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Lafayette, IN



ENTERTAINMENT SOFTWARE
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» DEPARTMENTS



7 News



43 Reviews & Ratings



125 Here's How



33 Consumer Watch

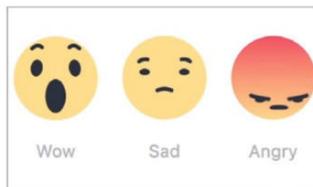
» FEATURES



How many CPU cores do you *really* need for DirectX 12 gaming? **108**



118 More space! How Windows 10's storage analysis helps you free up your hard drive



145 Tech Spotlight

» COLUMNS

139 Hassle-Free PC

141 Answer Line

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Children in America who
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join me and help put an
End to childhood hunger.

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NEWS

CONTENTS

- 8 **Obama on encryption: 'It's fetishizing our phones above every other value'**
- 11 **MIT's new 5-atom quantum computer could make today's encryption obsolete**
- 14 **Opera's testing a browser that kills ads, accelerating webpage loading by up to 90 percent**
- 20 **HP's Elite x3 is a flagship sailing into a dangerous Windows phone wasteland**
- 27 **Asus reveals two tiny, unique GTX 950 graphics cards that don't need extra power**
- 29 **Google explains why its self-driving car crashed into that bus**

Obama on encryption: 'It's fetishizing our phones above every other value'

BY CAITLIN MCGARRY

PRESIDENT BARACK OBAMA can't comment on the specifics of the ongoing feud between Apple and the FBI, but he did sit down with Texas Tribune editor-in-chief Evan Smith at the recent South by Southwest (SXSW) Interactive to weigh in on one of the most pressing issues facing American society today: Is national security more important than privacy in the digital age?

"The question we now have to ask is if technologically it is possible to make an impenetrable device or system where the encryption is so



Watch the video at go.pcworld.com/obama-sxsw



strong there's no key, there's no door at all, then how do we apprehend the child pornographer? How do we disrupt a terrorist plot?" Obama said. "If you can't crack that [device] at all, if government can't get in, everybody's walking around with a Swiss bank account in their pocket."

Obama is the first sitting president to take the stage at SXSW, the annual convergence of tech, music, and film in Austin, Texas. He appeared at the festival to urge tech companies, engineers, and the creative thinkers drawn to SXSW to work on innovative solutions plaguing American democracy, like making it easier to vote, and bringing Internet access to more people.

Those are important issues, of course, but with the Department of Justice pressing Apple to help unlock an iPhone 5c used in the San Bernardino terrorist plot, Obama's feel-good message on civic engagement took a backseat to who he sides with, Apple or the FBI. He wouldn't say, of course, but said he came down on the side of civil liberties, with a caveat.

"I suspect the answer will come down to how we create a system where the encryption is as strong as possible, the key is as secure as possible, it's accessible by the smallest number of people possible for the subset of issues that we agree is important."

The Edward Snowden effect

Obama realizes that Edward Snowden's NSA surveillance leaks have made the American people skeptical about the government's intentions when it comes to our devices.

"There are very real reasons why we want to make sure the government cannot just willy-nilly go into everyone's iPhones—smartphones—that are full of personal data," he said. "The whole Snowden disclosure episode elevated people's suspicions of this."

Snowden himself appeared at SXSW (go.pcworld.com/snowdensxsw14) in 2014 to urge the American people to embrace encryption, which makes it difficult if not impossible for the National Security Agency to monitor communications.

Obama said, "The Snowden issue vastly overstated the dangers to U.S. citizens in terms of spying," but also said encryption is essential to keep hackers from destroying digital systems like banks or air traffic control.

"We're going to have to make some decisions about how we balance those respective risks," he said. "We've engaged the tech community aggressively to help solve this problem. You can't take an absolutist stance on this. It's fetishizing our phones above every other value, and that can't be the right answer."

The Department of Justice also filed a response (go.pcworld.com/doj-apple) to Apple's argument against complying with the court order and basically slammed the company for its "corrosive" rhetoric. Apple was to face off with the FBI in court on March 22 for the first hearing in the case, but it was cancelled and the court order stayed when an outside party demonstrated to the FBI a possible method for unlocking the phone. Expect this fight to stay heated. 🔥

Snowden himself appeared at SXSW in 2014 to urge the American people to embrace encryption, which makes it difficult if not impossible for the National Security Agency to monitor communications.



MIT's new 5-atom quantum computer could make today's encryption obsolete

BY KATHERINE NOYES

MUCH OF THE ENCRYPTION WORLD today depends on the challenge of factoring large numbers, but scientists now say they've created the first five-atom quantum computer with the potential to crack the security of traditional encryption schemes.

In traditional computing, numbers are represented by either 0s or 1s, but quantum computing relies on atomic-scale units, or "qubits," that

can be simultaneously 0 and 1—a state known as a superposition that’s far more efficient. It typically takes about 12 qubits to factor the number 15, but researchers at MIT and the University of Innsbruck in Austria have found a way to pare that down to five qubits, each represented by a single atom, they recently said.

Using laser pulses to keep the quantum system stable by holding the atoms in an ion trap, the new system promises scalability as well, as more atoms and lasers can be added to build a bigger and faster quantum computer able to factor much larger numbers. That, in turn, presents new risks for factorization-based methods such as RSA, used for protecting credit cards, state secrets, and other confidential data.

The development is in many ways an answer to a challenge posed back in 1994, when MIT professor Peter Shor came up with a quantum algorithm that calculates the prime factors of a large number with much better efficiency than a classical computer.

Fifteen is the smallest number that can meaningfully demonstrate Shor’s algorithm. Without any prior knowledge of the answers, the new system returned the correct factors with a confidence better than 99 percent.

“We show that Shor’s algorithm, the most complex quantum algorithm known to date, is realizable in a way where, yes, all you have to do is go in the lab, apply more technology, and you should be able to make a bigger quantum computer,” said Isaac Chuang, professor of physics and professor of electrical engineering and computer science at MIT.

