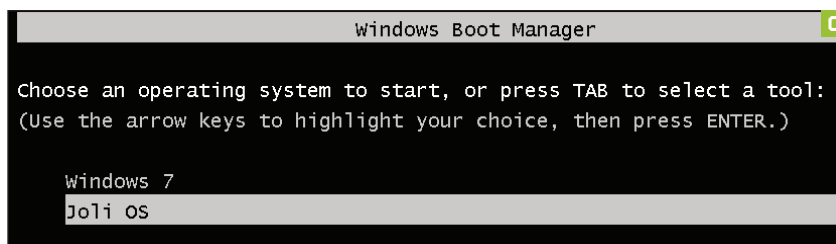
» By default, the installation package will want to set up shop on your C: drive. If you're OK with the location and partition size suggested, click Next. If they rub you the wrong way, click the option to change the configuration ([image B](#)). Your PC can rock a Joli OS installation with as little as 4GB of space. Once you've wrangled the installation settings you're after, click Next. Joli OS will install to your system, prompting you to go for a coffee. If you choose to do so, you'd better make it a quick one—after repeated installations, we've found the whole process to average less than five minutes in length.



3 REBOOT YOUR PC

Once the installation process is complete, you'll be prompted to reboot your system. Do so. Thanks to some behind-the-scenes magic and GNU Project's GRUB bootloader, you'll find that you're now rocking a dual-boot system that asks which OS—Joli or Windows 7—you want to boot into at startup. For the sake of this tutorial, use your keyboard's arrow keys to select Joli OS (image C), and hit Enter.

» You'll be rewarded with a Joli OS splash screen, followed shortly thereafter by a dialog and progress bar explaining that your Joli OS installation is being completed. In hindsight, we're sure the Joli OS devs would agree that this would be a way better place to go and grab a cup of java than during the unpacking process. As svelte an OS as Joli is, the last leg of its installation took a surprisingly long time to complete. That said, your patience will be rewarded with one of the best dual-boot thin-client experiences currently available. Once the installation process is complete, Joli OS will automatically restart your system, booting back into the OS so that you can get down to business.



4 SET UP JOLI OS

Whether you decided to take a coffee break or not, sooner or later your Joli OS installation will be complete and ready to use. Remember those login credentials we had you decide on back in Step 2? It's their time to shine: Once Joli OS has restarted, enter them in the field provided. You'll then be asked to either log into your existing Jolicloud account, or create one (image D). For existing Jolicloud users, logging in will connect your Joli OS installation to your account, allowing any of the preferences, settings, or documents that you've created with other iterations of Joli OS to sync with your new hardware-bound version of the operating system. For users that are new to Jolicloud and Joli OS, creating an account is not only a requirement for rocking the thin client on your computer, it is also a fantastic way to access all of your personal information, documents, and preferred applications everywhere you go, via the Jolicloud website, a dedicated Chrome app, thumbstick installations, and hardware dedicated to the operating system.

» You'll then be asked to describe what kind of hardware you've installed the OS to, as well as your computer's brand and model. This assists Joli OS in serving you the best drivers and updates for your particular rig. It could also come in handy later, should you decide to utilize the OS in multiple locations and need to differentiate between which installation is which.



5 ENJOY!

Now that you've installed your Joli OS thin client, you're ready to reap the benefits of what a dual-booting super rig like yours now has to offer (image E). For heavier tasks, like hardcore gaming, and photo manipulation, there's no question that Windows 7 is the right platform for the job. If all you're interested in is a bit of word processing, web browsing, or catching up on your email, you'll find Joli OS more than capable. What's more, Joli OS's low power requirements make it perfectly suited for road warriors looking to stay productive on a cross-country flight with nothing more than the charge in their laptop's battery, or for those of us who don't have the patience to wait for our computers to boot into a more robust OS.



6 JUST IN CASE

If for any reason you ever decide that Joli OS isn't for you, getting rid of it is even easier than installing it. Simply boot into Windows with an Administrator account, navigate to your Control Panel > Programs > Programs and Features > Uninstall. Locate Jolicloud in the list of applications and uninstall it as you would anything else. Boom: Your rig is back to being a mono-boot beast.

USE THE WINDOWS 7 PROBLEM STEPS RECORDER TO MAKE EASY PC GUIDES

THIS TOOL'S NOT JUST FOR SUPPORT CALLS —ALEX CASTLE

OF THE MANY NEW FEATURES introduced in Windows 7, the humble Problem Steps Recorder was one of the least talked-about. At first glance, the application—which combines an automatic screenshot utility and a sort of low-grade keylogger—appears to be nothing more than a tool to make

life a little easier for Microsoft's legion of support personnel. Upon closer inspection, there's actually much more to the Problem Steps Recorder.

For one, you don't have to be a Microsoft support rep to view the files created by the Problem Steps Recorder, which means that if your

clueless friend *insists* that his PC doesn't do what it's supposed to, you can have him record his actions, and tell him where he went wrong. Even more interestingly, you can use the PSR on your own machine to quickly and easily create illustrated, annotated PC tutorials.

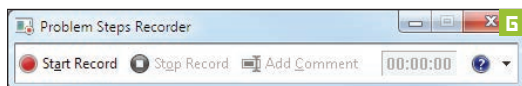
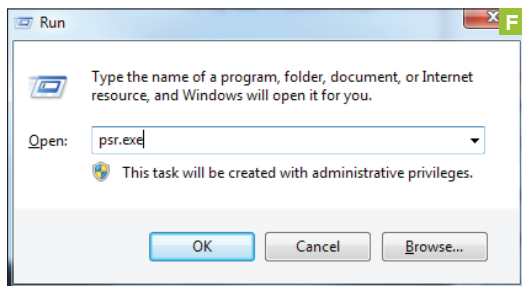
1 SHRINK YOUR WORK AREA

The Problem Steps Recorder punctuates every click you make with a screenshot, showing the entire desktop. If you're running at a very high resolution, or with multiple monitors, these screenshots will be hard to follow along with, so start by disabling your secondary monitor, if you have one, and lowering the resolution to something like 1028x764. Awful, we know, but it's only for a minute.

2 START THE PROBLEM STEPS RECORDER

In the tradition of all of Microsoft's handiest utilities, the Problem Steps Recorder isn't plainly visible in the Start menu. To run it, you'll need to open the Run dialogue box by hitting Win + R, and then typing psr.exe (**image F**). In a pinch, you can also search for PSR at the bottom of the Start menu.

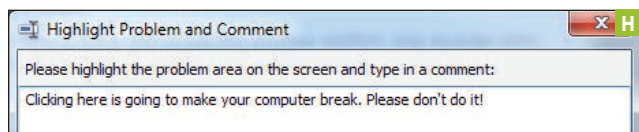
» The Problem Steps Recorder itself is pretty simple—just three buttons (**image G**). You probably don't need us to tell you that in order to begin your recording, you hit the Start Record button.



3 PERFORM YOUR ACTION

Now, simply perform the action that you want to illustrate. Try to do it as economically as possible; the PSR records a new screenshot every single time you click the mouse button, so any unnecessary clicks will make the final guide file longer, larger, and more complicated than it needs to be.

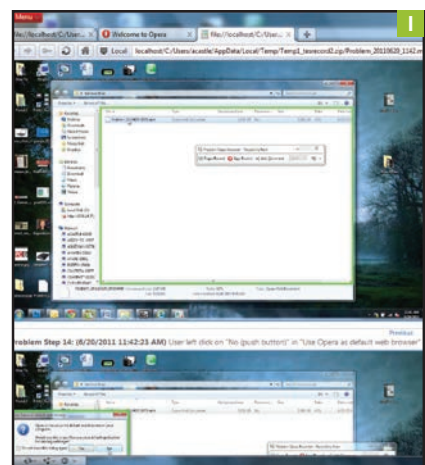
» If you want to elaborate on what you're doing at any time, or explain some onscreen element, click the Add Comment button in the PSR. You'll be prompted to select an area of the screen, and a dialogue box will pop up that allows you to enter a comment (**image H**). Doing this will create another screenshot in the final guide file, with your comment and the area you selected highlighted.



4 SHARE THE RESULTS

As soon as you hit the Stop button on the PSR, it will ask you where you want to store the .zip file it has created. Name it whatever you like, and put it wherever you want—this is what you're going to share with the person who needs help. Email them the file or share it using a service like Dropbox.

» Inside the zip archive, there will be just a single file, in the .mht format. Your system may not have a default association for .mht, but it's just XML—you can open it with any modern browser (**image I**). Explain to your friend how to extract and open the file (if only you could use the PSR for *this!*), and that's it—an instant, nicely formatted how-to guide. ☺



BUILD IT

NATHAN EDWARDS SENIOR ASSOCIATE EDITOR



A \$340 Ultra-Budget Box

Can we build a serviceable rig for just \$340? With AMD's Fusion APU, we're gonna try

LENGTH OF TIME: 1 HOUR

LEVEL OF DIFFICULTY: INTERMEDIATE

THE MISSION In past months, we've shown you how to build rigs for less than \$1,000, and last month we built a surprisingly speedy \$667 PC Value Meal. But what do you do when your budget is half that? Let's face it, not everyone has half a grand or more to spend on a new computer, and not every build has to be a tricked-out gaming rig. Sometimes you just need a second computer for the family, or an HTPC that doesn't break the bank. Heck, sometimes you just need a cheap first computer. That doesn't mean you have to head to big-boxville and pick a prebuilt off the rack. Indeed, we're betting that with a little elbow grease we can put together a machine for less than \$350 that'll perform basic tasks, if not with a surplus of power, at least without smoking and dying.



HOW DO YOU BUILD A PC for less than \$350? Combine, combine, combine. AMD's Brazos Fusion APU is great for that; for \$110 we got an Asrock E350M1 Mini-ITX motherboard with a 1.6GHz dual-core Hudson M1 APU and integrated Radeon HD 6310 GPU. Bam! That's motherboard, CPU, GPU, and onboard cooler taken care of. The E350M1 has two slots for DDR3 DIMMs; we'll use just one 2GB DDR3/1333 DIMM for now.

We chose the Rosewill RS-MI-01 BK chassis for several reasons. First, although it's small, it's roomy enough to accommodate one full-size optical drive and two 3.5-inch hard drives. Other Mini-ITX cases are smaller,

but require slimline optical drives and 2.5-inch hard drives—too pricy for our budget. The case also comes with a 250W integrated PSU that's more than enough to power our rig. The case also has one PCI expansion slot, just in case we want to upgrade to a single-slot discrete GPU sometime in the future—the motherboard features one PCIe x16 slot.

