

A step-by-step, illustrated guide from the experts at **MAXIMUMPC**

SUMMER 2012

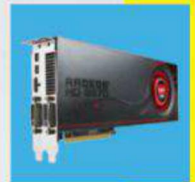
HOW TO BUILD The Perfect PC

Build
Exactly
the Right
Machine
for You!

- ▶ Construct a Battlefield 3 rig
- ▶ Build a home theater PC
- ▶ Take maximum advantage of Sandy Bridge-E
- ▶ Pick the right components for *your* needs and budget



PHOTOS
DETAIL
**EVERY
STEP**



IN-DEPTH LOOK
AT **WINDOWS 8**

DISPLAY UNTIL 09/17/2012





CASES | MEMORY | MICE | KEYBOARDS | COOLING | HEADSETS | SPEAKERS | USB DRIVES | SOLID-STATE DRIVES



DESIGNED FOR PERFORMANCE

Our complete line of kick-ass components can help turn your current PC — or your next build — into the dream machine you've always wanted. Whether it's the high-performance memory we're famous for, or our rock-solid PSUs, builder-friendly cases, or new gaming peripherals, you'll get the performance and quality you deserve.

DESIGNED FOR YOU

We're builder and gamers, too. We know that the details matter, so we've paid attention to the little things that make a big difference. You'll find intelligent features, high-quality materials, and excellent workmanship in all our products. For your next upgrade or build, choose Corsair and make your PC the best PC.

Corsair Components.

Designed for you.

Learn lots more at: corsair.com



facebook.com/corsair



[@CorsairMemory](https://twitter.com/CorsairMemory)

MAXIMUM PC

EDITORIAL

Editor-in-Chief: Katherine Stevenson
Deputy Editor: Gordon Mah Ung
Senior Editor: Nathan Edwards
Online Managing Editor: Alex Castle
Contributing Writers: Marco Chiappetta, David Murphy, Paul Lilly
Copy Editor: Catherine Hunter
Podcast Producer: Andy Bauman
Editor Emeritus: Andrew Sanchez

ART

Art Director: Boni Uzilevsky
Contributing Photographer: Mark Madeo

BUSINESS

Vice President, Consumer Media: Kelley Corten, kcorten@futureus.com
Vice President, Sales & Business Development: Nate Hunt, nhunt@futureus.com
National Director of Sales: Isaac Ugay, iugay@futureus.com
Sales Director, East Coast: Thomas Lundell, tlundell@futureus.com
Regional Sales Manager: Samantha Rady, srady@futureus.com
Account Executive: Austin Park, apark@futureus.com
Advertising Coordinator: Heidi Hapin, hhapin@futureus.com

Marketing & Sales Development Director: Rhoda Bueno
eCommerce & Fulfillment Director: Lisa Radler
Consumer Marketing Director: Stephanie Blake
Newsstand Director: Bill Shewey

PRODUCTION

Production Director: Michael Hollister
Production Manager: Larry Briseno
Production Coordinator: Jose Urrutia
Senior Print Order Coordinator: Jennifer Lim

FUTURE US, INC.

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

Chief Operating Officer: Rachelle Considine

Vice President & Chief Financial Officer: John Sutton
Vice President, Internet & Mobile Products: Mark Kramer
General Counsel: Anne Ortel

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

Non-executive Chairman: Peter Allen
Chief Executive: Mark Wood
Group Finance Director: Graham Harding
 Tel +44 (0)20 7042 4000 (London)
 Tel +44 (0)1225 442244 (Bath)

©2012 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.



Michael Brown

WHEN YOU WANT THE VERY BEST

THE CRAFTSMAN ERA was the greatest period in American architectural style, at least in my opinion. And if you've ever built your own PC or are thinking of building your first, you're likely to agree.

The craftsman movement, which started late in the 19th century, was a reaction to the boring uniformity of factory-produced goods. The assembly line is a supremely efficient manufacturing process, but the products that emerge from it are all too often devoid of character. Soulless machines, after all, take no pride in the objects they're churning out.

The craftsman movement celebrated originality and handicraft. And that's why I think it's appropriate to think of this philosophy while you're building your own PC. If anything ever lacked a soul, it's a factory-assembled PC: built for everyone and no one in particular.

While it's true that most of the components you'll put inside your new PC—and the case housing all those components—will have come off a factory assembly line somewhere, each one of them will be there because you decided they were the best choice for your mission and budget. And the machine you build will be the best machine for you because you invested a bit of your soul with the turn of every

screw, the routing of every cable, and the fine-tuning of every last component.

That's where we come in. Throughout these pages, we'll help you identify the best hardware for your next rig, and we'll take you through every step in the process of building it. Want to play the latest games, but can't afford to buy a machine from one of the boutique shops? Nathan Edwards will show you how to put together a killer Battlefield 3 rig. Working with an incredibly tight budget? Gordon Mah Ung will help you build a beast for around 800 bones. You can splurge on a Sandy Bridge-E CPU? Nathan has you covered there, too.

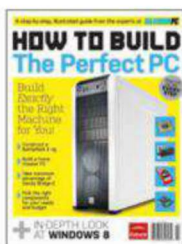
And once you've built your new rig, we've crammed this issue with how-tos, tips, and tricks to get the absolute most value out of it. Heck, we'll even show you how to set up Windows 8—long before the new OS hits store shelves.

In short, if you want the the very best in a PC, the best way to get one is to build it yourself. And Maximum PC is the very best magazine to turn to when you're ready to start (or even if you're just dreaming about it).

Have fun!

Michael Brown is a long-time contributor to Maximum PC.

↘ submit your questions to: comments@maximumpc.com



On the Cover
Photography by
Mark Madeo

inside

BUILD IT 2012

FEATURES



06



20



14



36

06 MEET INTEL'S CORE I7-2830
Meet the absolute best bang-for-the-buck CPU in the new Sandy Bridge-E lineup. You'll want one now!

14 CHILLIN' WITH LGA2011
A new socket calls for new cooler, and we've put seven contenders to the test. Which one comes out on top?

20 BUILD A BATTLEFIELD PC
We find you don't need to spend a lot to get a great experience with this game.



46

26 SET UP YOUR PC THE RIGHT WAY
Whether you bought it or built it, we'll show you how to set up your new rig for the rest of its life.

36 USE WINDOWS 8 TODAY
Looking forward to Windows 8? You don't need to wait for Microsoft to ship the final software. Try it right now!

46 HACK YOUR HARDWARE
The way we see it, hardware was meant to be hacked. How else are you going to find out how far it can be pushed?

4 HEAD TO HEAD
Looking for the best gaming mouse? We put the top two contenders to the test.

R&D: BUILD IT
58 BUILD A GAMING HTPC

64 BUILD AN \$830 PC

70 BUILD A CROSSFIRE PC

74 BUILD A SANDY BRIDGE-E PC

80 BUILD A BULLDOZER PC

R&D:HOW-TO
86 HOW TO USE DRUPAL GARDENS

90 HOW TO BORROW BOOKS FOR THE KINDLE APP

92 HOW TO SET UP A PERSONAL WIKI

95 HOW TO CREATE A PERSONALIZED QR CODE

96 THE LIST
Our rogues gallery of the best dual-GPU cards every manufactured.

MORE+

HEAD TO

BY ALEX CASTLE

Razer Naga Epic vs. Mad Catz Cyborg M.M.O. 7

The one-size-fits-all gaming mouse is a thing of the past. Game peripheral makers, facing an increasingly crowded market, have finally acknowledged the existence of massively multiplayer online RPGs—a genre of game that's popular, growing, and has its own unique control requirements. If you go hunting on the web, you can easily find a half-dozen high-end gaming mice specifically for MMOs, but save yourself the trouble; we're going to take a head-to-head look at the cream of the crop: old-guard Razer's Naga Epic versus up-and-comer Mad Catz' Cyborg M.M.O. 7.

Round 1: Buttons

The main thing that separates an MMO mouse from a regular gaming mouse is the button layout. Where a shooter requires mostly speed and accuracy, an MMO also requires quick access to many hotkeys and abilities—meaning you're going to want a lot more buttons than a normal mouse.

The Naga takes an uns subtle approach to the button issue. It slaps 12 buttons, touch-tone style, on the left side of the mouse. It's a lot to work with, but it also takes some real practice to hit any one of those buttons with your thumb, without looking. If a tight grid was the best way to lay out buttons, the Atari Jaguar would have become the model for modern gaming controllers. Unsurprisingly it did not, and a more organic method of distributing buttons across the entire controller won out. Incidentally, that's exactly what you'll find on the M.M.O. 7.

Winner:
M.M.O. 7

Round 2: Software

It's hard to fault either Mad Catz or Razer for the software suites behind the M.M.O. 7 or Naga. Both mice work just fine out of the box, but require configuration software to get the most out of their many, many buttons. Each allows for custom profiles, with on-the-fly sensitivity switching.

Both software suites allow you to customize the color of the mice's LEDs (the Naga's logo, wheel, and buttons glow, while the M.M.O. 7's two main buttons can be set to different colors), while neither mouse has internal memory for on-board profile storage.

Additionally, both Razer and Cyborg offer add-on software for World of Warcraft, which allows you to bind skills and abilities to buttons on the mouse from within the game.

Winner: Tie

Round 3: Feel

This one's a close call—both mice offer exceptional build quality, as well as customization options to fit any hand. The Naga Epic features Razer's trademark hyper-ergonomic design, with a silky rubberized finish and big, satisfying left- and right-click buttons. The mouse comes with three swappable pinky-plates, which let you change the shape of the mouse to your liking.

Those features would be enough to blow any mouse other than the Cyborg M.M.O. 7 out of the water. Where the Naga offers three side plates, the M.M.O. 7 has three swappable side plates, swappable palm rests, and adjustable dimensions and weight. All that on top of a solid metal base make the M.M.O. 7 the most sturdy and (when properly customized) comfortable MMO mouse you can buy.

Winner: M.M.O. 7

Round 4: Sensor

Technically, the Cyborg M.M.O. 7 has a higher-precision sensor, at 6,400 dpi to the Naga's 5,600, but isn't it about time we all admitted to ourselves that the dpi arms race has gone too far? You're not going to be able to feel any difference, because nobody but the most jacked-up Counter-Strike kiddies would ever set their sensitivity all the way up to 5,600, anyway. Both mice feel perfectly responsive, and have on-the-fly dpi switching, so you can always find just the right sensitivity setting.

Both are laser mice, of course, and track well on just about any surface. A mouse pad's preferable, but as long as you're not trying to play on your glass coffee table, any surface will do.

Winner: Tie

HEAD



We love the aesthetics of the Naga Epic, but couldn't they have given the buttons a little room to breathe?



The Cyborg M.M.O. 7 is so customizable it comes with a built-in Allen wrench.

Round 5: Additional Features

The M.M.O. 7's most interesting new feature is the "Action-Lock" system, which allows you to hold down a mouse button without having to physically press it, designed for games that use the mouse buttons for movement or mouselook. It's a clever idea, though we found that it hindered us more than it helped, as we often found ourselves accidentally pressing the ActionLock button.

The Naga Epic, on the other hand, has an additional feature that's quite useful: hybrid wired/wireless design. The mouse comes with a nifty little charging dock for when you're not gaming, and if it ever runs out of juice in the middle of a session, you can plug the dock's cable directly into the mouse and keep playing.

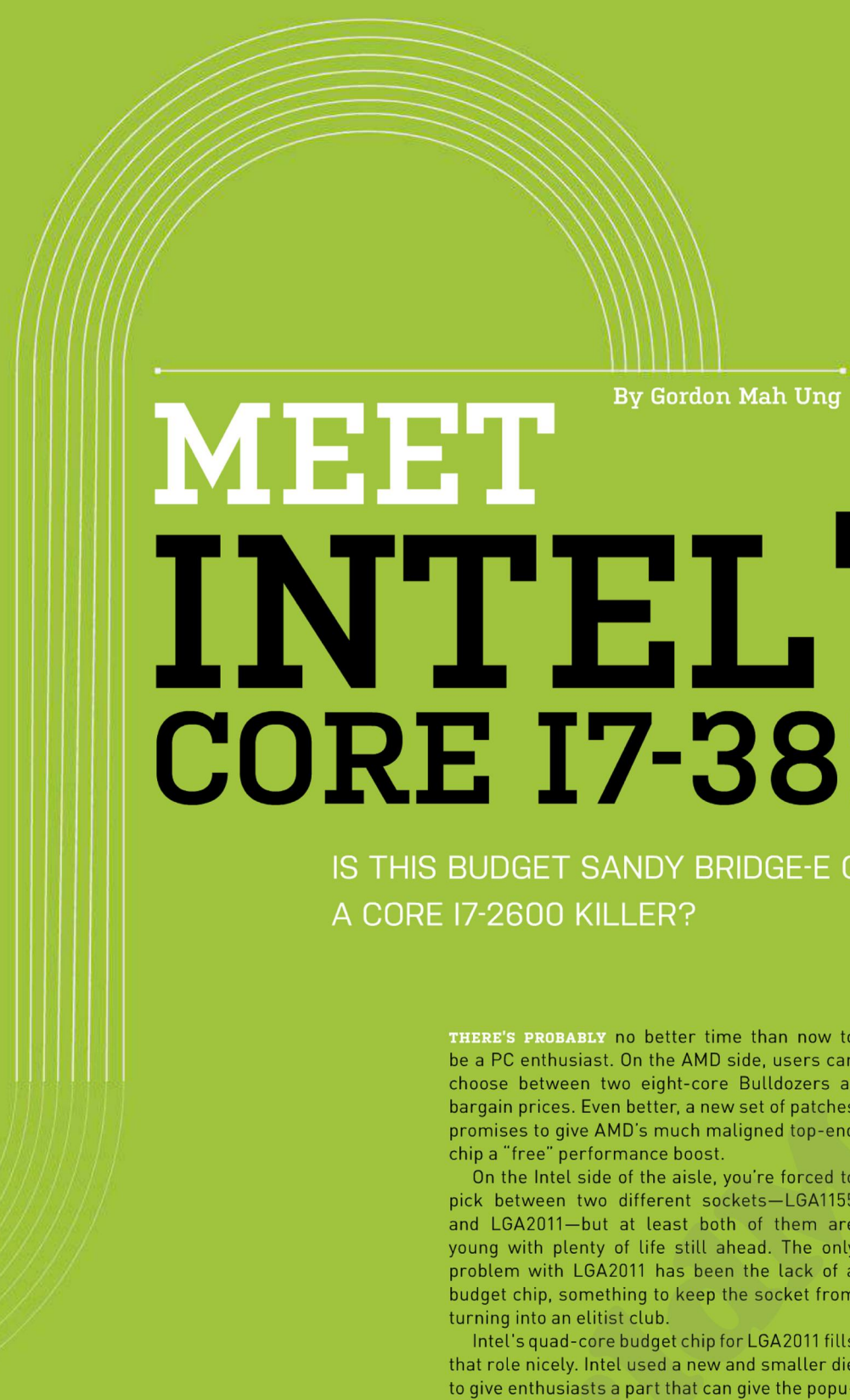
Winner: Naga

And the Winner Is...

It's a close call, but we have to side with the **Cyborg M.M.O. 7**. Razer's offering is a great mouse, and we'd be more than happy to wield it around Azeroth or Alderaan, but the button layout and customization options just aren't as impressive as Mad Catz' (for a full review of the Cyborg M.M.O. 7, turn to page 89). Of course, every person's hand shape and play style are unique, so your mileage may vary. We strongly doubt you'd be disappointed with either mouse. ⚡







By Gordon Mah Ung

MEET INTEL'S CORE I7-3820

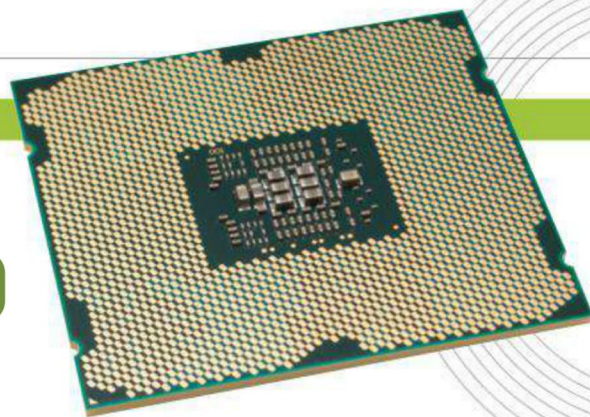
IS THIS BUDGET SANDY BRIDGE-E CHIP
A CORE I7-2600 KILLER?

THERE'S PROBABLY no better time than now to be a PC enthusiast. On the AMD side, users can choose between two eight-core Bulldozers at bargain prices. Even better, a new set of patches promises to give AMD's much maligned top-end chip a "free" performance boost.

On the Intel side of the aisle, you're forced to pick between two different sockets—LGA1155 and LGA2011—but at least both of them are young with plenty of life still ahead. The only problem with LGA2011 has been the lack of a budget chip, something to keep the socket from turning into an elitist club.

Intel's quad-core budget chip for LGA2011 fills that role nicely. Intel used a new and smaller die to give enthusiasts a part that can give the popular, populist Core i7-2600K a run for its money.

To find out if Intel's new Core i7-3820 is a 2600K killer and worth skipping LGA1155 for—and whether AMD's Bulldozer really sees new life from OS updates—read on.



THE CORE I7-920 OF LGA2011?

There's no doubt that the hottest enthusiast CPUs to have today are Intel's Sandy Bridge-E series. They're fast and feature-packed—and they're freaking expensive, too. The top-end 3.3GHz Core i7-3960X costs a wallet-busting \$1,000. One rung down, the 3.2GHz Core i7-3930K is cheaper but still more than \$600 on the street. Most folks don't have that kind of scratch. So what's an enthusiast of modest means to do if he or she wants to step into an LGA2011 board with some sweet quad-channel RAM and tons o' PCIe lanes?

Problem, meet Solved. Intel's new 3.6GHz Core i7-3820 now gives enthusiasts on a budget an entry-level-priced way into the land of LGA2011. It's essentially the Core i7-920 of the LGA2011 platform. The 3.6GHz Core i7-3820 may be a Sandy Bridge-E chip, but it's markedly different from its pricier siblings. The most notable difference is the core count, as the Core i7-3820 is a native quad-core chip using a new, smaller die than the flagship Sandy Bridge-E. This reduction in cores greatly helps reduce the price. Those hexa-core chips, remember, are actually eight-core dies with two cores disabled for both technical and marketing reasons. With eight cores aboard plus boatloads of cache, those hexa-core Sandy Bridge-E chips are gigantic in size, which lowers yields and contributes to the cost.

You don't just lose cores, though. The Core i7-3820 also backs the cache down to 10MB from 15MB on the top-end Core i7-3960X. And it features 1 billion fewer transistors, but don't get hung up

on that. First, high transistor counts don't necessarily equate to performance. Second, the Core i7-3820 is no slouch in the transistor-count game. Despite being a quad-core, it actually packs far more transistors than standard Sandy Bridge chips such as the Core i7-2600K. It even has more transistors than AMD's octo-core FX-8150 chip—as we learned when AMD embarrassingly had to restate the chip's transistor count from 2 billion to 1.2 billion.

In all other respects, we're told, the Core i7-3820 is the same as its bigger siblings. It has the same 40 PCIe 3.0 lanes, AVX and AES instructions, and quad-channel memory controller of the big boys. What it doesn't have is the pricing. At \$285 in volume, the chip is pretty darn cheap. Hell, it's even cheaper than the two top Sandy Bridge CPUs: the Core i7-2600K and Core i7-2700K, at \$317 and \$332, respectively. And that's where the battle is right now for performance enthusiasts. Sure, people absolutely love the \$1,000 Core i7-3960X, but the vast majority of power users are eyeing \$300 CPUs for their systems. Obviously, this sets the stage for a high-noon-style shootout between the Core i7-2600K (a better deal than the Core i7-2700K) and the Core i7-3820.

THE PLATFORM MATTERS

It's not just about the CPU. Since the Core i7-2600K is an LGA1155 chip and the Core i7-3820 is an LGA2011 chip, each is incompatible with the other's motherboard. Once you've picked your chip, you pretty much buy into the infrastructure around it, which takes

CPU's COMPARED

	Intel Core i7-2600K	Intel Core i7-2700K	Intel Core i7-3820	Intel Core i7-3930K	Intel Core i7-3960X	AMD FX-8150
Code Name	Sandy Bridge	Sandy Bridge	Sandy Bridge-E	Sandy Bridge-E	Sandy Bridge-E	Bulldozer
Clock	3.46GHz	3.5GHz	3.6GHz	3.2GHz	3.3GHz	3.6GHz
Turbo Clock (max)	3.8GHz	3.9GHz	3.9GHz	3.8GHz	3.9GHz	3.9GHz (4.2GHz)
TDP	95 watts	95 watts	130 watts	130 watts	130 watts	125 watts
Cores /Threads	4/8	4/8	4/8	6/12	6/12	8
Volume Pricing	\$317	\$332	\$285	\$555	\$990	\$245
Process	32nm	32nm	32nm	32nm	32nm	32nm
Total L2 Cache	1MB	1MB	1MB	1.5MB	1.5MB	8MB
Total L3 Cache	8MB	8MB	10MB	12MB	15MB	8MB
Die Size	216mm ²	216mm ²	293mm ²	435mm ²	435mm ²	315mm ²
Transistor Count	995 million	995 million	1.27 billion	2.27 billion	2.27 billion	1.2 billion
Socket	LGA1155	LGA1155	LGA2011	LGA2011	LGA2011	Socket AM3+
Memory Controller	Dual-channel DDR3/1333	Dual-channel DDR3/1333	Quad-channel DDR3/1600	Quad-channel DDR3/1600	Quad-channel DDR3/1600	Dual-channel DDR3/1866

you down different upgrade and build paths. Obviously, there's a price premium for selecting the LGA2011 route and Core i7-3820.

To see how much of a price difference there is between the two, we configured two theoretical enthusiast PCs. As performance rigs, each is configured with the top-end Radeon HD 7970 card, an 850 watt Corsair PSU, a 128GB Samsung SSD, a 2TB Seagate hard drive, and an LG Blu-ray combo drive. For our comparison, we opted for Windows 7 Professional because Windows 7 Home Premium has an artificial maximum memory limit of 16GB, which can easily be hit given the low price of RAM today.

Between the two rigs, the only different parts are the CPU, motherboard, and RAM. Why RAM? The quad-channel configuration of the Core i7-3820 needs to be fed four DIMMs for maximum memory bandwidth, while the Core i7-2600K will give you the maximum memory performance with just two DIMMs. For our theoretical build, we found 8GB memory kits using two 4GB DDR3/1600 modules for \$34. A kit of four 2GB DDR3/1600 DIMMs from the same memory company fetched about \$50. It's a price premium, but not enough to break the bank. And once we get to 16GB, it's essentially a tie using 4GB DIMMs. We should also note that 8GB DIMMs have recently tumbled in price, so you could build a 32GB machine using four 8GB DIMMs for about \$324 on a Core i7-2600K. That's not bad, considering that it was \$900 just a few months before. The advantage still goes to the Core i7-3820, which can get to 32GB of RAM using eight 4GB DIMMs for \$180. Of course, 64GB can only be done on a board with eight slots.

Moving on to motherboards, the Core i7-2600K has the upper hand. For our theoretical builds, we tapped midrange Asus boards for both. The mature LGA1155 socket for the Core i7-2600K gives you very good choices, with a decent midrange Z68 board going for \$179 and budget boards below \$100. In X79 land, boards are still priced at a premium. The cheapest board we could find was more than \$200, and decent midrange boards were sitting around \$330.

When everything is totaled up, however, the price difference between the two builds isn't that bad when you're building a higher-end system. Our Core i7-2600K rig came in at \$1,880. With almost the same components on a Core i7-3820, we would have spent another \$131. That's really not as pricey as we would have expected.

BUILD VS. BUILD

	Core i7-2600K	Core i7-3820
CPU	\$319	\$300
Cooler	\$30	\$30
Radeon HD 7970	\$550	\$550
16GB RAM DDR3/1600 (4x 4GB)	\$94	\$94
Midrange Motherboard	\$179	\$329
2TB HDD	\$200	\$200
128GB SSD	\$175	\$175
Blu-ray Combo ODD	\$60	\$60
850-Watt PSU	\$134	\$134
OS	\$139	\$139
Total	\$1,880	\$2,011

Which is cheaper? We configured two nearly identical machines with Sandy Bridge and Sandy Bridge-E chips to see how much of a premium you pay to ride the Sandy Bridge-E train.

It's not just strictly about prices. The Core i7-3820 gives you capabilities that the Core i7-2600K can't touch. The most notable is the availability of twice as many DIMMs. This gives you flexibility in how you configure your system's RAM. The quad-channel RAM also gives you roughly twice the memory bandwidth. Core i7-3820 has a leg up with its PCIe 3.0 support, too. PCIe 3.0 essentially doubles the bandwidth in PCIe 3.0 devices. Most people—including us—are inclined to pooh-pooh the value of doubling the PCIe bandwidth, since few devices actually swamp PCIe 2.0, but apparently it helps. AMD, for example, has said that simply switching a board from PCIe 2.0

NEXT-GEN INTEL CHIP TO FEATURE 3D TRANSISTORS

IF YOU'RE READY to jump aboard LGA2011 with a new Core i7-3820, Intel's upcoming Ivy Bridge CPUs might give you a bit of a pause.

Ivy Bridge chips will be the first CPUs based on Intel's new 22nm process using tri-gate transistors, which are literally 3D. Traditional transistors that limit and control the flow of electricity in a CPU are built in a two-dimensional fashion with the flow looking very much like a thin river with a gate laid

across it to control the current. With tri-gate architecture, the "river" builds straight up like a fin. Instead of the electricity running on only one plane, it now runs on both the sides and the top of that fin. This increases the surface area, and theoretically enhances the control of leakage and permits more flow through the 3D gate. Ivy Bridge chips could offer far more performance while using far less power. That's a more compelling

The tri-gate, "3D" transistor on the right offers more surface area and better control of leakage and power management than the standard flat, planar transistor on the left.



message for mobile users, but desktop users should benefit from enhanced microarchitecture, too. Intel is also promising to seriously pump up the graphics core in Ivy Bridge and to add PCIe 3.0. Ivy Bridge chips will be drop-in compatible with existing LGA1155 boards and also pair nicely with boards using the new Z77 chipset, which finally brings USB 3.0 to the table.

LGA2011 users aren't entirely left out: A version of Ivy Bridge for that socket will come later this year, as well, and will be dubbed Ivy Bridge-E.

to PCIe 3.0 boosts performance from 5 to 10 percent on its Radeon HD 7970 cards. LGA1155 boards will get their own PCIe 3.0 upgrade, but that won't come about until Ivy Bridge is available (see our sidebar on page 44) and will require buying a new CPU, since the PCIe is controlled from the CPU on Sandy Bridge and Sandy Bridge-E.

THE OVERVIEW ON OVERCLOCKING

For overclockers, Intel is taking an odd track with the Sandy Bridge-E chips. Its two hexa-core chips are classified as K and X parts, respectively, which means they're fully unlocked chips that let you change Turbo Boost or clock multipliers at will. The new Core i7-3820 carries no such designation, but Intel says the chip is "partially unlocked." Similar to standard Sandy Bridge chips, it features limited overclocking, using Turbo Boost of up to four bins on all cores. That lets you take the chip to 4GHz. To get further, you'll have to rely on new block ratios of 125, 166 and 250. Overclocking won't be quite as straightforward or easy as on a Core i7-2600K, which can be pushed beyond 4GHz without blinking, but at least it's possible.

DO-OVER FOR AMD FX

New Microsoft patch corrects scheduler issues and speeds up AMD's Bulldozer

Instead of bulldozing over Intel's CPUs, AMD's FX seemingly plodded along about as fast as its code-name next to an Indy car. OK, Bulldozer chips haven't been *that* slow, not by a long shot, but the reception the CPU has seen from the press and AMD customers makes it seem that way.

There was always one caveat with Bulldozer benchmarks that made us wonder if the OS was partially to blame for the chip's performance: Before samples of the chip ever hit the streets, AMD officials warned that Windows 7's scheduler wasn't optimized for AMD's new and unique dual-core modules.

AMD, in fact, has long said that it would take Windows 8 for the full performance of Bulldozer to be realized. Until then, there is at least some relief for the beleaguered chip. Microsoft recently released two patches designed to address the scheduler issue. The problem appears to stem from how Windows 7 deals with the core "parking" in FX chips. Core parking essentially puts unused cores to sleep to save power, but the Windows 7 scheduler was apparently putting cores to sleep that it could have assigned workloads to. Even worse, the Windows 7 scheduler would then wake up the cores it didn't use, which can cause performance to take a hit.

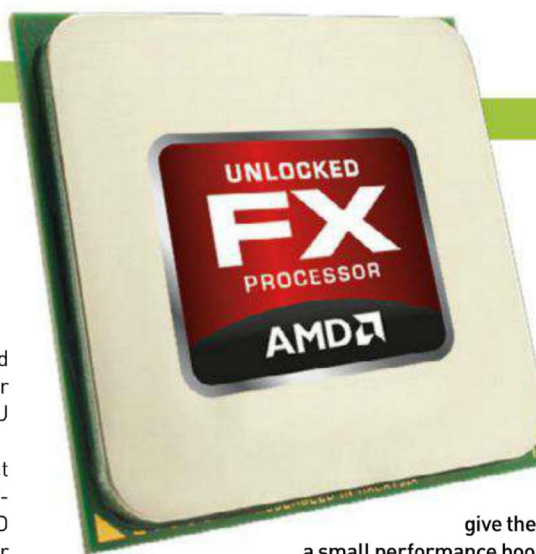
The additional performance from the two patches won't be as good as running Windows 8, AMD says, but it's still free. For the record, AMD says its testing has shown a 10 percent bump in Bulldozer performance in Windows 8 when compared to the same benchmarks in Windows 7. Applying the patches to Windows 7 gets you a roughly 1-2 percent increase over the pre-patched Windows 7, the company says.

The first patch, support.microsoft.com/kb/2645594, prevents Windows 7 from shutting down used cores prematurely and parking them when there are threads to be assigned. AMD says this helps reduce a performance penalty that comes from parking and unparking cores.

The second patch, support.microsoft.com/kb/2646060, updates the Windows 7 scheduler to be aware of all the modules used in the

MAKING THE BIG DECISION

What we would pick depends very much on what we want to do with our system today and tomorrow. A box on LGA1155 definitely gives you a cost advantage that can be used to put in a bigger GPU or fatter storage. LGA1155 also lets you scale up from sub-\$100 Celerons to the cheap-and-fast \$200 Core i5-2500K and then on to a Core i7-2700K. LGA1155 also isn't a dead-end, with chips for it using the new 22nm Ivy Bridge on tap for this spring or summer. Where LGA2011 takes over is in the higher-end enthusiast segment. Folks who want and need the ability to run six cores will want LGA2011. It's also the better platform for anyone who needs a ton of PCIe 3.0 lanes to feed fast RAID arrays and GPUs. LGA2011 is also the better option for anyone who actually needs a ton of RAM. How does Core i7-3820 fit in the picture? It lets you build into a box that will take you higher up on the power curve than an LGA1155 system will take you.



Two new patches give the AMD FX chip a small performance boost, with more to come when Windows 8 ships.

chip and will throw the first four threads at each of the four separate modules instead of loading two modules (four cores) with the four threads. Remember that Bulldozer's modules are made up of two cores that share resources. When a core is working on but one thread, it's being the most efficient. If you have two dual-core modules, for four cores, it would be the most efficient if two threads each ran on separate modules rather than both threads running on one module's two cores.

Oddly, we thought that Bulldozer might actually see more performance by placing more work on the same module, shutting down the other modules and then boosting the cores' clock speed, but apparently the best way to load them is to spread the work out among all the modules.

Be that as it may, we decided to retest the same FX-8150 chip that we tested in our Holiday 2011 issue. In addition to installing the two patches, we also updated the BIOS on the Asus Crosshair V Formula board. We then re-ran all of the previous benchmarks. Does the Bulldozer patch pump up the benchmark results? Well, if AMD is already saying its internal tests show just a 1-2 percent bump, we're not expecting to be blown away.

The final word on Bulldozer's performance may not actually be written until Windows 8 is released.

BRING ON THE BENCHMARKS!

We pass judgment on the patched FX-8150 and Core i7-3820

For our CPU showdown, we pretty much used the exact same hardware that we used in our Holiday 2011 CPU showdown. The AMD tests were run on an Asus Crosshair V Formula board, the Core i7-2600K on a Gigabyte GA-Z68X-UD3H-B3, and the LGA2011 part on an Asus P8X70 Deluxe.

The only differences from the tests run several months ago were BIOS updates to the AM3+ and LGA2011 platforms. Otherwise, we used Windows 7 Professional, a 150GB WD Raptor hard drive, 8GB of DDR3/1600, and a stock GeForce GTX 580, all running the same drivers. For the AMD rig, we reran our tests with both of the hotfixes installed.

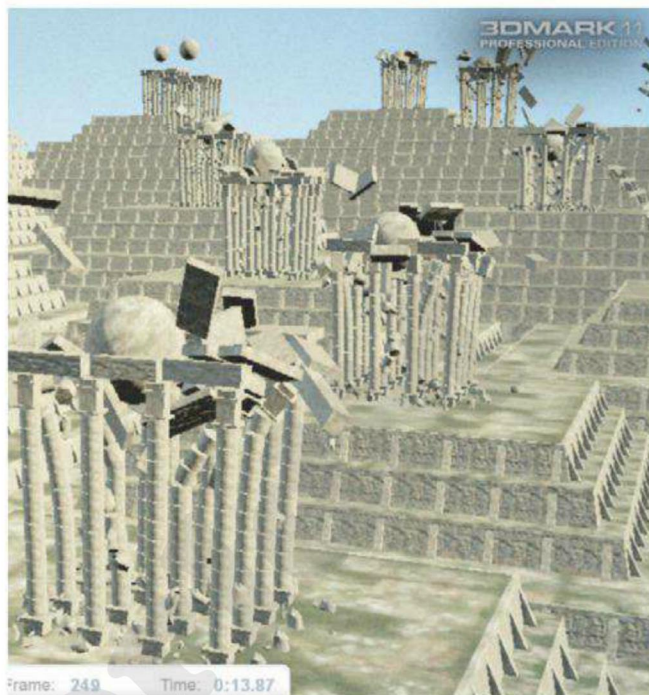
The verdict? It's a mixed bag. But let's face it, we shouldn't expect miracles in the first place. AMD has already said the patch adds maybe 1 or 2 percent in some tests and nothing in others. That's about what we saw: Some of the tests offered maybe a couple of ticks of additional performance, while others were the same. Still others showed the pre-patched state being faster. Does that mean the patch is hurting performance? No. More likely we're seeing the normal variances in performance that happen in any benchmark. We are, after all, talking about 1 to 2 points—that's pretty much within the margin of error for most tests. That's likely to disappoint the already dejected AMD faithful who were hoping the patch would give more serious benefits, such as the 10 percent boost predicted from Windows 8, with its fully updated thread scheduler. The bad news is that even with a 10 percent bump in performance from Windows 8's improved scheduler, it's not enough to put the chip in real contention with the Core i7-2600K, 2700K, and certainly not the new Core i7-3820. Even worse, by the time Windows 8 hits the shelves, Intel will likely have moved on to its 22nm Ivy Bridge CPUs. Ivy Bridge won't be a big jump forward on the x86 side of the fence, but it's going to be significant in terms of integrated graphics and power consumption. Still, for anyone running an AMD FX chip, there's no real reason not to install the patch, lest you leave any additional performance on the table.

The real battle here is between the 2600K and 3820 parts. When you consider that both chips use what are essentially the same execution cores, any performance difference can be attributed to cache, clock, and memory bandwidth differences. Some of it may also come from motherboard differences, but there's nothing to be done there, as both chips require different motherboards.