“It might still cost an enormous amount of money to build—you won’t be building a quantum computer and putting it on your desktop anytime soon—but now it’s much more an engineering effort, and not a basic physics question,” Chuang added.

The results of the new work were published (go.pcworld.com/scalableshor) earlier in March in the journal *Science*.

Without any prior knowledge of the answers, the new system returned the correct factors with a confidence better than 99 percent.

“In future generations, we foresee it being straightforwardly scalable, once the apparatus can trap more atoms and more laser beams can control the pulses,” Chuang said. “We see no physical reason why that is not going to be in the cards.”

A functional quantum computer large enough to crack traditional RSA encryption may still be in the future, but the U.S. National Security Agency is taking the possibility seriously. In January, it posted an FAQ (go.pcworld.com/cnsafaq) on the technology’s potential.

“If you are a nation state, you probably don’t want to publicly store your secrets using encryption that relies on factoring as a hard-to-invert problem,” said Chuang. “Because when these quantum computers start coming out, [adversaries will] be able to go back and unencrypt all those old secrets.” 

Opera's testing a browser that kills ads, accelerating webpage loading by up to 90 percent

BY MARK HACHMAN

OPERA FIRED A BROADSIDE in the web content wars, becoming the first desktop web browser with built-in ad blocking—and explicitly encouraging users to turn it on to improve their browsing experiences.

Competing browsers like Chrome or Firefox assign plug-ins like Adblock Plus the task of blocking ads. But with Opera's 37.0.2162.0 developer build for Mac OS and Windows, it's baked right into the



software. Opera says that turning on the ad-blocking feature can cut page load times by a whopping 90 percent, which *PCWorld* confirmed using a test build.

According to Krystian Kolondra, the senior vice president in charge of engineering for Opera, the current approach to advertising is damaging users' online experiences. "Our goal is to provide the fastest and the smoothest online experience for our users," he said in an email. "While working on that, we have discovered that a lot more time is spent on handling ads and trackers than we thought earlier."

Why this matters: Google's business model depends on selling online advertising. But with a business model that doesn't depend on online ads (and less than 2 percent market share), Opera can afford to lead the charge against intrusive or annoying web ads. What we don't know is what the web will look like when users block ads and "free" content providers restrict access in retaliation.

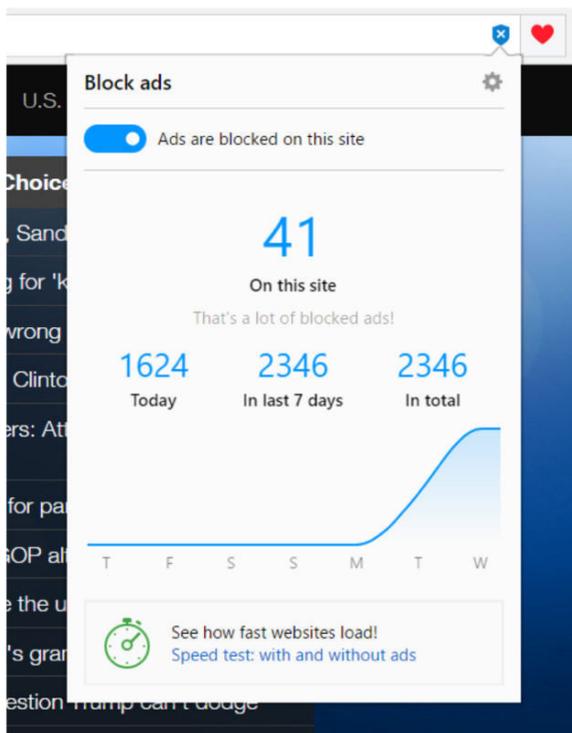
Ad blocking from the get-go

Online ads can be used for all sorts of reasons: to sell you things, to track you as you move around the Web, and even to plant malware on your machine. But it's also extra code that must be loaded together with the text and images you want to see. All that slows down the time it takes a page to load.

Install the new version of Opera, load a page, and immediately a pop-up

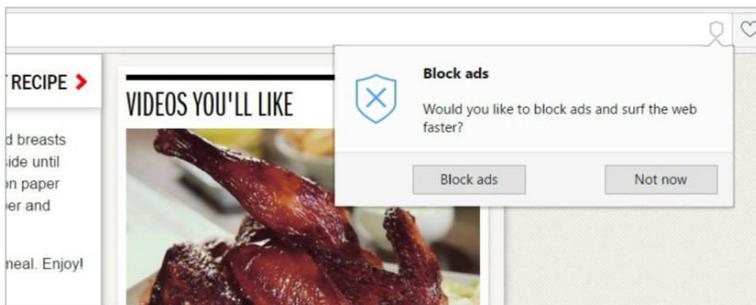
The new Opera browser

version will show you how many ads it found on the page.



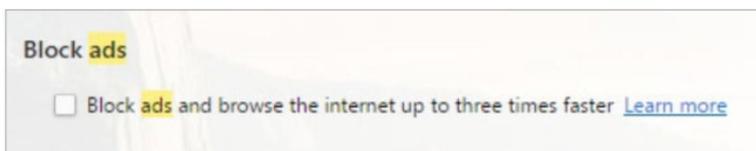
Opera's latest browser

immediately encourages you to begin blocking ads.



You can kill ads

in the new Opera browser via a global setting.



appears, asking whether you would like to “block ads and surf the Web faster.” If you agree to Opera’s invitation, ads are blocked right away. Alternatively, you can either check a box in the Settings menu (do a search for *ads* in the Settings search box; it’s faster) or simply click a small, grayed-out shield icon to the far right of the URL bar. When ad-blocking is enabled, that shield is blue.

Not convinced that ad-blocking will make a difference? Then click the shield: Opera added an incredibly slick benchmark tool to show you how many ads it’s blocked on a given page. The browser will also perform a speed test, timing how fast a page loads with or without ads. It’s incredibly convincing.