For our drives, we picked a DVD burner with solid performance and a low, low price of \$20. We also snagged a 320GB hard drive for \$40. We know you can get 1TB for less than twice that, but every penny counts.

INGREDIENTS

PART/URL	PRICE
Case/PSU Rosewill RS-MI-01 BK w/250W PSU www.rosewill.com	\$50
Mobo/APU Asrock E350M1 Hudson M1 Mini-ITX mobo w/AMD E-350 APU (1.6GHz, dual-core) and integrated Radeon HD 6310 GPU www.asrock.com	\$110
RAM Patriot 2GB DDR3/1333 DIMM www.patriotmemory.com	\$20
Optical Samsung SH-222AB CD/DVD burner www.samsung.com	\$20
Hard Drive WD Caviar Blue 320GB www.wdc.com	\$40
OS Windows 7 Home Premium 64-bit OEM www.microsoft.com	\$100
TOTAL	\$340



1

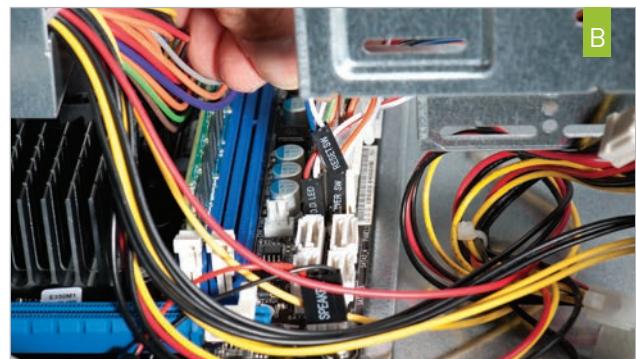
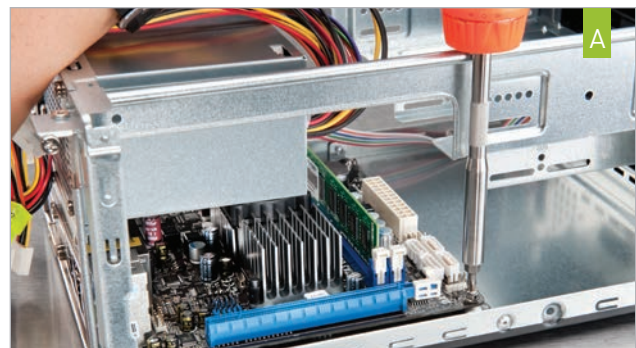
MOUNT THE MOTHERBOARD

THE FIRST STEP IS to prep the case. The Rosewill case we're using is pretty simple; to remove the top and side panels, just remove four screws on the rear panel, then lift the panel up and out. Remove the front bezel (but leave it close by) by detaching the clips at the sides and bottom of the bezel.

Before you install the motherboard, insert the RAM into the slot closest to the APU.

Install the motherboard I/O shield, then slide the mobo onto the four raised standoffs at the back of the case, aligning the I/O ports with the holes in the shield. Secure the mobo (**image A**) with four screws (they'll look like the ones you just removed from the rear panel), then, while you're at it, connect the 24-pin ATX power cable, as well as the front-panel HD Audio and USB 2.0 connectors. It's not going to get any less cramped inside the case later.

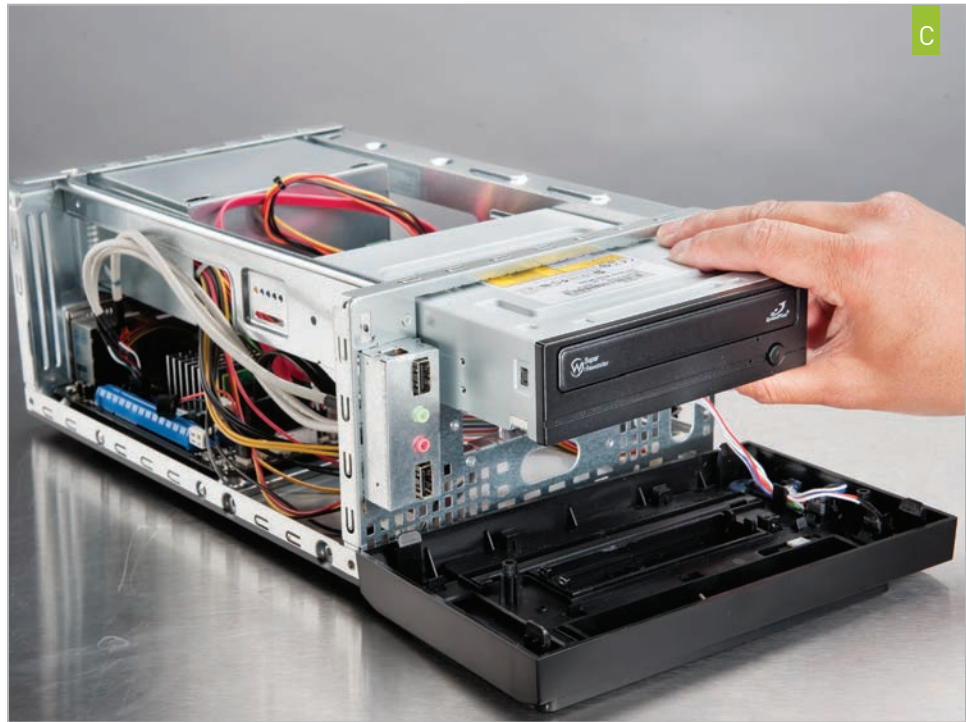
You should also attach the front-panel power, reset, and LED connectors (**image B**), as the optical drive will soon make access to that part of the motherboard difficult.



2

INSTALL THE OPTICAL DRIVE

NOW IT'S TIME TO install the optical drive. Slide it into the 5.25-inch drive tray at the front of the case until the mounting holes on the side of the drive line up with the rear-most sets of holes on the sides of the bay (**image C**). Secure with four to eight optical drive screws. Tuck the remaining length of the ATX power cable underneath the optical drive, and attach the SATA power and data cables. We suggest using the SATA power connector that's closest to the PSU for the optical drive, leaving the terminating connector for the hard drive. Replace the front bezel.



3

INSTALL THE HARD DRIVE

THERE ARE TWO 3.5-inch drive mounts in the case we're using: one at the front, which can be used for an external 3.5-inch drive, and a mounting point at the rear, to the right of the motherboard. We'll use the latter.

Attach the drive rails to the hard drive as shown (**image D**), using the same style of screw that you used for the motherboard. Insert the drive perpendicular to the optical drive at the front of the case (**image E**), then slide it back into place, making sure the SATA ports point toward the front of the case and the mounting holes on the case frame line up with the holes in the top drive rail. Secure with the pointed-ended screws.



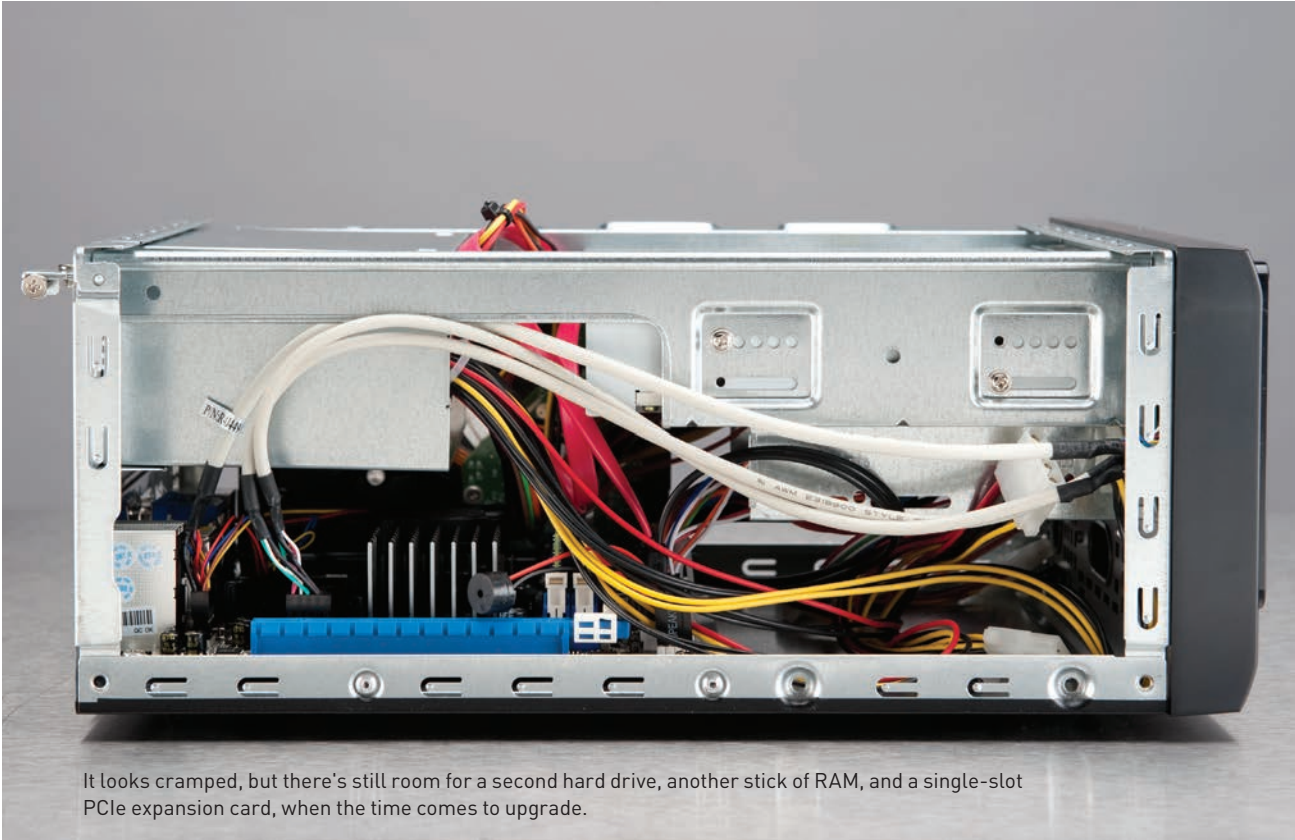
4

ATTACH THE CONNECTORS

CONNECT THE remaining SATA power connector to the drive (**image F**), then use the black 6Gb/s SATA data cable to connect the hard drive to the motherboard's SATA3_0 port. The hard drive doesn't have a SATA 6Gb/s connector, but both port and cable are backward-compatible; besides, the motherboard only comes with one SATA 3Gb/s cable, which we've used for the optical drive.