We expected this showdown to be close, but our tests, at least with this configuration, showed the Core i7-3820 to have some pretty healthy leads in the benchmarks. It didn't win across the board, but we saw everything from virtual ties to 14 percent performance boosts. For example, in Sony Vegas the Core i7-3820 achieved a considerable bump of 12 percent, in HandBrake about 8 percent, and in Valve's particle test a 9 percent lead over the 2600K. Where does the extra performance come from? Certainly part of it is from the i7-3820's 4 percent clock-speed advantage, but the rest

we legitimately give to the memory bandwidth and cache differences between the chips. It's clear to us that the Core i7-3820 is the winning part.

The big question is whether the 3820's better performance is worth the price differences elsewhere in the system. That's really up to you. We continue to think that LGA1155 is a pretty awesome platform for a lot of people. It offers everything from \$37 Celerons to \$332 Core i7-2700K parts, and within a few months you'll probably have Ivy Bridge parts to pick from, too. Where Core i7-3820 takes over is at the high-end—where you truly need a six-core part or a ton of RAM. Where would you need those six-cores or that much RAM? Work. If your day job is pushing pixels in video, 3D rendering, or any other app where more cores means more free time for you, building on the LGA2011 platform makes sense. If you can't afford a hexa-core processor, the Core i7-3820 lets you build a box with plenty of headroom for the future. We'd also select the Core i7-3820 if we were running a Radeon HD 7970 card. As the sole PCIe 3.0 card out today, we'd want that 10 percent performance bump you get from the faster PCIe 3.0 interface. We'd also go with the Core i7-3820 if we wanted to build either a tri-SLI or tri-CrossFireX rig, where additional PCIe lanes matter. ⚡



3DMark 11 is mostly a GPU test, but it does feature a physics test to stress CPUs, too.

BENCHMARK COMPARISON

	Core i7-2600K	Core i7-3820	FX-8150 Patched	FX-8150 Pre-patch
Clock	3.46GHz	3.6GHz	3.6GHz	3.6GHz
Cores / Threads	4 / 8	4/8	8	8
PCMark7 Score	3,450	3,443	2,912	2,838
PCMark7 Lightweight	2,612	2,598	2,152	2,222
PCMark7 Productivity	2,269	2,306	1,903	1,957
Cinebench 10 Single-core	6,011	6,209	4,006	4,080
Cinebench 10 Multi-core	23,315	24,456	20,414	20,277
Cinebench 11.5	6.84	7.46	6.01	5.97
POV Ray 3.7 (sec)	218.93	202.01	213.1	213.08
Bible (sec)	137	129	128	136
Fritz Chess Benchmark	13,065	14,190	11,567	11,704
Intel Burn Test (GFlops)	89.7	87	29	29
Sony Vegas Pro 10 (sec)	2,752	2,468	3,312	2,663
ProShow Producer (sec)	1,063	1,004	1,164	1,171
MainConcept (sec)	1,120	730	946	902
CyberLink Espresso 6.5 using CPU (sec)	379	309	430	429
CyberLink Espresso 6.5 using GPU (sec)	329	306	426	412
7-Zip 64MB load, 12 threads (MIPS)	19,046	21,485	19,904	20,400
7-Zip 64MB load, max core threads (MIPS)	19,288	21,590	20,361	20,773
wPrime 4-thread, 1024M	349.27	353.5	448	469
wPrime 6-thread, 1024M	293.16	265.5	353	357.07
wPrime 8-thread, 1024M	248.3	228.1	293	293.7
wPrime 12-thread, 1024M	271.2	245	322	328.08
HandBrake (sec)	336	311	347	345
Sandra (GB/s)	17.6	37.84	17.6	17.7
Valve Particle Test (fps)	179	196	107	108
Dirt 2 (fps)	189	188.8	115.4	120
Far Cry 2 (fps)	202.39	220	107	111.23
3DMark2011 Score	P6469	P6653	P6146	P6138
3DMark2011 GPU	6,186	6,267	6,194	6,167
3DMark2011 Physics	8,184	9,477	6,335	6,426
3DMark2011 Combined	6,671	6,759	5,580	5,569

Best scores in each contest are bolded.



Introducing the Corsair

DOMINATOR® PLATINUM

Beauty and Brawn.

The new Corsair Dominator® Platinum builds on the legacy of the world's most awarded high-performance memory, adding a striking new industrial design and LED lighting effects. Like all Dominator memory modules, they are built using only select memory ICs, highly-screened for performance and stability, and feature our patented DHX® (Dual-path Heat eXchange) cooling technology, so you can push them to the limit. The new design will look great in your current system — or your next build — and the user-swappable light bar lets you customize the LED lighting to match your rig. You can even connect Dominator Platinum to the Corsair Link system to monitor temperature and activity. It's memory with both muscle and finesse.

Corsair Dominator Platinum Memory. Designed for you.

Learn lots more at: corsair.com/dominator



facebook.com/corsair



[@CorsairMemory](https://twitter.com/CorsairMemory)

CHECK OUT THESE OTHER CORSAIR PRODUCTS DESIGNED TO MAKE YOUR PC THE BEST PC



POWER SUPPLIES



KEYBOARDS



MICE



SPEAKERS

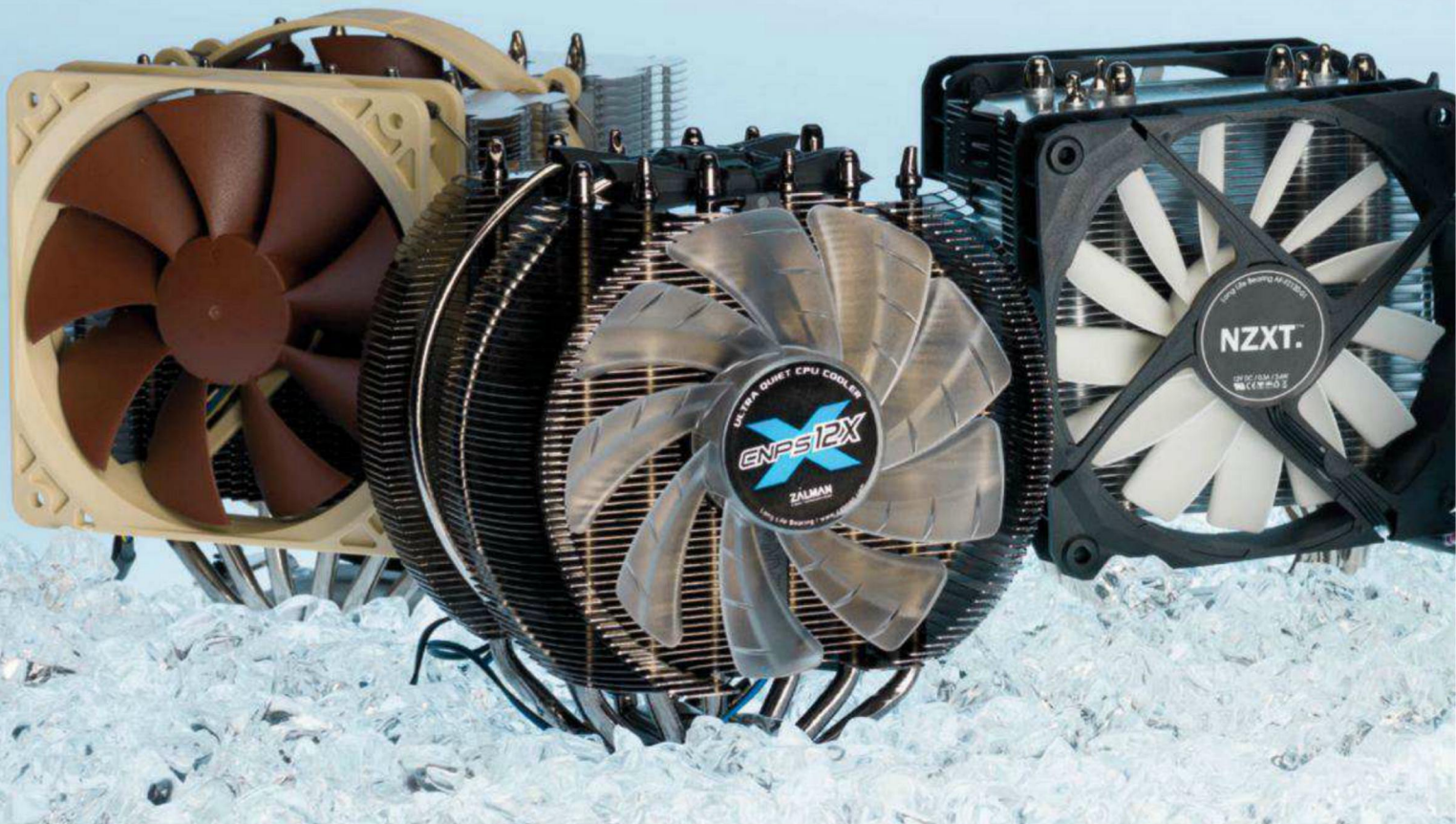


HEADSETS

CHILLIN' WITH LGA2011

By Nathan Edwards

INTEL'S **ENTHUSIAST** PLATFORM
PUTS OUT THE HEAT—HERE ARE
SEVEN WAYS TO COOL IT OFF



INTEL'S SANDY BRIDGE-E enthusiast platform brings with it a brand-new Intel socket (if you're counting, that's 87 this year alone), and that means new cooler mounting brackets! One nice thing about the X79 chipset: The boards ship with an integrated universal CPU mounting backplate, so no more fiddling around behind the motherboard.

Now, the new chipset has only been out for a few months, so cooler manufacturers are still working on getting their products compatible with the universal backplate. We were able to wrangle up seven LGA2011-compatible coolers, ranging in price from \$30 to \$120, to see how they cope with the new mounting system and whether they're up to the task of cooling an overclocked Sandy Bridge-E CPU.

We tested each cooler on a test bed with an Asus P9X79 Deluxe motherboard, a i7-3960X CPU, 16GB of DDR3, and a Thermaltake Level 10 GT case with its stock fans running at "high."

The i7-3960X is the flagship Sandy Bridge-E CPU, containing six cores and support for 40 PCIe lanes. Its Turbo mode hits 3.9GHz out of the box, but we've clocked the proc up to 4.2GHz. We tested each cooler after an hour of idling and an hour of full burn at 4.2GHz, using the Sandy Bridge-E version of Intel's internal thermal testing utility, and measuring the core temperatures with HW-Monitor. To further level the playing field, we're using the same thermal interface material for each cooler, eschewing the included thermal pastes in favor of Arctic Silver's Lumiere, which we've used for all our cooler tests for years. In a sidebar, we'll also talk about the effect of thermal paste on CPU performance.

Because very few of us run our CPUs at 100 percent across all cores for long stretches of time, the burn temperatures represent worst-case scenarios—this should be the hottest these CPUs ever get.

What are you waiting for? Turn the page!



COOLER MASTER HYPER 212 EVO

Meet the new boss, same as the old boss

WHAT, THIS OLD THING? Cooler Master's Hyper 212 Evo is the new-and-improved version of our standby CPU cooler. It's just \$35 and offers performance far exceeding other coolers in its price range, so it's the first thing we reach for when we build a new

budget-conscious rig. Given that LGA2011 CPUs don't come with heatsinks, the Evo is the closest thing we have to a stock cooler, and it will be the standard against which all other Sandy Bridge-E coolers are judged.

When we reviewed the Hyper

212 Evo (you can read our review at bit.ly/HJjMdo) we had two major complaints: The backplate mounting procedure remained annoying, and the cooler didn't have LGA2011 mounting support. Both of those problems have now been addressed.

The Hyper 212 Evo is a skyscraper-style heatsink, with four direct-contact copper heat pipes rising into an array of aluminum heat-dissipation fins. From the base of the heat exchanger to the tips of the heat pipes, the cooler is 6.3 inches tall, 3.13 inches deep, and 4.7 inches wide with the included 12cm PWM fan attached.

Thanks to the unified backplate on the LGA2011 socket (a crossover from Intel's Xeon

platforms), the Evo's mounting process is greatly simplified. The LGA2011 X-shaped crossbar now screws directly into the mounting holes on the included backplate. No more accidentally unscrewing mounting bolts when removing the cooler.

In our test bed, the Evo continues to impress, cooling our i7-3960X at 4.2GHz down to 74 C. It's not the best cooler in this roundup, but it outperforms coolers three times its price. While its height may be a concern in narrow cases, the heatsink and fan do not interfere with any RAM slots, unlike many other coolers in this roundup. The Evo remains an inexpensive, inexplicably kick-ass cooler.

SPECIFICATIONS

Dimensions HxDxW 6.3x3.13x4.7

(inches, with fans)

Weight 1 lb, 4.6 oz

Heat Pipes 4 copper direct-contact

Stock Fans 1x 12cm PWM

Add'l Fan Support 1 (clips included)

Cooler Master Hyper 212 Evo

\$35, www.cooler-master-usa.com



NZXT HAVIK 120

NZXT's second air cooler, and they still can't spell 'havoc'

NZXT DIDN'T ENTER the CPU cooling game until quite recently. We reviewed its first cooler, the skyscraper Havik 140, in December 2011. The Havik 140's dual 14cm fans helped it power to the top of our air-cooling charts, though the slightly cheap-feeling

mounting bracket kept it from Kick Ass Award status. NZXT's second air cooler is the smaller, less expensive Havik 120.

The Havik 120 stands 6.4 inches tall, 4.5 inches deep, and 5 inches wide with both 12cm fans strapped on—just about a

quarter of an inch shallower and narrower than the 140. The Havik weighs more than two pounds, and has four fat heat pipes to the 140's six. The Havik 120's mounting mechanism uses the bars-and-crossbeam model from the 140, and installation is easy. The cooler's two 13-bladed, 12cm fans have 3-pin connectors, and connect to one of two Y-splitters (one with a speed-limiting resistor). The fans attach to the cooling fins with rubber straps, which is not the most convenient mounting mechanism, especially when the motherboard is already mounted in the case.

The Havik 120 performed second-best of the five air coolers we

tested, dropping the overclocked i7-3960X to 73.7 C at full burn. Using the included resistor splitter cable increased CPU temperatures by a few degrees but reduced noise to quite low levels.

We like that the Havik 120's fin stack is high enough so the fans don't interfere with most RAM DIMMs, and that it performs well without being too loud. It's neither as quiet nor as effective as the 140, but it's smaller. At \$55, it's a good midpoint between the \$30 coolers in our roundup and those in the \$80-100 range.

NZXT Havik 120

\$55, www.nzxt.com



SPECIFICATIONS

Dimensions HxDxW 6.4x4.5x5

(inches, with fans)

Weight 2 lbs, 1.1 oz

Heat Pipes 4 direct-contact

Stock Fans 2x 12cm 3-pin (w/ splitter / resistor cables)

Add'l Fan Support No



XIGMATEK GAIA

A challenger appears!

SOMETIMES WHEN we use the Hyper 212 Plus in a build we get comments to the effect of, "Why don't you use Xigmatek's Gaia? It's just as good and just as cheap!" Just as cheap? Definitely. Just as good? We'll see!

Stop us if you've heard this before: The Gaia is a skyscraper-style stack of aluminum cooling fins on top of three direct-contact copper heat pipes. The Gaia is 6.5 inches high by 2.9 inches thick (with the fan) and 4.9 inches wide. At one pound, 4.7 ounces, it's practically the same weight as the Hyper 212 Evo. Aside from the slightly narrower cooling fins and the fact that it has three heat pipes rather than four—and that its 12cm PWM fan is held on by rubber pegs rather

than a plastic clip—the Gaia looks a lot like the Evo.

On LGA2011, the Gaia's install process is pretty easy. Four double-sided thumbscrews screw into the universal backplate, a mounting plate screws onto either side of the heatsink and mounts onto those thumbscrews, and then four nuts secure the mounting bracket. There are no screws or any other way of putting pressure on the heat exchanger other than tightening the mounting nuts as far as possi-

SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.5x2.9x4.9
Weight	1 lb, 4.7 oz
Heat pipes	3 copper direct-contact
Stock Fans	1x 12cm PWM
Add'l Fan Support	1 (rubber mounts included)

ble. The rubber fan mounts pop into slots cut into the sides of the cooling fins, which is great for damping vibrations but not as easy to attach or remove as plastic or wire clips.

The Xigmatek Gaia cooled our overclocked i7-3960X to 75.7 C in our burn test, within two degrees Celsius of the Hyper 212 Evo. We still prefer the Evo's installation procedure, at least for

LGA2011, and don't mind the \$5 price premium, but the Gaia is nearly as good as the Hyper 212 Evo, and even less expensive.

Xigmatek Gaia

\$30, www.xigmatek.com



NOCTUA NH-D14 SE2011

Cooling prowess as massive as its dual heatsinks

WHEN WE REVIEWED the first-edition Noctua NH-D14 back in April 2010, we praised its quiet performance, but our then-current test bed didn't put out enough heat to best showcase its cooling chops. Fortunately, our new one does. This coincides

nicely with Noctua's release of the NH-D14 SE2011, which includes (gasp) LGA2011 support and updates the D14's two fans to include PWM, or pulse-width modulation.

The new NH-D14 is just as massive as the old one. With both

fans attached, the heatsink stands 6.5 inches high, 6.2 inches deep, and 5.5 inches wide and weighs more than two pounds, 12 ounces. The cooler's six heat pipes rise into two sets of cooling fins, each the size of a lesser cooler's entire allotment. A 12cm PWM fan clips to the front and a 14cm fan clips between the two sets of fins, both using Noctua's wire clips, which are easy to install and remove. Installation is easy; just remove the center fan, mount four double-sided thumbscrews to the unified backplate, install two mounting bars over those, secure them with thumbscrews, and tighten the two spring-screws on the D14 onto the posts on the mounting bracket.

Because it's so massive, the NH-D14 blocks some RAM slots; we had to use low-profile RAM in order to fit the 12cm fan onto the cooler. But once that was accomplished, the NH-D14 achieved the lowest CPU burn temps of any air cooler in our roundup, at just over 72 C. When we added the resistor cables, the temperature increased to 76 C, but fan noise became almost imperceptible—certainly quieter than the case fans.

Of the air coolers we've tested on LGA2011 thus far, the NH-D14 takes the crown. If it weren't quite so massive, it'd be even easier to recommend, but it still garners our firm approval.

Noctua NH-D14 SE2011

\$85, www.noctua.at



SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.5x6.2x5.5
Weight	2 lbs, 12.8 oz
Heat Pipes	6
Stock Fans	1x 12cm, 1x 14cm, PWM
Add'l Fan Support	1



ZALMAN CNPS12X

It looks cooler than it is

THE CNPS12X MIGHT be Zalman's most eye-catching cooler, with two arrays of black-nickel-coated cooling fins and three 12cm fans to push air through them. And it is massive. It's 6.1 inches tall, 5.25 inches deep, and more than 6 inches wide, and weighs

two pounds, four ounces. It's so big it overhangs the inner four RAM slots on our Asus P9X79 Deluxe test motherboard, requiring the use of RAM without tall heat spreaders. The six direct-contact heat pipes rise into two sets of cooling fins, with the front and

rear fans nestled into their respective fins, and the middle fan in between the two sets. All three fans are controlled via a single 3-pin power connector.

Installation of the CNPS12X is a pain. Zalman has adopted the common mounting system of two parallel mounting bars with a perpendicular crossbar that bolts to each mounting bar and keeps the cooler in place. Alas, Zalman's system is flimsy and uses the same skinny hex bolts we complained about in our 9900MAX review (February 2011), and those require a special (included) hex wrench. The bolts are hard to access, thanks to their position directly below the center fan, and don't seem to

be able to apply much pressure to the heatsink.

Whether because of this or simply the nickel finish on the entire heat exchanger, the CNPS12X performed poorly on our overlocked system, getting the CPU to just below 78 C. Lest we base the score on an isolated incident, we installed the cooler several times over several days and got the same performance.

Without the included resistor cable, the CNPS12X is quiet. It's very quiet with the resistor cable, so if you're not overlocking, the CNPS12X is an appealing and beautiful cooler. But given the flimsiness and frustration of the install process, we can't recommend it for overlocked LGA2011 cooling.



SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6.1x5.25x6
Weight	2 lbs, 3.8 oz
Heat Pipes	6 direct-contact
Stock Fans	3x 12cm, 1x 3-pin connector
Add'l Fan Support	No

Zalman CNPS12X

\$100, www.zalman.com



INTEL RTS2011LC

Underwhelming in the extreme

INTEL ISN'T SHIPPING stock heatsinks with Sandy Bridge-E CPUs, perhaps assuming that consumers of \$600 and \$1,000 CPUs are going to want performance a little better than Intel's stock coolers have typically provided. Instead, Intel is offering a branded liquid-cooling loop as an optional accessory. The Asetek-built cooling loop features a glowing blue Intel

logo and a bright blue LED on its single 12cm fan, but otherwise looks nearly identical to the Antec Kühler 620, which was also built by Asetek (the company that also built AMD's Bulldozer-branded liquid-cooling loop).

The RTS2011LC uses Asetek's low-profile pump unit/heat exchanger and a 120mm radiator that's less than an inch thick and mounts in place of a stock case

fan (typically the rear exhaust fan). The heat exchanger mounts to the LGA2011 socket using Asetek's standard barb-and-ledge mounting system, although with big solid posts instead of the flimsy screws and plastic clips Asetek used to use. The PWM fan plugs into the pump, which plugs into the CPU_FAN header.

Alas, the cooler's single fan and radiator were no match for any of the air coolers in our round-up, save one. The RTS2011LC tied with the Zalman CNPS12X for last place, and its 12cm fan was irritatingly loud at full speed. For stock-clocked chips, the Intel

cooler is fine. It's quiet when not fully ramped up, and it doesn't block any RAM slots, unlike the Noctua and Zalman coolers. But for an overlocked Sandy Bridge-E CPU, the Intel liquid cooler is louder and hotter than the Cooler Master, Noctua, Xigmatek, and NZXT coolers, and more expensive than all but the Noctua, which is just \$5 more. If you want a great liquid-cooling solution for an overlocked LGA2011 chip, keep looking.

Intel RTS2011LC

\$80, www.intel.com



SPECIFICATIONS

Dimensions HxDxW (inches, with fans)	6x2.6x4.75
Weight	1.25x2.5x2.5 (circular)
Heat pipes	1lb, 12.5 oz [total]
Stock Fans	1x 12cm PWM
Add'l Fan Support	1x



CORSAIR H100

Double your radiator space, double your fun

ANOTHER ALL-IN-ONE liquid-cooling loop! Hooray! Corsair's H100 is its *fifth* liquid cooler; after two with Asetek, the company has put out three with CoolIT. The H60 is your standard 120mm radiator-with-single-fan, the H80 is the double-thick double-fan version, and the H100, Corsair's first liquid-cooler to support LGA2011, is also its first cooler with a 240mm radiator.

The H100's radiator is around an inch thick and 10.8 inches long and fits in any case that can accommodate a 240mm radiator, though some cases may not

have the vertical clearance to mount the fans inside the case. The pump/heat exchange unit is square and very slightly taller than Asetek's. It contains four 4-pin PWM headers to control the radiator fans, as well as a connector for Corsair's Link system control software/hardware combo (sold separately). There's also a three-speed fan-control button on top of the pump. The pump unit itself has a 3-pin motherboard fan connector and a 2-pin Molex for power. The cooler unit mount is simple: Four double-sided thumbscrews mount to the

unified backplate, the brackets at the corners of the pump unit slide onto those, and more thumbscrews secure them in place.

We mounted the radiator to the top panel of our Thermaltake Level 10 GT test bed, with the fans on the inside pushing air through the radiator out of the case. In this configuration, with the H100's fan speed set to medium, the Corsair cooler lowered our CPU's burn temperature to 69.2 C—the best

of any cooler in our roundup. Even with the fans at their lowest setting, the H100 was a match for the air coolers in the roundup.

Its 240mm radiator won't fit in every case, and it's the most expensive in our roundup, but the H100 is a competent, quiet liquid cooler and the best LGA2011 cooler we've yet tested.

Corsair H100

\$110, www.corsair.com



SPECIFICATIONS

Dimensions HxDxW 10.8x2x4.7
(inches, with fans)

Weight 1.6x2.6x2.6 [square]

Heat pipes 2 lbs, 2.5 oz

Stock Fans 2x 12cm, 3-pin

Add'l Fan Support 2x



KEEP YOUR COOL

Bigger and more expensive coolers aren't always better

THIS IS THE BIGGEST cooler roundup we've done in years, and it was enlightening. First, we really appreciate Intel finally bringing a unified backplate to a consumer-level CPU socket, and hope the trend continues, as it makes cooler installation much less irritating. However, some mounting systems still manage to be frustrating. Zalman's CNPS12X mounting bracket is likely responsible for its poor cooling performance.

The most interesting thing about our test results is that price and performance aren't strongly correlated. The cooler with the fourth-best performance, the Hyper 212 Evo, is just \$35, and only 5 C hotter than the best cooler, which costs four times as much. Heck, it's better than both the Zalman, which is \$70 more expensive, and the Intel liquid cooler, which is \$45 more. Both the Cooler Master and Xigmatek budget coolers earn our recommendation for low-to-medium overlocks.

We got the best performance in this roundup from Corsair's 240mm-radiator H100, and if you have the room in your case, you'll find it a quiet, effective solution that doesn't block any RAM slots. Adding a couple more fans will only make it better.

NZXT's Havik 120 and Noctua's DH-14 are both great coolers, as well; the Noctua is much larger and quieter (though you'll need low-profile RAM), while the Havik is more compact and cheaper and shouldn't conflict with your RAM. We bet it hits the sweet spot for a lot of users.

We'd recommend either the Havik 120 or the DH-14 over the Intel liquid cooler, or any single-fan, single-radiator liquid cooler. They're cooler and quieter and they fail better; an all-in-one with a broken pump isn't a cooler, but a massive stack of cooling fins with a broken fan is still a massive stack of cooling fins. And in the end, isn't keeping cool what matters?

SPECIFICATIONS

	CM Hyper 212 Evo	NZXT Havik 120	Xigmatek Gaia	Noctua DH-14	Zalman CNPS12X	Intel RTS2011LC	Corsair H100
Ambient Air	23.8	25	25.1	25.2	24.2	25	25
Idle Temperature	36.2	34.8	35.5	34.1	35.2	35.2	33.2
Burn Temperature	74	73.7	75.7	72.3	77.8	77.8	69.2

All temperatures in degrees Celsius. Best scores bolded. All tests performed using an Intel Core i7-3960 at 4.2GHz, on an Asus P9X79 Deluxe motherboard with 16GB DDR3/1600, in a Thermaltake Level 10 GT with stock fans set to High.



BY NATHAN EDWARDS

BUILD A BATTLEFIELD 3 PC

YOU CAN'T GET THE FULL BF3 EXPERIENCE ON A CONSOLE, BUT WHAT DOES IT TAKE TO GET IT ON A PC?

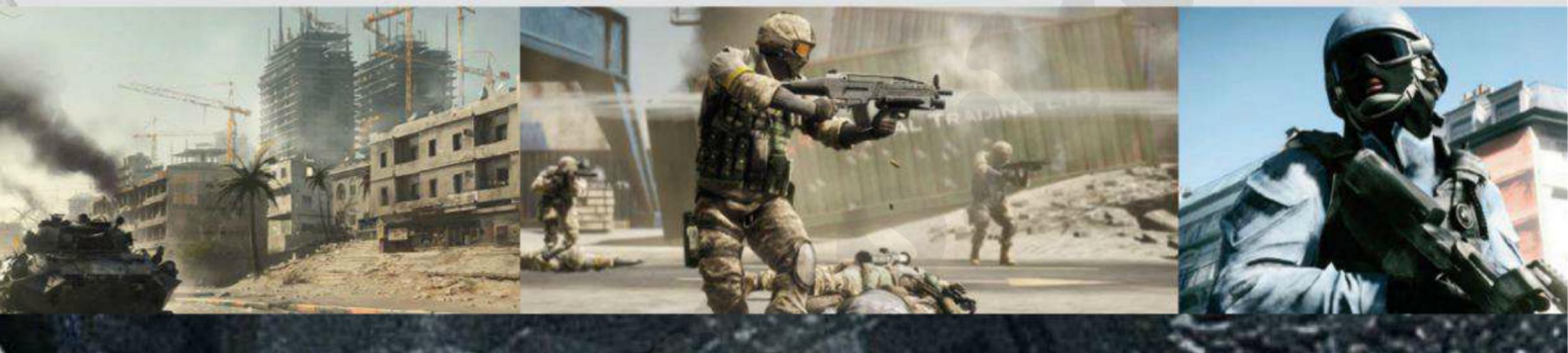
IN AN AGE OF SLOPPY CONSOLE PORTS, Battlefield 3 is a huge relief for PC gamers. Not only is the PC a "lead platform" for DICE's flagship modern shooter, but we're getting all the good stuff: 64-player maps? You won't find 'em on a console. DirectX 11 graphics? Only on a PC, Sparky. Indeed, Battlefield 3's Frostbite 2 engine brings fully destructible environments, ambient occlusion, MLAA, and full DX11 support—and it reaches its full potential only on the PC. But with great power comes great power requirements: DICE's minimum recommended GPU is a GeForce GTX 560 or AMD Radeon HD 6950, and performance scales up from there. That means a lot of us are going to have to go get new videocards—or a whole new rig.

Any Neanderthal can slap together a \$3,000 box and play Battlefield 3 like a dream, but

that's out of reach for most people. So we decided to build a machine that can play BF3 as nature intended—at 1920x1200 resolution, with all settings at Ultra—and do it for less than \$1,600.

At the time we produced this story, we didn't have access to the final Battlefield 3 code; but we played the open beta and used Battlefield 3-optimized drivers from AMD and Nvidia as they became available.

We'll start by explaining the parts we chose and why. Some were obvious, and some—like the videocards—changed multiple times. Then we'll talk about our testing and gameplay experience, and describe some alternate configurations. If you've ever needed a good excuse to upgrade or build a new rig, Battlefield 3 just might be it.



CPU

Intel Core i5-2500K



WE THINK the Core i5-2500K is the best midrange processor on the market. It's a 3.3GHz quad-core chip, and though it lacks Hyper-Threading, it's multiplier-unlocked and overclocks like a dream, thus extending its usable lifespan (though we left ours at stock speeds for this rig). Sandy Bridge is a great platform, and the 2500K hits the price/performance sweet spot for that platform. Bulldozer and Sandy Bridge-E CPUs weren't available when we built our system, but even if they were, we'd probably still go with the 2500K. It's that good a value.

MOTHERBOARD

Asus P8Z68-V Pro



ASUS'S P8Z68-V PRO is the perfect complement to our i5-2500K. Not only does it have Intel's excellent native 6Gb/s SATA chipset and USB 3.0 support, but it also brings three PCIe x16 slots—although the third is restricted to x4 mode, and the first two, if both used, default to dual x8 speeds. A UEFI BIOS enables use of hard drives bigger than 2.2TB, and Intel's Smart Response Technology (SRT) is an option if you prefer a large mechanical boot drive with a small SSD for caching—an option we considered before settling on the final storage loadout.

RAM

8GB Patriot Division 2 DDR3/ 1600



DICE'S MINIMUM RAM requirement for Battlefield 3 is 2GB, and its recommended specs call for 4GB. 4GB is, frankly, the bare minimum we'd consider putting into a new rig, and it's not very future-proof. The Z68 chipset is dual-channel, and our motherboard has four DIMM slots. With memory prices so low, it only made sense to go with two 4GB DIMMs. That gives us 8GB of RAM now, and room to double up later.

GPU

XFX Radeon 6970 2GB



THIS WAS THE trickiest part to pick. Throughout the beta period, Nvidia and AMD kept releasing beta drivers that would put their respective GPUs in the lead. AMD's second preview drivers, though, kicked the 6970's average frame rate on Ultra at 1920x1200 up to 45fps on our system—well in the playable range, and for \$150 less than Nvidia's GTX 580. If we had gone with the GTX 560 Ti or Radeon 6950, we would have had to ratchet down the graphical quality or the resolution. With the Radeon 6970 we get a tasty balance of performance and price.

SSD



120GB Corsair Force GT

OUR ORIGINAL PLAN called for a 3TB boot drive with a 40GB SSD for caching via Intel's SRT. That install fell over and died twice, thanks to some bugs with SRT and drives greater than 2.2TB, so we went back to the drawing board. We decided on a blazing-fast 6Gb/s SATA SSD with 120GB of storage as our boot drive. That's enough for the OS and a few of our favorite games and applications, with a larger traditional hard drive for documents, movies, music, and other media. A 120GB drive, right now, is the sweet spot between price and capacity.

HARD DRIVE

2TB Hitachi Deskstar 7K3000



WE HAD OUR EYES on a 3TB Deskstar and 40GB SSD, as noted previously, but—in addition to the aforementioned buggy install—we realized we could get a 120GB SSD and 2TB drive for around the same price. We figure we'll miss 1TB of mass storage less than we'd miss the ultra-fast load times of a dedicated SSD for our OS and gaming. For now, two terabytes is plenty for us, and the Deskstar is both speedy and reliable.

PSU

750W Corsair TX750 V2



NOT MUCH TO TALK about here; we needed power. Power enough to run our rig without stuttering, freezing, or crashing. Power that doesn't cost an arm and a leg. Corsair's TX750 V2 isn't frilly or fancy—we didn't spring for the modular version—but it does what it says on the tin, and that's enough. 750W is sufficient for our solitary Radeon HD 6970, and should even enable us to throw another card in the system later, if we so choose.

CASE

Rosewill Thor v2



FOR PRICE-CONSCIOUS builds we normally opt for mid-tower chassis, as they're usually less expensive than their full-tower kin. However, we reviewed Rosewill's Thor V2 last month and it really captured our imagination. Either it's well built for a budget full-tower, or it's cheap for a good full-tower, but either way, we dig its roomy interior, easy cable routing, and fantastic stock cooling. The Thor has two variable-speed fan controllers that support three fans each; we connected its intake fans (23cm, front and side) to one and its exhaust fans (14cm rear and 23cm top) to the other.

INSIDE SCOOP

1

The Cooler Master Hyper 212 Plus is our favorite step-up-from-stock CPU cooler.

2

The Thor has room for even the longest of graphics cards.

3

We skipped a Blu-ray player to save money. Why watch movies when you can play games?



PRICE LIST

	PART	URL	PRICE
Case	Rosewill Thor V2	www.rosewill.com	\$130
PSU	Corsair TX750 V2	www.corsair.com	\$120
Mobo	Asus P8Z68-V Pro	usa.asus.com	\$199
CPU	Intel Core i5-2500K	www.intel.com	\$220
CPU Cooler	CM Hyper 212 Plus	www.coolermasterusa.com	\$30
GPU	XFX Radeon 6970 2GB	www.xfxforce.com	\$350
RAM	2x 4GB Patriot Division 2 DDR3/1600	www.patriotmemory.com	\$80
Optical Drive	Plextor DVD/combo	www.plextor.com	\$25
SSD	120GB Corsair Force GT	www.corsair.com	\$220
HDD	TB Hitachi Deskstar 7K3000	www.hitachigst.com	\$120
OS	Windows 7 Home Premium, 64-bit OEM	www.microsoft.com	\$100
TOTAL			\$1,594

OUR BATTLEBOX IN ACTION

YOU GO TO WAR WITH THE DRIVERS YOU HAVE

BUILDING A RIG TO PLAY a game that hadn't come out yet presented some unique challenges. The Battlefield 3 beta was only open for a brief time, didn't include a benchmarking tool, and, well, wasn't the final shipping code. Also, throughout our testing, both Nvidia and AMD released updated Battlefield 3-specific beta drivers, which drastically improved performance with each respective company's cards. We tested performance by running the Fraps utility (www.fraps.com) throughout a series of matches in the beta, then taking the average frames per second from each playthrough and averaging them.