In my tests, Opera’s ad-blocking software eliminated traditional banner and display ads, as well as pre-roll ads on YouTube and other sites. (You’ll still see embedded video on news pages, however.) According to Kolondra, the browser will block tracking pixels and third-party scripts if they’re used for advertising purposes.

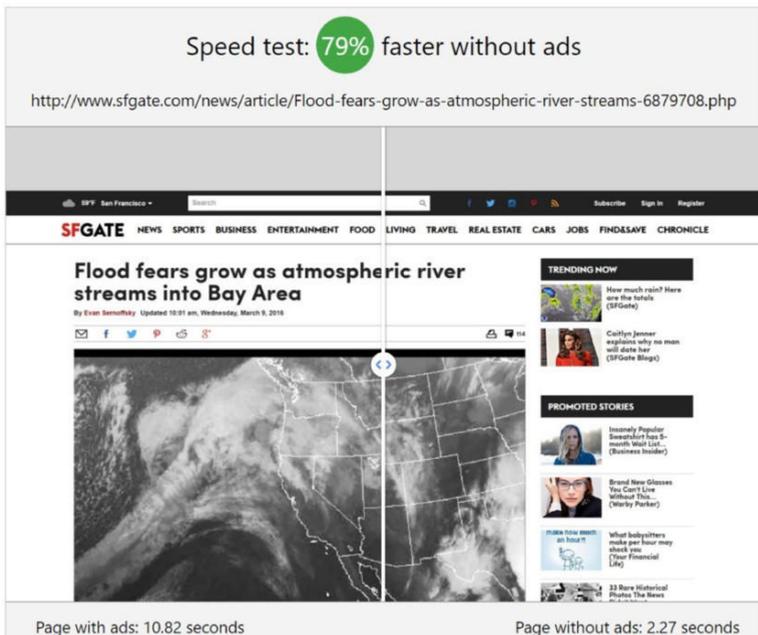
You’ll notice that some sites still feature embedded advertising, based on a whitelist that Opera used for testing purposes only. “We have no intention of making a business out of maintaining such a whitelist,” Kolondra said.

Opera's ad blocking performs as ... er, advertised

Using the test build provided to us by Opera, I found that page load times were essentially halved—an impressive feat, given that Opera (along with Chrome) already delivered the fastest page load times of all the browsers we tested (go.pcworldy.com/bestbrowser2015) last year.

I used two methods to measure page load times: the stopwatch method I used before, when I tried to determine how quickly a page was navigable; and Opera's own internal speed tests. I used a sample of the ad-heavy, mass-media sites I had chosen for our browser roundup—including PCWorld.com.

As a representative example, I found that loading a page on *The San Francisco Chronicle's* SFGate.com page took 3.39 seconds to become navigable with ads enabled, and 1.63 seconds without. (I rebooted between tests, to eliminate caching issues.) The amount of memory that page required shrank by about a third. Opera measured the time from when it began to load to when all the ads were finished: 8.74 sec-



How much can
blocking ads
speed up your
browsing?
Opera's internal
speed test will
show you.



onds. Without ads, the same page loaded in 3.18 seconds, or about 63 percent faster.

Webpage load times depend on a number of factors: the speed of the network connection, the size of the page, the number and complexity of ads. But the overall conclusion was inescapable: Blocking ads dramatically accelerates Web surfing.

As for compatibility: Opera worked flawlessly with the ads turned off—except, for some reason, on PCWorld.com, where the page became unresponsive.

An ad-free Web?

It should be obvious, but let's disclose it anyway: Browsing sites like PCWorld.com while blocking ads prevents that site from receiving ad money that would pay for the site and its content. (Full disclosure: IDG, the parent company of *PCWorld*, is running tests on Greenbot.com with messages asking users who run an ad blocker to turn it off to support the site. Other sites have simply refused to serve content to users who use ad blockers.)

"We understand ads are important for the Internet and without them many services could not exist—we're not against that," Kolondra said. "On the contrary. But we simply don't think ads/trackers should slow down the online experience so much. Today users see when

Ad blocking isn't just confined to Opera. Plug-ins on other browsers perform the same function, but Opera says its built-in ad blocker is more effective.

there's a bad ad on a page—when it covers some part of the page, blocking navigation or requires you to close it. But it's hard for users to know how much [the ads] affected the page loading.”

Ad blocking has sounded alarm bells around the Web, where a PageFair/Adobe report found that ad blocking grew by 48 percent inside the United States during the first quarter of 2015, to about 16 percent of the U.S. online population. (PageFair estimates that 20 percent of all worldwide browser users, or about 144 million users, block ads.)

Recently, the International Advertising Bureau's research lab released a guide (go.pcworld.com/iabadblockprimer) to engaging with ad blockers, as well as a script that IAB clients can place on their Web sites to detect their use.

Kolondra said it's time for the ad industry to stop talking and actually produce more effective, less intrusive ads. “We hope our actions can help to accelerate the change that the ad industry needs to pursue,” he said.

Kolondra said Opera “has a few ideas that we're going to pursue,” and that more announcements would be forthcoming. The ad-blocking developer build is “a test,” he said.

But even Kolondra was worried about a technological arms race of sorts. “My worry is that unless the problem with the bad ads is fixed, we can just expect more anti-anti-adblockers appearing on the market, and then anti-anti-anti-anti-adblockers,” he said. 🛑

We are having trouble showing you adverts on this page, which may be a result of ad blocker software being installed on your device.

As City A.M. relies on advertising to fund its journalism, please disable any ad blockers from running on cityam.com, then reload the page to see the rest of this content. More info [here](#).