At this point, you're ready to go! Check that the 24-pin power cable is connected to the motherboard, double-check your drives' SATA power and data connections, and make sure the front-panel connectors are all in place, then replace the top cover and secure it. Now all you have to do is install your OS and you're ready to go!





It looks cramped, but there's still room for a second hard drive, another stick of RAM, and a single-slot PCIe expansion card, when the time comes to upgrade.

BENCHMARKS: \$340 BUDGET BOX VS. GIADA PC

	GIADA i50		
PHOTOSHOP CS3 (SEC)	272	448	(-39.3%)
MAINCONCEPT (SEC)	4,736	8,925	(-46.9%)
3DMARK03 (3DMARKS)	1,189	6,548	(450.7%)
QUAKE III (FPS)	87	179.6	(106.4%)
QUAKE 4 (FPS)	9	43.7	(385.6%)

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

For detailed specs of the Giada i50, see page 74.

BENCHMARKING THE BUDGET BUILD

DON'T EXPECT MIRACLES from a budget this small. Our mini rig is more than capable of basic computing tasks, and it's a lot more powerful than a netbook of about the same price, but it can't hold a candle to even our \$667 budget rig from last month—but then again, it's half the price. Thanks to the integrated Radeon HD 6310 graphics chip, the mini rig handily trumps much more expensive mini PCs like the Giada i50 reviewed in this issue—at least in gaming and other GPU-limited tests. It can't compete

with the Giada's Core i5-430UM, despite our rig's higher clock speeds, in our Photoshop benchmark, or in MainConcept Reference, both of which might benefit from the Giada's 4GB of RAM (our rig has only 2GB) and faster Core i5 microarchitecture. Though a Blu-ray drive wasn't in our budget for this build, we were able to playback 1080p video (the *Iron Man 2* trailer we usually use for this test) with no issues using Window Media Player. And though this isn't a gaming powerhouse—averaging around 18fps in *Left 4 Dead 2* at 1280x800—it

still has oomph enough for older games, which is where a gamer with a \$340 hardware budget should be looking anyway. We don't mean that in a snobby way; there are dozens of gaming classics available on sites like Gog.com for very little money that will run great on our budget build, and keep you happy and gaming for hundreds of hours. With a \$400 budget, we could have added another 2GB DIMM and replaced the hard drive with a 7,200rpm 750GB hard drive. Hell, with \$1,000, we could build a truly

kick-ass rig. But that wasn't our goal. Our goal was to create a functional PC at as low a price as we could manage, and in that we succeeded, creating a device that outperforms many mini PCs and set-top rigs that are twice its price. If you need a machine for the kids, or for basic computing tasks, you don't have to spend more than this to get something serviceable. And if you come into some money later on, you can smack some more RAM in there, add a discrete videocard, and further extend the life of your PC. ☺

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

INSIDE

- 74** Giada i50 PC
- 75** Acer Aspire AS8950G-9839 Laptop
- 76** Samsung Series 5 Chromebook
- 78** XFX Radeon HD 6990 Videocard
- 80** Gigabyte GTX 560 Super Overclock Videocard
- 82** Solid-State Drives: OWC Mercury Extreme Pro 6G and OCZ Agility 3
- 84** Fractal Design Core 3000 Case
- 86** Netgear ReadyNAS Ultra 4 Plus NAS
- 88** Samsung Galaxy Tab 10.1 Tablet
- 89** Motorola Droid X2 Phone
- 90** Duke Nukem Forever
- 92** Lab Notes



SAMSUNG
SERIES 5 3G
CHROMEBOOK
PAGE 76

Giada i50

A real Velcro PC at last

PERHAPS YOU'VE HEARD about our concept for the Velcro PC: a computer so small, light, and unobtrusive that you could literally affix it to the back of your HDTV.

That concept might have finally arrived in Giada's i50 PC. Similar to the original Giada Ion-100 that we reviewed in the March 2010 issue of *Maximum PC*, the i50 is a serious step up over the original box.

The most noticeable upgrade is in the brains department: The original Ion-100 sported an Nvidia Ion 2 chip coupled with a 1.3GHz Atom 330; this new model features a 1.2GHz Core i5-430UM processor. It's not wickedly fast, mind you, but despite its 100MHz lower clock, it's several times faster than the weak-sauce Atom 330 part.

In graphics performance, however, the Arrandale-based Core i5 falls short. The older Giada with its Ion 2 walks all over the i50 in anything graphics-related. In fact, the Giada is the slowest we've ever seen in an HTPC. Some of that is the fault of the older graphics core in the Core i5, and some is the fault of the single-channel DDR3 RAM running at a leisurely 800MHz. For integrated-graphics folks, system RAM speed matters.

But does gaming performance really matter in a box that's meant to be an HTPC machine? We don't believe so. The Giada is more likely going to be used to stream content from various websites. The original Giada, despite its faster 3D performance, wasn't up to that task given its slow Atom chip. The Giada i50 is. We had no issues playing HD video from YouTube,



Gigabit Ethernet, VGA, HDMI, and four USB ports adorn the back of the Giada i50.

Vimeo, or Netflix. Granted, much of Atom's performance issues have been mitigated by Adobe's addition of GPU acceleration to Flash, but unoptimized players such as QuickTime will still trip up Atom systems. We expected the i50 to sail through our QuickTime test—playing a 1080p *Iron Man 2* trailer from the hard drive—but were surprised that the 1.2GHz Core i5 didn't have the chops for it. Is it the machine's fault or Apple's, though? The trailer played perfectly fine from Windows Media Player and also from the VideoLAN player. We were originally prepared to hold it against the Giada but ultimately decided that it's probably better to blame the QuickTime Player, which is an even bigger pile of poo than we had suspected.

Is the Giada i50 the best HTPC we've ever tested? No, our heart still belongs to Asrock's Vision 3D with its 2.4GHz Core i3 and discrete GeForce GT 425M part. But then again, the Asrock tips the scales at \$800 to \$1,000—without the OS. The Giada isn't cheap at \$650 with Windows 7 Home Premium installed, but we've seen it for \$500 on the street with the OS. The Giada is also quite a bit smaller than the Asrock



The Giada i50 sports a Core i5 CPU and is small enough to be hidden behind your HDTV.

machine and therefore truly suitable for those who want to mount it behind their HDTV Velcro-style. The i50 even comes with a VESA mount, too. It's not the fastest HTPC, but it's the smallest, most-capable-for-its-size machine we've encountered to date. —GORDON MAH UNG



Giada i50

VELCRO Incredibly small and light; sips power.

VELVET Could use a faster CPU and GPU; slight fan whine.

\$650, www.giadapc.com

BENCHMARKS

	Giada i50	MSI E350IA-E45	Dell Inspiron Zino	Giada Ion-100	Asrock Vision 3D
CPU	1.2GHz Intel Core i5-430UM	1.6GHz AMD E350	1.5GHz Athlon X2 3250e	1.3GHz Atom 330	2.4GHz Core i3-370M
GPU	Integrated Arrandale Graphics	Integrated Radeon HD 6310	Integrated Radeon HD 3200	Integrated Nvidia Ion	GeForce GT 425M
PHOTOSHOP CS3 (SEC)	272	438	449	552	162
MAIN CONCEPT (SEC)	4,736	4,604	7,080	8,858	2,452
3DMARK 2003	1,189	6,403	2,540	3,371	17,394
QUAKE III (FPS)	87	193	192	118	537
QUAKE 4 (FPS)	9	43	29	29	112

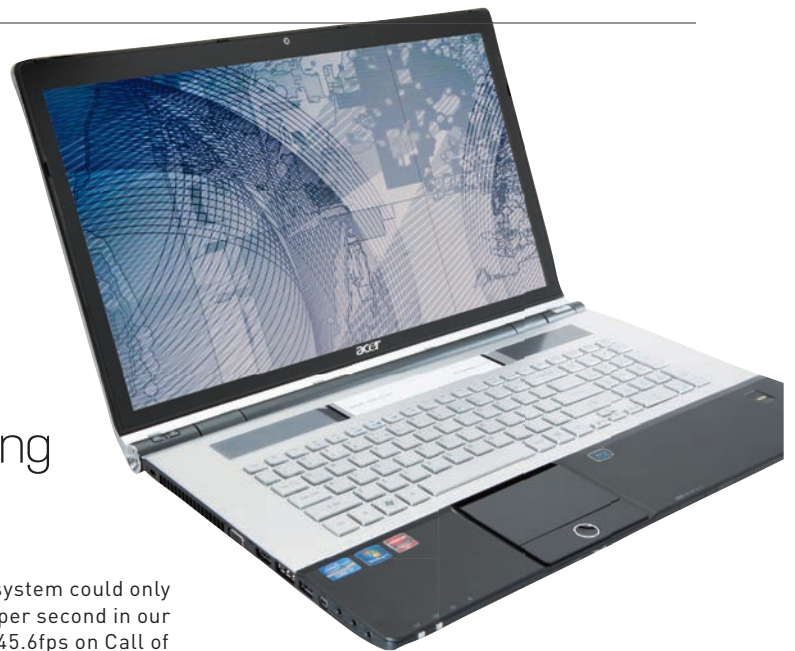
Best scores are bolded.

SPECIFICATIONS

PROCESSOR	Intel 1.2GHz Core i5 430UM
MOTHERBOARD	Custom using Intel HM55
RAM	4GB DDR3/800 in single-channel mode
GRAPHICS	Integrated
SOUNDCARD	Integrated
STORAGE	500GB Seagate HDD (7,200rpm)
NETWORK	Realtek Gigabit Ethernet, 802.11n, Bluetooth

Acer Aspire AS8950G-9839

A great big screen and booming sound provide cinephilic bliss



IT MAY NOT FIT in an average laptop bag and you could look a little comical trying to peck away at it on the local bus, but a really big notebook with a really big display pleases us. While the Acer Aspire AS8950G-9839 didn't impress us in terms of gaming performance, it's one of the best movie-watching laptops we've ever tested.

What sets this Aspire apart is its 18.4-inch full HD, widescreen, LED-backlit display. This huge, clear, bright display with 16:9 aspect ratio is perfect for watching movies, either from the included Blu-ray player or streamed online. It would also perform spectacularly on PowerPoint presentations. Equally impressive are the five built-in speakers and subwoofer. This Aspire's also surprisingly light, weighing only eight pounds on your lap and less than 10 pounds with the power supply. Note, though, that the screen's native resolution of 1920x1080 isn't any higher than a typical 17-inch screen. That's a bonus for those who prefer easy-to-read text and icons, but might be a disappointment to those searching for the maximum screen real estate.