For our Battlebox, we set a simple performance goal: We wanted a rig that could play Battlefield 3 at 1920x1200 at Ultra, the highest of its four performance presets,

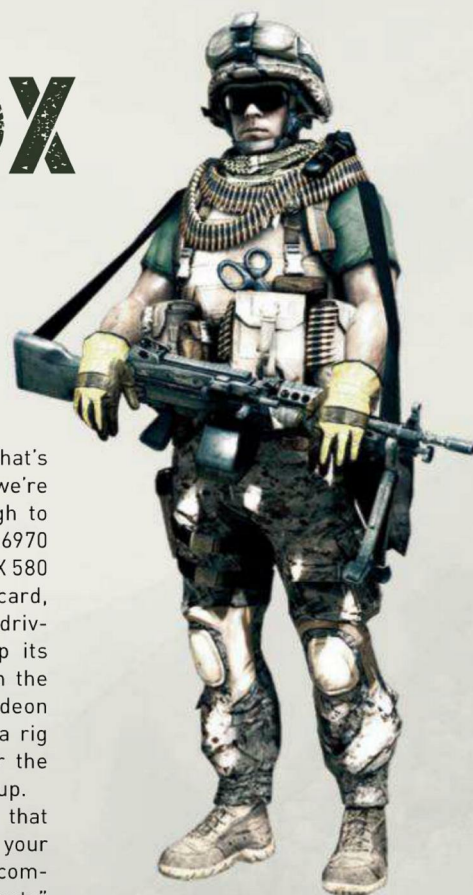
without having to turn down any of the settings. Neither the GTX 560 Ti nor the Radeon HD 6950 could stay above 35fps at Ultra, though both were fine at 1920x1200 on the High preset. Nvidia's GTX 580 delivered excellent performance at Ultra, averaging more than 45fps with the 285.38 beta drivers, while AMD's Radeon HD 6970, using the first set of Catalyst 11.10 preview drivers, mustered an average of 35fps—playable, but not quite the frame rate we were looking for.

However, just a few days before the open beta period ended, AMD released the Catalyst Preview 11.10 (version 2) drivers, which promised big Battlefield 3 performance gains. And boy, did they deliver. The new drivers let our Radeon HD 6970 average 42fps in Battlefield 3's

Operation Metro map. That's an average frame rate we're comfortable with—enough to choose the Radeon HD 6970 over the GTX 580. The GTX 580 is an objectively faster card, and Nvidia's release drivers will doubtless bump its performance higher than the 45fps we saw. But the Radeon is \$150 cheaper, and in a rig that's all about bang for the buck, we couldn't pass it up.

It goes without saying that upping your GPU will up your performance. DICE's "recommended system requirements" for Battlefield 3 advises using an Nvidia GeForce GTX 560 or AMD Radeon HD 6950. Nvidia provides more detail, saying that a GTX 560 or higher will play the game at 1920x1200 at High settings, while a 580 is required for Ultra settings. This is borne out in our testing. If you're OK with High quality, or you're playing at a lower resolution, you can get away with a GTX 560 or Radeon HD 6950. For Ultra at 1920x1200, we recommend a Radeon HD 6970 at minimum. The more GPU you bring to the game, the better it will look.

If you've built a gaming system in the past few years, you shouldn't have to do much to ready your rig for Battlefield 3, beyond adding a bit of RAM, perhaps, and upping your GPU power a bit. If you're running a Radeon HD 5870 or 6870, or a GTX 480 or 570, you probably don't need to upgrade at all. If you have a midrange card, you might consider adding a second one for an SLI or CrossFire configuration.



One thing the frames-per-second numbers don't tell you is how awesome Battlefield 3 looks at Ultra settings. Shoot, it even looks fantastic on High. So even if your current videocard is ancient, you can swap it out for a GTX 560 Ti or Radeon HD 6950 and still get a kick-ass experience—for less than the cost of a console. Don't get us wrong—we're sure BF3 will be just fine on a console, if you're OK with the 24-player maps, plodding dual-analog controllers, and prehistoric graphics.

We were super-excited for Battlefield 3 at this point, as much for its unabashed PC-centricity as its gameplay, which is addictive as all get-out. But if Battlefield isn't your bag, the rig we built is a great general-purpose gaming PC, with enough power to handle any modern game you care to throw at it. We just happen to want to throw Battlefield 3 its way and never stop playing. ⏻



The game looks even better in motion.
Plus, you can blow up the trees.



HOW TO

BY MAXIMUM PC STAFF

SET UP A

NEW PC

—THE RIGHT WAY

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

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

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

CHECK YOUR SPECS

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

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

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

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

Name	NVIDIA GeForce GTX 590		
GPU	GF110	Revision	A1
Technology	40 nm	Die Size	520 mm ²
Release Date	Mar 24, 2011	Transistors	3000M
BIOS Version	70.10.37.00.90		
Device ID	10DE - 1088	Subvendor	EVGA (3842)
ROPs	48	Bus Interface	PCI-E x16 @ x16
Shaders	512 Unified	DirectX Support	11.0 / SM5.0
Pixel Fillrate	29.2 GPixel/s	Texture Fillrate	38.9 GTexel/s

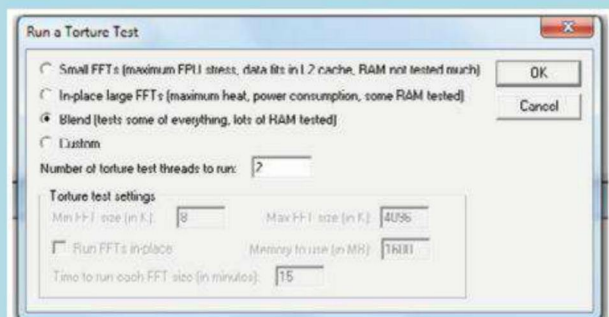
TechPowerUp's GPU-Z will tell you what speed the PCIe is running at.

CPU	Caches	Mainboard	Memory	SPD	Graphics	About
General						
Type	DDR3		Channels #	Triple		
Size	6144 MBytes		DC Mode			
			NB Frequency	2670.1 MHz		
Timings						
DRAM Frequency			667.5 MHz			
FSB:DRAM			2:10			
CAS# Latency (CL)			9.0 clocks			
RAS# to CAS# Delay (tRCD)			9 clocks			
RAS# Precharge (tRP)			9 clocks			

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

STRESS IT OUT

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



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

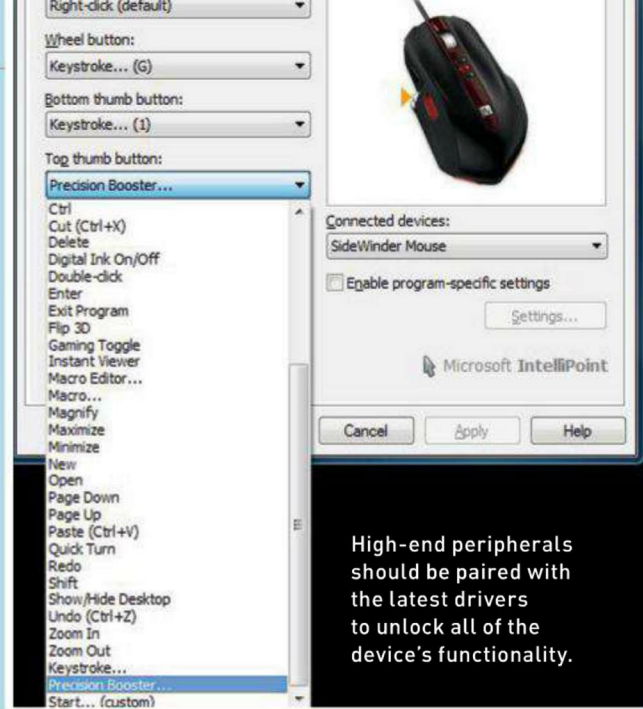
RTFM

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

STORE YOUR EXTRA PARTS

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





GET DRIVERS IN ORDER

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



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

PREPARE FOR DISASTER

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

SET UP YOUR SECURITY

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

DECRAPIFY YOUR PC

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

TRANSFER YOUR FILES, EASILY

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

TIPS FOR TRICKIER FILE TRANSFERS

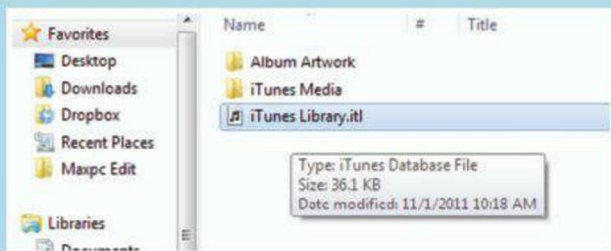
Moving documents from one computer to another is usually just a matter of copying-and-pasting onto an external hard drive and then to your new PC. That's fine for office docs and photos, but what about apps that build media libraries, like iTunes and Steam, or saved games, which go wherever the publisher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

iTunes

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

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

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



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

STEAM GAMES

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

GAME SAVES

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

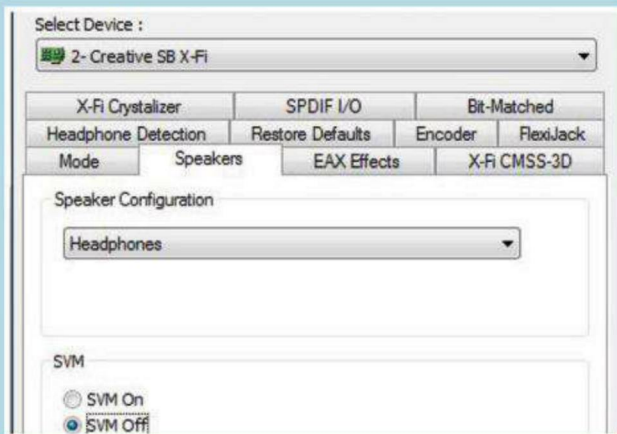
Run GameSave Manager on your old computer, and it will auto-detect the games you have installed, find out where the game saves are, and back them up, all via the Backup Gamesave(s) menu. Once you have a backup archive (a .gsba file), you can move it to your new computer and use GameSave Manager to automatically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



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

CONFIGURE AUDIO

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

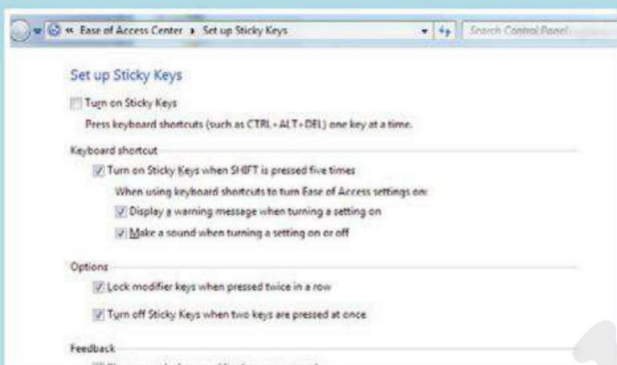


DISABLE ACCESSIBILITY SHORTCUTS

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

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

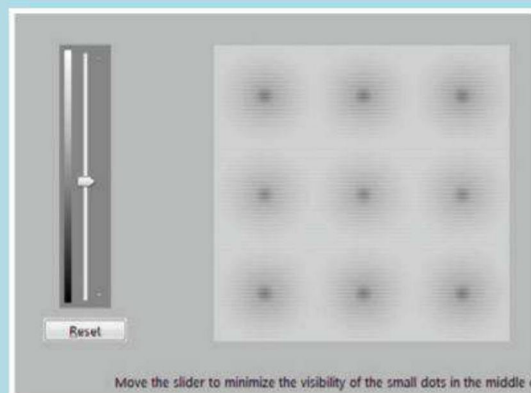
You can disable each shortcut individually by performing it, then choosing to turn off the shortcut, or you can disable them all in one fell swoop in Control Panel > Ease of Access Center > Make the keyboard easier to use.



CALIBRATE YOUR MONITOR

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

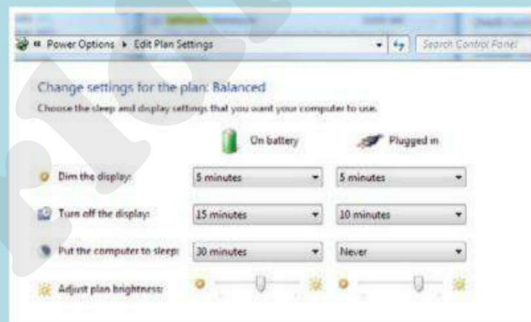
For a more thorough calibration, we recommend that you use high-quality calibration test images, such as those found at www.lagom.nl/lcd-test/.



ADJUST YOUR POWER SETTINGS

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

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



SHARE FILES ON A NETWORK

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

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

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

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

CREATE A GUEST ACCOUNT

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

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



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

MUST-HAVE APPS AND UTILITIES

NO PC IS COMPLETE WITHOUT THESE KEY PROGRAMS

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

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

Revo Uninstaller

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

KEEPASS Using top-of-the-line encryption algorithms AES and Twofish, KeePass acts as

a password manager, allowing you to store all your passwords (e.g., email, Facebook, online banking) in a single and secure database that can only be accessed by you. www.keepass.info

REVO UNINSTALLER These days, it's simply not enough to use Windows to uninstall

your programs, as harmful remnants can be left behind. Enter Revo Uninstaller, a free app that not only uninstalls software, but allows you to manually remove additional data left behind. www.revouninstaller.com

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

SUMATRA PDF Sumatra PDF is a free PDF creator and viewer



USE AN ALTERNATIVE DNS

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

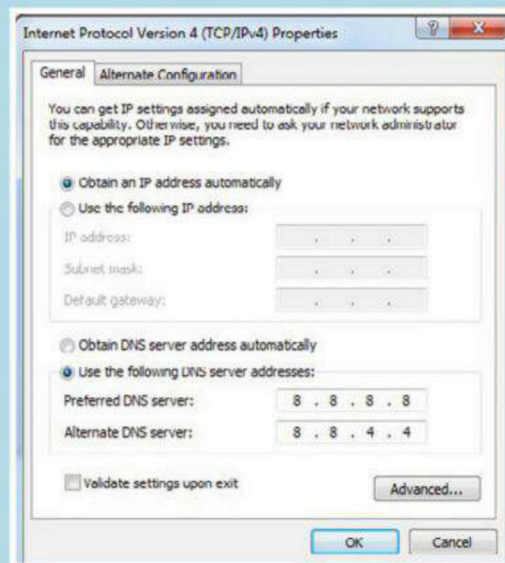
You might be able to speed up your web-browsing experience, as well as improve your online security, by switching to an alternative DNS resolution service, such as OpenDNS or Google Public DNS. We'll show you how to configure your Ethernet adapter to use the latter.

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

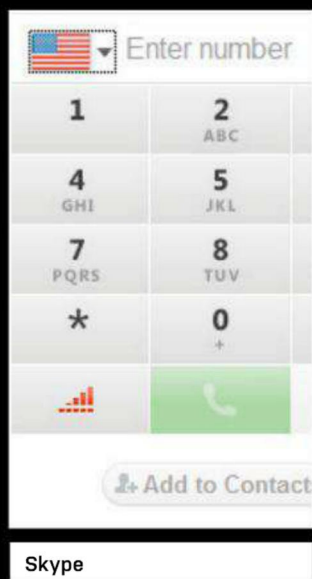
You should now be back on the General tab in the TCP/IP IPv4 Properties window. Click the radio button next to "Use the Following DNS Server Addresses" and type 8.8.8.8 in the Preferred DNS Server window and 8.8.4.4 in the Alternate DNS Server window. Click OK and close the Network Connections Properties window. Restart the network con-

nection by right-clicking it and choosing Disable from the pop-out menu, and then right-click it a second time and choose Enable from the pop-out menu. This should restart your connection using the new DNS settings.

To ensure your new settings are working, enter a hostname into your browser: www.maximumpc.com, for instance. If it resolves correctly, bookmark it, then click the bookmark. If it doesn't, roll back the changes you've just made and retest.



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



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

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

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

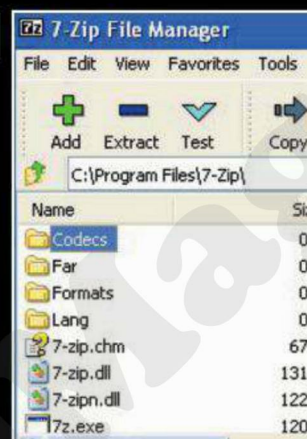
DIGSBY With Digsby you can consolidate all of your instant messaging accounts into one centralized hub, supporting AIM,

Digsby

Malwarebytes Anti-Malware

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

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



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

TIDY UP YOUR INSIDES

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

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

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

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

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



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



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

OPTIMIZE YOUR FAN SETUP

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

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

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



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

GET CHARGED UP



SHOW
AT 10.
C U
THERE?

YEAH! SO
PUMPED!

ITS
GONNA
ROCK!!

With USB, you can do it all.

USB inspires confidence as the most widely-accepted, reliable form of connectivity out there. Delivering effortless charging, video, data and storage to your home, office, car or anywhere in between. www.usb.org.



Message brought to you by USB Implementers Forum



Windows 8



Tktkt

Microsoft teased some basic details about the forthcoming operating system at the International Consumer Electronics Show in January, and in June the company showed a more complete picture of the OS's features at the D9 conference. At press time, Microsoft had promised more details to come at the BUILD conference this October. Here's what we know for sure, based on Microsoft's demos so far.

NEW LOGON SCREEN: From the moment you boot a Windows 8 PC, the user experience will be noticeably different from previous versions of the OS. Instead of a static login screen with nothing more than a profile pic and a password field, you'll see a dynamic, screensaver-like screen with a user-selectable image as the background. The screen will prominently display the date and time, your next upcoming calendar event, how many new emails you have, and how many chat requests you've received in your absence. Click or tap past this initial screen, and you'll see a more traditional login box.

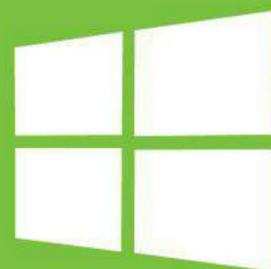
Microsoft will release multiple versions of Windows 8 for both x86 and ARM, including four distinct builds for the latter. What this means is clear: Windows 8 will be designed to run on low-power chips from ARM, Qualcomm, AMD, Intel, and Texas Instruments.

START SCREEN: Building on the Windows Phone 7 tile interface, Windows 8 will feature a new interface called the Start Screen, which represents programs as tiles. Tiles can be icons, images from the represented app, or details from within the app (such as weather or stock quotes). Some tiles will be widgets in and of themselves, while others will merely launch apps, such as Microsoft Word or PowerPoint.

TOUCH OPTIMIZATION: Consistent with our speculation over the last two years, Microsoft is making every effort to optimize Windows 8 for touch-screen control. The whole environment appears built primarily for tapping and sliding tiles around. Meanwhile, Microsoft created two kinds of onscreen keyboards: a standard half-screen keyboard that runs across the lower half of the display and a split keyboard that places the keys at the outer edges for thumb typing on tablets.

HTML5 AND JAVASCRIPT ENVIRONMENT: Windows 8 apps built for the new Start Screen interface will consist of HTML5 and JavaScript, which should simplify app development and open up Windows 8 app creation to a broader population of coders. Apps will run full-screen, just as they do on Windows Phone 7. This approach should also enable more device-independent apps that run as well on desktop PCs as they do on phones, with no porting necessary. The interface is designed for touch, but Jensen Harris, director of program management for the Windows User Experience team says it will work just as well with a mouse and keyboard.

SYSTEM-ON-CHIP SUPPORT: How do we know Microsoft is making Windows 8 for tablets? Because Steve Ballmer told us so back in January, and Jensen Harris mentioned it again in his June demo. And Intel's Renee James also said as much when she stated that





USE WINDOWS 8 TODAY!

By David Murphy

WITH THE WINDOWS 8 CONSUMER PREVIEW, YOU DON'T NEED TO WAIT AND WONDER WHAT MICROSOFT'S NEXT OS WILL BE LIKE—WE'LL SHOW YOU HOW TO DIVE RIGHT IN, NOW!

WELCOME TO WINDOWS 8, otherwise known as the future of your desktop. To some, it's known as a big, fat headache, a misdirection on the part of Microsoft in its quest to unify the Windows experience across all devices—smartphones, tablets, laptops, desktops, you name it.

But you needn't take anyone's word for it. You can judge for yourself, now that Microsoft has released the Consumer Preview of its latest operating system for the masses to enjoy (or criticize). This release sits somewhere between the delicate states of Final and Beta, which is a polite way of saying you can download and test it out for free right this very moment. But hold your breath if you find a feature that's a wee bit underdeveloped or buggy: Windows 8 isn't set in stone, although it's expected to reach store shelves by 2012's holiday season.

We've rolled up our shirtsleeves and jumped into the best and worst parts that Windows has to offer, so feel free to use this article as a helpful guide for your first steps into Windows 8. We'll show you how to install the operating system without ruining your current Windows environment, then we'll take you on a brief, guided tour of the parts of Windows 8 we love and the parts... well, let's just say the Metro UI takes some getting used to, OK?

We'll give you a glimpse of some of the more useful apps you can download—even as previews—from the Windows Store. And then we'll wrap it all up with some predictions for Windows 9 and beyond. Here's a spoiler: The odds of Metro going away are about as likely as Microsoft acquiring Apple and building the iWindow.

Got it? Wave one final goodbye to the Start button, and let's begin!



How to Install Windows 8 Consumer Preview

To keep your existing OS intact (which we hardly recommend), you can either dual boot or use a virtual machine

You like using your current operating system. In fact, you probably have a great number of files, applications, and games all intertwined with your current operating system. And the absolute last thing you want to do is back up everything within your operating system, wipe your drive, and introduce a fresh-faced—and not yet final!—Windows 8 into your life as your primary OS. You have two options when it comes to testing out Windows 8 without mucking up your primary Windows installation, settings, files, or any of that: You can split your current hard drive storage setup to create an extra, blank partition—Windows 8 goes there. Or, if you just want to monkey around in a self-contained environment within your current operating system, you can install Windows 8 onto a virtual PC.

Which option you choose is a matter of preference. A dedicated installation on a new partition, or dual-boot scenario, gives Windows 8 the full attention of your system's mighty resources. The downside? You'll have to suffer through the boot menu every time you load your PC; you won't be able to access your true "primary" operating system from Windows 8; and any changes (or issues) you create are permanent, as you don't really get a chance to "roll back" that which you've done.

Virtualization, on the other hand, costs you system resources and overall speed—it can be a real hog—but it allows you to marry Windows 8 to your existing operating system. Transferring files is easy; jumping between the two operating systems is easier; you can test out apps in Windows 8 and still be able to use them in your existing OS if things go sour; and, most importantly, you can quickly revert to prior versions of the OS and easily delete your virtual Windows 8 once you're done toying around.

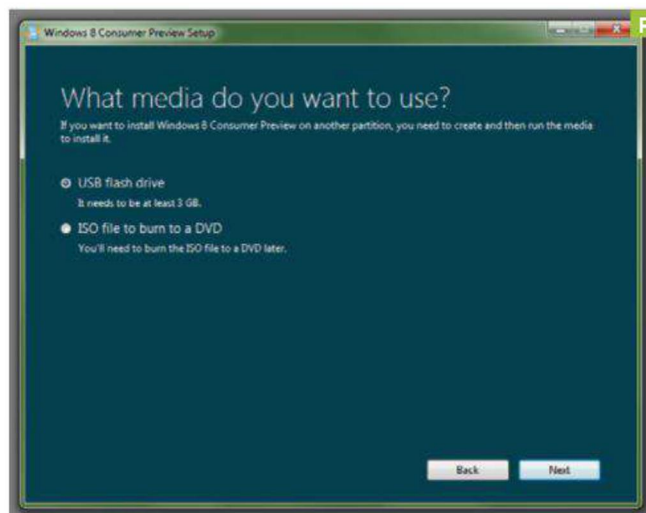
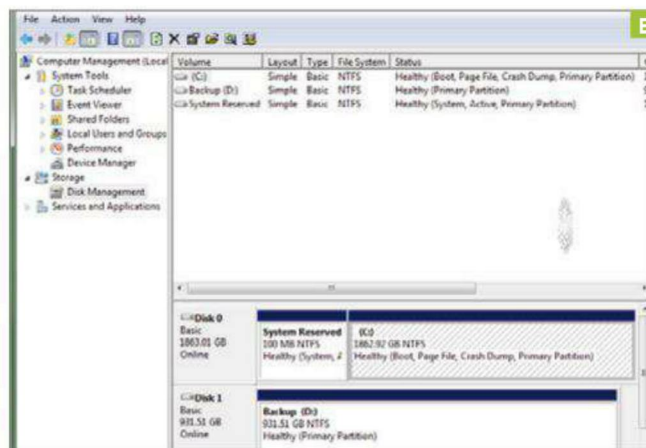
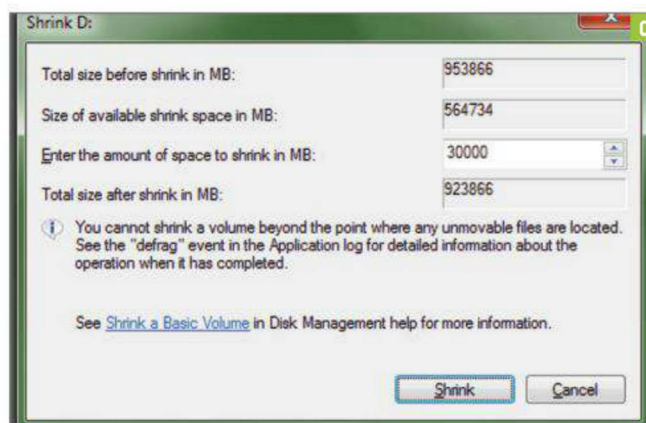
Here's how you do both:

DUAL-BOOTING: Before creating a new partition on an existing drive, it's a good idea to back up your data, just to be safe. Now grab the Windows 8 Consumer Preview setup file (bit.ly/AC9D52) and give 'er a run. While your version of the operating system downloads (32-bit or 64-bit, depending on what the setup program picks for your PC), go check your available hard drive space in Windows Explorer. You'll need to have at least 16 gigabytes free for a 32-bit installation of Windows 8, or 20 free gigabytes for a 64-bit installation.

Once the download is completed, Windows will prompt you to install Windows 8 by giving you three options to pick from: Install now, install on another partition, and install later. Pick option number two (partition), and the subsequent screen will ask you how you want to go about creating the installation media you'll need to use (image A).

We recommend that you use a USB key for a Windows installation whenever possible (it's just so speedy), but some older motherboards have iffy support for USB-based installations. So you might need to choose the optical disc option.

The setup program will automatically format your key and slap the necessary files on it. As this process chugs along, fire up your control panel (Windows 7 users), go to System and Security, then Administrative Tools. Now double-click Computer Management, and then select the Disk Management option from the left-hand menu. Roll up your shirt-sleeves: It's time to partition your hard drive (image B).



Everyone's hard drive setup can vary, so we'll just walk you through the basics of splitting a single drive partition into two. Right-click the graphical storage "chunk" that's home to your primary NTFS volume (C: for you, but we're using our spare drive D: for the purposes of example) and select Shrink Volume. Input just how much you want to shave off your primary operating system's partition—remember, 1,024 megabytes equals one gigabyte—and hit the Shrink button (image C).

What do you get? A new chunk of black, unallocated space to the right of your once-larger primary partition. Right-click this empty space and select New Simple Volume. The prompts are fairly self-explanatory after this point—just make sure to give your new partition a recognizable name and format it as an NTFS partition. Voilà. You're ready to install Windows 8.

Once the Windows Consumer Preview setup program has finished with your USB key, restart your computer. As it reboots, watch your boot sequence for any prompts related to "booting" or "boot order"—in our case, we only have to hit the F12 key to access a "boot from" menu. But since your motherboard is surely different, this option might be mapped to another key. Or, worse, you might have to go into your BIOS settings and change your system's boot order. If in doubt, check your motherboard manual.

Select the correct option—USB HDD, in our case—reboot your computer, and the official Windows 8 installation program should automatically fire up. Click the Install Now button, enter your product key (that you received when creating your USB Windows 8 installer), accept Microsoft's license terms, and select the option for a Custom installation. Pick the partition you previously created (hence the importance of giving it a memorable name), click Next, and go make yourself a pleasant beverage while you wait for the installer to work its magic.

From there, it's all downhill: Windows 8 will reboot your system a few times before the installation finishes, and it'll then ask you a series of questions to help you personalize your operating system prior to the first official run. One last tip, however: When you go to reboot your system to actually *load* Windows 8 for the first time, take out your USB key during your motherboard's boot sequence. If not, and if you set your system to always boot off any available USB devices before your hard drive, you'll find yourself continually looping back to the Windows 8 installation program. That's just silly.

VIRTUALIZING: Who needs partitions when you can just run your new operating system *within* your operating system? Once you've downloaded the Windows 8 Consumer Preview installation files and the setup program is asking you where you'd like to slap 'em—on a USB key or as an ISO file to burn to a DVD—you're going to pick the ISO option. Save the ISO file somewhere on your computer, but don't go reaching for the DVDs just yet—no need.

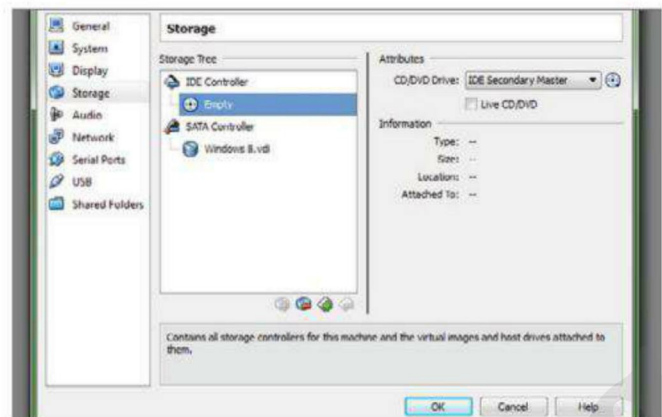
Head on over to the official website of the (free) virtualization software Oracle VM VirtualBox (bit.ly/iiEJOZ) and download the setup file. Why aren't we using Windows Virtual PC, you Windows 7 users might ask. Simple: It doesn't support 64-bit installations of operating systems; plus VirtualBox has support for 3D graphics, which will make for a more satisfying Windows 8 experience.

Once you've installed VirtualBox, click the big ol' New button in the app's upper-left-hand corner. Enter a good name for your virtual machine on the next prompt and make sure that both Microsoft Windows and Windows 8 are selected within the corresponding OS Type dropdowns (image D).

From here, there aren't a lot of options you really need to edit—you can pass through most using the default options that VirtualBox has already selected on your behalf, save for those we mention below.

Click Next until you're given a slider that asks you to adjust how much memory you want to assign to your virtual operating system. Windows 8 requires a minimum of one gigabyte to run; if you can spare it, up your virtual machine to at least two gigabytes, or 2,048 megabytes (image E).

Now, where are you going to physically store your operating system's files? On a virtual hard drive, of course! The option to "Create new hard disk" is selected by default once you reach VirtualBox's Virtual Hard Disk screen. That's great. Click Next until you reach the screen where



you're asked to set your hard drive's size. Remember: 16 gigabytes minimum for a 32-bit installation, 20 gigabytes minimum for a 64-bit installation. Adjust your size as you see fit, then click Next (selecting all the default prompts from that point forward) until you're taken back to the main VirtualBox Manager screen. Almost there!

Highlight your new Virtual Machine and click the big Settings icon above. While you can fiddle with a number of advanced settings to boost the performance of your Windows 8 installation—like adding support for more of your CPU's cores within the System menu—the most critical action you need to perform is mounting the ISO you previously made in order to install the OS.

Click the Storage option on the left-hand menu in the Settings window. Under IDE Controller, it should say Empty next to an icon of a CD. Click Empty. Then, click the icon of a CD that appears next to the CD/DVD Drive drop-down menu on the right portion of the Settings window. Go find your ISO file. Click OK to mount the disc and exit out of the Settings window (image F).

Ready? Click the big green Start arrow after you've clicked on your Windows 8 virtual machine. Run through the Windows 8 installation process (it's easy, since you're just custom-installing the operating system to a single virtual hard drive), run through the Windows 8 personalization process, and enjoy your new OS within an OS.



Tips

15 Windows 8 Tips and Tweaks

To Windows regulars, Win8 might feel like a totally foreign—and not altogether friendly—land. Here are some pointers for getting oriented

- 1 HOT CORNERS ARE YOUR FRIENDS** If you're a bit befuddled the first time you fire up Microsoft's newest operating system, we understand. Microsoft has left a number of navigational elements invisible to your eye unless you move your mouse over one of the four extreme corners of your screen. Hover your mouse over the top-right or bottom-right to access the Charms Bar: Windows 8's built-in Search and Sharing capabilities, as well as a list of devices you can send the contents of the current app to and Windows 8's ever-important Settings menu. Hover your mouse over the top-left or bottom-left corners of your screen to jump between open apps on Windows 8's Switch List, just like you would otherwise do by hitting the combination of Alt + Tab on your keyboard.



- 2 METRO: JUST TYPE IT!** When you're in Windows 8's Metro UI and you want to load an app, don't bother moving your mouse around the screen or trying to scroll your way to wherever it is you've placed the app's tile icon. Just start typing. Literally—start typing. You don't have to go find the search button or any of that: Windows 8 will try to find anything you type, be it "solitaire" or "control panel," or what have you.

- 3 HOT FOR HOTKEYS** Unless you're rocking a touchscreen PC, navigating your way around the Metro UI (and its horizontal-friendly apps) can be a bit of a drag. So don't use your mouse; use your keyboard. Check out some of these helpful hotkeys for flying through the OS and controlling its many elements:
WINDOWS KEY + TAB – Opens the left-hand Switch List.
WINDOWS KEY + C – Opens the right-hand Charms Bar.
WINDOWS KEY + I – Opens your ever-important Settings menu.
WINDOWS KEY + T – Dumps you back to Desktop Mode and cycles through your open windows on the taskbar.
WINDOWS KEY + LEFT/RIGHT ARROW KEYS – Docks the app to the left, middle, or right side of the screen with each press.
WINDOWS KEY + M – Jumps to the Desktop and minimizes all applications.
WINDOWS KEY + Q – Opens up Windows 8's global search utility within Metro.

- 4 THE PC SETTINGS PANEL IS YOUR BEST FRIEND** In its infinite wisdom, Microsoft has decided to split the options you can configure on Windows 8 between the contents of its typical Control Panel and a new Metro-based Settings menu, which can be accessed by going to the Charms

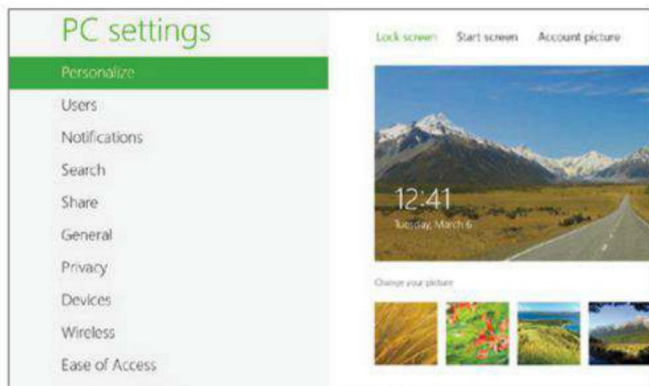
8 THINGS WE LIKE ABOUT WINDOWS 8

- 1 LINK UP** We applaud the company's efforts at reaching out to other popular third-party services for super-easy integration of email and contacts into Windows 8's default apps.
- 2 SYNC UP** For folks who enjoy being able to tap into their data wherever they are, Microsoft's SkyDrive integration within Windows 8 is a perfect complement to the synchronizations the OS can perform when your Microsoft Account and

Windows 8 user account are one and the same—allowing you to pull up your apps, preferences, people, etc., on any Windows 8 computer you log into.