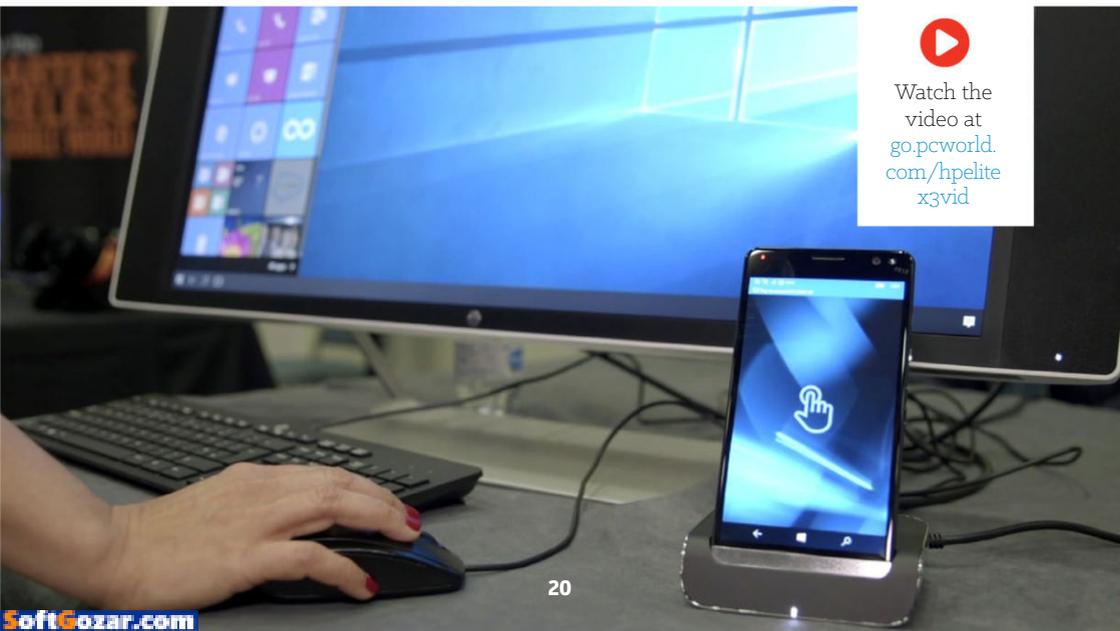
A small but growing number of sites simply refuse to show all or part of their content to users who block their ads.

HP's Elite x3 is a flagship sailing into a dangerous Windows phone wasteland

BY MELISSA RIOFRIO

IT'S A HELL of a time to launch a Windows phone, and yet that's exactly what HP did at this year's Mobile World Congress, when it debuted its Elite x3 flagship. This premium-level device enters a wasteland littered with failed phones, an ecosystem that, at last report, clings to just one percent of the worldwide market.

Despite the clear and significant risks, HP seems to have a reasonable strategy: Make it a beautiful, powerful device. Sell it into the cash-rich, Windows-centric corporate world. Finally, emphasize Continuum (go.pcworld.com/w10continuum), that standout feature



Watch the video at go.pcworld.com/hpelite/x3vid

in Windows 10 Mobile, the one thing its rivals Android and iOS can't touch.

Just settle a Windows 10 phone into a special dock, and it can control a connected display and input devices, acting much like a traditional PC. Anyone who's had to lug around a laptop for work can see the appeal of running everything from your phone.

It's too early to know whether this plan can pull Windows phones back from the brink. But I will grant this to HP: It's aiming high, and that's the best chance for some sort of success, even with tough odds. Now let's take a look at the brave, shining champion HP's sending into the void.

The Elite x3: As powerful as your PC

The Elite x3 is, indeed, a beautiful, powerful phone (at least on paper, as we've yet to test it). Its Desktop Dock and Mobile Extender show a compelling way to make the phone the center of your work life. HP's even working on ways to drag legacy apps onto the platform via HP Workspace (which we won't cover in this article).

HP went all-in on the Elite x3's design. "What if a device in your

Continuum lets a phone mirror its display on a monitor. Both the Desk Dock (shown) and the Mobile Extender have additional ports for connectivity.



HP's Elite x3
nests easily in
the Desk Dock.



pocket were as powerful as your PC?” asked HP’s Michael Park, during a recent briefing. Park said HP had conceived the phone as “beauty and brawn designed from the ground up for commercial use.”

As he showed the sleek, phablet-sized device, he reinforced the Elite x3’s flagship ambitions. “This is a device that executives would carry.”

The highlight specs seem to follow through on HP’s pledge to make a “no compromises” phone, with leading-edge features from the CPU on down:

- A graphite-colored body with polished-chrome accents
- A 5.96-inch, 2560x1440 (WQHD) edge-to-edge display with Corning Gorilla Glass 4 and an anti-reflective coating
- The brand-new Qualcomm Snapdragon 820 CPU with integrated Adreno GPU
- 4GB of LPDDR-4 RAM
- 64GB eMMC storage, SD extensible to 2TB
- Cat 6 LTE (“Designed for continuity,” explained Park: “We know LTE is where things are going.”)

- 8MP front-facing camera, 16MP rear-facing camera
- Dual SIM slots
- A 4,150mAh battery (No life spec yet, but Park promised it would last “all day.”)
- Dimensions: 3.29x0.31x6.36 inches
- Weight: 0.43 pounds (options could add weight)
- Durable: passed IP-67 and MIL Standard 810G, including a four-foot drop

I had several chances to hold the Elite x3 in my hand during the briefing. It's large, but thin and not heavy-feeling. I have a somewhat small hand and was able to grasp it comfortably, though I'd need to hold it with two hands to do more than a quick swipe or two. The textured graphite back is easy to grip.

The Elite x3 has a Bang & Olufsen sound system that was impossible to test at the crowded briefing. According to Park, it optimizes audio for Skype calling, with dual front-firing speakers and active noise cancellation.

Meet the Desk Dock and Mobile Extender

The Elite x3 is not an island. It needs the Desk Dock and the Mobile

HP's Elite x3 charges via USB-C. The Desk Dock sits in the background.