Unfortunately, the ATI Radeon HD 6850M with 2GB of DDR3 memory couldn't deliver the wow factor of the huge screen and blasting sound. At our test resolution

of 1680x1050, the system could only muster 26 frames per second in our Far Cry 2 test and 45.6fps on Call of Duty. That's playable, to be sure, but well below the zero-point notebook we use for comparison, which has a GeForce GTX 460M. The GPU is definitely the limiting factor here. In our CPU-intensive tasks the Aspire's 2GHz Intel Core i7-2630QM processor and 8GB of DDR3/1600 dual-channel RAM helped it blow past our zero-point machine, just like the other Sandy Bridge notebooks we've tested so far.

One of its unique features is a transparent, smooth touchpad that does double-duty as a media control center. A button below the touchpad lets you toggle the modes. We found it took time to get used to the glassy texture of the touchpad. Much worse, if you're the type who likes to eat Pringles while tending livestock on FarmVille, the greasy fingerprint smears are likely to get on your nerves. We're also concerned with the location of the little button that toggles Wi-Fi right at the front of the laptop where it's much too easy to press accidentally, especially when maneuvering this behemoth to just the right position on your lap.

The huge screen on this surprisingly light laptop is perfect for movies but its GPU lacks the wow factor.

Overall, as a desktop replacement, this notebook will satisfy everyone except those looking for cutting-edge 3D graphics. The big screen and well-designed speaker system make for an outstanding movie-watching experience, and your movie enjoyment won't be limited to sitting at your desktop—this notebook is not only light enough to lug around without too much stress and strain, it lasted more than three hours playing a DVD on battery power. That's impressive. —KEN FEINSTEIN



Acer Aspire AS8950G-9839

BUTTER Very large screen and excellent surround sound speakers; surprisingly lightweight.

MARGARINE Mediocre 3D graphics; some questionable industrial design decisions.

\$1,600, www.acer.com

BENCHMARKS

	ZERO-POINT	
PREMIERE PRO CS3 (SEC)	899.0	600
PHOTOSHOP CS3 (SEC)	131.0	104
PROSHOW PRODUCER (SEC)	876.0	639
MAINCONCEPT (SEC)	1,782	1,256
FAR CRY 2 (FPS)	48.5	26 (-49.1%)
CALL OF DUTY 4 (FPS)	62.2	45.6 (-48.9%)
BATTERY LIFE (MIN)	96	192

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

SPECIFICATIONS

CPU	2.0GHz Intel Core i7-2630QM
RAM	8GB DDR3
CHIPSET	Intel HM65
STORAGE	750GB 5,400rpm hard drive
OPTICAL	Blu-ray ROM/DVD burner combo drive
GPU	ATI Radeon HD 6850M w/2GB DDR3
CONNECTIVITY	HDMI out, VGA out, Ethernet, one USB 3.0, three USB 2.0, one eSATA/USB, FireWire, fingerprint reader, Wi-Fi, headphone, mic, line-in, media reader, webcam
LAP/CARRY	8 lbs, 4.6 oz / 9 lbs, 14.3 oz

Samsung Series 5 3G Chromebook

'Nothing but the web' is attractive, but hard to justify



IF YOU'VE USED THE CHROME web browser, you've used Chrome OS. Google's latest netbook operating system is little more than a very, very thin client underneath the Chrome browser, and a Chromebook is a netbook-like object that runs Chrome OS instead of a full Windows or Linux-based operating system. Chromebooks have finally hit retail (in the form of sleek netbooks from Samsung and Acer), and it's time to find out whether "nothing but the web" is enough computer for anyone.

The Samsung Series 5 Chromebook is well constructed. The 12.1-inch, 1200x800 LCD is readable at low levels and powerful at full brightness, the speakers have much more oomph than we were expecting, and the multitouch, buttonless clickpad is decent. The chiclet-style keyboard is the best we've ever used on a netbook and battery life is great—we clocked more than eight hours doing normal computing tasks.

The Chromebook comes with 24 months of free 3G data from Verizon Wireless, though the 100MB/month allocation is so stingy as to be laughable, and the à la carte pricing is prehistoric. Thankfully, the SIM card slot and Gobi multiband radio mean you have other data options.

Thanks to its 1.66GHz dual-core Atom processor, 2GB of RAM, and 16GB SSD, and the fact that it only has to run a web browser, the Chromebook is relatively speedy. It boots in less than 10 seconds, and resumes in two to three seconds. Browsing is snappy, and 720p Flash-based video on YouTube plays fine. We did have occasional hitches playing HD video on Vimeo.com, though.

Whether you consider Chrome OS sufficient for your daily computing needs

will depend on how heavily invested you are in Google's Internet ecosystem. Gmail, Music, Docs, and more work seamlessly, but Office docs need to be uploaded and converted through Docs to be usable. Chrome browser extensions and web apps work just as well as they do on a Windows desktop. In fact, it's easy to forget there's almost nothing behind the browser but a rudimentary file browser until you need to do something Chrome OS can't.

Chrome OS has Flash support baked in, but that's about it. You can't install Silverlight, Java, or Unity—serious blows to Netflix fans, business users, and gamers, respectively. There's no VPN ability, which will also hurt business users. And therein lies the dilemma.

The Chromebook is an attractive piece of hardware, and works well for what it is, but it's hard to justify purchasing one. At \$500, it's pricier than many devices of the same basic footprint—notebooks with more powerful hardware and more capable operating systems. The Chromebook is obviously designed more for productivity than for entertainment, so it's not really competing with tablet devices other than (perhaps) the Asus Eee Pad Transformer. We like the Chromebook, but we're as close to a target demographic as is likely to exist: We own powerful desktop PCs and smartphones, but could use a portable device with great battery life, constant Internet access, and a terrific physical keyboard.

At its price, though, the Chromebook loses its luster; there are just too many things that it doesn't do, and too few things you can't get from running the Chrome browser on a regular machine. It's a good

The hardware is great, but a browser-based OS is useless offline.

secondary device for a vanishingly small segment of the market (which might include us) but would rank as a tertiary device for most. —NATHAN EDWARDS



Samsung Series 5 3G Chromebook

ROME Solid, portable hardware; multiband 3G radio; file browser support; great battery life; great keyboard.

VANDALS 100MB/month data allocation is ludicrous; needs more plugin support; too pricey.

\$500, www.samsung.com

SPECIFICATIONS

CPU	1.66GHz dual-core Atom N570
RAM	2GB DDR3
DRIVE	16GB SSD
GPU	Integrated Intel
CONNECTIVITY	VGA out (via included dongle), 802.11b/g/n Wi-Fi, combo audio, media reader, Gobi 3G radio, SIM card slot
LAP/CARRY	3 lbs 4 oz / 3 lbs 13 oz

XFx Radeon HD 6990

Just how good is this rare beast of a card?

WHEN WE TOOK A LOOK at the reference version of AMD's Radeon HD 6990, we found a board that was impressive on a number of fronts, though not all the impressions were positive. The HD 6990 builds in two full Radeon HD 6970 GPUs onto a single board, each with its own 2GB of frame buffer. In our initial testing, performance looked to be very fast, but the reference board was also pretty noisy under load.

So we waited to get a shipping board from one of AMD's many board partners in order to formally review a real product. And we waited. And waited some more. (Bear in mind that availability of Nvidia's GTX 590 isn't much better.)

At last, XFX shipped us an actual retail Radeon HD 6990, so we're finally able to render a verdict on AMD's killer card. Before we dive into benchmarks and observations, it's worth recapping the specs and features of the card, and its GPUs.

The Radeon HD 6990 has five total display connectors, though it does cut back on the variety compared to the HD 6970, with four Mini DisplayPort connectors and a single dual-link DVI connector. XFX includes a pair of Mini DP-to-single-link DVI adapters (one passive, one active) plus one Mini DP-to-HDMI adapter in the box. With two GPUs and 4GB of GDDR5, this is a big card—over 12 inches long. It also requires two 8-pin PCIe power connectors.

It's also worth looking at core clock differentials. Nvidia reduces the core clock speed of its dual-GPU GTX 590 card by more than 20 percent, from 772MHz to 607MHz. By contrast, AMD lowers the core clock speed of the HD 6990's GPUs by only about 6 percent. It could be that AMD's GPUs are more power efficient, or simply that AMD is being more aggressive about its overall design. Given the HD 6990's noise level under load, we suspect a little of both.

As with the reference card, the XFX card has that overclocking mini-DIP

switch that allows you to push the clock speed up to 880MHz—the same core clock as a single-GPU HD 6970 card. However, XFX puts a giant yellow caution sticker over this switch. Given that rather dire warning, we tested the card at its default 830MHz clock speed.

Now that we understand a bit more about the key features, let's look at performance.

AMD's HD 6990 wins seven of our benchmarks, ties in one, and loses to Nvidia's GTX 590 in the remaining three. The 6990's maximum power draw is marginally lower. All of the games we tested support CrossFireX; if you're running an older game that doesn't support AMD's dual-GPU technology, you'll only see the performance of a single HD 6970. However, AMD's done a ton of work with its drivers, and all the current-generation games we've tested get a solid performance boost.

On the other hand, the XFX HD 6990 is *considerably* louder at full throttle than the GTX 590. Clearly, AMD has some work to do with its cooling solution to reduce noise levels. Or maybe AMD is just pushing those 40nm-based 6970 chips a little too hard, even at the lower clock speeds. As you might suspect given the fan noise, the HD 6990 gets quite hot at full load, so you'll definitely want a case with robust airflow.

The bottom line: XFX is shipping the fastest graphics card you can buy—that is, if you can find one. Availability is still very tight, and if you order one, expect it to be backordered for several weeks. It's also quite hot and quite loud, so be aware of that before buying. And all that performance comes at a price—the HD 6990 is also the most expensive card you can get, with prices ranging from \$700-\$800 depending upon the seller.

Still, if you're really looking for raw speed in a single graphics card—noise, heat, and price be damned—the HD 6990 is the frontrunner. **-LOYD CASE**

VERDICT



XFx Radeon HD 6990

✦ **JAMES T. KIRK** Extremely fast in most current-gen

games, even with AA; drivers are much improved; supports five monitors out of the box.

✦ **JEAN-LUC PICARD** Extremely loud under full load. Very hard to find—expect a wait.