- 3 STORAGE SPACES: NEWBIE RAID** Storage Spaces greatly simplifies the process of combining storage of all kinds—physical hard drives, solid-state drives, external hard drives, and flash storage—into giant pools of available storage. You can take away drives, add drives, and swap drives in and out: Microsoft says that a "resynchronization" process will rebuild the two-way mirror, three-way mirror, or parity of a pool, or what you'd otherwise see in your typical Windows environment as a single storage volume (e.g., C:\).
- 4 GREAT REASON TO BUY AN XBOX 360** You know a feature is going to be a big deal when we get this excited about it *and it doesn't even work in the Windows 8 Consumer Preview*. By that, we're referring to Microsoft's planned integration with users' Xbox 360 gaming consoles. In short, it appears that Microsoft wants to break down the wall that separates console gaming and PC gaming by allowing gamers to stream the

Bar's Settings option and clicking the slightly buried More PC Settings link. Here's where you'll be able to adjust your lock screen's background, Metro's colors, how notifications and Windows 8's built-in search work, the names of the attached devices Windows 8 has found, and your specific synchronization settings, among other important options.

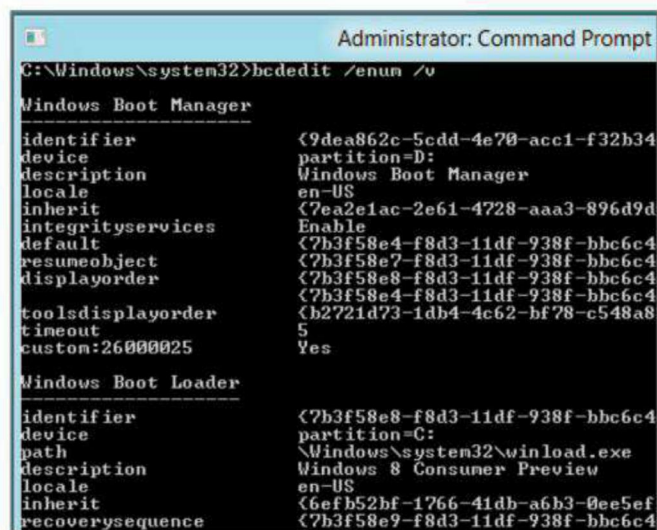


5 WINDOWS 8 VS. DISASTER Well, you've gone and done it. Either as a result of something (or things) you've installed, some setting you've mucked up, or just general apathy toward the well-being of your PC, Windows 8 doesn't work right anymore. In Windows past, this would normally force you to take a trip down reinstallation lane. That part hasn't changed, but Windows 8 now makes it really easy to return a broken operating system to happiness once again. Click the General tab within the aforementioned More PC Settings menu. The Refresh option strips your system of the third-party apps you've installed and returns it to factory-default settings, but keeps your User files. The Reset option wipes your operating system clean of all your data and returns your system to Windows 8's factory-default settings.

6 ENABLE SAFE MODE Speaking of computer disasters, if you want to reboot your system into Safe Mode, you can't just jam on the F8 key prior to Windows 8 loading: You have to first enable Safe Mode itself. Type "cmd" on your Metro UI, right-click

the Command Prompt app (called cmd), and select to run it as an administrator. Then type `bcdedit /enum /v` on the command prompt screen and hit Enter. Copy the entire "identifier" string (including the braces) for the entry that has "Windows 8 Consumer Preview" as the description, not "Windows Boot manager." Then, type the following into the command prompt: `bcdedit /your-identifierstring /d "Windows Developer Preview (Safe Mode)"` and hit Enter. After that, type in `msconfig` and hit Enter.

Within the System Configuration menu, click the Boot tab and select the entry called Windows Developer Preview (Safe Mode). Click the Safe Boot option, the Make All Boot Settings Permanent option, click OK, and click Yes. Restart your system, and you'll be given the option to launch either your normal Windows 8 environment or your new Safe Mode environment.



7 BE A SUPER-ADMINISTRATOR IN ONE CLICK Here's a great hidden tidbit of Windows 8: Move your mouse cursor to the lower-left corner of Windows 8's Metro or Desktop mode until it pops up the live thumbnail of the alternate environment. But don't left-click; right-click. You'll pull up a

multimedia contents of their systems to their consoles (and attached televisions), and stream their games from their consoles to their PCs.

5 BELLS AND WHISTLES A number of the fun little improvements found within Windows 8 are mostly cosmetic—too small to warrant individual mention here, but still worth calling out in aggregate. While much can be said about Windows 8's split Classic Desktop/Metro UI interface, we love-love-love some of the tweaks that Microsoft has put into cornerstones of the operating system.

6 SPEEDIER STARTUP AND SHUTDOWN We can't speak to the overall "snappiness" of Windows 8, as we'd be comparing an application-packed installation of Windows 7 to a barebones, fresh installation of Windows 8. But we *can* (and did) compare the two operating systems' startup and shutdown times.

On a fairly antiquated laptop (by today's standards), Windows 8 beat Windows 7's shutdown time by a full 10 seconds, taking just 17 seconds from the press of the Shut Down button to a powered-off state. From the press of the power button to the Windows 8 Lock Screen (or Windows 7

login screen), Windows 8 took just 32 seconds. Windows 7? Almost a full minute (51 seconds).

Why such a dramatic difference? Windows 8 slaps the kernel into hibernation mode when you shut down the system, saving your system from having to reinitialize it on the next boot.

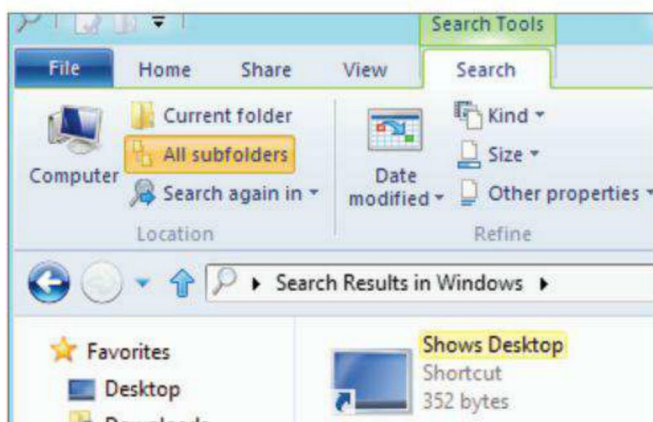
7 SENDING EXPLORER TO THE OFFICE Fire up Windows Explorer within Windows 8, and you'll swear you've accidentally launched Microsoft Office 2007. That's right: The ribbon is here. Or, to say it another way, Microsoft has finally started taking steps to unify its user interfaces across its major applications. Amen.

8 STRONGER SEARCH We were fans of Windows 7's speedy indexed search capabilities, but Windows 8 ups the ante by adding a lovely looking (and lovely functioning) search screen directly within the Metro interface. And here's the fun bit: You don't have to click anything at all to start searching. You need merely start typing the app you're trying to find. Boom! Up pops Windows 8's search window.

menu of shortcuts to a bunch of handy power-user options, including Command Prompts, your Disk Management window, and your System menu, among others.



8 HATE METRO? Here's a fun one. Fire up Windows Explorer and navigate to your Windows directory. Do a search for "shows desktop," and copy the shortcut that you find into the following location: C:\Users\username\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Startup. By doing so, you'll ensure that Windows 8 always boots to the Classic Desktop instead of its Metro UI.



8 THINGS WE HATE ABOUT WINDOWS 8

1 BRING ON THE ADVERTISEMENTS Microsoft does plenty to integrate its virtual storefronts into the OS at any cost. Case in point? The Video app. The first thing you'll see upon launching it is not a gallery of your videos, or a top-20 list of local videos you've watched, or anything like that. No, you get a spotlight of all the quote-unquote awesome content you can purchase from Microsoft directly.

2 WHERE THE HECK AM I? Since Windows 8 is like Windows 7 with a fancy new tablet design bolted onto the side, Microsoft has done an amazing job (not!) of splitting important content and op-

9 FAST-UNINSTALL APPS Looking for a quick way to nuke any Windows Apps or third-party apps you've installed on Windows 8? Just right-click the app's icon within Windows' Metro UI and select Uninstall. Third-party apps will jump you to the good ol' Windows Programs and Features window for the same ol' Windows uninstallation routine you should be used to by now. Apps downloaded from the Windows Store will simply disappear. Poof!

10 HATE PASSWORDS? Passwords are important, especially if you're using Windows 8 to share files within a network. For important files and directories, you're going to want to make sure that only those with user accounts on your system can access your files. Or, if you're extra security-conscious, you're also going to want to make sure your system is password-locked whenever you step away from your desk (via Windows' Lock Screen).

But what if you don't like having to type in your password each time you boot your computer? You can remove this part of the process—but still use your password to protect other parts of Windows 8—by hitting Windows Key + R and then typing "netplwiz" into the Run window's field and hitting Enter. Uncheck "Users must enter a user name and password to use this computer" and click OK.

11 BYPASS WINDOWS' DEFAULT APP CHOICES Some of the new apps built directly into Windows 8's Metro UI are of questionable usability—here's looking at you, Video app. But it's equally frustrating to have to use an "open with this app" command whenever you want to pull up a new file format.

Our solution? Edit your file-opening preferences in one big batch. Type "default programs" within Windows 8's Metro UI and click the corresponding link that appears. Select "Set your default programs" and have at it—each program will tell you how many extensions it *can* open versus how many it *is* opening, just to give you a sense of your batch-processing power.

12 TASK MANAGER IS AWESOME One of the better upgrades in Windows 8 is to Task Manager. Load it up by typing "task manager" in Metro (or give your system the three-finger salute), then click the More Details link at the

tions between the two different environments. In essence, you set up your system settings in two different settings locations. And while we see how that might work on paper—Metro settings follow Metro, Desktop settings follow Desktop—this walled-garden approach is unnecessary. Settings are settings; if you can't adjust Metro in Desktop, Microsoft should at least give users a better way to access each environment's settings options from the settings panels of the other.

3 STRAPPING A BOMB TO A MONKEY The Windows Metro UI could not feel any more like its own operating environment that's been strapped, rather crudely, onto the back of Windows 7.

Sure, there are a few cosmetic upgrades to the classic desktop—many we like, in fact. That doesn't remove the disjointing effect of having to constantly shift your focus between a svelte, common experience and a graphical monstrosity.

Shoot, plugins aren't even supported on the Metro version of Internet Explorer. You have to select the "View on the desktop" option, hidden beneath a wrench icon near IE's Metro address bar, just to watch a freakin' YouTube video. *Come on.*

bottom of the window. Up pops Window 8's new-and-improved Task Management program.

Of particular interest is the prettied-up Performance tab, which reveals the last 60 seconds of your system's CPU, Memory, Disk, and Network use. A new App History tab gives you a look at just how many resources your apps eat up over a lengthier period of time. And the ability to enable or disable apps that start with Windows itself has been moved from Windows' System Configuration menu to the Task Manager's Startup tab.

Name	CPU time	Network	Metered network
Mail, Calendar, People, a...	0:04:02	19.6 MB	0 MB
Music	0:02:45	6.7 MB	0 MB
Xbox LIVE Games	0:01:50	15.9 MB	0 MB
Video	0:01:19	10.1 MB	0 MB
Solitaire	0:01:06	0.1 MB	0 MB
Xbox Companion	0:00:53	8.8 MB	0 MB
Weather	0:00:17	0.3 MB	0 MB
Store	0:00:13	5.3 MB	0 MB

13 MANAGE THY TILES Want to move tiles? Easy: Drag them around. Want to move a tile to its own column? Drag it on over—it's exactly how you form new groups of apps. Want to shuffle an entire column's worth of tiles around? First, click the magnifying glass icon in the lower-right corner, and then move away. And although you can select multiple tiles by right-clicking each one, you can't move a number of tiles *en masse*. Sorry!

Finally, resizing tiles—those that can be resized—is as easy as right-clicking the tile and selecting the Smaller or Larger option.

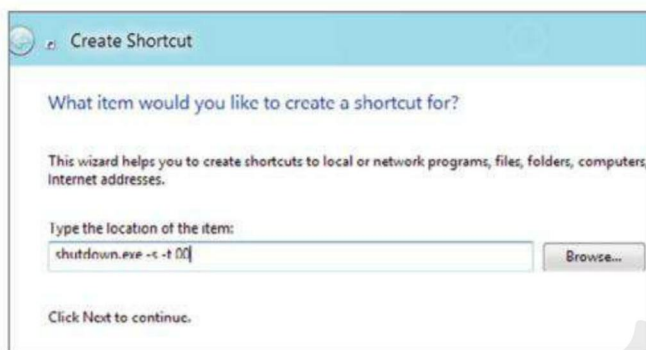
14 SYNC UP Windows 8 comes with a plethora of ways to synchronize your operating system to all the various third-party accounts you hold on other sites. The most important one

to link up is your Microsoft Account, which you can do when you set up Windows 8 for the first time *and* via the Users menu within PC Settings (Charms Bar > Settings > More PC Settings). By doing so, you'll be able to load your preferred themes, settings, languages, and app settings—to name a few—on any Windows 8 machine you touch. Your Microsoft Account also powers Windows 8's SkyDrive cloud storage, for what it's worth.

But that's not all. You can integrate your Hotmail, LinkedIn, Google, Facebook, and Twitter accounts with Window 8's People application. And, if it works, you can chat with your Facebook and Windows Messenger friends via the aptly named Messaging application.

15 SHUT DOWN One of the more peculiar features of Windows 8 is how Microsoft buried the shutdown button within its Metro UI. You can always switch over to Desktop mode and give it the ol' Alt+F4 to receive your shutdown options. But you can also create an actual shutdown tile that accomplishes the same effect in Metro.

Within Desktop mode, right-click the desktop and create a new shortcut. For its location, you'll want to type in the following: shutdown.exe -s -t 00. Feel free to name the shortcut whatever you want ("Nuke it from orbit"?). Once it's on your desktop, fire up Windows Explorer and move the shortcut to your C:\ProgramData\Microsoft\Windows\Start Menu\Programs directory. Jump back to your Metro interface and you'll see your Shutdown button appear as a brand-new tile. Click once, and off goes your system!



4 POOPING ON THE POWER USER Is it really that hard, Microsoft, to allow advanced customization within your smorgasbord of squares? Sure, you can make some tiles take up two horizontal spaces, and you can shrink some of these larger tiles back to a single tile's worth of space. And yes, you can grab tiles and slap them into new columns—yippee!—but that's about it. You know what would have been nice to see in the Metro UI? At least the same level of customization that one could find on (or hack into) one's smartphone.

5 LET USERS DICTATE SERVICES It's great that Microsoft has made an attempt to integrate third-party services directly into Windows 8. What we don't like, however, is the fact that Microsoft's the one dictating which services get invited to the Windows 8 party. And heaven help the person who runs more than one Twitter account or Gmail account—currently you can only tie your Windows apps to a single account per Windows user account.

6 WHY BREAK WHAT WORKED GREAT? There's no need to fix that which wasn't broken. Worse, that which Windows users were

familiar with (and fond of) based on their experiences with an operating system's many versions over the last many years.

7 PUFF UP THE CLOUD Now that Microsoft is playing in the cloud—giving users the ability to transfer their files and settings across any Windows 8 systems they log into with their Microsoft Account—it's time for Microsoft to up the ante when it comes to the security options it offers its accountholders.

We'd love to see at least some information on the Microsoft Account website to indicate which systems a person has logged in on using his or her Microsoft Account.

8 NO OBVIOUS REASON TO UPGRADE Minus a few fun features here and there (Storage Space, File History, Shutdown Hibernation, et cetera), there's little more than window dressing to inspire users to flock to their local Microsoft stores upon Window 8's final release. Windows 8 is, for lack of a better word, a new makeup kit for Windows 7.



8 Best Apps from the Windows 8 Store

You can pick up these programs right now, within Microsoft's store, and install them directly into Metro, like apps onto a smartphone

1 CUT THE ROPE In Cut the Rope, which has a striking similarity to Angry Birds—just replace “catapult physics” with rope-cutting—your goal is to capture stars with a piece of candy. The candy dangles from a rope (or many ropes), and how and where you cut the rope affects its height and ability to sway into other objects (like stars. Or a frog’s mouth). You’ll figure it out; trust us. And you won’t stop playing, either.

2 EVERNOTE Evernote is designed to be the digital archive of your various “notes to self”—as well as any other documents, images, and other such attachments you want to keep tabs on. The Windows 8 app (in preview) only accepts text notes right now, but it does synchronize these with any other device you’ve installed Evernote on. And you can still view other elements (like pictures) that you’ve placed into notes using other devices; you just can’t put them there yourself on Windows 8.

3 COOKBOOK Cookbook is a perfectly designed application for Windows 8’s Metro UI. It delivers just enough useful information (recipes and cooking instructions) without seeming sparse. It displays adequate illustrations of the food you’re trying to make without turning the app into one giant picture and caption combination after another. Our only qualm is a big one: No search. Hopefully a big fat tie-in to Win-



dows 8’s type-anything-in-Metro search tool makes its way to this app—otherwise, it’s just a tad under-flavored.

4 NEWS REPUBLIC Like many apps gracing the Consumer Preview of Windows 8, News Republic shows a lot of promise, but it’s not quite up to the standards one can enjoy from other apps on, say, one’s tablet PC—in other words, it’s no Pulse or Flipboard. But as a fairly nondescript news reader, News Republic performs well. Adding new topics you want to follow is as easy as searching for them using Metro’s app-contextual search. And once you have your favorites set up, you need merely click into each category to see what the news of the hour happens to be.

5 SIGFIG Although we’re slightly annoyed that we have to first register for an account to use this stock market-watching application, it makes complete sense once you see the power of SigFig in action.

Connect your brokerage account to the app, and you’ll get easy access



to your portfolio via Windows’ Metro UI—and more importantly, statistics and graphics related to your portfolio’s performance.

While we’d love to also be able to research potential purchases via the app—or even make these sells and buys within the app itself—SigFig doesn’t disappoint when it comes to presenting key financial information in a digestible (and pretty) fashion.

6 GRANTOPHONE Sorry, Windows 8 desktop and laptop users, but we had to throw at least one bone in this

brief app roundup to your touchscreen-happy counterparts. Grantophone joins the throngs of different apps on the various smartphone markets that help you make funny sounds with your device. We’re talking synthesized sounds that, if combined together, could get you one step closer to recreating your favorite



Daft Punk jam. To detail Grantophone’s multitude of settings would take the rest of this article’s space.

7 PIRATES LOVE DAISES It’s not the greatest tower defense game you’ll play, but it does have its enjoyable, swashbuckling moments. Like all tower defense games, you’ll have no choice but to continue playing once you’ve started to build up your mighty pirate defenses.

8 SLAPDASH PODCASTS Slapdash Podcasts is to audio broadcasts what the aforementioned News Republic is to articles.





The Future of Windows

We hazard a few predictions about where Windows will go from here

How do you predict the future? It's easy: There's going to be a Windows 9 in a few years—unless Microsoft pulls an Apple and just goes with, "The New Windows," or "Windows," or something like that. As for what might be inside Microsoft's future operating system, however, that's a whole 'nother ballgame.

It's not that hard to get caught up in some childlike fantasy when asked to predict the future path of Microsoft's main OS. You know—Windows 9 will allow your desktop to transform into a giant robot, or Windows 9 will be an on-the-fly hybrid OS that transforms into a simpler version of Metro for free-floating tablet devices and the full-fledged Windows 9 when these devices are connected to a dock/keyboard setup.

Honestly, we kind of like the robot idea.

But let's get serious. What's likely to be the future direction of Microsoft Windows? Even considering that the general consumer reaction to Windows 8—assuming it's not just a Band-Aid for tablets while Microsoft devotes the core of its resources to a completely revamped version of the OS—will likely play a role in what Microsoft decides to do within its big follow-up.

ONE OPERATING SYSTEM. PERIOD

Since one can't mention Windows 8 without saying something about its Metro UI in the very next breath, here's the first prediction: Metro is just the beginning. The meeting ground, as it were. It feels as if Microsoft's grand goal is to unify its devices under a single operating system, similar to how there's always one story written about Apple every three months that suggests the company is on the verge of combining OS X and iOS.

So what are the benefits of transforming Windows into a hardware-agnostic platform? Easy: One look and feel for consumers, whether they're using their next-generation Xbox consoles, PCs, smartphones, or tablets. One development platform and unified APIs would allow apps and features to cross over between devices without demanding a huge chunk of developer resources. And, of course, apps could release faster (if not simultaneously) on all devices—great news for those used to waiting six months for a smartphone version of a new PC program to hit. To borrow a phrase from the late Sun Microsystems: "Write once, run anywhere."

We can't foresee how Microsoft might balance the simplicity of its Metro-style interface against the expansiveness of its classic Desktop interface—currently a sore point for those playing with Microsoft's squares for the first time. But we do think their roles will switch.

Microsoft will make Metro (or an equivalent tablet-style UI) the dominant measure of Windows 9, which will force the company to find some way to make a simple interface complex when it's warranted. Perhaps this will involve a tighter integration of Windows Explorer (et al) within Metro, versus the cop-out "switchy interface" treatment of Windows 9's predecessor OS. Perhaps Microsoft will turn over a rock and find a Jonathan Ive of software to make this difficult pairing possible.

IT'S JUST A SCREEN

Microsoft is going to do everything it can to pull devices together as tightly as possible underneath the Windows 9 umbrella. Your tablet won't just

be an independent product, for example. It'll interact with your primary computer's Windows 9 installation as if it were your primary (or secondary) monitor. It'll be your Xbox controller or Wii U-style helper interface. It'll be your remote control—not just for interacting with other Windows 9 products, but the traffic cop for guiding data transfers and/or streams to the other Windows 9 devices you own.

I'm not talking about some souped-up tricorder fantasy where you can suddenly use your Xbox 720 to turn on your kitchen sink from three miles away. But based on Microsoft's brief experiments with "one screen for many purposes" in Windows 8, it's only fitting that the company extends this philosophy to cover even more scenarios (and more devices) with Windows 9. And maybe the company could even let consumers use their Kinect 2 motion-trackers to shift between screens or send their files flying around different devices.

THANKS, CLOUD. THANKS, VALVE

Another no-brainer: Windows 9 is going to be tied into the cloud. Just how much, though, is the big question. At the very least, you can count on deeper integration—perhaps even built directly into the filesystem—of Microsoft's SkyDrive-based hosting.

The time is not far off when cloud-based storage won't be a separate app you load within Windows or a folder you simply drop things into. It'll just be. You'll still be able to keep certain apps and mission-critical files on your desktop (for performance or security), but Windows' default storage mindset will switch from the local to the ethereal. (Plus, this would give Microsoft a way to upsell customers on virtual storage space and permanently tie them into the Windows family forevermore. Ta-da!)

Now, how much crazier we get with the cloud is anyone's guess. This includes everything from behind-the-scenes backups of your entire hard drive, to apps that run completely in the cloud and just require a minimal hook within your OS to function, to the real biggie: a cloud-based operating system. In the latter scenario—which would use techniques Microsoft's been busy patenting—you'd download or physically install just a small chunk of data required to actually boot an operating system.

The bulk of Windows 9 (or 10?) would live in the cloud—your device would be akin to a terminal, which makes us wonder how we'd approach software such as games: Would these run in the cloud as well and just stream an image to one's device? What happens when one's Internet connection is slow, jittery, or nonexistent? Does that mean your OS goes offline for good? Your videogame dude dies?

We could keep our heads in the hardware clouds all day long, if we'd like. But at the very, very least, here's hoping that future incarnations of Windows adopt a Valve-like approach to software.

A "buy once, run anywhere" concept could allow a user to authenticate into Windows 9 on any hardware device, and then just as easily download and run apps he or she has previously purchased via the Microsoft Store. Given just how app-centric Windows 8's Metro UI has become, it only makes sense to let users download (or stream) a Microsoft Office app, or a partner's Adobe Photoshop app, for example. The world is going digital distribution: Microsoft should, and will, embrace its conveniences for end users. ☺

HACK YOUR HARDWARE

By Marco Chiappetta

11 DIY PROJECTS TO UNLEASH YOUR GEAR'S HIDDEN POWER—FOR FREE!

THERE ARE SEVERAL practices that distinguish true power users from common folk. System building is one. Component benchmarking certainly applies. As does religious parts swapping. And then, of course, there's hardware hacking. Hacking, more than anything else, exemplifies our ongoing quest for more—more performance, more functionality, more power—because we're wringing this extra goodness from gear we already own, using crafty methods and occasionally pushing the bounds of practicality in the process; sometimes just for the heck (or should we say *hack*?) of it.

We know that GPUs and CPUs often have features disabled or dialed back in order to fit a price point. We'll show you some nifty ways to access their hidden capabilities, as well as some fixes for inherent flaws. We also know that our gear can be made to do more than it was intended to with the help of third-party software, as you'll discover in our webcam and Roku projects. And if you want to make your smartphone smarter, increase your Wi-Fi router's range, or RAID your SSDs, we'll turn you on to those tricks, too.

So what are you waiting for? Let's get hacking!



OVERCLOCK AMD BULLDOZER

After years of AMD hyping the Bulldozer microarchitecture for its supposed efficiencies, the initial batch of Bulldozer-based AMD FX Series processors arrived with a resounding thud due to disappointing performance and relatively high power consumption. But amid all the fervor following the launch, many enthusiasts seem to have missed the fact that AMD's current flagship FX-8150 is still technically the fastest desktop processor the company has released to date. Of course, being the fastest processor in AMD's lineup doesn't mean there isn't some frequency headroom left under the hood. It turns out that the Bulldozer-based AMD FX-8150 is a pretty decent overclocker.

We all saw the reports of AMD's Bulldozer breaking overclocking records and earn-

ing a place in the Guinness World Records. But those overclocks were performed with liquid-helium cooling, binned chips, extreme voltages, and only a single Bulldozer module (two cores) enabled. Overclocking a retail-ready processor with all of its cores enabled using more traditional cooling methods is a different story altogether. Luckily, not much has changed with Bulldozer in the overclocking department; the tried and true methods of tweaking multipliers, voltages, and the HyperTransport clock that worked with the Phenom II carry over to Bulldozer, as well.

We set out to see what kind of overclocks were possible with an AMD FX-8150 using a standard air-cooler and an AMD 990FX-based Asus motherboard. Instead of using the motherboard's UEFI to overclock, though, we turned to AMD's OverDrive utility, which lets users overclock from within Windows in real-time without having to reboot and waste time constantly restarting a system.

Because FX Series processors are "unlocked," their multipliers can be raised or lowered to increase or decrease the CPU frequency at will. Increasing or decreasing the HT clock has the same effect, and pumping more voltage into a chip will typically allow for higher frequencies, as well, provided it is adequately cooled.

The FX-8150 has a base clock of 3.6GHz, which will dip down to 1.4GHz while idling. When half (or fewer) of its cores are being utilized, the FX-8150 is able to Turbo up to a peak frequency of 4.2GHz. When all of its cores are being fully utilized, the FX-8150 can Turbo up to 3.9GHz. And while all of this is happening, the processor's voltage will fluctuate between approximately .85v and 1.36v. By disabling Turbo, turning the voltage up beyond



1.4v, and cranking up the CPU multiplier with AMD's OverDrive utility, all of the cores on the chip can run at even faster speeds and offer much better overall performance.

How much faster the FX-8150 will run varies from chip to chip, but we found that at 1.4125v, our CPU could reliably hit 4.41GHz (22x multiplier x 200MHz HT clock). At frequencies any higher at that voltage, the test bed was unstable, and pumping upwards of 1.5v into a 32nm chip with air cooling isn't ideal. To hit 4.41GHz, we simply launched OverDrive, chose Advanced mode, disabled Turbo, and moved the CPU multiplier and voltage sliders as necessary. Please note that the CPU settings in your BIOS/UEFI should be set to Auto should you want to experiment with OverDrive.

When running at 4.41GHz, the FX-8150 offered up a Cinebench R11.5 score of 7.31, an increase of 1.3 points, or 21.6 percent, over the stock score of 6.01. And its temperature peaked at only 71 C. That kind of performance boost won't allow the FX-8150 to overtake many of Intel's faster chips, but it's a huge gain nonetheless and one that's easily obtained using OverDrive.



The AMD OverDrive real-time overclocking and system-monitoring utility is a great tool for tweaking the performance of a Bulldozer-based system when used in conjunction with the right motherboard.

AMD CORE UNLOCKING: UNLEASH DORMANT CPU CORES

IN THE EARLY STAGE of a processor architecture's lifetime, it is common for multicore dies with nonfunctional cores to be harvested for use in lower-end products, while fully functional dies end up at the high-end. Over time, however, as manufacturing processes mature and yield increases, there are fewer and fewer dies with nonfunctional elements to harvest. If there is still demand for lower-cost processors, though, in lieu of expending engineering resources designing a new, cheaper-to-produce core, chip makers like AMD will often disable perfect-

ly good cores in an existing CPU design to satiate the market.

Such is the case with a number of chips in AMD's aging Phenom II product line. After years in production, yields are high on quad-core versions of the chip, but there is still a relatively large demand for cheaper, dual- and triple-core Phenom II processors. As such, many of those dual- and triple-core chips have additional cores on-die that are functional, but dormant. Manufacturers of enthusiast class motherboards, however, have devised BIOS/UEFI-level tricks to un-

OVERCLOCK INTEL SANDY BRIDGE-E

Intel's Sandy Bridge-E is a beast of a micro-architecture. It takes many of the good things about the already awesome Sandy Bridge and vastly expands upon them. Whereas Sandy Bridge-based processors sport up to four cores, 16 lanes of integrated PCIe 2.0 connectivity, dual-channel memory controllers, and 8MB of shared L3 cache, Sandy Bridge-E features eight cores, 40 lanes of PCIe 3.0-class connectivity, quad-channel memory, and up to 20MB of shared L3. We should point out, though, that current SNB-E based desktop processors have only four or six cores enabled and up to 15MB of shared L3.

The sum of SNB-E's parts results in the fastest desktop processors Intel has released to date. Of course, there's always some room for improvement with a little overclocking. Unfortunately, SNB-E inherited one of SNB's undesirable traits, as well—a finicky BCLK, or base clock. Like original Sandy Bridge-based parts, Sandy Bridge-E processors offer limited flexibility for overclocking when using BCLK manipulation. Users who want to alter CPU and memory frequencies via the BCLK are limited to just a few MHz in either direction [approximately 3-5MHz]. With Sandy Bridge-E, however, two new BCLK multiples (125MHz and 166MHz) are also available that were not with Sandy Bridge, so there is some fun to be had there. Like K-Series SKUs, though, Core i7 Extreme Editions are fully unlocked, meaning CPU, Turbo, and memory clocks can all be adjusted by using different multipliers.

When overclocking SNB-E chips, power and cooling considerations are paramount. Running at its stock 3.3-3.9GHz speeds, the Core i7-3960X is rated for 130W, but power consumption and heat output increase substantially when the chip is overclocked. With

that in mind, Intel and its motherboard partners have incorporated options to dynamically increase voltages when necessary and specify peak current thresholds. These new options and SNB-E's more demanding power and heat considerations make the overclocking process somewhat more complex, but if you don't feel like tinkering much and have a good cooler and PSU, playing with voltages and multipliers are all that is necessary to achieve some monster overlocks with SNB-E. We should also point out that although options are available to disable SpeedStep and various C states, overclocking SNB-E only requires finding the right combination of BCLK, voltage, and maximum Turbo frequencies. By altering those options alone and not messing with SpeedStep or C states, the processor can still throttle down while idle to minimize power consumption and temperatures.

To give you some examples, most SNB-E-based processors can achieve 4.5GHz with decent air or liquid cooling. A large percentage of the chips can do 4.6GHz to 4.7GHz with minimal effort, and 4.8GHz should be doable with the right voltage (1.4v to 1.5v) and high-end cooling. 5GHz-plus should also be possible with select chips and more exotic cooling.

We did some overclocking with a Core i7-3960X Extreme Edition processor and Cooler Master Hyper 212 cooler with the excellent UEFI utility on the Asus P9X79 Deluxe motherboard and were able to push our particular chip to 4.75GHz. We achieved that speed using a 125MHz BCLK strap and a peak all-core Turbo multiplier of 38 (125MHz x 38) with a peak voltage of 1.425v. At that speed and voltage, however, we were pushing the limits of the cooler—the processor would approach the 90 C mark



after extended periods of sustained load, and at 91 C, SNB-E-based chips will begin to throttle.

With the processor overclocked to 4.75GHz, the Core i7-3960X Extreme Edition's Cinebench 11.5 score jumped from 10.51 (stock frequencies) to 13.99 (overclocked frequency), an increase of 33.1 percent. Not a bad performance boost for simply altering a few settings in our motherboard's UEFI utility.



The UEFI utility on Asus' P9X79 Deluxe motherboard allowed us to take our Sandy Bridge-E based Core i7-3960X to 4.75GHz by altering only a few options in the Ai Tweaker menu.

lock those cores and turn cheap processors into something much more powerful.

Unlocking cores is very easy, provided you've got the right CPU and motherboard combo. Asus, Gigabyte, MSI, and other motherboard makers all offer Socket AM3/AM3+ boards with core unlocking capabilities (the boards require a SB7x0 or newer south bridge with Advanced Clock Calibration). As for the processors, many Phenom II X2, Phenom II X3, and Athlon II X3 chips are unlockable. Although not guaranteed, processors from newer batches should

have no trouble being unlocked. If you've got one of these processors, do a quick search to see if others have had success with it—most likely they have.

To actually perform the unlock requires nothing more than entering the BIOS/UEFI, heading into the Advanced CPU configuration menu and enabling Core Unlocking or ACC (or whatever the motherboard manufacturer has called the setting). Keep in mind, though, should your chip unlock without incident, it may require increased cooling to deal with the additional active cores.



A simple flip of a switch within the Asus CrossHair V Formula motherboard's UEFI can unlock dormant cores on some AMD dual- and triple-core processors, resulting in significant multithreaded performance improvements.



MOD YOUR RADEON HD 6900 GPU'S COOLING

We have had the opportunity to evaluate a number of AMD Radeon HD 6900 series cards since their release. For the most part, the cards have been well-built and stellar overall performers. A small number, however, have suffered from minor cooling-related issues that can have an adverse effect on GPU temperatures. The issues have never caused any instability or major problems to speak of, but remedying them will lower operating temperatures, which in turn can result in a quieter, more overclockable card.

On the backside of reference Radeon HD 6900 series cards, there is a metal retention/spring plate that secures the GPU heatsink in place and applies constant pressure to ensure good contact with the chip. On occasion, that spring plate hasn't been fully tightened or was slightly bent to the point where it wasn't applying optimal pressure. While disassembling cards to fix the issue, we've also found that some Radeon HD 6900 series cards have had way too much thermal paste applied to their GPUs. Ideally, only a small amount of thermal interface material should be used to facilitate heat transfer from a chip to a heatsink; a paper-thin amount is all that is necessary. But on many of the Radeons we've disassembled, there has been so much thermal paste installed that more has oozed out from the sides of the GPU die than is actually necessary in the first place. And having too much thermal paste applied to a chip can actually hinder cooling performance.

To ensure that an affected Radeon HD 6900 series card is optimally cooled by the stock heatsink, there are a few steps you need to take.