Extender to fulfill its Continuum capabilities.

The Desk Dock is a small stand with connectors that also functions as the base for using Continuum. We've seen similar docks from Microsoft for its own Windows phones, and also from the recently revealed Acer Liquid Jade Primo (go.pcworld.com/jadeprimo).

It measures 4.25x3.74x1.2 inches and weighs a shade under a pound. Its connectors include a DisplayPort, two USB-A, one USB-C, and an RJ-45 port.

While I expected a dock from any new Windows phone, I didn't expect a device like the Mobile Extender, basically a laptop-shaped dumb terminal. However, it solves the problem of what to do if you don't have a display, keyboard, and mouse waiting for you and your Windows phone on the road.

Connect the Mobile Extender to the phone, either wirelessly or via its USB-C port, and you have a somewhat-mobile computer that's really your phone. It's something you could take on a trip for times when you need to focus on work. IT managers could hand them to visitors camping in the lobby or at a mobile workstation, or even someone who needs to work from home.

The Mobile Extender has no CPU, memory, or storage. It does have a

The Desk Dock for the Elite x3 has one DisplayPort, two USB-A ports, one USB-C port, and an RJ-45 port.

12.5-inch display and a backlit keyboard with a drain hole. Its three USB-C ports include one for charging the Elite x3, and two more for data and power. There's also a micro HDMI port. Its 4-cell, 46.5Wh battery can last three days in standby mode, per HP's claims.

With both the Desk Dock and the Mobile Extender, HP has created accessories that aid and abet Continuum. Imagine the first deployments to mobile users, who are likely to be skeptical of the Windows phone being handed to them, They can complain about carrying a second phone. They can complain about the dearth of apps. But when they first try a Desk Dock or Mobile Extender, I'll be surprised if a little light doesn't go on over their heads.

The phone that can't fail

Windows phones have come and gone. In the wisdom of hindsight, I can hypothesize that one problem was the vendors. Partners like HTC and Alcatel who only make phones, not PCs, weren't invested in the Windows ecosystem in the same way that HP, Acer, and Vaio (go.pcworld.com/w10vaio) are.

Of course, the early Windows Phones weren't connected to the traditional Windows platform anyway. Now that Windows 10 Mobile has brought Continuum into the world, PC vendors can see as well as I can how this new feature helps Windows users complete the circle and have the seamless experience Microsoft is promising across all its devices.

Now the rest of the world needs to see this as well, and that's no sure thing. HP's already experienced one spectacular phone fail, if you remember its ill-fated acquisition of Palm. We've watched Windows phones fail as consumer devices, with lackluster low-end

The Desk Dock for the Elite x3 looks a lot like the docks we've already seen from Microsoft and Acer.





handsets and no good flagships to lead a charge.

At least HP's strategy of selling the Elite x3 into the corporate space is avoiding throwing good phones after bad. Granted, forcing people to use it because their companies tell them to doesn't sound like much fun initially. On the other hand, the IBM PC caught on with consumers after establishing itself in corporations, so there's an arguable precedent that a successful Elite x3 will help Windows phones sneak back into the consumer market someday...

The Elite x3 and its accessories are expected to release this summer, but pricing hasn't been set yet. HP probably didn't want the Elite x3 to be burdened with the mission of single-handedly reviving the Windows phone market. If it can't catch on, though, none of the other Windows phones have any better of a chance. 🛑

The Mobile Extender

shows two USB-C ports on its right side, for data and power. A third USB-C port is intended primarily to charge the Elite x3.

Asus reveals two tiny, unique GTX 950 graphics cards that don't need extra power

BY IAN PAUL



ASUS WAS BUSY downsizing its graphics cards recently, but in a good way. The company revealed two new versions of Nvidia's GTX 950 (go.pcworld.com/gtx950) that are ideal for PCs with paltry power supplies and anyone rocking an HTPC with a mini-ITX motherboard. Neither build sacrifices the basic specs of the GTX 950, but they do follow the lead of the older GTX 750 Ti (go.pcworld.com/gtx750ti) and sip all their power from the motherboard PCIe connection—no extra power pin connections required.

The first new card is the Asus GTX 950-2G (go.pcworld.com/asus-gtx9502g) (pictured on top above), which lacks the 6-pin power connection required by the stock GTX 950 models by limiting its TDP to 75 watts, the amount provided by a motherboard's PCIe slot. Nvidia's standard design for the 950 requires a power draw around 90W.

Other than the lower power requirements all the other specs appear to stick to the GTX 950 standards. The card has 2GB of onboard GDDR5

RAM, a base clock of 1026 megahertz, and a boost clock of 1190MHz. As for ports, you get an HDMI 2.0 port, a DVI-I port, and a DisplayPort.

The only thing to watch out for with the 950-2G, as Anandtech reports, is that the card may throttle back performance under heavy loads due to the lower power requirements. The 950-2G's 75W

maximum power draw is the absolute limit of what a PCIe slot can provide. Drawbacks like this are expected, however, as you usually have to give up a little bit of performance in exchange for reduced power demands and the more convenient design.

A few days after the 950-2G came out, Asus also introduced the Mini GTX 950-2G (go.pcworld.com/minigt9502g). This is basically a cut-down version of the 950-2G. Again, it comes with no PCIe power connector, and the same external ports as its bigger brother. The single-fan design measures just 6.7-inches long, making it a good fit for mini-ITX boards in HTPCs and other diminutive PCs.

The impact on you at home: Graphics cards that don't require extra power through a PCIe connector are a boon to older PCs, HTPCs with limited space for new components, and prebuilt "boxed" PCs that don't come with beefy power supplies. As long as you have a compatible PCIe slot, these new cards can breathe new life into your PC for gaming and other graphics-intensive chores. The new graphics cards are live on Asus's site, but the company hasn't mentioned a price or release date for either version. We'd expect both cards to be priced competitively in the sub-\$200 range. That's especially important for the Mini 950-2G, which will have to contend with the superb Sapphire Nitro Radeon R9 380 ITX Compact (go.pcworld.com/nitror9380itx)—a card that will offer superior frame rates, but needs an extra power connection. 🛑

Graphics cards that don't require extra power through a PCIe connector are a boon to older PCs, HTPCs with limited space for new components, and prebuilt 'boxed' PCs that don't come with beefy power supplies.