\$700-800, www.xfxforce.com



SPECIFICATIONS

	XFx Radeon HD 6990	Asus GTX 590
SHADER UNITS	3,072	1,024
TEXTURE UNITS	192	128
ROPS	64	96
POWER CONNECTORS	2x 8-pin	2x 8-pin
CORE CLOCK FREQUENCY (MHZ)	830	607
MEMORY CLOCK FREQUENCY (MHZ)	1,250	854
FRAME BUFFER SIZE	2x 2GB	2x 1.5GB
MEMORY INTERFACE	256-bit	384-bit
VIDEO CONNECTORS	DL-DVI, 4x Mini DP	3x DL-DVI, 2x Mini DP

* Nvidia and AMD shader cores are not directly comparable.

BENCHMARKS

	XFx Radeon HD 6990	Asus GTX 590	XFx Radeon HD 6970	EVGA GTX 580 SC
3DMARK 2011 (EXTREME)	3,277	2,661	1,814	2,021
3DMARK VANTAGE PERF	28,075	28,261	20,443	23,888
UNIGINE HEAVEN 2.1 (FPS)	50	54	27	36
CRYSIS (FPS)	62	56	36	36
BATTLEFORGE DX11 (FPS)	99	147	47	78
FAR CRY 2 / LONG (FPS)	150	149	94	122
HAWX 2 DX11 (FPS)	145	186	91	158
STALKER: COP DX11 (FPS)	89	86	53	58
JUST CAUSE 2 (FPS)	72	60	41	52
ALIENS VS. PREDATOR (FPS)	78	67	40	44
F1 2010 (FPS)	87	82	65	72
METRO 2033 (FPS)	39	39	22	26
SYSTEM POWER @ IDLE (W)	156	174	139	141
SYSTEM POWER @ FULL THROTTLE (W)	501	515	331	395

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

This card packs two HD 6970 GPUs, 4GB of fast GDDR5, and one noisy cooling fan.

Gigabyte GTX 560 Super Overclock

Gigabyte pushes GTX 560 to Ti levels

HOW MUCH OVERCLOCKING head room is there in Nvidia's new GeForce GTX 560 part? Gigabyte decided to find out by taking the non-Ti budget part, adding a second fan, and flogging the hell out of it.

The result is the Gigabyte GTX 560 Super Overclock.

For those out of the loop, the GeForce GTX 560 is built on a core with only 336 shader cores versus the 384 in the Ti version, as well as 56 texture units versus 64 in the Ti part. Stock cards run at 810MHz but Gigabyte gets a solid 11 percent overclock to 900MHz. Unlike its predecessor, the GeForce GTX 460 768MB, the GTX 560 gets a full 1GB of GDDR5 and the same memory bus width as the GTX 560 Ti card.

The result is near-GTX 560 Ti performance, which is great. Also great: a price point of roughly \$200-\$220. MSI's Twin Frozr II GTX 560 Ti card, which we reviewed in the April issue, can be found for less than \$250, so the GTX 560 is still priced lower, even overclocked.

The Gigabyte card is built with two of the biggest cooling fans we've seen on small videocards. They also use the newly fashionable narrow-blade design. So even with the core clock pushed to 900MHz, the card's noise level isn't offensive.

Other features are pretty standard. The card offers two dual-link DVI connectors and a Mini HDMI port. Two PCIe 6-pin connectors are needed for power. The card itself has some nifty power-phase status LEDs, which look cool if you're someone who fancies transparent side panels on your PC chassis. As with every other graphics card maker, Gigabyte ships software to tune clock speeds. Honestly, though, it's really not worth it—you're already hitting more than 10 percent above stock.

In the end, though, performance is what counts. So how does Gigabyte's \$200 marvel actually measure up? Not bad. Not bad at all. We compared it to the 2GB Palit GTX 560, which runs at reference clocks,



A second fan lets Gigabyte massively overclock the GeForce GTX 560.

Asus's overclocked Radeon HD 6870, and the MSI Twin Frozr II GTX 560 Ti. (The GTX 560 Ti is just offered as comparison, since it's a \$250 card.)

The outcome is pretty impressive. The Gigabyte card falls just short of the theoretically more capable GTX 560 Ti and crushes the real competition. The Radeon HD 6870 only managed a couple of wins, and even fell behind in idle power usage. About the only time the 2GB Palit card outperformed the Gigabyte 1GB card was when running Metro 2033 at 2560x1600 with 4x AA—that's a scenario when more video RAM helps.

So if your graphics card budget is in the \$200 range, give this card a close look. It's fast, quiet, and will fit in most cases.

—LOYD CASE

VERDICT
9
KICK ASS!

Gigabyte GTX 560 Super Overclock

GOLD SHIRT Impressive performance for the price; relatively quiet; moderate size.

RED SHIRT Fan bulk makes adjacent slot usage problematic.

\$200-220, www.gigabyte.com

SPECIFICATIONS				
	Gigabyte GTX 560 Super OC	Palit GTX 560 2GB	Asus Radeon HD 6870 DirectCU	MSI N560GTX-Ti
3DMARK 2011 PERF	4,475	3,878	4,314	4,519
UNIGINE HEAVEN 2.1 (FPS)	20	22	18	26
CRYSIS (FPS)	26	23	29	29
HAWX 2 DX11 (FPS)	117	109	77	127
STALKER: COP DX11 (FPS)	46	36	34	44
ALIENS VS. PREDATOR (FPS)	29	27	26	32
METRO 2033 (FPS)	16	16	20	17
SYSTEM POWER @ IDLE (W)	133	120	140	130
SYSTEM POWER @ FULL THROTTLE (W)	305	310	252	305

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



Suddenly, SandForce

Was the Vertex 3 a fluke, or are all second-gen SandForce SSDs so fast?

WE WAITED A LONG TIME for the second-generation SandForce SSD controller. When we finally got our hands on OCZ's Vertex 3 in March, it was just in time to be the only SF-2281-powered SSD in our June 2011 roundup. We boggled at the Vertex 3's speeds and hoped they weren't a fluke. Now more vendors are shipping SF-2281 SSDs, and it's time to test two contenders: OWC's Mercury Extreme Pro 6G and OCZ's "value" Agility 3. **-NATHAN EDWARDS**

OWC MERCURY EXTREME PRO 6G 240GB

Any fears we had that the OCZ Vertex 3's speeds were due solely to some voodoo magic or secret deal with SandForce were unfounded. OWC's Mercury Extreme Pro 6G—a product name that contains three too many buzzwords—goes toe to toe with the Vertex 3 in nearly every benchmark, and exceeds it in some.

Like the Vertex 3, the Mercury Extreme Pro 6G (and why not tack on "Enhanced Premium Plus" while you're at it, OWC?) utilizes 256GB of synchronous, 25nm NAND (Micron, in our review unit). As with other SandForce drives, 16GB are reserved for redundancy and overprovisioning; the rated capacity of the drive is 240GB. Unlike the Vertex 3, the Mercury Extreme Pro comes in a sparkly blue chassis. And that's about the only difference.

In AS SSD's incompressible-data sequential read test, the Mercury averaged nearly 506MB/s—on par with the Vertex 3. Its sequential write speed, at 290MB/s, was 10MB/s higher than the Vertex's. In CrystalDiskMark, though the Mercury's sustained reads were 5MB/s slower than the Vertex 3's, both its sustained writes and 32QD 4KB read and write speeds exceeded

the Vertex's. IOMeter's 32QD 4KB random-write test confirms it—the OWC drive is *slightly* faster at 4KB random writes.

Now, the Mercury's performance is not *significantly* higher than the Vertex's, and its street price is around \$10 more at the 240GB capacity—again, not significant. The Mercury is just as good a drive as the Vertex 3, if not slightly better, and we don't hesitate to recommend it. Plus, it's blue.



OWC Mercury Extreme Pro 6G 240GB

\$550, www.macsales.com

OCZ AGILITY 3 240GB

OCZ already ships two drives with the blazing-fast SF-2281 controller—the Vertex 3 and the firmware-tweaked Max IOPS Vertex 3. So, why a third? Like its

BENCHMARKS

	OWC Mercury Extreme Pro 6G	OCZ Agility 3	OCZ Vertex 3
CAPACITY	240GB	240GB	240GB
CONTROLLER	SF-2281	SF-2281	SF-2281
CRYSTALDISKMARK			
SUSTAINED READ (MB/S)	479.8	213.8	485.5
SUSTAINED WRITE (MB/S)	297.6	248.8	289.8
4KB READ, 32QD (MB/S)	172.7	129.7	171.2
4KB WRITE, 32QD (MB/S)	249.6	229	247.4
AS SSD			
SEQ. READ (MB/S)	505.7	211.6	506.2
SEQ. WRITE (MB/S)	290.95	237.4	280.19
4KB READ (IOPS)	5,158	4,782	5,539
4KB WRITE (IOPS)	12,966	12,767	14,263
READ ACCESS (MS)	0.15	0.09	0.16
WRITE ACCESS (MS)	0.26	0.27	0.22
ATTO			
64KB FILE READ (MB/S)	462.17	422.81	446.47
64KB FILE WRITE (MB/S)	483.07	479.53	505.38
IOMETER			
4KB RANDOM WRITE, 32QD (IOPS)	87,968.52	90,267.67	85,144.43
MAX ACCESS TIME (MS)	39	57	61
PREMIERE PRO ENCODE/WRITE (SEC)	423	426	422
PCMARK VANTAGE X64 HDD	60,683	61,403	59,978
PCMARK 11 X64 SECONDARY STORAGE TEST	5,302	4,859	5,285

Best scores bolded. Our current test bed is a 3.1GHz Core i3-2100 processor on an Asus P8 P67 Pro (B3 chipset) running Windows 7 Professional 64-bit. All tests used onboard 6Gb/s SATA ports with latest Intel drivers.

predecessors the Agility and Agility 2, the Agility 3 is OCZ's "mainstream" SSD for this generation. So what distinguishes it from the Vertex 3, and is there any reason to buy it?

Like other 240GB SandForce drives, the Agility 3 uses 256GB of NAND, with 16GB devoted to overprovisioning. Unlike the Vertex 3 and OWC's Mercury Extreme Pro, which use synchronous NAND for their storage, the Agility 3 uses asynchronous, which is slower.

The good news is that the Agility's use of cheaper NAND only becomes a problem in

a few situations, most of which are unlikely to impact home users. The slowdown is only apparent in tests that read and write large amounts of incompressible data to disk, like AS SSD and CrystalDiskMark. Since a large part of SandForce's speed advantage is its compression algorithm, the slower NAND in the Agility 3 can't keep up, and the Agility 3 clocked in around 210MB/s reads and 240MB/s writes in those tests. In tests that more closely mirror most real-world scenarios—such as PCMark Vantage and PCMark 11, Premiere Pro, and IOmeter—the Agility 3 performs nearly as

well as SF-2281 drives that use synchronous NAND.