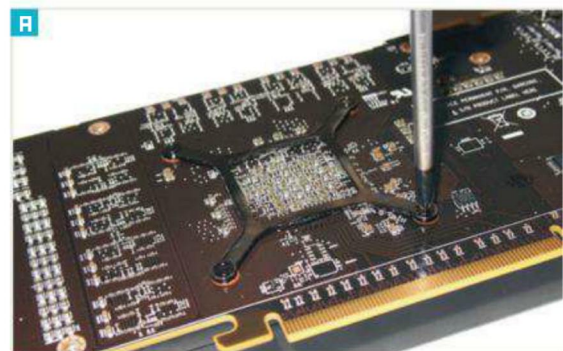
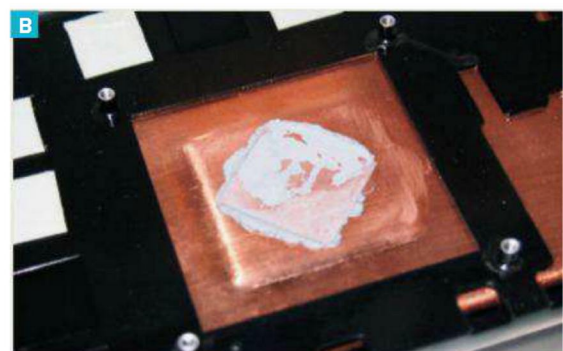
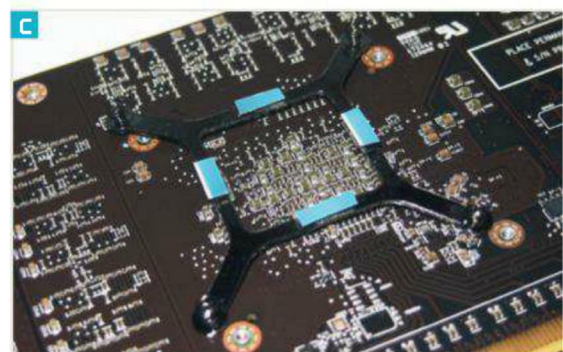
1 DISASSEMBLE THE CARD To disassemble a reference Radeon HD 6900 series card, first remove all of the

screws on the backside of the PCB that hold the rear stiffening plate in place, and then remove the plate. Then remove the two screws at the top of the case bracket above the MiniDP ports. Next, remove the four screws holding the heatsink's spring plate in place (**image A**). At this point, gently rock the entire cooler assembly and pull it away from the PCB, being careful not to yank the wires for the fan out of their connector. Once the cooler is loose, unplug the fan connector and set the cooler aside. Be careful not to remove any of the sticky thermal pads on the memory chips.

2 RE-APPLY THERMAL PASTE With the card disassembled, you'll want to clean off the old thermal paste (**image B**). Use some isopropyl alcohol (or other cleaner safe for electronic circuits) to carefully clean all of the stock thermal paste from the GPU and heatsink's base. Then apply a very thin layer of quality thermal paste to the GPU; the smallest amount necessary to cover the chip is all that should be used.

3 RE-ATTACH AND ADEQUATELY TIGHTEN SPRING PLATE

Now the cooler can be reinstalled, but before re-attaching the spring plate make sure it is not bent or deformed in any way, and add a few thin shims to raise it slightly from the PCB and increase the spring pressure. Keep the shims very thin so as not to damage the GPU—we cut up an old rewards card from the supermarket. Stick the shims to the rubber pads on the underside of the spring plate (**image C**) and then put it in place and tighten the screws in a crisscross pattern. Then reinstall the backplate and you're ready to test.



The cooling on our project card was definitely improved. Before touching it, the GPU on our 6970 idled at 44 C and peaked at about 82 C. After the mod, the GPU's idle temp remained steady at 41 C. Peak temps still hit 82 C because the cooler is throttled based on load, but it took somewhat longer to hit the peak, and the card seemed to cool down faster, too.

OVERCLOCK A GEFORCE GTX 560 TI

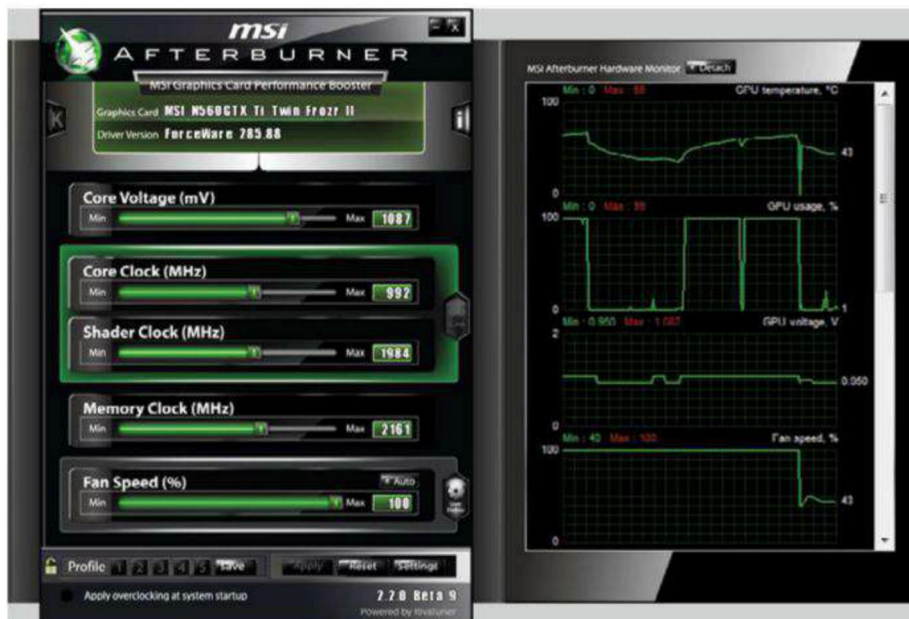
Nvidia's GeForce GTX 560 Ti, which is based on the company's mainstream GF114 GPU, has proven to be quite a capable graphics card in its price segment. To prevent the card from being too fast and potentially encroaching on the more expensive GeForce GTX 570's territory, however, Nvidia had to delicately balance the 560 Ti's features and performance. The GeForce GTX 570 is powered by a pared-down version of the much more expensive GF110 GPU—to cannibalize its sales would be bad for Nvidia and its board partners, indeed.

With the right tools and a bit of experimenting, it's easily possible to significantly boost the performance of the more affordable GeForce GTX 560 Ti. The MSI Afterburner GPU tuning utility, for example, gives users the ability to not only overclock their GeForce GTX 560 Ti cards (and many other graphics cards, as well), but also alter fan speeds and GPU voltages for even more extreme overclocks.

To illustrate just how much performance is left under the GeForce GTX 560 Ti's hood, we grabbed MSI's already factory-overclocked GeForce GTX 560 Ti Twin Frozr II card and did some tweaking with Afterburner. The first steps in the process are obviously downloading and installing Afterburner. We recommend downloading the latest beta build available at bit.ly/3f5il3 to ensure the broadest compatibility. It wasn't until Afterburner v2.2.0 beta 9 that the 560 Ti was even supported, so if you've got a newer graphics card, using the latest beta is the way to go.

After downloading and installing Afterburner, launch it. A simple menu with a few sliders and hardware monitoring information will open. You could begin overclocking right away, but there are some hidden options that you need to enable in order to unlock the full potential of the app. At the lower corner of the main window, click the Settings button. A new window will open with a number of options available; tick the Unlock Voltage Control and Unlock Voltage Monitoring options and then click OK. Then close and re-open Afterburner and the voltage monitor and voltage control sliders should be available.

MSI's Afterburner GPU monitoring and performance-tuning utility can be used to tweak and overclock numerous graphics cards, not just those built by MSI.



Our particular MSI GeForce GTX 560 Ti Twin Frozr II started with a core voltage of 1000mV, or 1v (although it was reported at .95v in the voltage monitor), an 880MHz GPU clock with 1,760MHz shaders and 2,100MHz GDDR5 memory. (The actual memory clock was 1,050MHz with an effective data rate of 4.2Gb/s. Afterburner reports DDR speeds.) Like a CPU, pumping more voltage into a GPU should allow for higher frequencies—within reason—provided the GPU has adequate cooling. Without modding a card's cooler, however, cranking up the voltage beyond about 5-9 percent isn't advisable. The Twin Frozr II cooler from MSI is fairly capable, though, and the card has a robust voltage regulator module, so we were confident we could push our particular card much further than stock.

Without tweaking our card's GPU core voltage, its GPU could hit 940MHz with decent stability. Increasing the GPU's core voltage to 1.087v, however, allowed us to

push the GPU all the way up to 992MHz, an increase of 112MHz (12.7 percent) over stock and 170MHz (20.6 percent) over Nvidia's reference spec for the 560 Ti. Just for giggles, we also increased the memory clock to 2,161MHz, but didn't have much success beyond that number. The fan speed was maxed out to ensure the lowest possible temps.

Our tweaking was well worth the effort. The stock MSI 560 Ti Twin Frozr II offered up 25fps and a score of 629 in the Unigine Heaven 2.5 benchmark and 32.2fps in Alien vs. Predator.* At its overclocked frequencies, though, the card managed 26.9fps and a score of 681 in Unigine Heaven and 34.6fps in AvP, increases of 8.2 percent and 7.5 percent, respectively. Not bad for doing little more than downloading a free utility and turning a few knobs.

* Benchmarks were run at 1920x1200 with 4xAA and maximum tessellation enabled.

“OVERCLOCKED, THE CARD SAW AN 8.2 PERCENT IMPROVEMENT IN UNIGINE HEAVEN

USE NIBITOR TO MOD A GEFORCE CARD'S BIOS

Although many GeForce-based graphics-card attributes can be altered using readily available applications, or even driver control panels, some hardcore modders prefer to edit a card's BIOS to eliminate the hassle of manually dialing in settings after updating drivers or moving a card from system to system.

Modding a GeForce card's BIOS requires a few utilities, namely GPU-Z, NiBiTor, and NVFlash (all of which can be downloaded at www.mvktch.net and www.techpowerup.com).

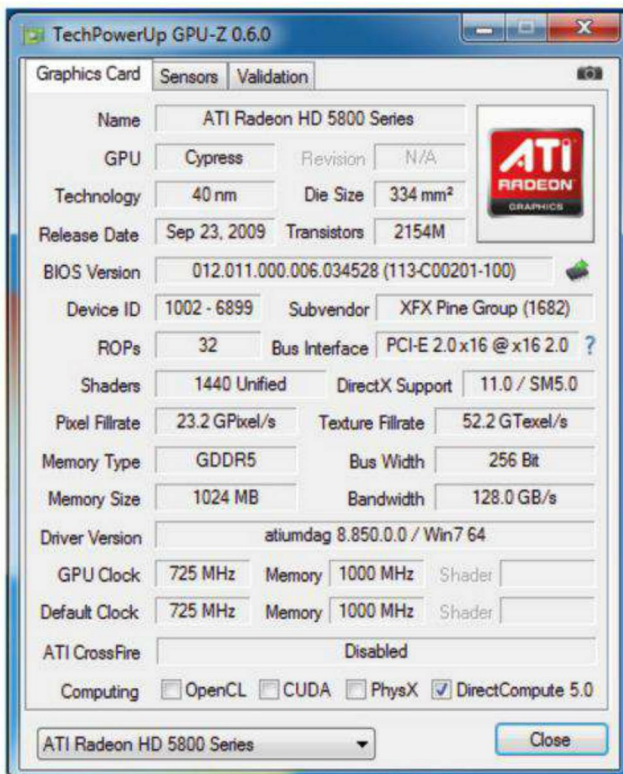
Technically, GPU-Z isn't an absolute necessity, but since NiBiTor has issues extracting BIOS files on some Windows 64-bit systems, GPU-Z can come in handy. GPU-Z is used to extract and save a card's original BIOS, NiBiTor to edit BIOS values, and NVFlash to flash the tweaked BIOS onto the card being modded. Before performing a GPU BIOS mod, a quick

disclaimer is in order. A bad flash or incorrect setting can render a graphics card unusable. In the event of a problem, installing a second card in a system can be used to restore the other card, but tread lightly and only change values you're confident will work.

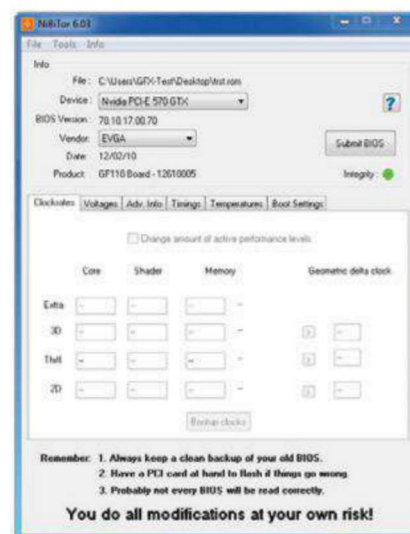
To mod a GeForce's BIOS, fire up GPU-Z and click the button next to the BIOS version listing to extract and save the card's original BIOS. Make a backup copy in case there's trouble later, and then open the original file in NiBiTor. If the GeForce in question is from the pre-Fermi days, frequencies, voltages, and other options can be changed easily right on the main window's various tabs. If you've got a Fermi-based GeForce, however, go to the Tools menu and choose Fermi Clocks and Fermi Voltages to alter either (min and max fan speeds can still be altered in the main interface). The frequency and voltage fields are rather cryptic for Fermi cards, though, so be sure to consult the oracle, i.e. Google, to know which to alter for your particular card, or try another utility called FermiCalculator

(bit.ly/rqb29t) to go it alone.

Once you've got the BIOS values tweaked to your liking, save the BIOS file in NiBiTor, copy it to a bootable disk along with NVFlash, flash the modded BIOS to your card, and you're done.



GPU-Z is a handy tool when you're curious about the low-level architecture of the GPU at the heart of your bright, shiny, and new videocard.



The Nvidia BIOS editor NiBiTor can be used to alter the BIOS settings on a wide array of GeForce graphics cards.



FermiCalculator is a good tool for those who really want to get into the nitty-gritty of GPU overclocking.

RAID SOLID-STATE DRIVES FOR PEAK PERFORMANCE

Solid-state drives are hot commodities for enthusiasts looking to squeeze every bit of performance from their systems. While even a single, midrange solid-state drive is a huge upgrade over a standard hard drive, RAID-ing two (or more) SSDs can result in truly extreme performance. A pair of modern SSDs running in RAID 0, for example, can silently offer upward of 1GB/s of read bandwidth, with similar writes and nearly nonexistent access latency. That's something no array of hard drives could even muster.

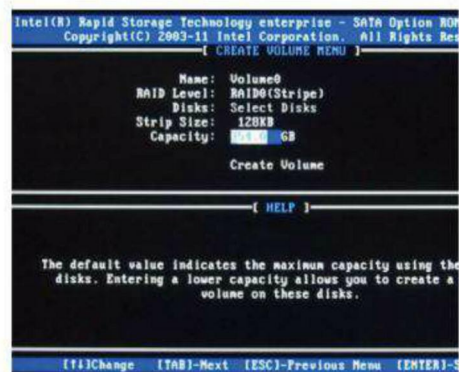
Configuring a group of solid-state drives in RAID is no different than doing the same with standard hard drives. We used an Intel X79 Express-based motherboard from Asus for this endeavor, but the process is similar for a wide range of boards and chipsets.

With the SSDs connected to the RAID-capable ports on your motherboard (or RAID controller card), power up the system and enter its BIOS or UEFI. Then

head into the advanced configuration or integrated peripherals menu and find the SATA configuration option. Once there, set the SATA ports for RAID mode, then save the changes and exit the BIOS / UEFI.

On the next boot, you should see a prompt at some point after the POST in which you can enter the RAID configuration menu / option ROM (on our Intel-based system, we had to press Ctrl+I). Enter the option ROM and you'll see a handful of menu items. First you'll have to select the drives to include in the array and create the volume. Once created, you'll then have to give the volume a name and choose the RAID mode—we chose RAID 0 for its high-performance characteristics. Then you'll have to choose a stripe size (Intel recommends 128K for RAID 0) and finally set the total capacity of the RAID volume. Save the settings, exit the option ROM, and that's it.

Keep in mind that you'll also need to install the correct drivers for your OS to



Configuring RAID on an Intel-based motherboard requires little more than entering the option ROM and working through some simple menus. AMD, Marvell, and other RAID controllers can be configured in a similar fashion, as well.

properly detect the array. And that Trim—an important feature of SSDs that helps maintain long-term performance—is not supported in RAID, but the idle garbage-collection algorithms available in newer SSDs will still work.

USE A WEBCAM AS A SECURITY CAMERA WITH OBJECT RECOGNITION

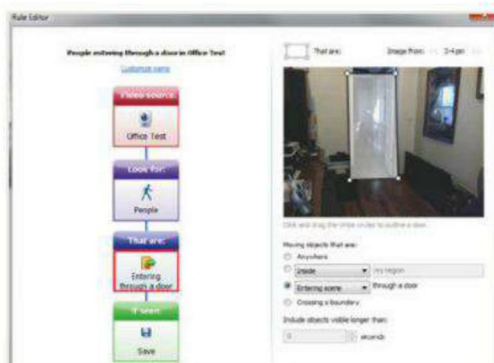
Boring video conferences and subpar facial recognition may have been the only jobs some webcams were good for, but when paired with the right software, a webcam can be transformed into a powerful security tool.

The process is straightforward, too. First, make sure your webcam is connected to your PC or network, its drivers are installed, and the cam is operational. Then download and install Vitamin D Video (www.vitamininc.com). The app is free for single camera installations and is available for both Mac OS X and Windows.

Once you launch the app, a Camera Setup configuration wizard will open (if the wizard doesn't open, the configuration can be completed by accessing the Tools menu and selecting Add Camera). From the Camera Type drop-down choose your camera type (either Network IP camera, or USB / Built-In), and then from the Camera drop-down select the specific camera you'd like to use; then click Next. Vitamin D will test the camera connection. If all is well, click the Next button; if not, ensure that your webcam is working. On the subsequent

screen, give the camera location a name (e.g., Office, Front Door, etc.), click Next again, and then click Finish to complete the initial phase of the setup process.

At this point, Vitamin D is capable of capturing video, but a few more tweaks will exploit some of the app's more powerful features. First, go to the Tools menu, select Options, and in the Options menu click the Move Video button to specify a directory other than the default option in which to save your videos. Then switch from the Preview pane to the Search pane by clicking the spyglass at the upper-left of the interface, and click the + button to define some rules. The app can track moving objects or specific shapes and distinguish between cars and people, for example, or even capture objects as they pass through specified thresholds. Once you've got your rules set up, switch on your camera in the app, and it'll capture video as long as the camera is connected.



Vitamin D Video can transform a lowly webcam into a powerful security camera with object recognition.

SUPERCHARGE YOUR ANDROID SMARTPHONE

Over the last few years, as smartphones have gotten more powerful and prolific, wireless carriers have begun polluting them with more and more bloatware, not to mention abhorrent software like Carrier IQ. Perhaps it's the unwanted software or the common enthusiast trait of craving total control over our devices, but rooting or jailbreaking smartphones and flashing custom firmware, aka ROMs, has become increasingly more popular. Not only can flashing a smartphone with a custom ROM eliminate objectionable bloatware, it can also add new features (like Wi-Fi tethering), and potentially increase performance.

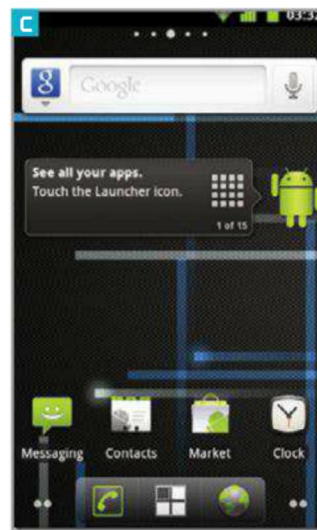
The process of flashing a custom ROM to a smartphone is far from universal. In fact, there can sometimes be multiple methods for flashing a single phone. But there are some common threads among the myriad devices. Usually, you'll have to obtain root access, somehow set the phone to accept downloads, use some sort of utility to flash a custom recovery image, and then from within the recovery image, flash the new ROM.

To demonstrate the process, we used a fairly new Samsung Galaxy S II i727 Skyrocket and an alpha build of the excellent CyanogenMod firmware

(www.cyanogenmod.com). For specifics regarding your particular phone, we suggest perusing the forums at the smartphone-enthusiast website xda-developers (www.xda-developers.com), which has the goods on virtually all of the popular smartphones available.

1 GATHER FILES AND SET PHONE TO DOWNLOAD MODE To flash the SGSII Skyrocket, we first must grab all of the necessary files, which consist of Odin v1.85, USB drivers for the SGSII, the custom CWM recovery image, and the alpha build of CyanogenMod—all of which are linked in the Skyrocket subforum on the xda-developers site. With all of the files in hand, we next have to put our phone in download mode. To do so, we have to shut the phone off (remove and then reinsert the battery to be sure) and then hold down both the Volume Up and Volume Down buttons, while simultaneously plugging in its USB cable (the other end of which is plugged into a Windows 7 system). Once in download mode, we release the buttons and then hit the Volume Up button one more time to bypass an onscreen warning message and continue on. Next, we install the USB drivers for the phone and once the phone is properly detected by Windows, we fire up Odin. If your phone is in download mode and its drivers are correctly installed, Odin should identify a device on a virtual com port. Here, our Samsung Galaxy S II i727 Skyrocket is identified as device 0 on COM5 (**image A**).

2 FLASH THE RECOVERY IMAGE With the proper drivers installed and the phone plugged in, Odin immediately recognizes the device and is ready to flash the new recovery image. Odin is capable of flashing bootloaders, recovery images, modems, and some carrier-specific files. For our purposes, we only need to flash the recovery image. To flash the recovery image, we tick the field in Odin labeled PDA and then browse to the CWM recovery image file we had downloaded. With the file selected, we click Start and Odin does the rest. A few moments later the recovery image with CWM is flashed to the phone (**image B**).



3 FLASH THE CYANOGENMOD IMAGE With the CWM recovery image installed, we're ready to flash CyanogenMod. First, we power the phone off again and remove the phone's MicroSD card. We then copy the CyanogenMod image to the MicroSD card, reinsert it into the phone, and enter CWM by holding both the Volume Up and Volume Down buttons and simultaneously pressing and holding the power button until the Samsung logo flashes twice on screen. Once in CWM, we clear all of the phone's caches and user data, and follow the onscreen menus to select and flash the CyanogenMod image. Upon restarting the phone, we are done (**image C**).



STREAM PERSONAL MEDIA TO A ROKU

The various Roku set-top devices are some slick pieces of hardware. The diminutive boxes are affordable and allow users to stream a plethora of digital content. As cool as many of the channels on the Roku are, though, not being able to easily stream content from a home network out of the box is somewhat disappointing. Many of us have amassed huge collections of digital media, after all; being able to stream that media from our PCs to a TV with a sub-\$100 box the size of a Klondike bar would be handy, indeed.

There is a way to stream personal files to a Roku, however. It's a bit of a pain to configure and costs a few bucks, but in the end it's worth it. By installing the Roksbox channel to your Roku (30 days free, \$15 lifetime), strategically arranging your files with a specific directory structure, and setting up what's essentially a web server, Roksbox will allow you to "tune in" to your own personal channel.

Before we explain how to use Roksbox with your Roku, we're going to assume you've already got your device up and running and have an account registered on the Roku site. If so, head on over to the Roksbox site (www.roksbox.com) and click the link at the lower-left labeled "Add Roksbox Channel to Your Roku Player." You'll be taken to a new page and presented with a personalized URL that, when clicked, will take you to the Roku site and add the channel to your selections. Please note: It can take a few minutes (sometimes longer) for the channel to appear in your Roku's interface after being added, so be patient. Once the Roksbox channel is listed in your selections, go to the channel store on the Roku player and select Roksbox.

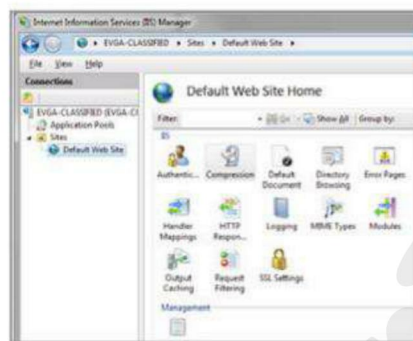
With the Roksbox channel installed, the next step is to organize your media with a folder structure Roksbox can handle. By default, the channel looks for videos, music, and image files in your Videos, Music, and Photos directories. Create a folder with any name you like (we chose D:\media\l) on the machine that'll be serving the files. Inside it, create the Videos, Music, and Photos directories, and copy your media into the folders. Keep in mind, the Roku will only stream MP4 (H.264), MOV (H.264), and WMV/ASF (WMV9/VC-1) video files, AAC and MP3 audio, and JPG and PNG images. MKV

Roksbox gives users the ability to stream their own personal content to the Roku player, provided the files are stored on a network-accessible PC and are of the correct format.



files are supported only through the local USB port on the Roku.

The next step is to set up the web server. Windows 7 systems have IIS 7.5 built in; it just has to be enabled. If you prefer to use a different web server, Mongoose or Apache, for example, those will work, too. Our media was on a Windows machine, so we stuck with IIS. To enable IIS on Windows 7, click your Start button and type Windows Features into the search field. The Windows Features menu will open. In it, tick Internet Information Services and then tunnel down in the menu and also tick Basic Authentication. Then click OK and IIS will be installed. Note, if you have a firewall enabled, exclude IIS so traffic can pass through on port 80.



All of the web server's options can be configured through the IIS Manager utility, which is available under Administrative Tools after enabling the feature in Windows.

Next, head into Administrative Tools (go to Control Panel, then System and Security) and launch Internet Information Services (IIS) Manager. When the IIS menu opens, select Default Web Site from the Connections menu, and then click Advanced Settings in the Actions menu. In the window that opens, alter the Physical Path option so that it points to the directory where your media was copied and click OK. Then double-click Directory Browsing in the IIS window and enable it. Next, double-click MIME Types and add the MP4 extension, with the type "video/mpeg."

The last three steps are to enable Basic Authentication, disable Anonymous Authentication, and to create a user name with password (if you don't already have one) for login. Select Default Web Site from the Connections menu again and double-click Authentication; you can enable Basic Authentication and disable Anonymous Authentication from there. Once done, close IIS manager and create a new user account if necessary.

With the web server configured, head into the Roksbox settings on your Roku and point it to the IP address of your server. It'll ask for login credentials, and if all is well, you'll then be able to browse the files in the Videos, Music, and Photos directories and stream away. Should you run into any issues, there is an extensive step-by-step How To guide available on the Roksbox site. 

REPLACEMENT WI-FI ANTENNAS: THE REAL UPGRADE

Firmware tweaks and repositioning a wireless access point or router can only do so much to improve wireless performance and reception. To take wireless performance to the next level requires upgrading the router's antennas.

Wi-Fi antennas come in all shapes and sizes, from corner and window mounts, to elongated pole mounts, indoor and outdoor models, and simple replacement rubber-duckies. All of the antennas, however, will typically fall within one of two categories: directional or omnidirectional. The vast majority of antennas included with virtually all commercially available routers and access points (if it has external antennas) are omnidirectional, which is to say they transmit and receive wireless signals from all directions. Conversely, directional antennas better receive and focus transmitted signals in a single direction. Wi-Fi antennas will also carry some sort of dBi rating, which is a measure of the antenna's gain. Higher-gain antennas typically offer longer range and better performance over a given distance in comparison to lower-gain antennas.

Which antenna is best suited to a particular application will be determined by the environment and positioning of the router or AP. A centrally located router in a relatively open area that's servicing systems all around it, for example, would be best served by a high-gain omnidirectional antenna. A router sitting in the corner of a building, which has to transmit a signal to the opposite corner, would benefit from the focused signal of a directional antenna pointed in the proper direction.

Whichever antenna option is best for your setup, one thing is certain: Replacing the basic antennas that come included with most routers with high-gain alternatives will result in an immediate and noticeable improvement in signal quality and range, which ultimately improves performance, as well.

High-gain directional antennas are a surefire way to improve wireless performance, signal quality, and coverage.



OPTIMIZE WI-FI PERFORMANCE, RANGE, AND COVERAGE

We have explained how to install and use open-source firmware such as DD-WRT (www.dd-wrt.com) and Tomato (www.polarcloud.com) on wireless broadband routers on multiple occasions, so we won't go in-depth on the topic again here. Suffice it to say that using open-source firmware can enhance the performance and stability of a wireless network, enable a number of useful features, and give users a level of control that's unheard of with the stock, bare-bones firmware included with many routers.

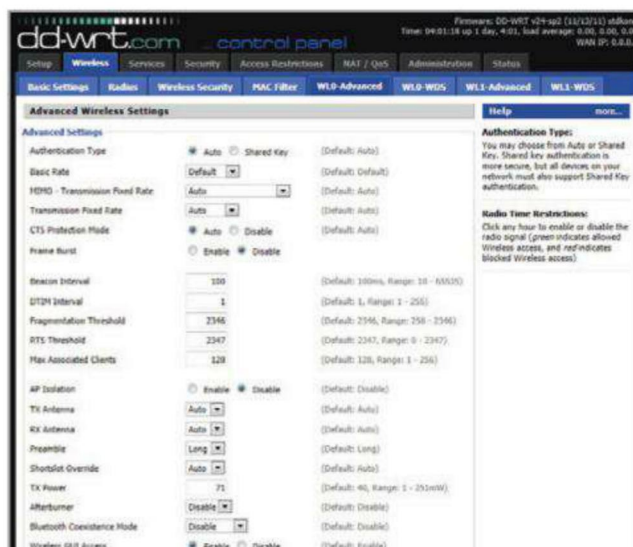
Simply installing open-source firmware isn't enough to fully optimize your wireless connection, however. It's a key component to a fast, stable wireless network, yes. But there are changes to the default settings within the firmware and commonsense environmental tweaks you can make that all incrementally enhance overall performance. Within the advanced wireless configuration menus in DD-WRT, for example, there is a setting labeled TX Power, which alters the transmit power of the router. Increase the value in the TX Power field and—you guessed it—the router will transmit a stronger, farther-reaching signal. There are some caveats to altering the TX Power value, though. First off, increasing the value too much can fry the router's radio, so do some research to find the optimal value for your particular router. Although

the default value (usually between 40mW and 71mW) may seem low when a maximum value of 251mW is available, cranking things up to the maximum is not advisable. Excessively high TX Power values can not only damage the router's radio, but will also introduce unwanted electrical noise and instability. We'd recommend increasing the TX Power by only a couple percentage points for a small boost in output. If you've got a device that sits on the fringe of your wireless net-

work, a small bump in TX Power may be enough to rope it in with a stronger signal—provided its range isn't limited by its own capabilities.

Another firmware tweak to consider is disabling unneeded wireless modes. If all you've got are N-mode capable devices on the network, there's no need to enable B and G modes, which can drag down peak performance. We also recommend scanning your environment with a utility like inSSIDer (www.metageek.net) to see which wireless channel has the least amount of traffic, and configuring the router to use that channel.

Using a commonsense approach to your router's positioning can also have a huge impact on wireless performance. It's best to keep other wireless devices that may use similar frequency bands, like cordless phones, as far away from the router as possible to minimize the chance of interference. Microwave ovens are also notorious for interfering with Wi-Fi signals. Finally, if possible, position your router in as central a location as possible if you've got to service a large area. Most routers ship with omnidirectional antennas that transmit signals in all directions, so it's best to minimize the distance between the router and any devices that are going to connect to it. The ideal way to do that is to (obviously) make the router the central point between all of your wireless devices. ☺



Open-source firmware like DD-WRT gives users the ability to boost the transmit power on many popular wireless routers, which can help increase their range.

MAXIMUM PC

MAXIMUM ACCESS!



In your mailbox, in your pocket,
on your tablet

PRINT:

Get Maximum PC magazine delivered
to your door and save 87%!

Brutally honest product reviews

Tips to supercharge your PC's performance

The insider's guide to cutting-edge technology

DIGITAL:

Get a monthly subscription for
only \$0.99 per month.

Get instant delivery with your choice of
Apple Newsstand, Amazon Kindle or NOOK!



www.maximumpc.com/access



Use your mobile phone
to subscribe now!

Download the free Microsoft
Tag Reader at gettag.mobi or
visit your app store.

MaximumPC is
published by Future US, Inc.
© 2012 Future US, Inc.



*Subscription offer good in U.S. only. Newsstand price per year is U.S. \$7.99 per issue.

BUILD IT

NATHAN EDWARDS SENIOR ASSOCIATE EDITOR



Get Gaming on an HTPC

I don't want to watch cable TV. I don't want to use a controller. I just want to watch 3D Blu-rays and frag people with a mouse and keyboard, all on a box that fits on my entertainment center. Is that too much to ask?

LENGTH OF TIME: 2 HOURS

LEVEL OF DIFFICULTY: INTERMEDIATE

THE MISSION We've built our fair share of home theater PCs in the past, with all sorts of different use cases in mind. Our August 2010 HTPC was a stunner built for 3D, with passively cooled GPU, CPU, and PSU, as well as a four-channel CableCard tuner and Blu-ray 3D support. In June 2011, Gordon tried to make a small-form-factor HTPC that could cut out the previous build's

bulk (and CableCard) while still supporting Blu-ray 3D. Both of those rigs handled their respective tasks well, but what if I don't care about cable but do care about gaming? This month's task is to create a kick-ass gaming rig in an HTPC form factor—one that can handle modern games, as well as 3D Blu-ray and Dolby TrueHD audio, without sounding like a jet engine.



The Right Tools for the Job

WHEN BUILDING A PC for the living room, the first thing to consider is the chassis. After testing many cases, including Lian Li's PC-P50 and Silverstone's oldie-but-goodie CW02, I settled on the Silverstone GD06, a microATX case with three 12cm cooling fans, front-panel USB 3.0 ports (with internal header!), and two hot-swap SATA bays. The other cases were roomier, but I wanted to keep the footprint as small as possible.

The videocard needs to be able to handle Blu-ray 3D and support HDMI 1.4a for true lossless HD audio. That's the easy part. It also has to have the power to play today's games, and the GTX 560Ti has that. MSI's Twin Frozr II version is speedy, factory-overclocked, quiet, and doesn't draw a lot of power. For Blu-ray playback, we're hitting up an old favorite: Plector's PX320-SA.

We're not crippling this rig with an Atom or Fusion board. Asus's Maximus IV Gene-Z combines a powerful Z68 gaming platform with easy overclocking, two PCIe x16 slots, onboard 6Gb/s SATA, and X-Fi-branded onboard audio using Realtek codecs. Intel's Core i5-2500K brings four unlocked processors at 3.3GHz.

I picked a speedy 6Gb/s SATA SSD for an OS drive, and a large-capacity drive for media storage. The case's front hot-swap SATA bays make it easy to add more storage later.



The GD06's front panel latches when not in use to prevent miscreants from waltzing off with your drives.