Google explains why its self-driving car crashed into that bus

BY OSCAR RAYMUNDO

IT TOOK 1.4 MILLION MILES for Google's self-driving cars to learn that people can be terrible drivers—even people operating the city bus.

"We don't like cars bumping into things," Chris Urmson, Director of Google's Self-Driving Project, told the audience during his recent SXSW panel.

Back in February, one of Google's cars got into an accident with a bus while trying to get back on the road from a right turn lane. The car estimated that there was not enough space for the bus to get through so assumed the bus driver was going to stop and let the car through.



A Google car
even got pulled
over once.

“The car made an assumption about what the bus driver was going to do, and the bus driver made an assumption about what the car was going to do, and the assumptions did not match,” Urmson continued. The self-driving car was going 2 mph and no one got hurt. According to Urmson, the accident did not bruise his confidence in Google’s self-driving project, but admits it was a “tough day” for the company.

Safer than humans?

In January, Google commissioned a study that showed the company’s self-driving cars had a lower collision rate than the national rate. Google’s cars got in 3.2 accidents for every million miles driven, while the national rate for traditional vehicles is 4.2 accidents. Urmson is set to testify in a Congressional hearing about safety protocol and road regulations involving autonomous cars.

“We’re all in this together,” Urmson said at SXSW. The director said that the pros of developing this technology (less traffic, fewer accidents overall, give blind people more mobility) outweigh the cons, and that he expects more serious accidents in the future as Google’s

self-driving cars are tested in new, challenging situations.

Since Google's Self-Driving Car Project started in 2009, Google's cars have clocked 1.4 million miles on the road, and they are adding 10,000 miles of test driving every week.

Each car is equipped with sensors, cameras, and lasers that instantly estimate 1.5 million measurements in every direction. The car then uses these measurements to assess the driving situation, generate a

trajectory, and see if it needs to slow down and what it needs to slow down for. The cars make an informed prediction ten times per second.

"The car understands what cyclists and pedestrians are going to do, as well as other moving vehicles," Urmson said. "It even understands if it's a police car with the door open."

Google's cars also share this data between vehicles, Urmson continued. So if one of the cars experiences an unusual driving situation—Urmson used the real example of a self-driving car that encountered a woman in an electric chair chasing a duck on the road—it can generalize based on all the data and also deal with "anomaly detection."

"There's no page in the DMV manual [on how to handle these situations]," Urmson said. Self-driving cars need to understand it's an unusual situation and react accordingly to an infinite number of wacky and erratic scenarios. That's why it remains inconclusive when self-driving cars will actually be ready to hit the road on their own.

Urmson agrees that it could be the next three years, or the next 30, because this technology is going to be released incrementally. When asked about other companies working on self-driving technology, most notably Apple, Urmson said he was "excited."

"The more people working on it, the more likely we'll see it all over the world," he said. 🚗

Self-driving cars need to understand it's an unusual situation and react accordingly to an infinite number of wacky and erratic scenarios.

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CONSUMER WATCH



These are the worst domains for harboring malware

For some new gTLDs, the ratio of malicious domains is almost 80 percent, Spamhaus says.

BY LUCIAN CONSTANTIN

GENERIC TOP-LEVEL DOMAINS (gTLDs) that have sprung up in recent years have become a magnet for cybercriminals, to the point where some of them host more malicious domains than legitimate ones.

Spamhaus, an organization that monitors spam, botnet, and malware activity on the Internet, has recently published a list of the world's top 10 "worst TLDs." What's interesting is that the list is not based on the overall number of abusive domains hosted under a TLD, but on the TLD's ratio of abusive domains compared to legitimate ones.

Over the years, lists of spam-friendly TLDs have typically had *.com*, *.net*, and *.org* at the top. However, a TLD's trustworthiness ultimately relies on the ability of the organization that manages it—known as the registry—to police its name space and to enforce rules for its resellers, the registrars.

If, for example, 1 percent of all *.com* domains were used for malicious activity, one could say that the *.com* registry, Verisign, is doing a relatively good job at keeping the abuse rate down. The problem is that because the *.com* TLD is so large, its 1 percent might represent more malicious domains than in a much smaller TLD where the rate of abusive domains is actually 50 percent.

Therefore, comparing good-versus-bad ratios is a better way to determine which registries care more about their TLDs' reputation, something that ultimately affects their legitimate customers.

"Spam and other types of abuse continue to plague the Internet because bad actors find it very cheap and very easy to obtain thousands of domain names from the Top Level Domain registries and their resellers, the registrars," Spamhaus said in a blog post. "A few registrars knowingly sell high volumes of domains to professional spammers for profit, or do not do enough to stop or limit spammers' access to this endless supply of domains. These registrars end up basing their entire business model on network abuse."

Over the years, lists of spam-friendly TLDs have typically had '*.com*,' '*.net*' and '*.org*' at the top.

Based on Spamhaus' data, some of the generic TLDs that have been created in recent years thanks to ICANN's relaxed policies are not doing enough to stop abuse. This could be either because they're inexperienced at tackling such issues or because they care more about revenue than a clean Internet.

At this time, Spamhaus' 10 Worst Top Level Domains list looks like this: *.download* with 76 percent bad domains; *.review* with 75.6 percent bad domains; *.diet* with 74.3 percent bad domains; *.click* with 72.4 percent; *.work* with 65 percent; *.tokyo* with 51 percent; *.racing* with 50.8 percent; *.science* with 49.9 percent; *.party* with 45.3 percent; and *.uno* with 42.5 percent.