Unless you often write a lot of incompressible data to disk, you're not likely to notice much speed difference if you opt for the Agility 3, and you'll save some scratch—a 240GB Agility 3 was about \$65 cheaper than the same size Vertex 3 as of press time.

VERDICT



OCZ Agility 3 240GB

\$475, www.ocztechnology.com



OWC markets the Mercury Extreme Pro 6G to Mac users, but that doesn't mean we can't buy it.

Does the cheaper NAND in the OCZ Agility 3 make a difference? Yes and no.

Fractal Design Core 3000

One of the nicer \$70 cases we've tested

MUCH LIKE ANOTHER Fractal Design case we reviewed recently, the Arc Midi (August 2011), the Fractal Design Core 3000 is a simple and effective case, made all the more enticing by its affordability and ease of use.

It's always with a little apprehension that we step into the sub-100-dollar case category; so we're surprised and happy to report that the Core 3000 is a very solid contender for you budget builders.

Calling the Core 3000 a mid-tower chassis would be technically correct, though at 17 inches tall by 19 inches deep by 8 inches wide, it's on the smaller side of the spectrum. This becomes apparent when building into the chassis—our test build was a little more difficult than normal due to the limited space inside. Our test bed's abnormally large heatsink made it damn near impossible to get the 8-pin power connector connected, though we could have mounted the heatsink afterwards, as the motherboard tray has a large CPU backplane cutout. As in many cases, the top hard drive cage is removable to accommodate long GPUs—we had to remove it to fit an 11-inch GTX 590. Though the case is cramped inside, we were still able to utilize the three backplane cutouts for cable organization, though getting slightly larger power supply cables through them was a bit of a hassle.



Fractal seems to be bringing restraint back to case design. We approve.



The Core 3000's top hard drive cage is easily removable to accommodate long videocards.

The Core 3000 features six hard drive trays, seven PCI expansion slots, and two optical drive bays, which each use two screws to hold the drives in place. Like Fractal's Arc Midi, the case is painted matte black throughout, but the hard drive bays and PCI expansion covers, in addition to the two stock 12cm fans (exhaust, top) and one 14cm fan (front), are white, which makes for a stark visual contrast.

The front of the chassis is mesh, lined in matte plastic. Up top you're given four USB 2.0 ports, a reset switch, and your standard audio jacks. It's also noteworthy that the Core 3000 gives you a ton of cooling options: You can add a 12cm front fan, one 12cm bottom fan, a 12cm or 14cm fan at the top, or a 12cm or 14cm side-panel fan. This number of fan mounting options is unusual for a case in this price range, but most definitely welcome. Even with the stock fans, however, the case performed well in our thermal testing, out-cooling every mid-tower case from last month's roundup.

Ultimately, the Core 3000 is a respectable case for the price. Sure, we'd like to see USB 3.0 inclusion or a SATA hotswap dock of some sort, but these aren't must-haves for a case in this price range. Little inclusions, like the black/white color scheme and removable dust filters tell us that Fractal focuses on the details, and we appreciate it. Your \$70 gets you a smaller-than-normal mid-tower that makes for a quick (albeit slightly cramped) build that's easy on the eyes. For all you budget builders out there, the Fractal Core 3000 is worthy of your consideration. —ALAN FACKLER



Fractal Design Core 3000

■ CORE Not bad looking; very affordable; many cooling options; removable dust filters.

■ BORE Cramped; only two optical drive bays; a little small for a mid-tower.

\$80, www.fractal-design.com

Netgear ReadyNAS Ultra 4 Plus

Speedy network storage and user-friendly RAID



We especially like the “backup” button on the front of the ReadyNAS Ultra 4 Plus.

THERE ARE A NUMBER of slick and interesting features buried within Netgear’s ReadyNAS Ultra 4 Plus. They include an easy-to-navigate setup screen, integrated backup utilities, a magician’s hat worth of streaming services, and ample settings for user permissions and management groups. But don’t let the good looks deceive you: Some of these features can be maddening to configure.

The Netgear ReadyNAS Ultra 4 Plus runs a dual-core 1.8GHz Intel Atom processor, 1GB of DDR2 RAM, and supports up to four drives in an X-RAID2 configuration. X-RAID2? That’s not a typo—X-RAID2 is Netgear’s proprietary technology that lets you add or remove drives from your array at will. With two drives, the X-RAID2 creates a mirror array. With three drives, your capacity doubles; with four, it triples.

Whether you’re transferring single huge files (like movies) from this Gigabit-powered NAS device or from your desktop to the ReadyNAS, you’ll appreciate the system’s haste: We clocked sub-minute transfers in either direction for a single 2.79GB file. On our test that measures a device’s ability to process 176 files totaling 659MB, the ReadyNAS took between 11 and 14 seconds to complete the transfer. Blink and you’ll miss it.

We were impressed by the design of the NAS box’s primary configuration screen—accessed by using the Setup button on RAIDar, Netgear’s included find-my-NAS software. All the standard NAS box network-settings options are present, including a one-click option to set up jumbo frames, if you have a Gigabit network that supports them. Setting up

new users (or groups of users) and giving them access to any of the contents on the ReadyNAS couldn’t be easier—you even have the option to import groups of logins and passwords as a .csv file. Sharing multimedia via one of the multiple services available on the ReadyNAS is easy—you can set up a working iTunes streaming service and DLNA server within seconds.

According to the ReadyNAS’s manual, the drive’s software should be able to find storage devices attached to the three USB 2.0 ports, and make those volumes accessible via Windows Explorer and the NAS device’s built-in backup utility. We weren’t able to get the device to recognize either a Corsair Flash Padlock 2 flash drive or a WD Passport external drive, though.

We had difficulty getting the ReadyNAS’s built-in backup utility to back up Windows 7 shared folders. Having to figure out one’s host, path, and login credentials is too much for the average user; a simplified (or more thoroughly explained) version of the backup screen would make it much easier for users to back up portions of their desktop systems onto the NAS.

We appreciate the scheduling functionality built into the ReadyNAS backup utility, as well as the button on the front of the device that lets you launch a backup with a single press. Couple that with the device’s ability to power on and off at a set schedule, and you have a great system for

backing up your networked computers—provided you can get it set up.

There’s a lot more to like in the ReadyNAS: easy-to-install add-ons by both Netgear and community members that build popular utilities like BitTorrent and TiVo support directly into the storage device; a disk-scrubbing and automatic parity-fixing utility that tries to fix up any data corruption in your RAID during scheduled downtime; streaming support for Orb; remote file management via a simple Windows Explorer utility; and Skifta-based media streaming to supported devices (including smartphones).

A few more built-in features would sweeten the ReadyNAS’s appeal, but it’s a pretty speedy product with an unconventional method for slapping a ton of storage in an appealing networked configuration. Just watch out for a few of the pain points. And be prepared to shell out extra for drives; the device ships diskless.

—DAVID MURPHY

VERDICT

Netgear ReadyNAS Ultra 4 Plus

READY TO GO Easy-to-access storage; dynamic RAID configuration; good transfer speeds; ample features; powerful backup scheduling.

ONE REPUBLIC Backup difficult to configure; doesn’t work with all USB storage devices.

\$700, www.netgear.com

Samsung Galaxy Tab 10.1

The slickest, slimmest, best-looking Honeycomb tablet yet

SAMEYNESS PERMEATES all Honeycomb-based tablets. Like the Galaxy Tab 10.1 reviewed here, the Motorola Xoom and Asus Transformer have the same processor (Nvidia's 1GHz Tegra 2), and their screens share common dimensions (a 1280x800 resolution across 10.1 diagonal inches). So you have to look for subtle variations to distinguish one Honeycomb tablet from another.

Well, the Tab 10.1's most important variation isn't very subtle. Turn on this tablet, and you'll be immediately wowed by a display quality that's noticeably, tangibly, demonstrably brighter and richer than what you'll find in the Motorola or Asus. We viewed control images on all three tablets, as well as on a desktop monitor, and the Samsung simply delivered truer colors—not just more vibrant, but also more accurate. Samsung doesn't hype its 10.1-inch screen as a "SuperTFT" display (as it does with the glass in the Galaxy Tab 7), but there's clearly some type of pixelly mojo at work here.

The Tab 10.1 also boasts an industrial design that makes the competition look like Radio Shack close-outs. We're reluctant to make comparisons to Apple hardware, but Samsung has delivered a chassis that reeks of Cupertinoian sophistication, from its soft, rounded corners to the interplay of brushed metal and glossy plastic on the back. And at 0.34 inches deep, the Tab 10.1 is exactly as thin as an iPad 2, one of that tablet's biggest bragging points. We've long felt that weight isn't an important differentiator in the tablet space (unless, perhaps, your hands are inflamed by late-stage arthritis), but we *can* concede that chassis thinness makes a difference. The Tab 10.1 simply feels better in our hands than does the Xoom or Transformer, which are 0.5 and 0.47 inches deep, respectively. Perhaps it's



A sophisticated industrial design and supremely vibrant display help the Samsung Tab 10.1 stand out among its Android competition.

perceived, and not actual, weight reduction that tips the scales, so to speak.

While its two competitors sport 5MP rear cameras, the Tab 10.1 comes with a 3MP rear sensor, but is none the worse for wear. The Samsung's still images clock in at 2048x1536 instead of 2592x1944 like the other two tablets, but we found its image quality to be superior to both—less compression artifacting and truer colors (especially compared to the Xoom). In terms of video recording, Samsung's rear camera captures at 720p (just like Tablet-dee and Tabletdum), but performed better in transitions through changing light conditions. Like the Motorola Xoom, the Tab 10.1 comes with Android's nifty video-editing app, Movie Studio.

Performance-wise, the Tab 10.1 yielded screen swipes and redraws on par with the Xoom and Transformer—which is to say, extremely fast and fluid. Samsung hasn't yet released a 3G (let alone 4G) version of the Tab 10.1 in the U.S., but that should be coming soon. Do we care much? No. If we're stuck in the field without Wi-Fi, we'll use our smartphones to retrieve Internet data. But we do lament the Tab 10.1's lack of a microSD card for expandable storage. This omission, along with the lack of cellular radio, helps keeps the 16GB version of

the Tab 10.1 under \$500. Oh, and Samsung is still using a proprietary cable for power and data connectivity. Boo, Samsung, boo!