INGREDIENTS

PART/URL	PRICE
Case Silverstone GD06 www.silverstonetek.com	\$130
PSU Silverstone Strider Essential ST70F-E 700W www.silverstonetek.com	\$85
Mobo Asus Maximus IV Gene-Z usa.asus.com	\$180
CPU Intel 3.3GHz Core i5-2500K www.intel.com	\$220
CPU cooler Stock Intel www.intel.com	\$0
GPU MSI Twin Frozr II GTX 560 Ti us.msi.com	\$240
RAM (2x) 4GB Corsair Dominator DDR3/1600 www.corsair.com	\$100
Blu-ray combo drive Plector PX-B320SA www.plector.com	\$110
SSD 120GB Corsair Force GT www.corsair.com	\$220
HDD 3TB WD Caviar Green www.wdc.com	\$115
OS Windows 7 Home Premium, 64-bit OEM www.microsoft.com	\$100
TOTAL	\$1,500

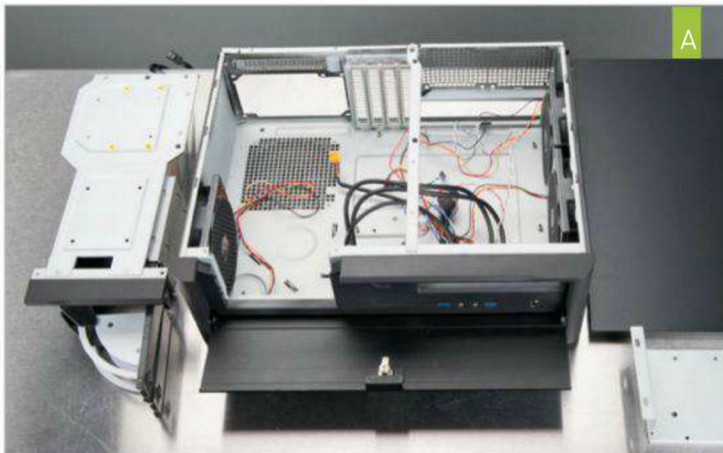


Putting It All Together

1

PREP THE CASE

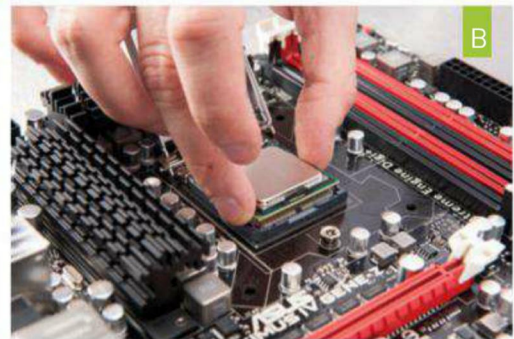
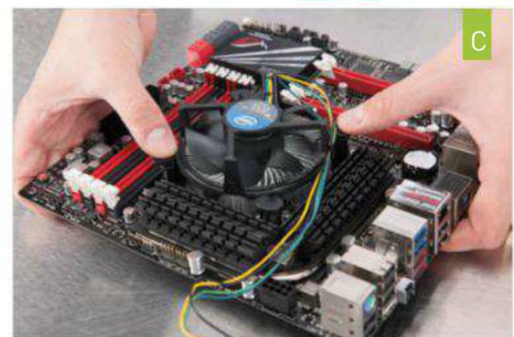
REMOVE THE THREE SCREWS securing the top cover of the GD06, then slide the cover off of the case. Unlock and open the front-panel bezel. Take out the four little screws securing the optical drive bay, and remove the bay. Do the same with the four screws holding the HDD trays. Lift out the bays and set them aside (**image A**).



2

INSTALL THE PSU

STICK THE FOUR RUBBER FEET that ship with the case onto the underside of the PSU (the side with the intake fan). Mount the PSU with the fan pointing to the bottom of the case.



3

INSTALL THE CPU, COOLER, AND RAM

OPEN THE CPU GATE and remove the plastic socket protector. Align the CPU with the socket and gently lower it into place (**image B**). Lower the gate and secure the CPU. Since we're using the stock cooler, all you have to do is remove the plastic cover, make sure the stock thermal pads are in place, and align the four posts on the heatsink with the mounting holes in the motherboard. Press down firmly on two opposite pins at a time until you hear a firm click, then repeat for the other two pins (**image C**). Make sure the cooler is firmly attached; it shouldn't wobble. Connect the CPU fan to the CPU_FAN header. Mount the RAM in either the red slots or the black slots.

4

MOUNT THE MOTHERBOARD

INSTALL THE MOTHERBOARD I/O shield in the case, then put a motherboard standoff into the rightmost center hole (when viewed from the rear of the case)—this is the only standoff you need for microATX that isn't preinstalled in the chassis. Slide the motherboard into the case (**image D**), aligning the I/O ports with the I/O shield, and screw the motherboard screws into the standoffs.



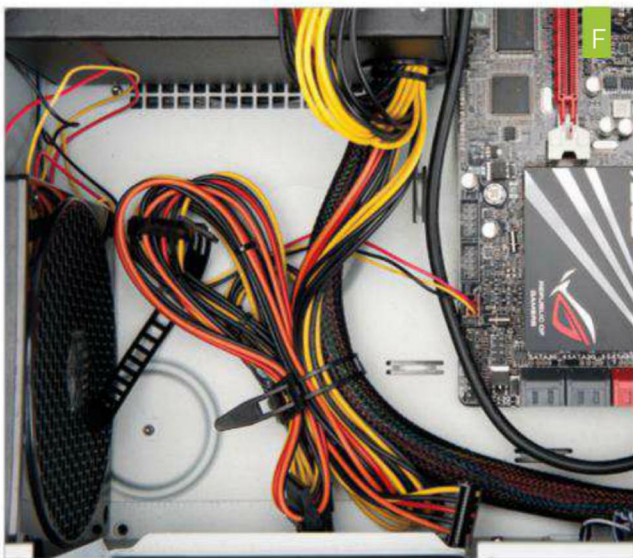
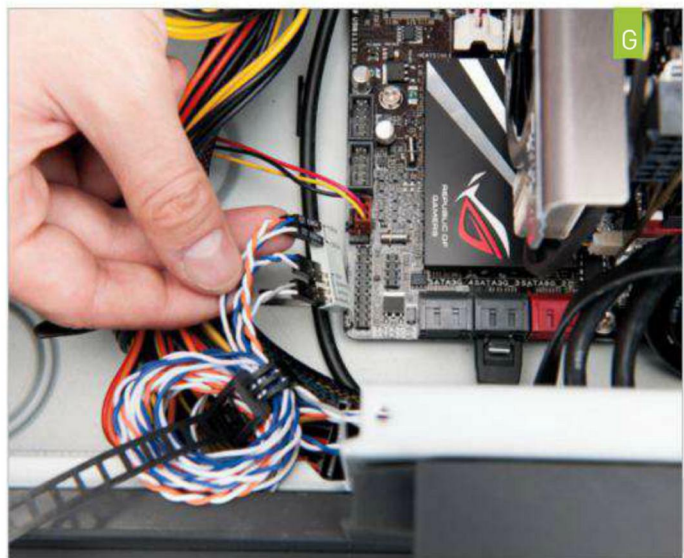
5

CONNECT CABLES

THE TRICKIEST PART of this build is the wiring. As you perform each step, keep the next steps in mind. Plan ahead and make sure to coil excess cable and secure it to tiedowns when possible.

Connect one end of a black SATA cable to one of the four gray SATA ports on the motherboard. Connect the PSU's 24-pin ATX power connector to the board. Run the 8-pin ATX power cable along the bottom edge of the motherboard, and then up behind the I/O ports to the AUX input (**image E**). Set aside a SATA power cable, the dual-6-pin PCI Express power cable, and a 4-pin Molex power cable, and tie the remaining PCI Express and SATA power cables down in front of the motherboard (**image F**) using the cable ties included with the case.

Coil the front-panel connectors until they're just long enough to reach the pins, then connect them to the motherboard's pinout. Install the pinout onto the board (**image G**). Tie down the excess cable. Attach the front-panel audio and USB 3.0 headers, pulling excess cable below the optical drive bay. Plug the system fans into fan headers on the motherboard.



6

INSTALL THE GPU

REMOVE THE TWO PCI expansion slot covers closest to the I/O ports and install the videocard. Make sure it's seated firmly in its slot, but don't push down too hard lest you flex the motherboard.

To keep your install looking neat and tidy, be sure to run the ATX auxiliary power cable underneath the card to keep it out of sight as much as possible. This is one of the moments when you really appreciate a case that's nicely finished on the inside. We have innumerable scars from snagging our fingers on rough edges.

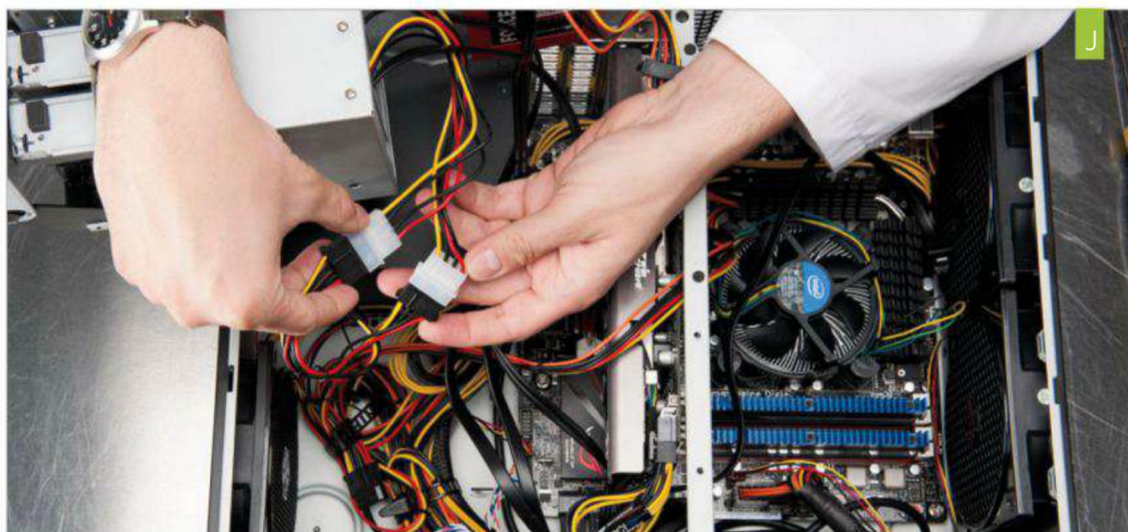
Now, plug the two PCI-E 6-pin plugs into the ports on the end of the card (**image H**). Your GPU won't run correctly if it doesn't get enough additional power from these cables (it will also draw power through the PCI-E slot).



7

INSTALL THE DRIVES

ATTACH THE SSD to the underside of the hard drive bracket using the four SSD screws (**image I**). Plug a 6Gb/s SATA cable into the SSD. Plug the two SATA cables from the hot-swap bays to two of the mobo's gray SATA ports, and attach the other end of the SATA cable from the SSD into one of the red ports. Attach the two 4-pin Molex connectors from the hot-swap bays to two of the 4-pin connectors from the PSU (**image J**). Attach the end SATA data connector from the cable you moved over earlier. Replace the hard drive tray and reattach the four screws that hold it in place. Slide your mass storage drive into one of the hot-swap bays and close the door.



8

INSTALL THE BLU-RAY DRIVE

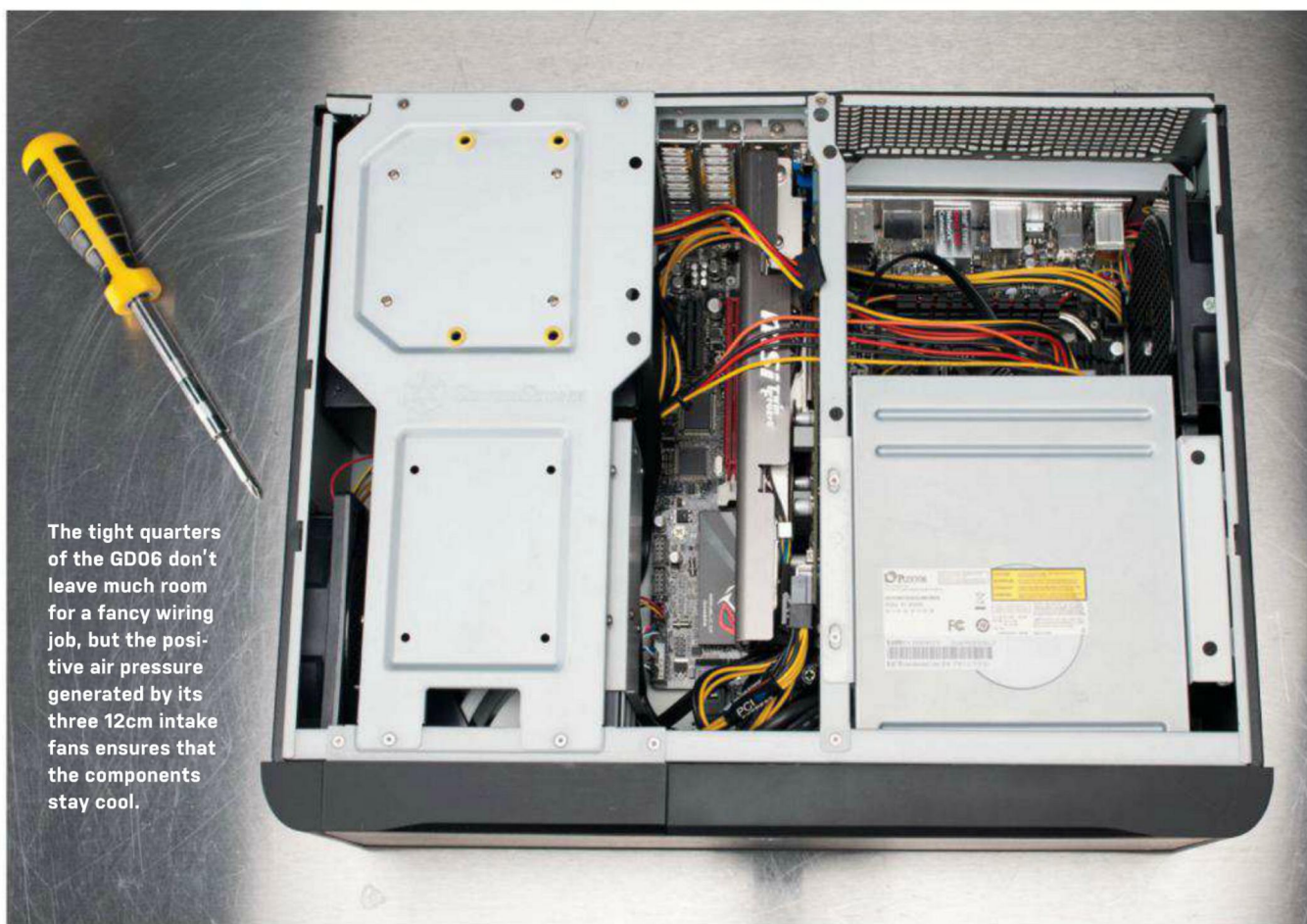
ATTACH THE OPTICAL drive to the optical drive tray (**image K**), making sure the mounting holes on the drive are aligned with the front set of mounting holes on the tray. Attach with four optical-drive mounting screws and plug in the SATA power and SATA data cables you previously routed to the area. Reinstall the drive bay using the four screws you removed in Step 1.



9

WRAP IT UP

SLOT THE STORAGE DRIVE into one of the front hot-swap bays, and then replace the case's top cover. Install OS and drivers, and away you go!



The tight quarters of the GD06 don't leave much room for a fancy wiring job, but the positive air pressure generated by its three 12cm intake fans ensures that the components stay cool.

IT'S GOT GAME!

I WORRIED THAT AN ACTIVELY cooled gaming rig in an HTPC chassis would be too noisy, especially compared to passively cooled rigs like our August 2011 machine. But all builds involve compromises, and I wasn't willing to give up gaming performance in exchange for a few decibels. Fortunately, the GD06's fans are pretty quiet, and MSI's Twin Frozr II cooler makes the GTX 560 Ti run quietly, as well. The rig only really got loud when I was installing driver updates from the optical drive. The drive runs much more quietly when playing a movie.

And to my relief, the system is pretty speedy. Our zero-point machine is an aging-but-still-powerful overclocked Core i7-920 with a dual-GPU videocard. The Sandy Bridge processor and GTX 560 Ti helped the gaming HTPC hold its own reasonably well in the benchmarks despite a stock-clocked processor sans Hyper-Threading.

The rig plays 3D Blu-ray and offers a protected Dolby TrueHD audio path

via the videocard's 1.4a-compatible Mini HDMI port—essential elements in a home theater PC. If you must have cable, you can drop in Ceton's InfiniTV tuner and a CableCard. If you must have a dedicated soundcard, you can add in one of those. If you're really crazy, you can add both. I prefer to go without either and save the \$650. I still have access to Netflix, Hulu Plus, and anything I can stream over my home network.

It's also great for games. Some of us like gaming on a giant screen, and we want to use a mouse and keyboard when we do. And now we can, with a box that's far more powerful than any console.

If you're curious about the rest of an HTPC setup—recommended remotes, peripherals, sound systems, TVs, and more—check out our guide to the Ultimate 3D HTPC from last year (bit.ly/nvnfdw). The

peripheral recommendations still stand, though 3D-compatible TVs have only gotten easier to come by.

There's more than one way to skin a cat (eww), and my gaming HTPC isn't the same as yours. What would you change? What essential part did I miss? What totally unnecessary expense did I incur? Email your critiques, build suggestions, and more to comments@maximumpc.com!

BENCHMARKS: GAMING HTPC RIG

ZERO POINT			
Vegas Pro 9 (sec)	3,049	3,411	(-11%)
Lightroom 2.6 (sec)	356	312	
Proshow 4 (sec)	1,112	986	
Reference 1.6 (sec)	2,113	2,258	(-6%)
STALKER (fps)	42.0	34.1	(-19%)
Far Cry 2 (fps)	114.4	91.9	(-20%)
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%			

Our current desktop test bed consists of a quad-core 2.66GHz Core i7-920 overclocked to 3.5GHz, 6GB of Corsair DDR3/1333 overclocked to 1,750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and 64-bit Windows 7 Ultimate.

BUILD IT

GORDON MAH UNG DEPUTY EDITOR



Here's What \$830 Gets You

Putting together an all-purpose rig under a strict budget is the best way to keep a PC builder on his or her toes

LENGTH OF TIME: 2.5 HOURS

LEVEL OF DIFFICULTY: INTERMEDIATE

THE MISSION Building expensive, over-the-top machines is easy. It's when you dip below the \$1,000 mark that it gets difficult. This month, I undertook the challenge of building the best all-around PC I could for less than \$850. To me, that meant a machine good at multithreaded tasks as well as gaming. We've said it before, and we'll stick to our guns: Intel's Core i5-2500K is the sweet spot for price/performance. Unfortunately, that price is too high for this configuration. That left me pondering whether to do yet another Core i3 box or another AMD box.

Readers have been ragging on us about what fantastic deals Phenom II procs currently are. I looked high and low and, surprisingly, I did find some e-tailers selling Phenom IIs way below the list price. For just \$139, you can net a 3.5GHz Phenom II X4 970. That gives you four cores, a much larger cache, and a fully unlocked part for not much more than the Athlon II X4 has been going for. The Phenom II X4 isn't always a clear-cut winner against its Intel counterpart, the 3.3GHz Core i3-2120, but it does hold its own in multithreading tasks and game-related chores, which are all about the GPU.





PICKING THE OTHER PARTS

I INITIALLY PICKED Nvidia's GeForce 560 Ti card for this build, but later decided to swing ATI because our motherboard, a Gigabyte GA-970A-UD3, only offers CrossFireX support. To get SLI on an AMD board, you need to pony up for a 990FX chipset, which would have broken my budget. The best deal seems to be the Radeon HD 6950 card. The 6950 is a cut-down Radeon HD 6970 made to rain on the GeForce 560 Ti's parade. Gigabyte's GV-R695UD was about the cheapest I could find at the time, and it features enhanced cooling over a stock card.

When it came to the other components, I had one thing working for me and another against me. Working for me was system RAM. RAM is so cheap that building a rig with even 32GB is doable (provided you have eight DIMM slots). However, 4GB is about all you really need in a budget box—and all I could afford. Yes, 8GB would have been nice, but I had to save pennies for something really out of control: the hard drive.

Here's how dire things are right now: In August 2011, we built a \$667 PC that had a 1TB WD Caviar Blue drive for \$60. This year, I was happy to get a bare 500GB Western Digital Blue drive for \$99. In fact, the drive I snagged for this build had already risen 30 percent in price by the time I finished building my rig. The same hard drive six months ago sold for \$34!

I'm still sticking to the \$99 price, as that was the price when I originally configured the machine, but by the time you read this, the hard drive could be \$500, and we'll be living in a dystopian world where people are scrounging e-waste dumps looking for 32MB USB keys discarded in 2003. I'll pull up in my busted-up \$830 PC and some dirty, toothless PC mechanic will marvel at the "last of the 500GB Interceptors! A piece of history!"

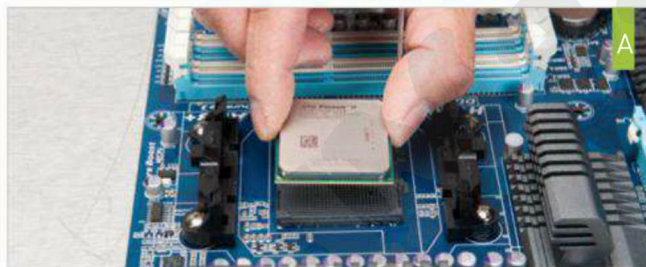
INGREDIENTS

PART/URL	PRICE
Case Bitfenix Outlaw www.bitfenix.com	\$47
PSU Rosewill RG700-S12 www.rosewill.com	\$50
Mobo Gigabyte GA-970A-UD3 www.gigabyte.com	\$99
CPU AMD 3.5GHz Phenom II X4 970 Black Edition www.amd.com	\$139
Cooler Cooler Master Hyper 212 Plus www.coolermaster.com	\$21
GPU Gigabyte GV-R695UD www.gigabyte.com	\$239
RAM 4GB Patriot DDR3/1333 www.patriot.com	\$19
Optical Drive Samsung SH-2222 www.samsung.com	\$18
Hard Drive Western Digital Caviar Blue 500GB www.westerndigital.com	\$99
OS Microsoft 64-bit Windows 7 Home Premium (OEM) www.microsoft.com	\$99
TOTAL	\$830

ASSEMBLING THE HARDWARE

1 INSTALL THE BRAINS

TO KEEP THINGS easy, I installed the Phenom II X4 970 with the board out of the case. First, drain any built-up static electricity by touching a large metal object. Unlock the AM3+ socket by lifting up the arm. Match the gold triangle in the CPU's corner with the white corner marker on the motherboard (**image A**). Gently lower the chip into the socket until it rests flush with the socket. Now lock the arm in place, and you've just installed your CPU (**image B**).



2

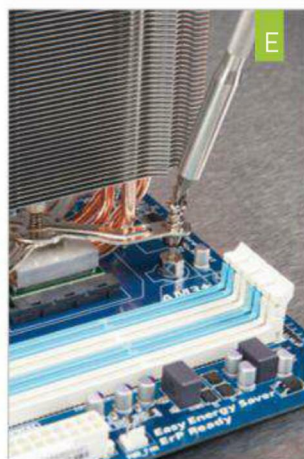
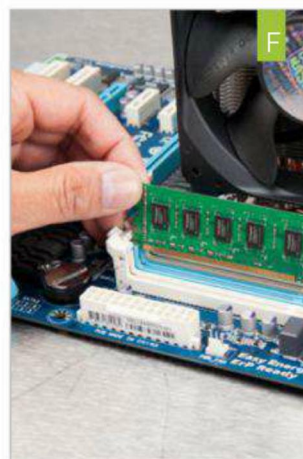
INSTALL THE COOLER AND RAM

I WENT WITH the amazingly cheap (\$20!) Cooler Master Hyper 212 Plus. It offers far more performance than the stock fan. To install it, first remove the stock mounting bracket from the motherboard by using a Phillips-head screwdriver to remove both of the plastic brackets on top (**image C**). The metallic backplate on the back should now pop off. Reassemble the bracket and place this in your motherboard box in case you need it in the future. Now place a small dab of thermal paste on the CPU heat spreader. You can use a plastic bag as a makeshift glove to spread the paste on the heat spreader's surface.

The Hyper 212 Plus comes with a backplate, which you will have to hold in place while you install the bracket. With the bracket in place, install four of the nut-and-screw assemblies to hold the bracket in place. Now use the included tool to lightly torque the

screws in place (**image D**). Don't over tighten, as it could chew into the motherboard. Remove the fan from the cooler, and spread the X-shaped bracket through the base of the cooler. Now, using a screwdriver, attach the x-bracket to the four exposed nuts with the four spring screws (**image E**). Once the cooler is firmly attached, snap the fan back in place and hook up the fan to a fan header. For my configuration, I set the fan to blow air through the cooler where it would be exhausted through the case's rear fan.

While the board is out, you might as well install the RAM by matching up the notches in the RAM with the notches in the slots. On this board, I installed the pair of 2GB modules in the two blue slots (**image F**). If you're not using this board, you should consult your manual to see how to install the RAM for dual-channel mode.



3

PREP THE CASE

INSTALL the optical drive in the bay of your choice, which will be the top bay for most people, since the system will likely sit on the floor. At this point, you should also install the hard drive in one of the bays that will clear the GPU, as the hard drive will jut out quite a bit in this BitFenix case (**image G**). You should now install the PSU, as well. I chose to face the fan intake toward the bottom of the case—that way, air is sucked in through the bottom and vented out the rear.



4

MOUNT THE MOTHERBOARD

THE BITFENIX case is a bit unusual in that it features an inverted design that flips the guts of the case. Remember to knock out the rear metallic I/O panel that's in the case before you mount your board. When you mount your board, make sure you use as many screws as you have mounts in the case. If you have nine mounting points, you should use nine screws or you will need to remove the board and start all over again ([image H](#)). You should know that the BitFenix case is a bit shallow, and the Hyper 212 Plus is a little tight in the case. The side panel will fit, but it will be right up against the cooler.



5

MOUNT THE GPU

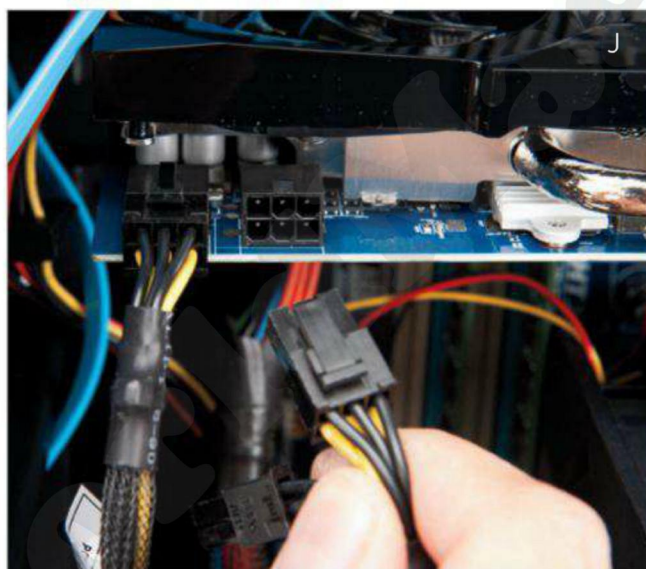
THE GIGABYTE version of the Radeon HD 6950 features three fans to keep it cool—and in my case, they're flipped over so the warm air is directly vented out the top. Remember, since the case is inverted, you'll be installing it in the x16 PCIe slot that is the lowest in the board ([image I](#)).



6

CONNECT THE UMBILICAL CABLES

CONNECT THE main power connector, the ATX12V, and pipe power to the GPU, HDD, and ODD. You should also take the time to connect the power switch, LED, and reset switch, and plug in the USB and front audio panel headphone jack ([image J](#)).





1. For a mere \$99, this Gigabyte GA-970A-UD3 AM3+ board gives you CrossFire support and modern amenities.

2. The Radeon HD 6950 is just a step down from the Radeon HD 6970, and pretty darn cheap, too.

3. This old AMD Phenom II X4 970 still has a few tricks left in it, especially if you overclock it a teeny bit with the aid of the Cooler Master Hyper 212 Plus.

4. We feel lucky to have scored our Western Digital 500GB Caviar Blue for \$99. Will we laugh when we look back at the great hard drive shortage of '11, or cry?

BUDGET BURNER OR JUST BURNT?

OUR BUDGET burner doesn't set any benchmark records. Nor would we expect it to at a mere \$830. Even up against our old zero-point system with its 2.6GHz Core i7-920 overclocked to 3.5GHz, the \$830 rig didn't win any battles (mind you, our zero-point cost north of \$2,500 when originally constructed).

Where the \$830's talents come into play is against far more modest machines. For example, when put up against the \$667 rig we built in August 2011, the extra cash helps out. That 3.1GHz Core i3-2100 box takes a back seat in our multithreaded tests, and the Radeon HD 6950 eats the \$667 Radeon HD 6790's lunch, as well as dinner.

In the interest of full disclosure, I did decide to give the \$830 a little extra edge by overclocking the Phenom II X4 970 to 4.1GHz. Since I paid \$20 for the Cooler Master Hyper 212 Plus, I figured I'd make it work for a living. But what about last month's \$1,500 AMD FX-8150 Bulldozer box? The \$830 box's four cores couldn't hang with the Bulldozer's eight cores, but in gaming benchmarks, the Radeon HD 6950 isn't that much slower than the Radeon HD 6970 in the pricier box. In STALKER, I'm only giving up 7 percent, and Far Cry 2 saw a mere 5 percent delta between the two rigs. That ain't bad when you're looking at \$830 vs. \$1,500. To be fair, that Bulldozer rig also didn't have Microsoft's new hotfix that specifically addresses Windows 7's scheduler issues with the Bulldozer chip, so there's a good chance that last month's machine is even faster today.

Still, I'm not unhappy with the performance of this machine, especially the frame rates I'm seeing. Not everything is perfect, though. It's hard to believe that I had to fall back to a 500GB HDD to make budget, and it would have been nice to run 8GB of RAM instead of the 4GB of DDR3/1333. I also must note that there have been negative comments regarding the reliability of budget Rosewill PSUs, but I'll take the risk because they're low-cost and, more importantly, have a U.S.-based website where you can actually use the two-year warranty. You can't say that for a lot of budget PSUs, where the warranty is in name only.

BENCHMARKS

	ZERO POINT	
Vegas Pro (sec)	3,049	4,980 (-39%)
Lightroom 2.6 (sec)	356	453 (-21%)
ProShow 4 (sec)	1,112	1,662 (-33%)
MainConcept 1.6 (sec)	2,113	2,848 (-26%)
STALKER: CoP (fps)	42.0	30.7 (-27%)
Far Cry 2 (fps)	114.4	94.2 (-18%)

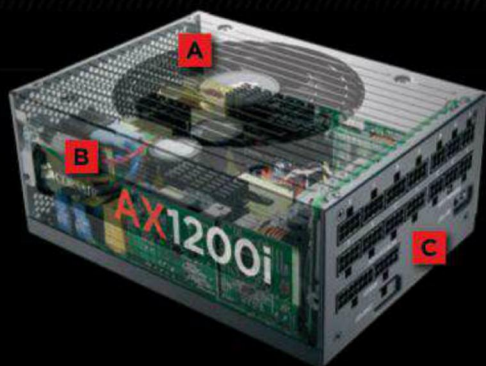
Our current desktop test bed consists of a quad-core 2.66GHz Core i7-920 overclocked to 3.5GHz, 6GB of Corsair DDR3/1333 overclocked to 1750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and 64-bit Windows 7 Ultimate.



Introducing the Corsair

AX1200i

DIGITAL ATX POWER SUPPLY



- A** Digitally controlled power for solid voltage regulation and outstanding performance
- B** Upgraded internal components and digital design for 80 PLUS[®] Platinum efficiency
- C** Fully modular cables for quick and easy installation



facebook.com/corsair



@CorsairMemory

Complete Digital Control.

DIGITALLY CONTROLLED POWER

The revolutionary new AX1200i is the first desktop PC power supply to combine DSP control with Corsair Link[™] to bring you an unprecedented level of monitoring and control. The digital signal processor in the AX1200i adjusts on-the-fly for incredibly tight voltage regulation for clean, stable power and efficiency that's 80 Plus Platinum certified. It's so efficient that the fan isn't even used at lower power loads.

CORSAIR LINK

Combine the AX1200i with Corsair Link for real-time monitoring of temperature, efficiency, and power use. Using the Corsair Link Dashboard, you can even set your own over-current protection points and fan profiles. There's simply no other power supply like it.

The Corsair AX1200i Digital ATX Power Supply. Designed for you.

Learn lots more at: corsair.com/ax1200i

CHECK OUT THESE OTHER CORSAIR PRODUCTS DESIGNED TO MAKE YOUR PC THE BEST PC



CASES



MEMORY



SOLID-STATE DRIVES



USB FLASH



COOLING

BUILD IT

NATHAN EDWARDS **SENIOR EDITOR**

(CrossFire)X Marks the Spot

X79. CrossFireX. XMP. This month I'm going to build a gaming rig that tears our benchmarks a new one. Or several new ones

LENGTH OF TIME: **2 HOURS**LEVEL OF DIFFICULTY: **INTERMEDIATE**

THE MISSION My first X79 build, back in January 2012, was pretty modest. Well, as modest as a PC with a 1,000-dollar processor can be. It performed well in CPU-intensive benchmarks, but it had only a single GTX 580, so it did about a third as well as top-tier systems in graphics tests.

Back when I built that PC, the Core i7-3960X was the only Sandy Bridge-E CPU available to us, and the GTX 580 was the fastest single-GPU card on the market. Well, this time I'm going to build a Sandy Bridge-E system with the new quad-core Core i7-3820 and the new fastest single-GPU videocard on the market: AMD's Radeon HD 7970.

Wait, just kidding. I'm not going to use a 7970. I'm going to use three of 'em!

INGREDIENTS

PART/URL	PRICE
Case NZXT Switch 810 www.nzxt.com	\$170
PSU Silverstone Strider Gold 1200W www.silverstonetek.com	\$270
Mobo Gigabyte X79-UD5 www.gigabyte.com	\$325
CPU Intel Core i7-3820 www.intel.com	\$285
Cooler Noctua NH-D14 SE2011 www.noctua.at	\$90
GPU 3x AMD Radeon HD 7970 www.amd.com	\$1,650
RAM 16GB G.Skill Ripjaws DDR3/2133 www.gskill.com	\$160
Optical Drive Samsung SH-222AB CD/DVD burner www.samsung.com	\$20
SSD Samsung 830 Series 256 GB www.samsung.com	\$360
Hard Drive 3GB Seagate Momentus www.seagate.com	\$230
OS Windows 7 Professional 64-bit (OEM) www.microsoft.com	\$139
Extra Fan Xigmatek XAF-F1452 14cm www.xigmatek.com	\$24
TOTAL	\$3,723



TRIPLE YOUR VIDEO POWER, TRIPLE YOUR FUN

SINCE I KNOW I want to use three Radeon HD 7970s in CrossFireX configuration, I'll need an X79 motherboard that supports CrossFireX. Gigabyte's X79-UD5 has three x16 PCIe 3.0 slots, as well as a nifty backup BIOS that (spoiler alert) totally saves my butt later. It also supports the DDR3/2133 XMP profile of my G.Skill Ripjaws Z RAM.

The Core i7-3820 isn't an unlocked part, but I can still get an easy Turbo Boost overclock to 4GHz with it, and it has to share a chassis with three Radeon HD 7970s, which put out a lot of heat. So I'm using Noctua's NH-D14 SE2011, my favorite air cooler from this month's roundup (page 50).

All these beefy components need room, air, and power.

For the first two needs I'm going with NZXT's Switch 810 chassis, which is reviewed in this issue (page 84). It's big, roomy, good-looking, and has plenty of fan support. I especially like the pivoting drive-bay fan mounts that can aim cool air directly at the videocards, and I'm going to add a fan to the lower one.

I'm also going to need a powerful PSU with enough juice for my rig; Silverstone's Strider Gold 1,200W is fully modular and can support all three GPUs and my slightly overclocked proc, too.

A speedy 256GB Samsung 830 Series SSD makes for a good Windows drive, and a 3TB Seagate Barracuda will sit in the Switch 810's hot-swap bay.

HARDWARE HIGHLIGHTS

ASIDE FROM a few details, this is a pretty standard build, so I'll skip the complete step-by-step and just call out a few interesting steps on the way. For the most part, you'll be fine following the case and motherboard instructions.