Some TLD owners claim that it's up to resellers to deal with cases of domain misuse and policy violations, but if they don't force those resellers to take action, nothing will change, Spamhaus said. "A good number of the TLDs succeed in keeping spammers off their domains and work to maintain a positive reputation; this shows that, if they wished to, any TLD registry can 'keep clean'" 



Microsoft slips Windows 10 upgrade ads into Internet Explorer security patch

BY IAN PAUL

MICROSOFT IS ADDING a new weapon to its aggressive Windows 10 push—or at least it appears that it is.

Microsoft has added what sounds a lot like an advertisement for Windows 10 to a recent Patch Tuesday release for Internet Explorer, bundling it in with a critical security patch. The new update affects only Windows 7 and 8.1 PCs and brings an upgrade prompt to Internet Explorer 11.

In its description of update KB3146449 (go.pcworld.com/updatedexplorer11), Microsoft says it “adds functionality to Internet Explorer 11 on some computers that lets users learn about Windows 10 or start an upgrade to Windows 10.” Or as we common folk call it, an ad.

As Woody Leonhard at *InfoWorld* first reported, this update will supposedly put a blue banner on the IE11 new tab page that says, “Microsoft recommends upgrading to Windows 10.” *ExtremeTech* points out this is not the same as the blue banner that pops up when you visit sites like MSN.com recommending an upgrade to Windows 10.

It also appears this ad can’t be stopped by rolling back the update, as it’s built right into KB3139929 (go.pcworld.com/MS16-023), a critical security update for IE11.

The impact on you at home: So far neither Leonhard nor *ExtremeTech* were able to get the supposed blue banners to show up in IE11 in testing. It may be that Microsoft hasn’t yet activated the banner ads, or that the company had second thoughts about the strategy. Either way, packaging Windows 10 upgrade prompts in a security update is a terrible idea and a breach of user trust.

The update went out to all PCs as part of a Patch Tuesday update, but only non-domain joined PCs—such as home users and small businesses—will see the ads. PCs that are managed by an IT department will not see the new update prompts. At least not yet. 🔌

The impact on you at home:
So far neither Leonhard nor
ExtremeTech were able to get
the supposed blue banners to
show up in IE11 in testing.



Credit card extended warranties and electronics: How a little extra hassle can save lots of money

BY IAN PAUL

ABOUT A YEAR and a half ago, I received a somewhat menacing voicemail from the Microsoft Store.

The store representative reminded me that I'd spent a good chunk of change on a Surface Pro 3 (go.pcworld.com/surpro3rev), and—to paraphrase—it'd be a shame if something happened to it without extended warranty coverage. Peeved, but confident in my resolve never to pay for additional device warranties, I deleted the message.

A little over a year later, my Surface Pro 3 started developing a nasty yellow discoloration along its left edge. Microsoft's one-year warranty had already expired, and now the company wanted \$320 plus tax for an out-of-warranty repair.

That store rep might've gotten the last laugh if it wasn't for my credit card, which automatically adds an extra year of warranty coverage for many purchases, including electronics. This is a fairly common benefit (go.pcworld.com/ccwarranties) among major credit cards, and has always hung in the back of my mind when declining extended coverage. But until my Surface started acting up, I'd never actually put this added protection to the test. Does built-in warranty coverage from

a credit card actually work?

The short answer is yes, but not without a fair share of phone calls, paperwork, and potential runaround.

Getting a claim started

With my Chase Freedom card, figuring out where to start was a slight hassle. Although Chase's website lists extended warranty protection as a benefit, it doesn't include any details on who to call or how to begin the process.

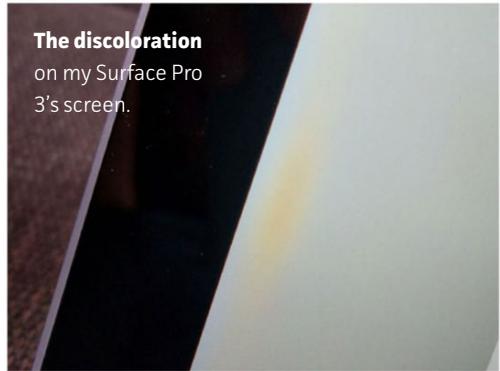
To find out, I called the number on the back of my card and performed the customary "speak to a representative" ritual, which led to a second number specifically for credit card benefits. After calling that number and briefly describing my problem, I received a claim number and a promise that someone would follow up by email.

A couple days later, I received an email from "Card Benefit Services"—evidently a third-party insurer acting on Chase's behalf—along with a PDF form requesting some information:

- A copy of the sales receipt
- A copy of the relevant monthly credit card statement
- A copy of the manufacturer's warranty
- A copy of the repair estimate, or invoice if the repair was already performed
- A signed copy of the PDF form itself.

Most of those items were easy enough to get, and for the repair estimate, I visited Microsoft's support website (go.pcworld.com/msserviceorder) and partially filled out a service request—just enough to view and print out the \$320-plus-tax repair price.

After six days of silence, a second email arrived, asking for something new: "A copy of a diagnostic from an authorized service center stating what is wrong with the product and whether it is cost effective to repair it."



I wasn't sure what this meant, so I called the benefit provider for an explanation. Apparently I'd have to find a technician who could look at my Surface and provide more information. (The representative said I'd be reimbursed for any diagnostic costs.)

This was where the ride started to get bumpy.



Checking out the claim

Unsure of what to do next, I called Microsoft's support line and explained the whole situation to a representative, who redirected me to my nearest Microsoft Store. An employee there seemed certain that I could bring in the Surface and get some kind of official diagnosis.

At the Microsoft Store, I heard a different story. No one was sure how to deal with my request, since repairs aren't done in-house. After some waiting around, a store manager took my number and promised to look into it.