The Samsung is by far the slickest of our Honeycomb triumvirate. Its screen quality is a huge differentiator, but it doesn't have the expansion dock of the Asus tablet, or the 3G connectivity of the Motorola. The Galaxy Tab 10.1 is certainly the Honeycomb tablet we'd pick first, but it's not so far ahead of the pack as to earn our first Kick Ass award for an Android tablet. For that distinction, we're looking for a hardware build-out that spares no features, and brings something truly revolutionary to the table.

We're getting a bit tired of all this sameness. —JON PHILLIPS

VERDICT **9** **Samsung Galaxy Tab 10.1**

■ **COKE** Best screen quality in a Honeycomb tablet display; super-thin, sophisticated design; able camera.

■ **TAB** Proprietary cable; no microSD expansion; no fancy-schmancy extras like a purpose-built keyboard dock.

\$500, www.samsung.com

Motorola Droid X2

Verizon's only dual-core phone

REMEMBER WHEN AUTO MAKERS would take an old chassis, beef up the engine, and call it a day, without any thought about updating the transmission or suspension? Yeah, that's the kind of thinking that led to the auto bailout of aught-9.

The Motorola Droid X2 is sadly reminiscent of those times. The phone is nearly the same as the original Droid X save the lack of a physical camera trigger button on the right side of the body. The dimensions, weight, and battery are identical. The radio bands are also the same, with no 4G aboard this CDMA-only handset.

The key differences lie in the brains and the screen. The X2 is the first phone on Verizon's network to feature Nvidia's hot Tegra 2 chip. With its dual-core 1GHz Cortex A9 CPU and ultra-low-power GeForce GPU, Nvidia's chip is arguably the most coveted engine to have in your smartphone today.

But as we said, the chassis isn't up to speed. Despite the power the Tegra 2 can provide, the Motorola NinjaBlur interface felt unforgivably laggy. Long-time users of Motorola Android phones probably know what we speak of—that horrible four-second lag between instructing the phone to add a desktop shortcut and when it actually pulls up the list. On the muscle-bound Droid X2, that lag becomes, well, two seconds. Other Android phones are near-instantaneous.

The Droid X2 isn't helped by the "upgraded" screen, either. The X2 gets a resolution bump from the original's 480x854 to 540x960. The screen looks crisper and perhaps whiter than the original's TFT

screen, but the PenTile-based display on the X2 has a truly criminal pixel lag anytime you scroll. It's most apparent on black on white, but can be seen elsewhere. The distinct PenTile matrix is also noticeably apparent and may annoy some users, but not as much as the pixel lag, in our opinion.

So is it all over for the Droid X2? Actually, no. Remember, Verizon users don't live in a world of unlocked SIM cards where you can run any GSM phone you want. As such, the Droid X2 is likely the fastest phone in the Verizon lineup in compute tasks, and likely the fastest GPU too. Nvidia's gaming expertise is apparent in the free TegraZone app (which, oddly, is not installed by default). TegraZone points you to a set of curated Tegra-only 3D games that are actually impressive for a phone, especially the bereft Android platform.

That leaves us a little torn. It's easy to slam the X2 for its MotoLag and its screen, but it is possibly the best gaming Android phone on Verizon today. We should also note that the slow pixel-response time didn't seem apparent in gaming, only in the 2D interface. Android aficionados should also give some props to Moto for some of its under-the-hood tweaking, such as the In Case of Emergency support and power profiles. T9 dialing is also now included.

Is that enough to overcome its shortcomings? That's a very difficult task to weigh. The Droid X2 makes sense for Droid X users who want more speed and have a drawer full of accessories, as they should be compatible. For all others, it makes



Fast Tegra 2 can't overcome the atrocious pixel lag in the X2.

more sense to hold out for the long-awaited Tegra 2-powered Moto Bionic instead.

—GORDON MAH UNG

VERDICT
6

Motorola Droid X2

■ **NASP X-30** Fast performance in games; snappy except when NinjaBlur is lagging.

■ **VIN DIESEL'S xxx** Atrocious pixel lag, PenTile screen, and no Gingerbread.

\$200 with 2-yr contract, www.motorola.com

BENCHMARKS

	Motorola Droid X2	Motorola Droid X	LG Optimus 2x
QUADRANT	2,572	1,376	2,475
SMARTBENCH2011 PRODUCTIVITY	2,569	829	2,958
SMARTBENCH 2011 GAMES INDEX	2,453	1,529	2,589
SUNSPIDER JAVASCRIPT BENCHMARK 0.9.1	4,051	6,584.4	4,135.7
NENAMARK 1 (FPS)	37.9	22	55.4
BROWSERMARK	51,246	31,608	45,197
LINPACK	35,508	14,202	31,328
OS VERSION	2.2.2	2.2.1	2.2.2

Best scores are bolded.

SPECIFICATIONS

SCREEN	540x960 PenTile with Gorilla Glass
CPU	1GHz Nvidia Tegra 2
GPU	ULP GeForce
RAM	512MB
STORAGE	8GB + MicroSD
STOCK BATTERY	1,540mAh Li-ion
RATED STANDBY	220 hours
RATED USAGE	480 minutes
REAR STILL CAMERA	8MP
VIDEO	720p
WEIGHT	155 grams
RADIO	CDMA 1x 800MHz/1900MHz, EVDO
UI	NinjaBlur

Duke Nukem Forever

DNF: Do not finish

NEAR THE BEGINNING of Duke Nukem Forever, you make your way through a bona fide Duke Nukem museum. Statues, paintings, fourth-wall-shattering tributes to Duke's greatest hits—the place nearly has it all. And we say “nearly” because one thing is missing from that perfume-scented love letter to Duke's past: Duke Nukem Forever itself. Play for a bit longer, though, and it's not hard to see why. The game's a musty, maggot-infested relic, no doubt, but it gets the finer details all wrong. It's like meeting the zombie of a former loved one; you see it from a distance, and you want to run up and embrace it with 14 years of pent-up longing. But as you close the distance, you take note of its jerky movements and its spittle-slurred babble. And then you realize something: It has no soul.

Duke Nukem Forever quite clearly doesn't know what it wants to be. Nostalgia-soaked blast-from-the-past or spectacle-driven corridor slog? So instead, it opts to fail miserably at both. Gone is Duke 3D's guns-a-blazing approach to combat. Now Duke's fallen in line with every other faceless FPS soldier and gotten himself a recharging health meter. Battles, then, tend to see you scurrying behind cover and taking desperate potshots, because—for all of his bravado—Duke's a bullet sponge in that he can absorb fire about as well as an actual sponge. This,



Boom. Headshot.

of course, leads to frustrating, one-hit-kill-packed trial and error—especially where boss fights are concerned. Oh, and that's only after the game's nearly actionless opening, which lasts upwards of an hour.

On top of that, Duke's now limited to only two weapons at a time, so don't be surprised to find your bullets uselessly pinging off enemies because you left the correct gun on the moon or something. And that's to say nothing of the shooting itself, which generally feels spasmodic and uncoordinated—like Duke's a teenager on the wrong side of an overnight growth spurt. Happily, zany weapons like the Shrink Ray are still a blast to use, but after taking a merciless beating at the hands of so many other issues, combat's fun factor hobbles away barely breathing.

Level design, meanwhile, has abandoned the freeform whimsy of Duke 3D for the predictable corridor crawling of today's shooter kingpins. Which is a shame, because—during rare moments when the King

decides to venture off the beaten path—a few glimmers of legitimate creativity shine through. See, open areas are essentially toy boxes. If you find an item, odds are, Duke can awkwardly extend his hand at it—in a weird petting motion—until it does something. This, in turn, increases Duke's ego, which is the game's name for his health meter. It's a nice bit of self-referential cleverness that gels perfectly with Duke's larger-than-life personality. For instance, you might sign an autograph or lift weights. Or you might fling poop.

Duke Nukem's always been about borderline-offensive humor, but make no mistake: These aren't the Duke jokes you know and love. This primarily stems from the fact that they aren't actually jokes. There's no punch line—no method to the madness. The game's just a never-ending torrent of outdated references punctuated by a heaping helping of potty humor. No one is safe from Duke's keen sense of what was funny seven years ago. Chuck Norris, Christian Bale's



LAB NOTES

GORDON MAH UNG SENIOR EDITOR



SYSmark 2012

It's not the benchmark that matters, it's how you use it

IF YOU READ OUR NEWS STORY this month, you know that SYSmark 2012 is embroiled in controversy—AMD and VIA have come out saying the new benchmark is unfair to their parts. Furthermore, Nvidia has quit its affiliation with BAPCo (the group that created SYSmark 2012), but didn't say why.

Should we believe the critics? I can tell you that after observing years of benchmarking wars, the answer is yes and no. It's true that SYSmark 2012 doesn't accurately reflect the capability of CPUs with powerful graphics cores, but how many business applications (the B in BAPCo is for "business") in use today actually do?

At the same time, AMD and VIA have a point. Shouldn't a new benchmark reflect the changing landscape of hardware? It's a foregone conclusion that GPU-based computing will play a very large role in the future of the PC.

Ultimately, it's up to a responsible tech media to properly interpret the meaning of SYSmark 2012 results, or those of any benchmark, for that matter.

Results file: TEST_PROJECT.fdr

Scores					
	Office Productivity	Media Creation	Web Development	Data/Financial Analysis	3D Modeling
Scenario Rating	99	100	100	102	96
Iteration 1	98	99	99	105	98
Iteration 2	99	99	101	102	95
Iteration 3	100	100	100	99	94

SYSmark 2012 Rating: 99

Hardware	
Motherboard type	
CPU type	Intel(R) Core(TM) i3 CPU 540 @ 3.07GHz
CPU frequency	3060 MHz



Amber Bouman
Online Features Editor

In between benchmarking and reviewing four new LCD monitors, I'm really excited to be putting together two image galleries for MaximumPC.com that cover two of my favorite topics: maps and tattoos (as they each relate to technology, of course). Check the site! I'm sure the galleries will be up by the time you read this.



Nathan Edwards
Senior Associate Editor

I really, really wanted to be able to recommend the Chromebook. I enjoyed using it, and had few complaints with the hardware or the OS, as far as that goes. It's just hard to envision where it would fit into the tech ecosystem for most people. A web-only netbook, no matter how pleasing, is just an extravagance when you can get so much more for the same price.