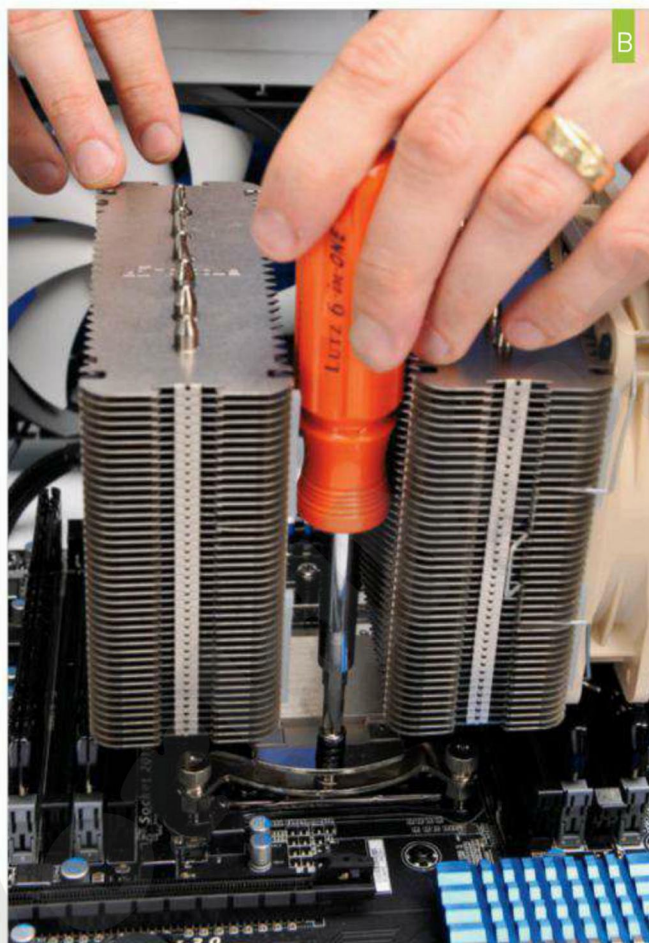
1

INSTALLING THE COOLER

THANKS TO THE INTEGRATED backplate on the LGA2011 socket, it's not necessary to preinstall the CPU cooler before you install the motherboard. I put the CPU and RAM in my board and installed it in my case before I put in the cooler. One word of caution: If you're not using the RAM I used, make sure the heat spreaders aren't too tall; the Noctua NH-D14 cooler overhangs some of the RAM slots and can conflict with oversize RAM heat spreaders.

To install the NH-D14, first mount the four double-ended thumbscrews into the screws on the socket, then install the crossbeams and secure them with the included nuts (**image A**).

Once the mounting bracket is in place, apply a dot of thermal paste the size of a small pea to the center of the CPU. Remove the cooler's center fan and place the cooler on the heatsink such that the spring screws line up with the posts on the crossbar. Tighten the spring screws, alternating screws each few rotations until the screws stop turning (**image B**). Reattach the fan, making sure it's pointing the same direction as the front fan, plug both fans into the Y-cable, and plug that into the CPU_FAN header.



2

ADDING A FAN

THE SWITCH 810 HAS a decent array of stock fans, but I have three GPUs super-heating the air, and I want to make sure they're adequately ventilated. I really like the pivoting fan mounts on the backs of the two hard drive cages, but only the top one has a fan preinstalled, so I'm going to add one to the bottom cage, as well.

Remove the thumbscrews at the top and bottom of the drive cage and pull it out of the chassis. Use fan screws to install the fan into the mount—only the top two mounting holes will be used (**image C**). Adjust the fan so that it's pointing up where the GPUs will be and reinstall the cage into the case. Run the fan cable behind the motherboard tray and plug it into the fan connector there (**image D**).



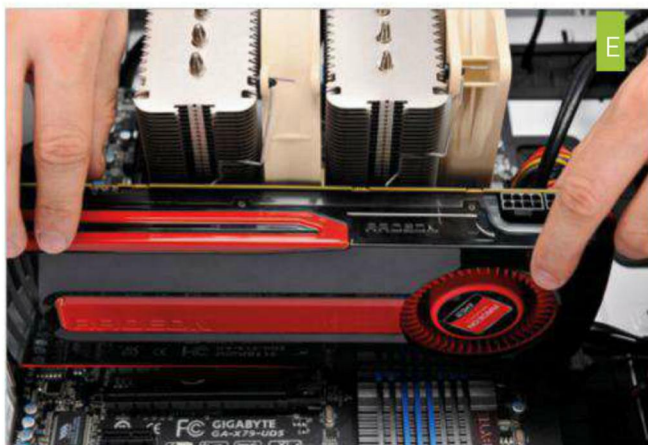
3

INSTALLING ALL THE GPUS

BECAUSE THEY TAKE up so much room in the case, I installed the GPUs last—after I installed the DVD burner, hard drive, and SSD; after I mounted the PSU and connected all the power cables; even after I connected the case's front panel connectors.

Install the first GPU into the topmost x16 PCIe slot (**image E**), then the other two in order. You should have three PCIe power cables from the PSU, with an 8-pin and a 6-pin power connector on each. Connect one cable per videocard, making sure to power both the 8- and 6-pin connectors on each card.

Use one CrossFire bridge to connect the first and second videocards, and another to connect the second and third, as shown (**image F**).





1. Noctua's NH-14 cooler may be huge, but it's effective.

2. The NZXT Switch 810's motherboard tray features plenty of cable-mounting cutouts.

3. Silverstone's Strider Gold 1,200W PSU is fully modular, so there's no excess cabling interrupting airflow.

4. These pivoting drive-cage fans are key for getting maximum airflow directly to the GPUs.

JOINING THE ONE PERCENT

ONCE THE MACHINE was built and the wiring tidied up a bit, I fired it up and installed Windows and all the drivers, then I updated the BIOS to the latest version and did a bit of overclocking. Well, my first attempt at updating the BIOS corrupted it. Fortunately the Gigabyte board automatically restored the BIOS from its backup, and I was able to successfully update that. A simple multiplier overclock brought the proc to 4GHz—not very ambitious, but very safe. I also made sure my RAM was set to its XMP profile timing of DDR3/2133. These efforts gave me modest improvements over the stock-clocked state in the CPU- and memory-bound benchmarks.

So how does my CrossFireX rig stack up? Against our aged zero-point it's a slaughter: anywhere from 15 to 32 percent faster in CPU-bound benchmarks, and a whopping 238 percent improvement in STALKER: Call

of Pripyat and 92 percent in Far Cry 2. So to make things interesting, I also tested the rig against our 2011 Dream Machine.

In CPU tests, the Dream Machine clearly has the edge—namely, a 20 percent clock advantage. With its unlocked 2600K overclocked to 4.8GHz, it crushed the i7-3820 in this month's rig, which was a whopping 23 percent slower than its older rival in MainConcept Reference and 12 percent slower in Vegas Pro 9.

In graphics-bound tests, though, the Dream Machine is dethroned. The triple Radeon HD 7970s proved their mettle against even Superclocked GTX 580s, with 13 percent gains in Stalker and 24 percent in Far Cry 2. The triple 7970s are so powerful, actually, that they edge out the dual overclocked GTX 590s found in the CyberPower Fang III reviewed in this issue (page 76). That's triple CrossFireX beating quad SLI!

As if that weren't impressive enough, this rig puts out the second-highest 3DMark 11 Extreme score of any machine we've tested, at X7,619. That's just a tiny bit below the X7,785 set by the Maingear rig we tested in February 2012. And Unigine Heaven 2.5? Try 75.4fps with all settings maxed out. That's 5fps more than the dual Asus Mars II cards (quad GTX 580s) in the Maingear. For reference, the mighty Dream Machine's three 580 cards came in at X5,863 in 3DMark and 43.4 fps in Heaven.

True, the rig I've built lacks water-cooling, a Blu-ray drive, or scads of storage. It's also got a CPU with a modest overclock. But thanks to the extraordinary performance of its three Radeon HD 7970s, it's a hell of a lot of rig for under \$3,400.

BENCHMARKS

	DM 2011		
Vegas Pro (sec)	2,191	2,502 (-12%)	
Lightroom 2.6 (sec)	233	270 (-14%)	
ProShow 4 (sec)	801	963 (-17%)	
MainConcept 1.6 (sec)	1,394	1,819 (-23%)	
STALKER: CoP (fps)	125.9	142.0	
Far Cry 2 (fps)	177.5	219.5	
	0%	10%	20% 30% 40% 50% 60% 70% 80% 90% 100%

All gaming benchmarks run at 2560x1600 resolution. Our 2011 Dream Machine consists of an Intel Core i7-2600K CPU @ 4.8GHz on a Gigabyte GA-Z68X-UD7-B3 motherboard with 16GB Corsair DDR3 and a Corsair H100 liquid-cooling system. It has three EVGA GTX 580 Superclocked GPUs and runs Win 7 Ultimate 64-bit on a pair of 240GB OCZ Vertex 3 SSDs in RAID 0.

BUILD IT

NATHAN EDWARDS **SENIOR EDITOR**

Building a Beast: Sandy Bridge-E

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

LENGTH OF TIME: **2 HOURS**LEVEL OF DIFFICULTY: **INTERMEDIATE**

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

So I'm going to build a raging game machine using the Sandy Bridge-E flagship CPU: the Core i7-3960X, a \$1,000, six-core beast running at 3.3GHz. Along with a great motherboard and cooler, I've rustled up a passel of RAM, a titanic GPU, a quiet case, and a speedy SSD. I'm going to see whether X79 has what it takes to wrest the enthusiast crown from X58, and whether it can do so quietly.



INGREDIENTS

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

BUILDING FROM THE CPU OUT

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

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

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

ASSEMBLING THE HARDWARE

1

PREP THE BOARD

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

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

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



2

PREP THE CASE

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

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



INSTALL THE CPU COOLER

3

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

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



4

INSTALL DRIVES

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

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

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



5

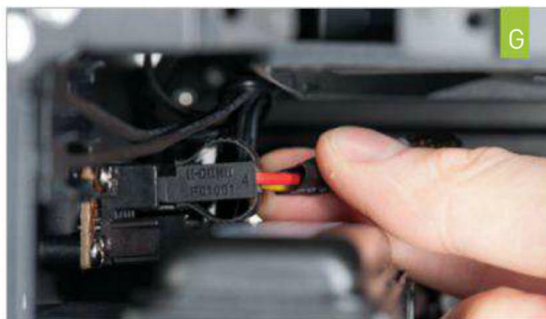
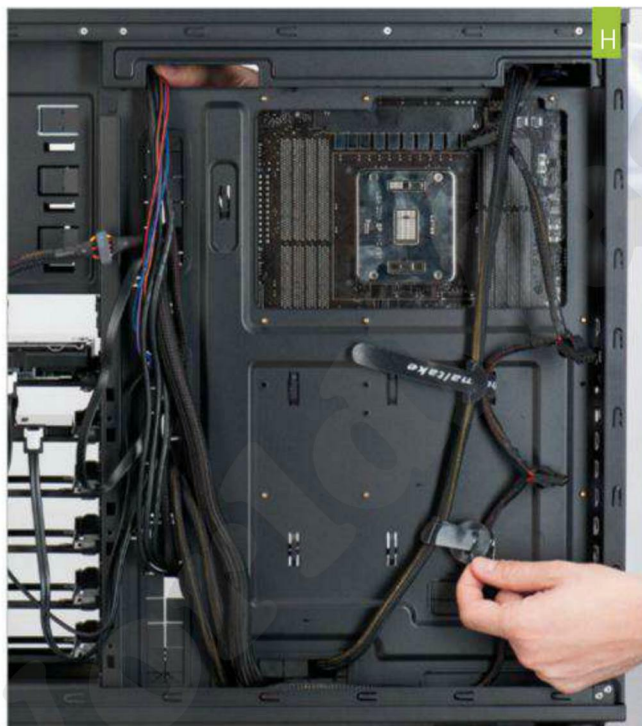
INSTALL PSU, ROUTE WIRES

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

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

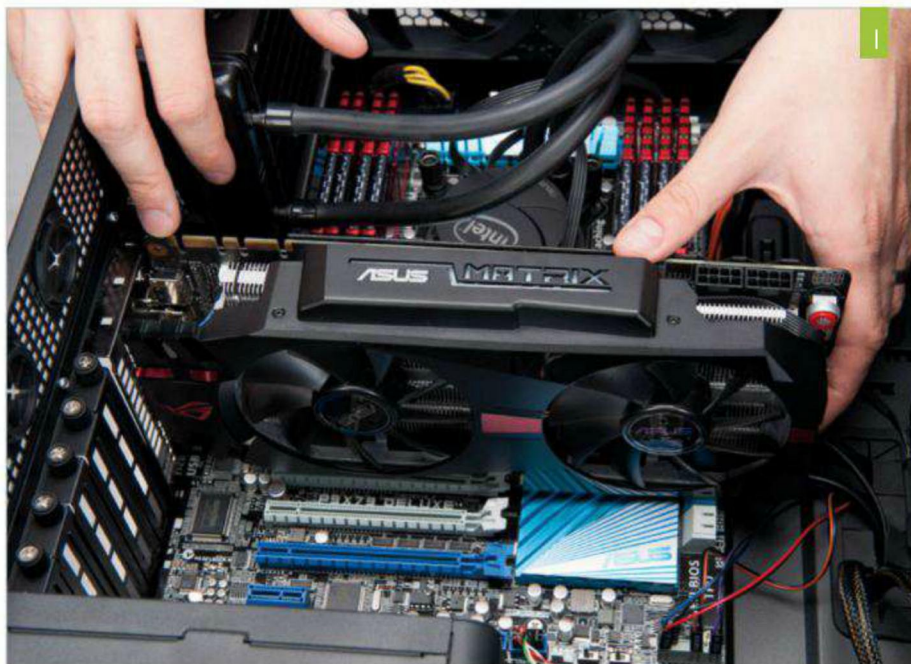
Don't forget to attach two 8-pin PCIe power cables (the ones with the red connectors) to your PSU and run them up to where the videocard will be. When completed, the right side of my case looked like **image H**.

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



INSTALL THE VIDEOCARD

FROM AN installation perspective, the only unusual aspect of the Asus Matrix GTX 580 we're using is its tremendous size—it uses three expansion slots instead of the usual two. Install it in the case's second through fourth expansion slots, which correspond to the top PCIe x16 slot on the motherboard (**image 11**). Attach the two 8-pin power connectors. Double-check to make sure everything is connected and powered, and you're all set!



IT'S A QUIET RIOT, ALL RIGHT

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

In CPU- and RAM-dependent tests, my X79 also trounced Dream Machine 2011's overclocked 2600K, though the single GTX 580 in my rig, overclocked as it was, couldn't match the three GTX 580s in the Dream Machine, producing just 51.6fps in our Stalker benchmark to the Dream Machine's 125.9fps. It fared a bit better in our Far Cry 2

benchmark, at 124.5fps, but the tri-SLI Dream Machine pushed over 203fps to our 2650x1600 panel. Still, with a few more GPUs, the Sandy Bridge-E machine would trounce our Dream Machine.

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

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

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

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

BENCHMARKS

	ZERO POINT																		
Vegas Pro (sec)	3,049	1,905																	
Lightroom 2.6 (sec)	356	245																	
ProShow 4 (sec)	1,112	795																	
MainConcept 1.6 (sec)	2,113	1,379																	
STALKER: CoP (fps)	42.0	51.6																	
Far Cry 2 (fps)	114.4	124.5																	
			0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%						

Our current desktop test bed consists of a quad-core 2.66GHz Core i7-920 overclocked to 3.5GHz, 6GB of Corsair DDR3/1333 overclocked to 1750MHz, on a Gigabyte X58 motherboard. We are running an ATI Radeon HD 5970 graphics card, a 160GB Intel X25-M SSD, and 64-bit Windows 7 Ultimate.



1

2

3

4

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

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

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

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

BUILD IT

NATHAN EDWARDS **SENIOR EDITOR**

Rumbling into Bulldozerland

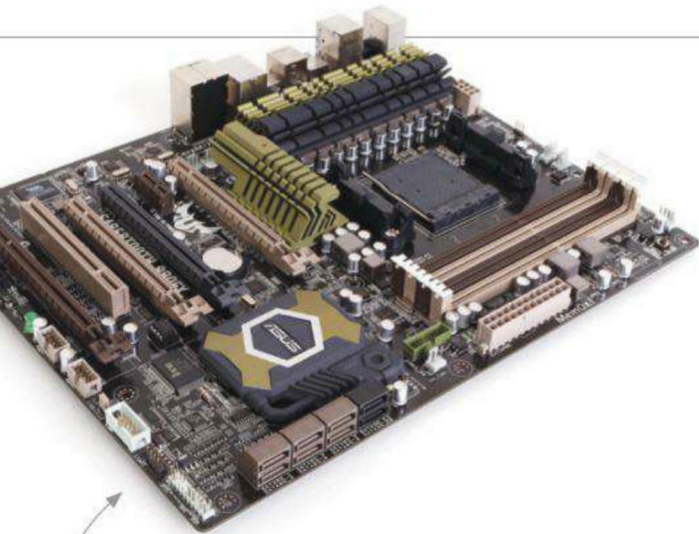
Can AMD's eight-core CPU be the centerpiece of a kick-ass rig?

LENGTH OF TIME: **3 HOURS**LEVEL OF DIFFICULTY: **INTERMEDIATE**

THE MISSION When AMD's Bulldozer architecture finally hit retail, deputy editor Gordon Mah Ung put the highest-performing chip, the FX-8150, through the wringer. His conclusion: It's a decent competitor to Intel's i5-2500K, but it's no match for the (much more expensive) Sandy Bridge-E or 2600K parts. And that's OK; there are plenty of reasons to want a solid midrange performer. Maybe you really, really want to be able to say you have an eight-core processor. Maybe you're opposed to Intel for religious reasons. Or maybe you just want genuine PCIe x16 lanes without having to put out for the pricey X79 platform.

Whatever your reason, an FX-8150 can be a respectable foundation for a solid gaming rig, since modern gaming is still more about the GPU than the CPU. For this build, I took AMD's flagship processor and built a \$1,500 gaming rig around it. In the end, I realized that \$1,500 gets you a lot of PC these days.





BUILDING FROM THE CPU OUT

CENTRAL TO MY BUILD, of course, is AMD's top-tier Bulldozer part, the 3.6GHz FX-8150. It'll rest in Asus's Sabertooth 990FX motherboard, which has USB 3.0, six SATA 6Gb/s ports, and plenty of PCIe x16 lanes. The 990FX isn't markedly different from 890FX, except for one glaring change: Board vendors are now offering SLI "support" (read: unlock codes) in the BIOS. I was originally going to use Cooler Master's Hyper 212 Evo CPU cooler, but in the course of overclocking I decided to swap it out for AMD's Asetek-built Bulldozer FX liquid cooler, which bears a very strong resemblance to Antec's K hler 920 (also built by Asetek).

To keep things in the AMD house and at the \$1,500 price point, my graphics card of choice is the Radeon HD 6970. It's got enough juice to power any game on the market at reasonable settings, and at \$330 it fits well with my budget without being a budget card.

NZXT's just-launched Phantom 410 is a smaller version of the original Phantom, with a few more fans and USB 3.0 support. Corsair's TX750 v2 PSU is more than enough power for my overclocks and any extra graphics cards I want to add later.

The one wild card in my build is the hard drive. Thanks to the still-ongoing Thailand floods, the price of a 750GB 2.5-inch hybrid drive is (at press time) only a little more than a 1TB 3.5-inch drive. The 8GB of NAND cache on the Momentus XT gives a performance boost to my most frequently accessed sectors of the disk, so boot and oft-used programs will be faster.

INGREDIENTS

PART/URL	PRICE
Case NZXT Phantom 410 www.nzxt.com	\$99
PSU Corsair TX750 v2 www.corsair.com	\$105
Mobo Asus Sabertooth 990FX www.asus.com	\$189
CPU AMD FX-8150 www.amd.com	\$269
Cooler AMD Bulldozer Liquid Cooling Kit www.amd.com	\$100
GPU XFX Radeon HD 6970 www.xfxforce.com	\$330
RAM 38GB Patriot G2 DDR3/1600 www.patriot.com	\$49
Optical Drive Plextor PX-850SA DVD burner www.plextor.com	\$25
Hard Drive 750GB Seagate Momentus XT www.seagate.com	\$239
OS Windows 7 Professional 64-bit (OEM) www.microsoft.com	\$99
TOTAL	\$1,504

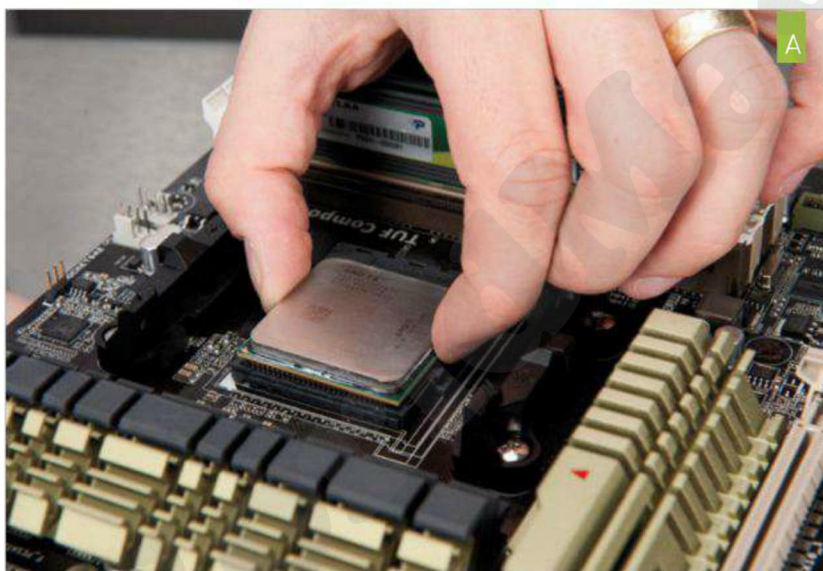


ASSEMBLING THE HARDWARE

1

PREP THE BOARD

TO INSTALL THE CPU, lift the socket arm and gently lower the CPU into place, making sure the triangle on the CPU's corner is aligned with the correct corner in the socket (**image A**). Lower the lever back into place. Install the RAM into the second and fourth slots (the tan ones).



2

PREP THE CASE AND INSTALL MOTHERBOARD

BEFORE WE START building into the case, it's time to move some fans. Remove the side, top, and front panels from the case, then remove the rear 12cm exhaust fan and top 14cm exhaust fan. This will involve unplugging them from their fan controller connectors behind the motherboard tray. Use the long screws provided to install the 12cm fan in the front of the case, directly above the existing intake fan (**image B**). Reconnect it to one of the fan control connectors behind the motherboard tray. Set aside the 14cm fan and its screws for now.

Install the motherboard standoffs in standard ATX configuration, put the motherboard I/O shield in place, then install the motherboard in the case (**image C**).



3

INSTALL THE CPU COOLER

IF YOU'RE getting flashbacks to last month, I don't blame you. AMD's Bulldozer-branded liquid-cooling system is built by Asetek, the same OEM that makes Intel's RST2011LC liquid cooler, and is, in fact, nearly identical to the Asetek-made Antec Kühler 920.

The instructions say to install the cooling fans as intakes, but we're going to use ours as exhaust. Attach one fan to the inside of the cooler, then attach the other through the exhaust fan mounts to the radiator (**image D**). Run the radiator fans' power cables behind the motherboard tray.

Assemble the cooler mounting bracket as shown in AMD's

instructions and clip it to the CPU heatsink (**image E**). Unscrew the four screws attaching AMD's cooling mount to the backplate and remove the plastic mounts. Mount the CPU cooler/pump unit to the AMD backplate, tightening the mounting screws in an X-shaped pattern (**image F**). Attach the 3-pin pump power cable to the CPU_FAN header and run the radiator fan Y-connector behind the motherboard tray to the radiator fan cables (**image G**). Run the USB 2.0 cable behind the motherboard tray to the bottom of the motherboard and connect it to a USB 2.0 header.

Install the GPU in to the topmost x16 PCIe slot.



4

INSTALL THE DRIVES

REMOVE THE TOP optical drive bezel and replace the case's front panel. Slide the optical drive into that bay and secure it with the toolless mechanism. Add thumbscrews if you'd like. Take a hard drive tray from the cage and remove the mounting posts from the sides. Install the Momentus XT using the 2.5-inch mounting holes on the bottom of the tray (**image H**). Replace in bay.



5

INSTALL THE PSU

INSTALL THE POWER supply into the case with the fan facing down. Bring the dual-4-pin ATX auxiliary power cable, 24-pin ATX power cable, and two 6-pin PCIe power cables through the cutout nearest the PSU to the back of the motherboard tray. Bring the auxiliary ATX power cable through the opening at the top of the motherboard tray and connect it (**image I**). Bring the 24-pin motherboard power cable through the top side cutout and connect it, then connect the 6-pin PCIe connectors to the GPU—one will require the use of the 2-pin connector, as well.



6

FINISH THE WIRING

REPLACE THE TOP 14cm fan, but flip it around so that it's used as an intake fan rather than exhaust. This will keep the motherboard voltage regulators under the radiator from overheating (**image J**).

Connect the fan power lead to one of the fan controller connectors behind the motherboard tray.

Connect the front-panel connector power and LED switches to the board, as well as the HD Audio, USB 2.0, and USB 3.0 connectors. Connect SATA power and data cables to the optical and hard drives, then connect 6Gb/s SATA cables from the drives to the lowest set of SATA ports on the motherboard.

Use zip ties to tie excess fan controller connectors and case wiring to the rear of the motherboard tray (**image K**). Bundle the unused power connectors here as well, if you can fit them.



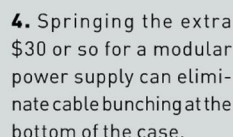
7

WRAP IT UP

AT THIS POINT you should connect your monitor, mouse, and keyboard and turn on the rig. Enter the BIOS's Advanced Mode, go to Boot, and deselect "Wait for F1 on Error." This will prevent the system from hanging up due to a perceived fan-speed error from the pump. Exit out of the BIOS, and install Windows and your drivers as normal, making sure to install the ChillControl software for the CPU cooler.

Once Windows is set up and working, it's time to tweak the CPU a little bit. Bulldozer parts seem to vary in their overclocking stability: After many overly ambitious overclocks, I got to 4.2GHz, mostly by upping the CPU multiplier, but I've seen overclocks of over 4.8GHz with the same CPU and motherboard, so your mileage may vary.

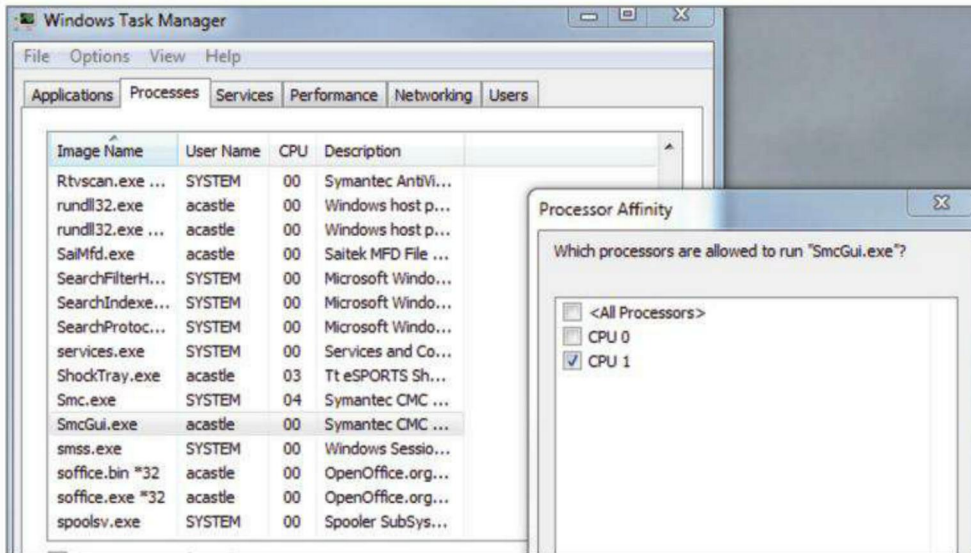




HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP



ALEX CASTLE
ONLINE MANAGING EDITOR

GET THE FEATURES OF WINDOWS 8 RIGHT NOW

WHILE I'M AS EXCITED AS THE next guy about the follow-up to Windows 7, not all of the new features look quite so... new. Here are three features of Windows 8 that you can have today:

Ambient Data: One of the coolest features of the new Metro UI is tiles that display constantly updated data. Windows has toyed with this before with desktop widgets; but if you want real power, you'll have to check out a third-party solution like Samurize (www.samurize.com).
Cloud Sync: Microsoft is fully embracing cloud sync in Windows 8, but there's no reason you shouldn't already be using cloud-sync services like Dropbox (www.dropbox.com) or SugarSync (www.sugarsync.com).

New, Ugly Windows Explorer: Just kidding—they can keep that one.

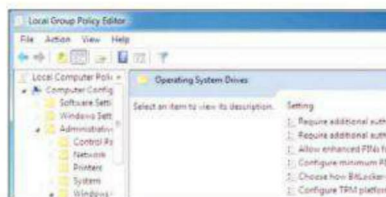
MICROMANAGE YOUR PROCESSES

IS YOUR MASSIVELY MULTICORE PROCESSOR CAUSING PROBLEMS WITH LEGACY APPLICATIONS? YOU CAN RELEGATE A PROCESS TO A SINGLE CPU CORE BY OPENING THE TASK MANAGER, RIGHT-CLICKING A PARTICULAR PROCESS, AND SELECTING SET AFFINITY.

MAKE - USE - CREATE



58
CREATE A FLEXIBLE WEBSITE FOR FREE WITH DRUPAL GARDENS



60
PROTECT YOUR BOOT DRIVE WITH BITLOCKER

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

CREATE A FLEXIBLE WEBSITE WITH DRUPAL GARDENS

—Seamus Bellamy

“WITH DRUPAL GARDENS, THERE'S NO NEED TO WORRY ABOUT PAYING SCADS TO A TALENTED WEB DESIGNER

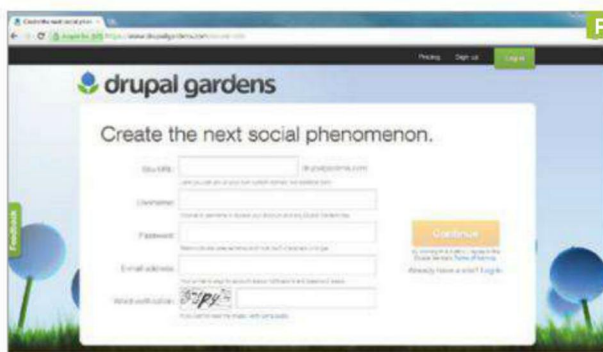
IN A WORLD WHERE most of us have turned to expressing ourselves in snippets through the use of services like Twitter, Facebook, and Google+, there's still a place in this world for websites. After all, 140 characters might be enough to push out a message concerning how much you drank last night and where you think you left your pants, but unless you're a MAG Poetry Prize winner, you might have some difficulty expressing the emotions you felt in seeing the Grand Canyon for the first time on your summer vacation. And it goes without saying that for businesses, in particular, having a website to showcase or offer support for your products is a no-brainer.

These days, folks looking to build their own site are spoiled for choice. For those who just want to throw their pictures and videos up online without worrying about anything more than what template to use and an occasional bit of spellchecking, Tumblr, Blogger, and Windows Live Spaces are all great ways to go. If you demand more control over your site's look and functionality, you can rely on open-source content management systems like Joomla, Drupal, or WordPress. Unfortunately, to get the most out of these, users often need to be prepared to fulfill the role of not only content creator but also backend site administrator, dealing with frustrations such as choosing a reputable ISP, setting up your home computer to act as a server, deciding whether or not to download new versions of the program, and dealing with PHP databases.

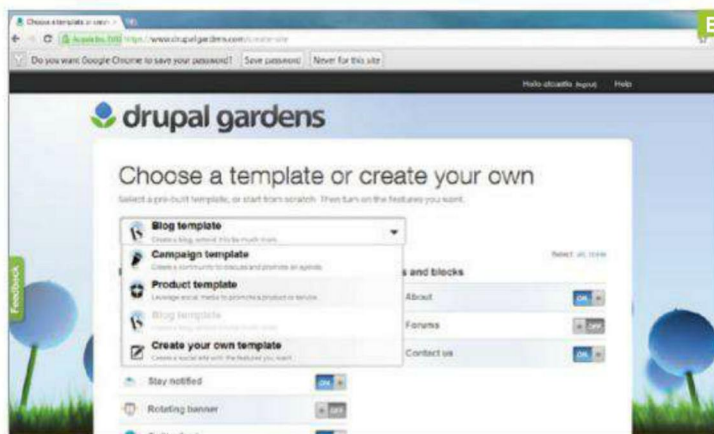
Isn't there a happy middle ground?

There is. Drupal Gardens takes the power and flexibility of the open source Drupal 7 content management system and combines it with turnkey-style site management, allowing users to go from nil to an up-and-running site in well under an hour. With Drupal Gardens, there's no need for worrying about backend administration, working with frustrating FTP uploads, or paying scads to a talented web developer for his years of dedicated technical education. Simply sign up for an account, set up your site, and get posting. How do you get started? Glad you asked.

1 SIGN UP First, visit the Drupal Gardens website (www.drupalgardens.com) and click Create a Free Site. You'll be taken to a sign-up page that asks for a site URL (**image A**). As Drupal Gardens is a relatively new service, chances are you won't have too much difficulty snagging a domain name that works for you. Once you've settled on your credentials, click the Continue button.



2 CHOOSE YOUR WEAPON While a blog might be great for keeping a concise online record of your cat's busy life, it doesn't do much if you're trying to promote a product or service. Fortunately, Drupal Gardens accounts for this by offering a number of stylistic alternatives, including a template optimized for promoting a product or service and another designed to help groups discuss or push their agenda forward (**image B**). If none of Drupal Garden's basic templates do it for you, there's also the option to create a template to meet your particular needs. Must-have features like a rotating banner, an area for your Twitter feed, and feedback and contact forms can all be turned on or off with push-button simplicity. When you're satisfied with the type of site and feature set you've selected, click Continue.



3 RETICULATING SPINES At this point, as you will see by the progress bar you're presented with, your Drupal Gardens site is well on its way to being set up. Check your inbox: Acquia will have sent you an email when your site is ready to go. When

it shows up, click the link to complete the setup process. You have seven days to click the link before your Drupal Gardens site and account are both deleted. Now, let's move on. This is where things get interesting.

4 WELCOME HOME While it might not be much to look at yet, your new Drupal Gardens digs are set up and ready to be tweaked (**image C**). Where services like Tumblr leave you to your own devices, Acquia has been good enough to provide a few sample posts and other filler content to all new Drupal Gardens sites in order to give users a feel for the template they've chosen. Had enough of a feel? Good—time to make it your own.



5 MASTER YOUR DOMAIN Drupal Gardens, like Drupal 7, can be controlled and manipulated via the administration toolbar at the top of your browser. Only users who have signed into the service can see or interact with the administration toolbar—it's not visible to anyone else. Here's the lowdown on its various functions.

- » **Dashboard:** Clicking this link provides you with an overview of the latest updates to your Drupal Gardens site.
- » **Contents:** Shows a list of your entire site's content, as well as who posted it. Here, an administrator can create, publish, unpublish, edit, or delete any of the site's posts.
- » **Structure:** Essentially, the structure link lets you decide what appears on your site and where it shows up. From here, you can configure your Drupal Gardens site's data structure, content types, menus, and taxonomy. This is also where you can create simple content lists.
- » **Appearance:** With the options available via the Appearance link, you can pimp out your site to your heart's content, changing the site's layout, color palette, logo, font customization, page borders, themes, and more (**image D**). For the skilled (or adventurous), there's also an option to putter about with Cascading Style Sheets.
- » **People:** From here, you can invite new people to your site under a wide variety of permissions levels. If anyone gets out of line, the People overlay also provides the ability to block or delete users.
- » **Modules:** With Drupal, Modules make the magic happen. Nothing on your site happens without them. The Modules link makes it a cinch to enable or disable modules, adding or taking away func-

tionality with just a few mouse clicks. While some of the modules must be enabled at all times, Drupal Gardens provides you with a wide variety of additional modules to help you customize your site's look and feel.

» **Configuration:** As the link's name suggests, from here users are able to configure a wide variety of their site's functions, including account settings, content authoring defaults, how media such as photos, audio, and video are presented, language settings, and a number of administrative functions.

» **Reports:** With this link, you can check on your site's stats, recent log messages, and other important site information. For individuals looking to leverage their website for sales, media relations, or product information, these metrics are vital.



6 UPGRADE While Drupal Gardens' free offerings will sate the website-building appetite of most users, Acquia also offers a number of tiers of additional service that allow for a variety of finishing touches, like additional storage, one-on-one technical support, additional responses for any of your site's web forms, and the use of a custom domain name (**image E**).

Now that your site is up and running, don't be afraid to tinker! Drupal's reputation as a flexible, durable CMS is well earned, thanks to the hard work of countless developers volunteering their time over the years. The chances of you breaking anything are pretty minimal. If you do find a way to flummox the works, don't fret: The helpful folks in the Drupal Gardens forums are standing by to help you unbugger just about anything you accidentally bugger up.



PROTECT YOUR BOOT DRIVE WITH BITLOCKER

—Alex Castle

When it comes to protecting the data on your computer, you can't do better than strong encryption. Properly encrypted, your files are safe even if a ne'er-do-well gains access to your computer, either physically or through a network. In the past, we've discussed how

to use various encryption tools to encrypt individual files or create virtual, encrypted drives. Now, we'll look at how to get maximum security by encrypting your boot disk using the BitLocker full-drive encryption system that's built into Windows 7 Ultimate and Enterprise.

1 ASSESS YOUR SYSTEM Ideally, you have a motherboard with a Trusted Platform Module (TPM) chip. A TPM chip securely stores cryptographic keys, which BitLocker uses to access your boot drive before Windows even loads. The TPM also detects any early boot files that have been modified, protecting you from rootkits and other low-level malware. You can check with your motherboard manufacturer to see if you have a TPM, or you can just attempt to go straight to Step 3. If you don't see a message that looks like **image F**, you're good to go. Otherwise, you don't have a TPM and you'll need to continue to Step 2.

You'll also need an additional, small partition on any boot drive you wish to encrypt in order to use BitLocker. Windows creates this extra partition by default during installation, but even if you don't have one, the BitLocker software can create it for you.

F A compatible Trusted Platform Module (TPM) Security Device must be present on this computer, but a TPM was not found. Please contact your system administrator to enable BitLocker.

[What are BitLocker's system requirements?](#)

2 ENABLE USB KEY STORAGE By default, BitLocker requires a TPM chip to work. To change this, open the group policy editor by bringing up the Run menu (press Win + R) and then typing gpedit.msc.

Navigate through the hierarchy on the left side of the group policy editor, selecting the following folders, in order: Computer Configuration > Administrative Templates > Windows Components > BitLocker Drive Encryption > Operating System Drives (**image G**). Once you've found the right folder, double-click "Require additional authentication at startup" to edit that policy entry.

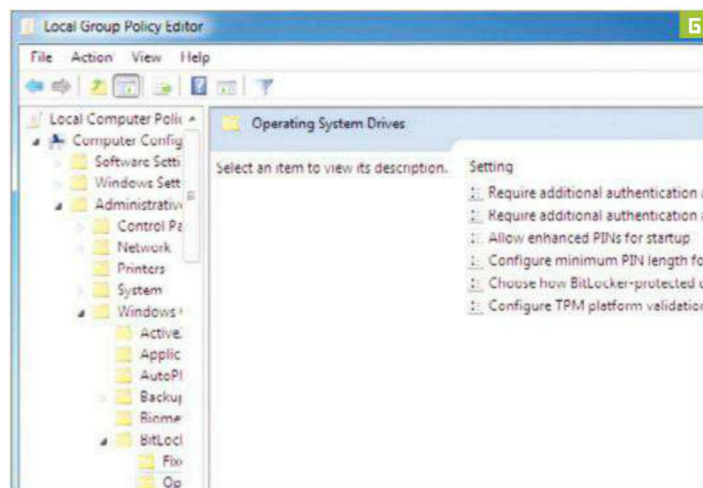
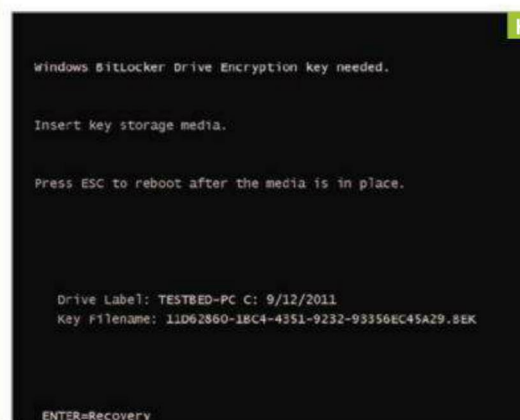
In the policy editor, all you need to do is click the radio button marked Enabled. In the bottom-left, a checkbox labeled "Allow BitLocker without a compatible TPM" should already be checked. If it isn't, check it. Click OK and exit the group policy editor.

3 ENABLE BITLOCKER The actual process of enabling BitLocker is straightforward: You can right-click a drive in Explorer and click Turn On BitLocker, or you can go to the BitLocker section of the control panel and enable it on any drive from there.

As long as you've followed the previous two steps, you should see a screen asking you for your BitLocker startup preferences. If you have a TPM, you have three options. If you select "Use BitLocker without additional keys" your startup process will be basically unchanged. Someone with access to your computer will be able to get at your data, but you'll be protected from rootkits and from people accessing your data remotely. Alternatively, you can choose to enter a PIN every time you log in.

If you're using the USB method, you only have access to the last option, "Require a Startup key at every startup." With this method, you'll only be able to boot your computer while you have a USB drive with a startup key inserted in the machine.

Once you select an option, you'll be asked to insert a USB drive to use as the key, and you'll choose where to store your recovery key, which you'll need if you want to decrypt your data on a different computer, or if the TPM detects a problem. It will take some time for BitLocker to encrypt your drive, but once it's finished, your data is safe. Anyone attempting to boot from your drive without the proper key won't even get to the Windows boot screen (**image H**).

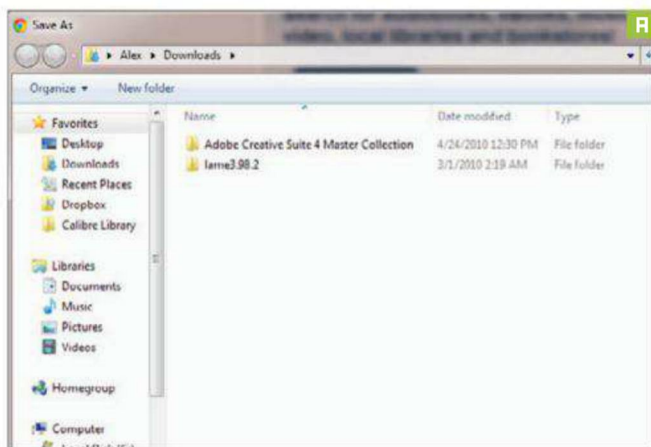
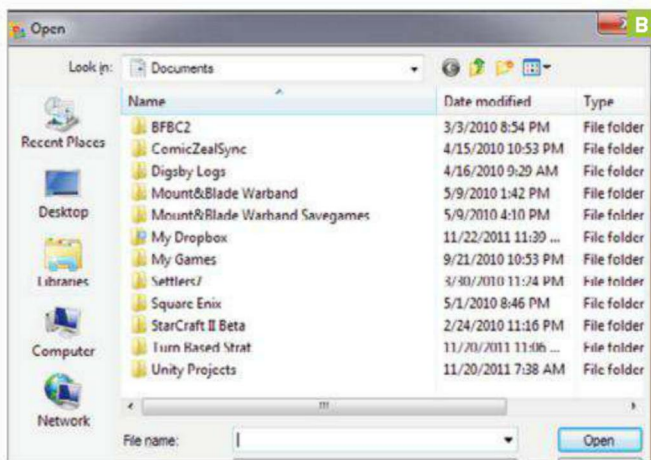


Customize the Windows 7 File Browser Menu

—Alex Castle

IN WINDOWS 7, browsing for files from within a program can be a bit confusing. Why? Because for some reason, there are two separate menus for exactly that function, and they behave differently.

The first sort of menu looks more or less like Explorer.exe (**image A**). It's got a folder view in the main part of the window, and a navigation pane on the left side that makes it quick to get where you want to go. If you frequently save to or load from a particular location, you can make sure it's always at hand by dragging that location into your Favorites bar. This is the good window.



1 DOWNLOAD PLACESBAR EDITOR

PlacesBar Editor is available for free at bit.ly/lqKxW. Simply follow the link to download the app, unzip it, and install it. Once it's installed, go ahead and run the program. The main interface is strangely complicated—despite an unnecessarily large assortment of buttons and icons on the top of the window, there's actually really only one thing we care about: the fields in the Windows tab.

The second menu is a holdover from pre-Windows 7 days—it's the plain-old Open menu, with a small browser and a wimpy selection of predefined, uncustomizable shortcut icons on the left (**image B**). It is, unfortunately, still more common in programs (including Adobe's Creative Suite) than the superior, newer menu.

Fortunately, you actually *can* customize the second type of file browser—it just takes some work. There's a way to do it in the system registry, but it's complicated and not necessary. Instead we'll use a free app called PlacesBar Editor.

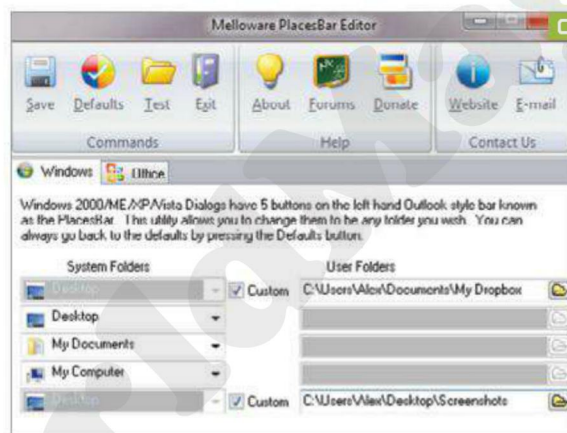
2 CUSTOMIZE YOUR WINDOWS PLACES BAR

The Windows tab lets you directly customize the line-up of five icons that appear in your places bar (**image C**). For each of the five places, you can click the drop-down box on the right to select any system folder on your computer, such as My Documents, the Desktop, or My Computer. Most of these locations are already in the places bar, so you'll more likely use the field to the right (which you can enable by clicking the Custom checkbox).

Here, you can add any non-system folder by simply entering its complete path in the text field, or clicking the folder icon and browsing for it. You can use any folder on your system, or any network location. We particularly like being able to add our Dropbox folder to our places list, as well as our working folder for screenshots.

Once you've made your changes, you'll have to click the Save button at the top in order to have them take effect. At that point, you can click the Test button to open a sample file browser and make sure everything is in order.

Note that when you click Save, all places bar icons are changed to the ones specified. In other words, you can't just use PlacesBar Editor to change a single location and keep the rest the same—you'll have to define a full set of five (or less) that you want to use. If, for whatever reason, you don't care for your new layout, you can click the Default button to get the old locations back.



Borrow E-books for Your Kindle or Kindle App

—Alex Castle

THESE DAYS, THERE are any number of ways to do your reading that don't involve anything quite so passé as paper and ink. There's plenty of dedicated reading hardware and software, but nothing as robust as Amazon's Kindle offerings. Between the Kindle, the Kindle Touch, the Kindle Fire, and the free Kindle apps for Android, iOS, and Windows, you can read your Kindle books virtually anywhere.

But still, there are certain advantages to paper books. Your

Kindle doesn't have that new-book smell, or the satisfying heft of a good hardcover. Also, no digital reader can match the convenience and value of borrowing books for free from a public library—or can it?

Amazon has recently scored another point for e-books—you can now borrow books from your local public library from home and have them sent directly to your Kindle app or device, all for free. It's a fairly simple process—just follow these steps.

1 FIND AN OVERDRIVE LIBRARY

First, you'll need to find a library near you that supports the Kindle public library lending program. Currently, this is limited to libraries that use the OverDrive system for online book checkouts. Fortunately, the majority of libraries do use OverDrive, so you shouldn't have a hard time finding a qualifying library near you. To search all OverDrive libraries, go to search.overdrive.com and click Library Search.

» Like real books, the library only has a certain number of digital copies of each book available to lend out. If other Kindle users have already borrowed all the copies of a book you want to read, you'll have to add yourself to the queue for that book. To find a book you can borrow right now, check the box labelled "Only show titles with copies available."

2 GET A LIBRARY CARD

The whole library metaphor (and the legal ground that Amazon is standing on) would crumble if anyone in the world could borrow books from any library. That means that while you can borrow a book from the comfort of your own home, you'll have to have a library card to do so.

» Hopefully you already have a library card, but if you don't, you might be in for an outing. Most local libraries offer free borrowing privileges, but require proof of address, which must be shown in person. So get out that ID, haul yourself down to your local branch, and get yourself a card.

3 FIND A BOOK

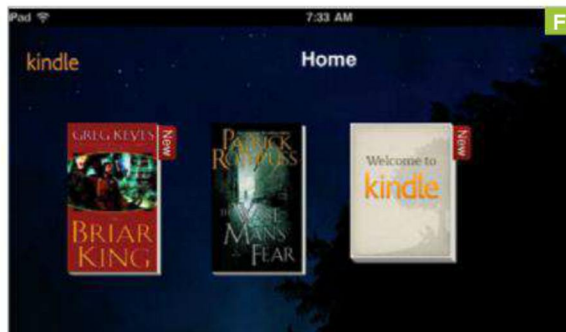
Now, you simply need to find a book to rent. Go to the OverDrive digital lending site for your library that you found in step one, and find the Advanced Search button. Then, click the Format drop-down and select Kindle Book ([image D](#)).



4 DOWNLOAD THE BOOK TO KINDLE

Once you've found a book (or books—most libraries are pretty generous with the number of e-books you can have checked out at once) that you want to read, click the Add to Cart button underneath the Kindle icon, then click Checkout. When you finish the Library side of the checkout procedure, you'll be directed to Amazon.com, where you can enter your username and password, and select which of your Kindle devices you want the book sent to ([image E](#)).

» The next time you open your Kindle device or app, you should be able to find the borrowed e-book in the Archived Items section. Now you can download the book to your device ([image F](#)) and start reading right away. Unlike library books, you can't keep these past their due date—if you've borrowed a popular book, make sure to read it before the expiration date, or you'll have to go to the back of the line before you can check it out again.



Sideload Android Apps

—Markkus Rovito

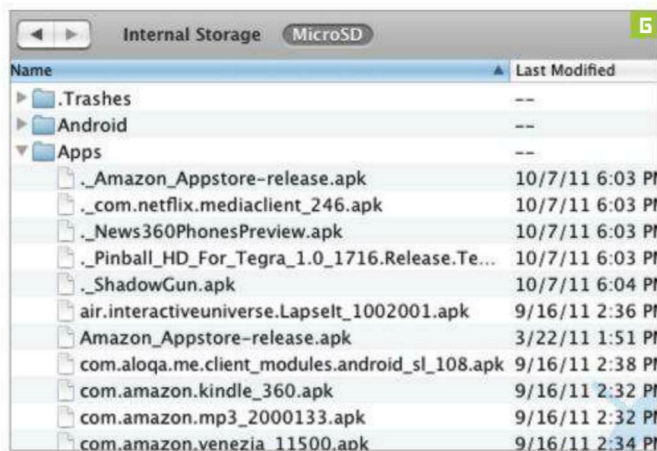
YOU'VE FOUND that hot new app on the Android Market, and you can't wait to click the Install button. But you're getting the message that the app isn't compatible with your device. Being the good Maximum user that you are, you'd rather find out for yourself. Those messages are sometimes wrong, after all. Or

perhaps you want to take advantage of the daily giveaways in the Amazon Appstore. Or, if you're one of the millions of Kindle Fire owners, you may want more choices than the limited Amazon Appstore provides. All of the above comprise sufficient reason to start sideloading apps to your Android device.

1 GET SOME APPS TO SIDeload

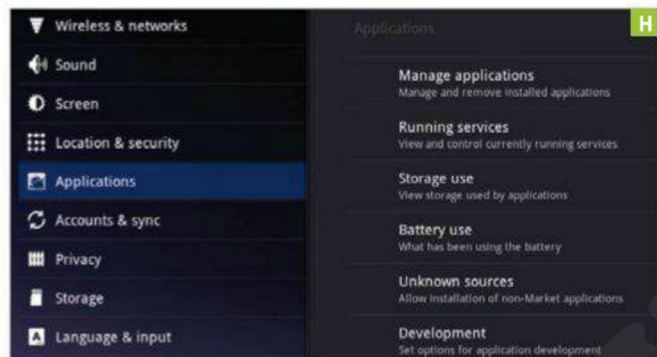
The reason you sideload apps in the first place is because you're sourcing them from a place other than the sanctioned method, which is usually the Android Market or some device-specific boutique app store. Android Apps come in the form of .apk files. You can procure such files from a prior device backup, straight from a developer's website, and of course from... the Internet (you know the deal).

» Next, transfer those .apk files from your PC to your Android however you like: on a microSD card (**image G**), through a cloud service such as Dropbox, via a USB transfer, etc. Just remember what directory those files end up in, so you don't have to root through too many folders looking for them later.



2 TWEAK APPLICATIONS SETTINGS

The default setting in Android is to not allow the installation of non-Market applications. Fie on that! Go to your Android device's Settings, and under Applications, check the "Unknown sources" box (**image H**), allowing you, in effect, to sideload. Some unfor-

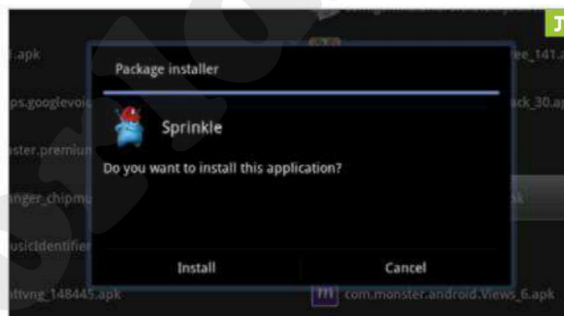


tunate souls may have tyrannical devices that have modded the Android OS to not allow sideloading at all, in which case they'll have to look into rooting the device or installing custom Android ROMs. But that's a whole other How To.

3 INSTALL THE APPS THROUGH A FILE MANAGER

To install your .apk apps, you essentially launch the files through a file manager app. Many Android devices come with a file manager preloaded. For the rest, there are tons of file managers out there and a good handful of high-quality free ones. If you have access to the Android Market, like most Android users, we like Metago's Astro File Manager or Rhythm Software's File Manager HD for Honeycomb tablets. For folks locked into the Amazon Appstore (users of the Grid10, Kindle Fire, etc.), we prefer ES File Explorer.

» Because you heeded our warning to remember what folder your .apk's are in, you just need to launch your file manager and find them (**image I**). If they're on a microSD card, you'll probably need to hit the file manager's Up button a couple of times to find the "Removable" directory. Touching an .apk icon will open the Package Installer, where you can touch the Install button to finish the deed (**image J**). Now that app, whether it will function properly or not, is ready to launch. Enjoy the sweet freedom of the gray market!



Set up a Personal Wiki –Seamus Bellamy

IF YOU'RE LOOKING to build a website where you or other users can create, tinker with, or delete content on the fly from just about any web browser under the sun, you're looking to build a wiki. Wiki-style sites offer a level of inclusion and flexibility unmatched by anything else online today. With a wiki, multiple people can make changes to site content simultaneously, typically with little or no coding expertise. Even if you're not looking to create the next Wikipedia, a wiki can be a great tool for collaboration or personal organization.

Unfortunately, things on the back end of some of the most popular wiki applications, such as Mediawiki, Instiki, and Dokuwiki require that an administrator be conversant in PHP or SQL to get things up and running. That said, not every wiki website requires a truckload of coding knowledge to implement. If you're interested in creating your own wiki to use alone or with a far-flung team of contributors, you can use one of the two methods in this article to get the knowledge-sharing ball rolling in no time at all.

Wiki on a Web Host

FOR ANYONE WHO wants to get their wiki up and running with little or no heavy digital lifting involved, using a wiki-centric web service provider like Wikidot is a great way to go. Offering a wide range of free and paid subscription models that include a very respectable number of customization options, there are few wiki-centric web hosts operating today that can match Wikidot for its flexibility and user-friendly feel.

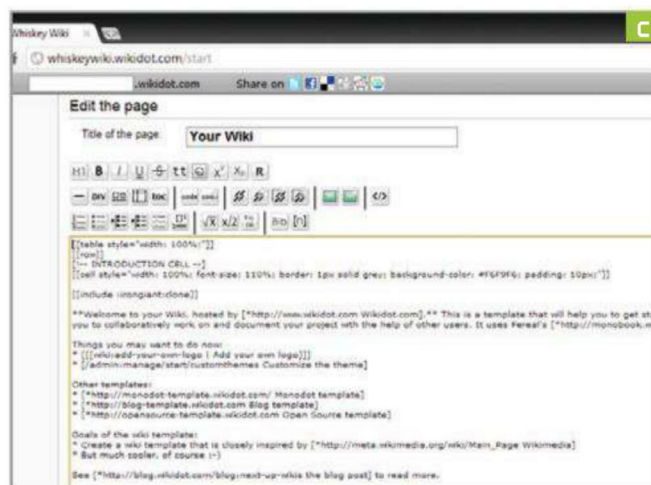
1 MEET WIKIDOT To get started with Wikidot, navigate to the service's main page (www.wikidot.com), select a pricing option, and choose a name for your wiki's domain. For this exercise, we've opted to go with Wikidot's free subscription plan, but the setup process is similar no matter what plan you decide upon. Once you've chosen a name for your wiki, click the Get It Now button (**image A**). You'll be asked to create a Wikidot account and provide a few pieces of basic information about yourself. Once this is done, an account confirmation notice will be sent to you via email. Click the enclosed link and log into your new Wikidot account.



2 SET UP YOUR WIKI Upon logging in, you'll be asked to set up your wiki, decide on a title, tagline, web address, and template style (**image B**). Users are also given the option of choosing an interface language and selecting an access policy—open, closed, or private—for their site.



3 CUSTOMIZE AND POPULATE After reticulating a few splines, your new wiki site will be ready to go. You'll note that Wikidot has populated your wiki with some useful information to give you an idea of what the template should look like once you and your collaborators have uploaded some new content to it (**image C**). Users are invited to add a customized logo, tinker with their template's theme, and modify the wiki's content using a wide variety of HTML code snippets provided free of charge—a nice perk for individuals with little or no coding experience.



Wiki in Your Dropbox

IF YOU'RE LOOKING to leverage the organizational power of a wiki to keep your personal affairs in order but want to do so without having to rely on a web host, or worse, deal with the frustration and hassle of setting up a database and home server, TiddlyWiki is a fantastic option. A wiki system contained in a single .html file, TiddlyWiki can be accessed through any modern web browser on any platform with or without web access. When paired with a Dropbox account, TiddlyWiki becomes a ubiquitous information powerhouse that you'll be able to access from just about anywhere you go.

1 DOWNLOAD TIDDLYWIKI In order to set up TiddlyWiki, you're gonna have to download it first. Fortunately, the application can be obtained for free from www.tiddlywiki.com. Download the version designed for Windows Vista and extract it to your desktop. By default, the file will be named "empty." Rename the file to something memorable so that it doesn't get lost in the gazillions of other files floating around your rig.

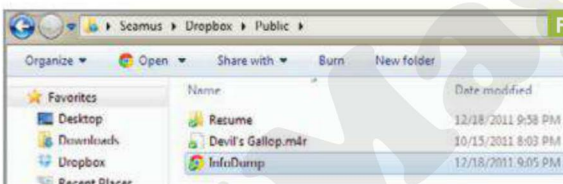
2 SET UP SHOP Locate the TiddlyWiki .html file and double-click to open it. Doing so should open a TiddlyWiki start page in your default browser. To get you up and running, TiddlyWiki will suggest that you personalize your wiki by changing its name and subheading (**image D**). Click the hyperlink for each and alter the text in the field provided. Once you're finished, click Done, which you'll find just above the text entry field you've been tinkering with. You'll also want to enter your name using the field provided, so that you can claim credit for any future edits. Now, look to the right-hand side of your browser window and click Save Changes.



3 TWEAK In the top-right corner of your browser window, locate a link labeled Backstage and click it. Doing so gives you access to a number of drop-down menus chock-full of options designed for customizing your TiddlyWiki (**image E**). Change the settings as you see fit. Extras, such as themes and plugins can be downloaded from TiddlyWiki.com, making it easy to pimp out your wiki right.



4 DROP IN ON DROPBOX If you haven't already signed up for a free Dropbox account and installed the service's client on your rig, stop by www.dropbox.com and follow the instructions provided. Once you're up and running with Dropbox, open your computer's Dropbox folder and drag your TiddlyWiki .html file into it. The file will be uploaded to Dropbox's servers, making it both accessible and editable from any computer or mobile device with a Dropbox client installed on it, tablets and smartphones included. If you opt to place the file in your Dropbox account's Public folder (**image F**), it becomes possible to share your TiddlyWiki with others, turning your personal wiki into a private members-only website.



Why Use a Wiki?

There's no wrong way to use a wiki. A flexible, multipurpose platform, your new wiki can fulfill many different roles.

ONE-STOP INFORMATION SHOP

Your wiki can provide you with a space to jot down quick notes, rough project outlines, capture information from other online sources, or even piece together your

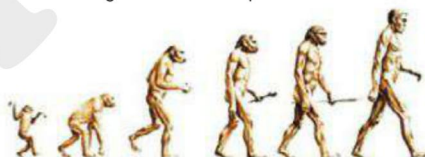
shopping list. What's more, it can all be accessed from just about anywhere you can get online with a web browser.

COLLABORATE FROM ANYWHERE

Wiki users can instantly collaborate on projects with others no matter where they are in the world without having to shuttle content back and forth via email or rely on services such as Google Docs.

TRACK YOUR PROGRESS

Wikis are designed to track all revisions made to their contents, making it easy to keep track of how your ideas have formed, from rough draft to final product.



Get Insanely Fast Storage with a RAMDisk

—Alex Castle

WHEN YOU GET DOWN to it, memory is memory. Your hard disks, SSDs, RAM, and even CPU cache are all structurally and functionally very different, but they still do the same thing—store ones and zeroes. Each type of memory is well suited for its particular job, but there are times when you might want to use them a little differently.

That's the case with a page file, which uses your slower secondary memory to extend your RAM. However, these days, RAM has gotten so cheap and so plentiful that a page file is rarely used. Instead, you should consider the reverse: You can use extra space in your RAM to extend your computer's filesystem using RAMDisk software.

1 SHOULD YOU USE A RAMDISK? There are big advantages to using RAM as a hard disk, and none are bigger than the speed boost you'll get by switching to RAM. RAM is fast memory, and in our benchmarks a RAMDisk performed reads and writes at nearly 10 times the speed of even a top-quality SSD (**image G**). That's fast.

» The disadvantages of a RAMDisk are capacity and volatility: Capacity, because RAM just isn't very big, normally. That's what has kept us from using RAMDisk in the past, but now that 32GB of RAM is a very affordable option for your PC, you should have enough to spare for a modest-size RAMDisk. The volatility issue is that RAM gets cleared out every time it powers down. Most RAMDisk software has the option to write to an image file on system shutdown or on a timer, but you'll always run the risk of losing recently saved data in a power outage.

» So, generally speaking, a RAMDisk is a great option for someone who needs small amounts of very fast storage on a temporary basis. Video editing and encoding are great examples of this, as is editing large batches of photos.

All	5	1000MB	G: 0% (0/4084MB)
	Read [MB/s]		Write [MB/s]
Seq	5217		7205
512K	5133		7053
4K	708.7		628.2
4K QD32	660.9		599.5

2 INSTALL A RAMDISK There are multiple RAMDisk software packages available, but we recommend that you start out with DataRAM RAMDisk (bit.ly/ZeeZ3). It's not the most fully featured product available, but it's got the big advantage of being free for disks up to 4GB. It's also easy to install and use, so it makes a great option for trying out a RAMDisk, and deciding if it's something you'd like to use.

» Another example of RAMDisk software is SuperSpeed RamDisk (www.superspeed.com), which has a better feature set, but the free version is only a trial, and an upgrade costs \$50—more than the \$15 it costs to upgrade DataRAM RAMDisk.

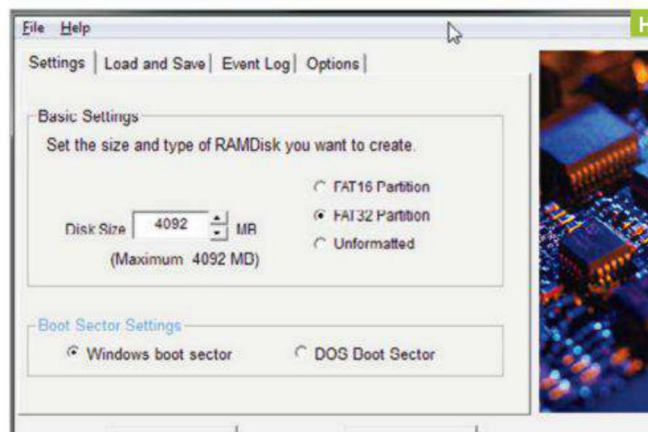
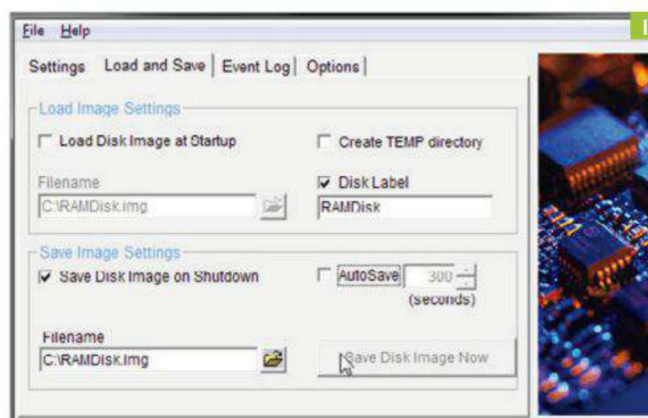
» Download DataRAM RAMDisk and run the .msi file to install the software.

3 CONFIGURE YOUR RAMDISK After you've installed the software, open the Start menu, navigate to the DataRAM RAMDisk folder, and launch the Configuration Utility.

The configuration program will open, and you'll be able to choose what you want your RAMDisk to look like. In the first tab you'll be able to choose the size and filesystem for your RAMDisk to use (**image H**). Select as much memory as you want to use (remembering that the free version only allows up to 4GB of space) and pick the FAT32 filesystem.

» The second tab lets you configure the RAMDisk's image file, which allows it to persist even if you shut down your PC (**image I**). We strongly recommend that you tick the checkbox for the second section, so that your RAMDisk will save to a file on system shutdown. Next time you use the RAMDisk you can select the first checkbox and load that file.

» Once you've done all that, click the button at the bottom of the window to start the RAMDisk. Even if you close the configuration utility, your system will still see the RAMDisk. Load a storage benchmark, and marvel at the insane speeds. ⏻



Create a Personalized QR Code

—Alex Castle

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

Unlike traditional supermarket-style barcodes—which codify

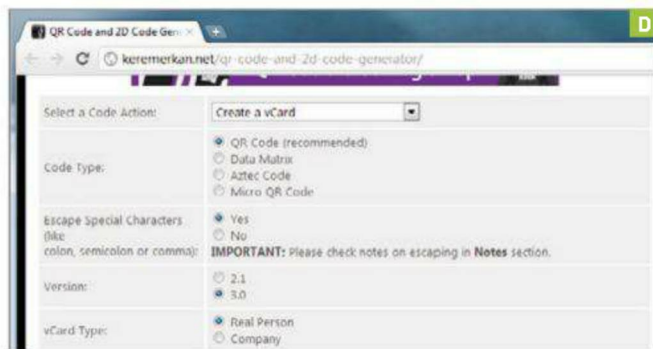
an identification number—QR codes are binary representations of numbers or letters, and can be many different sizes. A tiny QR code can represent just 30 numbers, and a giant one can represent thousands of letters, numbers, and punctuation marks. With that much flexibility, everyone can find a use for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

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

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

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

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



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



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

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

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



THE LIST

11 MOST NOTABLE DUAL-GPU CARDS

11 QUANTUM3D OBSIDIAN X-24, 1998

In 1998, the only thing more badass than dual Voodoo2 cards in SLI was the Obsidian X-24, which combined two V2s—each with an incredible 12MB of RAM and a 95MHz clock—in one card!

10 ATI RAGE FURY MAXX, 1999

It wasn't fast and its drivers were bad, but ATI's Rage Fury Maxx was way ahead of its time. Its dual 125MHz chips each featured an amazing 32MB of SDRAM RAM!

9 3DFX Voodoo5 5500, 2000

It didn't matter how good this dual-VSA-100 card was, because most folks had already written off 3dfx.

8 NVIDIA GEFORCE 7950 GX2, 2006

Besides packing 1GB of RAM and 500MHz GPUs, this card kicked off the quad-SLI wars.

7 ATI RADEON HD 3870 X2, 2008

Sporting 1GB of GDDR3 at 1,800MHz and 825MHz cores, the HD 3870 X2 paid dividends in ATI's strategy to make slightly slower, but far cooler chips.

6 NVIDIA GEFORCE 9800 GX2, 2008

Striking back a few months later, Nvidia combined two G92 cores to wrest the top-card title with the GeForce 9800 GX2 and its 600MHz GPUs and 1GB of RAM.

5 ATI RADEON HD 4870 X2, 2008

ATI volleyed with the Radeon HD 4870 X2. Faster than the GX2 and Nvidia's new GeForce GTX 280, the card's 750MHz GPUs had a whopping 2GB of RAM.

4 NVIDIA GEFORCE GTX 295, 2009

Nvidia's follow-up, the 1.8GB GeForce GTX 295, wasn't a knockout with its 576MHz clocks, but it did the job and most considered it the preferred option.

3 ATI RADEON HD 5970, 2009

Next came the Radeon HD 5970—a respectably fast card even today, with 2GB of GDDR5 RAM and 725MHz cores.

2 ATI RADEON HD 6990, 2011

After a year-long break, ATI came back with its fast, loud, hot, and hard-to-get Radeon HD 6990.

1 NVIDIA GEFORCE GTX 590, 2011

Despite its 607MHz cores and 3GB of RAM, the GTX 590 is well behaved and runs quieter than its AMD counterpart.



The Speed you need at the price you want.

Intel® Solid-State Drive 330 series
delivers the perfect blend of
performance, quality, and value.



6Gb/s Performance:

Sequential: Up to 500 MB/s reads: Up to 450 MB/s writes

Random: Up to 22.5 k IOPs reads: Up to 33k IOPs

Intel Quality:

Backed by a 3-year limited warranty

World class quality, reliability, and customer support

Visit intel.com/go/ssd for more information



DOWNLOAD
THE MAX PAYNE 3
COMIC

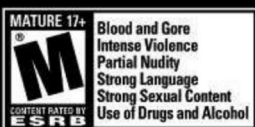
PRODUCED BY
MARVEL

ROCKSTARGAMES.COM/MAXPAYNE3/COMICS

ROCKSTAR GAMES PRESENTS

MAX PAYNE 3

MAY 29



ROCKSTARGAMES.COM/MAXPAYNE3

#MAXPAYNE3



©2004 - 2012 Rockstar Games, Inc. Rockstar Games, Rockstar Studios, Max Payne, and the Rockstar Games  marks and logos are trademarks and/or registered trademarks of Take-Two Interactive Software, Inc. in the U.S.A. and/or foreign countries. The ratings icon is a trademark of the Entertainment Software Association. All other marks and trademarks are properties of their respective owners. All rights reserved.