Alan Fackler
Online Associate Editor

I haven't had a lot of time lately to invest in an RPG, but after hearing good things about The Witcher 2, I made time. It's a great game so far, but man, it offers virtuality no guidance. I often can't figure out which mission will progress the game, and the missions themselves seem purposely ambiguous. I'm all for exploring and adventuring, but come on!



Alex Castle
Online Managing Editor

Right as we were closing this issue I got my review unit of the new Razer Hydra motion controller. Preliminary attempts to control my computer entirely by waving these little batons around have been a bust, but I'm looking forward to trying out the controller with some games. Stay tuned for the full review next month!



Katherine Stevenson
Deputy Editor

With all signs indicating that AMD's new Llano Fusion part will be a boon to notebooks, I'm looking forward to putting the chip to the test. Word has it that HP has identical notebooks that can be configured with either Llano or Sandy Bridge, so expect to see a head-to-head contest coming soon.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

- > Budget Parts
- > Review Sponsorship
- > iPad Praise

What Kind of Budget Are You On?

I just finished reading the July 2011 issue and happened to look up the price of the "Budget Processor" on your Best of the Best list, Intel's Core i5-2500K. It's \$225. Now, I'm not against paying that for a good processor, but I think you might need to readjust your levels for "budget." Considering that a quad-core Phenom can be had for less than half of that, and even a decent Sandy Bridge Core i3 chip can be had for \$120, \$225 doesn't exactly seem low-budget any more. I would like to see a few more options for true "low-budget/performance" builds.

—Drew Bierlein

SENIOR EDITOR GORDON MAH UNG RESPONDS: I understand your concern, Drew, but I think the 2500K part offers several advantages over a Phenom, Core i3 part, or even an older Lynnfield chip. Compared to a Lynnfield part, the 2500K offers better pricing and forward compatibility. LGA1156 is all but dead at this point. The 2500K is also the cheapest LGA1155 chip that will overclock. A Core i3-2100 is a fine chip,

but won't overclock and has only two cores. AMD also offers a great cost/performance ratio, but I'd put more money on the 2500K in most benchmarks, especially if you factor in overclocking. It's unfortunate that Intel doesn't offer its other processors in unlocked configurations, or I'd think they'd be worthy of the budget recommendation, as well.

Turn off Defrag

In the August 2011 issue you said that Windows 7 has automatic hard drive defragmentation and that you "shouldn't defrag an SSD." So how do I turn off auto-defrag?

—Joseph Sabatino

SENIOR ASSOCIATE EDITOR NATHAN EDWARDS RESPONDS: Provided your drive is in AHCI mode and properly configured, Windows 7 should detect that you have a solid-state drive and disable defragmentation on that drive. But just to make sure, open the Start menu, type dfrgui.exe, right-click it, and select Run as Administrator. Select your SSD from the list of drives, click Configure Schedule, and make sure Run on a Schedule is not checked.

Is Someone Sponsoring Your Reviews?

I have read *Maximum PC* since it was known as *boot*, have been a continuous subscriber for several years, and always love the informative articles. At the same time, I have to admit, I have always found the reviews to be slightly biased, and not always completely forthcoming. For example, it can be quite easy to find the same product mentioned twice (same issue, or separate issues), but with conflicting/contradictory

very same mobo starts off by saying, "While not a huge jump forward...." Obviously, these two statements, to a certain degree, contradict each other, and both can't accurately be true. So I'm curious, is the proofreading done by two entirely different people, or are the "reviews" subsidized by the companies whose products are being "reviewed," with products appearing in the Best of the Best providing the accurate/honest opinion of *Maximum PC* magazine? I could add additional comments regarding

“ARE THE 'REVIEWS' SUBSIDIZED BY THE COMPANIES WHOSE PRODUCTS ARE BEING 'REVIEWED'?"

information. Case in point: On page 82 of the August 2011 issue, the review of the Asus P8Z68-V Pro motherboard has a subtitle stating, "New Z68 chipset makes big improvements over P67." But on page 96, Best of the Best, your synopsis of the

the P67 vs. Z68 Head to Head comparison on page 16, as the first three rounds should technically, for various reasons, be a tie, but, for (obvious) space-saving reasons, I will leave that one alone.

—Robert Ryan

submit your questions to: comments@maximumpc.com

SENIOR EDITOR GORDON MAH UNG RESPONDS: As the person who wrote the Head to Head comparison, the review of the Asus Z68 board, and the Best of the Best synopsis, I can tell you that no one is subsidizing anything.

What you are likely seeing (and reading conspiracy into) is the very conflicted feelings I have for both the Z68 and P67 chipsets. In fact, when I discuss the merits with other staff members, it takes several qualifiers just to explain the relative virtues.

Is Z68 a big improvement over P67? Yes. Virtu, SSD caching, onboard hardware security-token support, and the ability (if the board has the ports) to support the integrated graphics are indeed big improvements over P67. Is it a huge jump forward? No. Where's the additional SATA 6Gb/s ports, USB 3.0, or some way to add more PCIe slots, Intel? Z68 is, in effect, P67+. That

doesn't mean it's a bad chipset. In fact, for most people building a new box, I recommend Z68 over P67 for the new features. However, for someone with a P67 box, I don't recommend paying to upgrade. And, at the same time, for a gamer building a high-end box with big, fat GPUs and SSDs and therefore unlikely to use the SSD caching or Virtu, the differences are pretty minor, so a P67 board would be fine.

By the way, this response is brought to you by Intel's Z68 chipset, Asus's motherboard division, and the letter O.

In Praise of iPad 2

Regarding your iPad 2 vs. Motorola Deathmatch (June 2011), as both an iOS and Android owner, the intangibles give the iPad 2 the nod for me (and a lot of folks) over the Xoom. People whine about being tethered to iTunes; however, I can share

apps from multiple accounts among every iOS device in the house. I find Android's practice of associating apps with one email address and one device to be much more restrictive. Also, Android tablets need every ounce of power they can get since hardware is quickly rendered woefully obsolete with each revision. I'm not interested in buying a new Android tablet yearly just to make it work with the latest apps.

Meanwhile, my iPad 1 hangs right in there performance-wise with my iPad 2. Android is also too fragmented and confused with its own identity for me. Sure it runs Flash, but even that has its flaws, as early Xoom adopters found out. Lastly, sure the native Safari browser is slow but I don't use it anyhow. I use Terra, which is free and much faster. Xoom wins the head-to-head battle, but iPad 2 wins the war.

—Jim Harley ☺

[NOW ONLINE]

25 GAMES, 25 GUNS: THE WEAPONS THAT DEFINED FIRST-PERSON SHOOTERS

Even though it's made the jump to consoles in the last decade or so, the first-person shooter genre still forms the core of PC gaming. And what's at the core of a good shooter? That's right: Guns.

We've collected a list of 25 guns that define the PC shooter experience. Check out the complete gallery and share your own favorites at bit.ly/jmk6JK.



[NEXT MONTH]

COMING IN
MAXIMUM PC'S

**BRAZILIAN
WAXED
OCTOBER
ISSUE**



Windows 8

News of Microsoft's next OS just keeps coming. Tune in next month for a complete rundown on what we know for sure and what we can surmise about the next Windows OS.



Step up to a DSLR

Are you fed up with the crappy pics you get from your point-and-shoot or smartphone camera? We'll show you what to look for in a DSLR and review four top models.



Smartphone Superlatives

Which smartphone offers the best gaming? Best battery life? Best display? Best camera? We answer these questions and others next month.

HARDWARE



BUDGET GPU

XFX RADEON HD 6870

Competition is a wonderful thing. That's the reason the XFX Radeon HD 6870 (which we originally reviewed back in late 2010) has come down in price to become the best budget card you can get, at around \$180. It's no performance slouch, offering 1,120 stream processors, a 900MHz core clock, and 1GB of fast GDDR5. Even with all that GPU goodness, it sips power. www.xfxforce.com



GAMES WE ARE PLAYING

The Witcher 2
www.en.thewitcher.com

Portal 2
www.thinkwithportals.com

Frozen Synapse
www.frozensynapse.com

Alice: Madness Returns
www.ea.com/alice

THE REST OF THE BEST

High-End Processor
Intel 3.46GHz Core i7-990X
www.intel.com

Midrange Processor
Intel 3.4GHz Core i7-2600K
www.intel.com

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

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

LGA1366 Motherboard
Asus Rampage III Extreme
www.asus.com

AM3 Motherboard
MSI 890FXA-GD70
www.msi.com

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

Performance GPU
XFX Radeon HD 6970
www.xfxforce.com

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

Performance Hard Drive
OCZ Vertex 3 100GB
www.ocztechnology.com

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

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

High-End Cooler
ProLimatech Armageddon
www.prolimatech.com

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

Mid-Tower Case
NZXT Phantom
www.nzxt.com

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

MAXIMUM PC (ISSN 1522-4279) is published 13 times a year, monthly plus Holiday issue following December issue by Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Phone: (650) 872-1642. Fax: (650) 872-2207. Website: www.futureus.com. Periodicals postage paid in South San Francisco, CA and at additional mailing offices. Newsstand distribution is handled by Time Warner Retail. Basic subscription rates: one year (12 issues) US: \$14.95; Canada: US\$19.95; Foreign: US\$29.95. Basic subscription rates including monthly CD, one year (12 issues/12 CD-ROMs) US: \$30.00; Canada:

US\$34.95; Foreign: US\$39.95. Canadian and foreign orders must be prepaid. Canadian price includes postage and GST (GST #R128220688). PMA #40612608. Subscriptions do not include newsstand specials. POSTMASTER: Send changes of address to Maximum PC, PO Box 5159, Harlan, IA 51593-0659. Standard Mail enclosure in the following editions: None. Ride-Along enclosure in the following editions: B1, B2, B3. Returns: Pitney Bowes, PO Box 25542, London, ON N6C 6B2, Canada. Future US, Inc. also publishes @Gamer, Crochet Today!, Guitar Aficionado, Guitar World, Knitting Today!, MacLife, Nintendo Power, The Of-

ficial Xbox Magazine, PlayStation: The Official Magazine, PC Gamer, Revolver, Windows: The Official Magazine, and World of Warcraft Official Magazine. Entire contents copyright 2011, Future US, Inc. All rights reserved. Reproduction in whole or in part is prohibited. Future US, Inc. is not affiliated with the companies or products covered in Maximum PC. Reproduction on the Internet of the articles and pictures in this magazine is illegal without the prior written consent of Maximum PC. Products named in the pages of Maximum PC are trademarks of their respective companies. PRODUCED IN THE UNITED STATES OF AMERICA.