Later that day, the manager called back with a potential solution: He'd simply write a letter that explained the screen discoloration and listed the cost for out-of-warranty repairs. He sent the letter by email, and I forwarded it along to Chase's benefit provider. (I should note that I never mentioned being a member of the press during any of this, so there's no reason to believe my treatment was special.)

Five days later, another email from Chase's benefit provider arrived, saying I'd have to call with "more information to process your claim." The friendly representative explained that she needed to speak with the Microsoft Store manager to double-check that my repair was necessary. (I suspect she was also trying to find out if I might have

A non-damaged

Microsoft
Surface Pro 3.

caused the damage myself.) For whatever reason, she was unable to reach the Microsoft Store directly on her phone, which led to a couple days of phone tag as we tried to get the manager to call her.

Fortunately, everything worked out once they got in touch. In a somewhat anti-climactic resolution, the representative from Chase's benefit provider informed me that my claim had been approved. A check for \$342.40, she said, would arrive within a couple of weeks.

Credit card extended warranties: The takeaway

What have I learned from this experience? Mainly that if you want to get reimbursed under a credit card's extended warranty, you may have to put in some effort.

Over the years, I've made several manufacturer's warranty claims on electronics within the standard year that most purchases include for free. In those cases, the process is simple: Tell them what's wrong, bring the device into a store or ship it out, and get a repaired, refurbished, or new device in exchange.

By comparison, device makers and retailers may not have a clear procedure for dealing with credit card warranty claims. For a product as complicated as a phone, tablet, or PC, diagnosing the problem may require jumping through hoops. Patience is required as you satisfy the demands of the insurance company dealing with the claim.

None of this has changed my personal feeling that in most cases, extended warranties aren't worth paying for. Even before my Surface started acting up, the amount I've saved over the years by not purchasing warranty coverage far outweighs any repair or replacement costs I've had to make. The existence of additional credit card coverage makes it even easier to come out ahead.

My story, however, does end with a twist: Once my card's benefit provider issued the check, that was the end of our transaction, and I'm under no pressure to get the actual repair done. Now \$342.20 richer, the yellow discoloration on my Surface Pro 3 doesn't seem so intolerable. 🛑

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REVIEWS & RATINGS

CONTENTS

- 44 **HP Spectre X360 15T:** It's sexy and thin, but comes with a performance cost
- 55 **Samsung Galaxy S7:** A mild improvement, but it's still the best phone around
- 70 **Origin EON17-SLX:** It sets new records, but calling it a laptop is a stretch
- 79 **Samsung T3:** This 'USB 3.1' SSD is stupidly fast
- 84 **Sapphire Nitro R9 Fury graphics card:** Fast, furious, and ridiculously quiet
- 93 **Asus Zen AiO Z240IC:** A high-res all-in-one with class. Like, you know... an iMac
- 98 **Razer BlackWidow Ultimate 2016 Edition:** The small improvements that matter
- 103 **Superhot:** The most innovative shooter we've played in years

TESTED IN PCWORLD LABS

In this section, hardware & software go through rigorous testing.

REVIEWS & RATINGS



HP Spectre X360 15T: It's sexy and thin, but comes with a performance cost

BY GORDON MAH UNG

WITH ITS NEW SPECTRE X360 15T, HP is offering a different approach to the high-end, high-performance 15-inch laptop. This is a laptop, the company says, that's aimed at folks who want a sizable screen and reasonably great performance wrapped in a great package.

The Spectre X360 15T (go.pcworld.com/spectrex360) certainly has the "great package" part down. It's essentially a bigger version of the beautiful 13-inch Spectre X360. Both feature a similar CNC-milled aluminum chassis, as well as a 10-point touch IPS panel that can be folded back into A-frame mode or tablet mode. Most impressive is that, despite the Spectre X360 15T having a far larger screen than the 13-inch version, the two models are the same thickness.

Our review sample measures 16.55mm (a little more than half an inch) near the hinge—that's awfully thin for a 15.6-inch laptop. Compare that to Dell's new XPS 15, which is maybe 20mm. Or Samsung's new 15-inch Book 9 Pro and the mid-2015 Apple MacBook Pro 15, which are both about 18mm.

The Spectre X360 is also pretty light for its size at just over 4 pounds and 2 ounces. By comparison, the mid-2015 MacBook Pro 15 and the 15.6-inch Samsung Book 9 Pro with 4K touchscreen each push about 4 pounds and 7 ounces.

The Spectre X360 15T
(right) back-to-back with the original 13-inch Spectre X360.





Dell's new XPS 15 (top) is the thickest of the three 15-inch laptops here, with the HP Spectre X360 15T (middle) winning in thinness overall. Samsung's new Book 9 Pro (bottom) has the largest footprint but comes in second in the thin category.

Not surprisingly, using the Spectre X360 15T feels like using a bigger version of the Spectre X360 13. Interestingly, despite the X360 15T's larger body, its keys are roughly 0.1mm smaller. Both laptops give you a top-notch backlit keyboard that doesn't feel cramped. In fact, the relative roominess is noticeable compared to typing on, say, the Dell XPS 13 for an extended period.

The trackpad has the same wide format we've seen before from HP. Its piano-style hinge gets progressively harder to push at the top, but overall, I have no complaints about the design.

Ports, audio, and screen

The Spectre X360 15T's thin body doesn't stand in the way of a generous port selection. You get three USB 3.0 Type A ports, a full-sized HDMI port, and a mini DisplayPort, as well as an SD card reader and combo analog audio jack. HP also includes a forward-looking USB-C port, but there's no Thunderbolt 3.0 support for it—just USB 3.1.

In the audio department, HP has placed four speakers tuned by Bang & Olufsen inside the Spectre X360 15T's chassis, but they just aren't very loud compared to the X360 15T's contemporaries. They aren't bad, mind you—but I expected better performance from the B&O brand.

The screen on our review unit is an 1920x1080 IPS panel with support for touch. (HP offers a 4K panel, but for most people, that option is overkill.) When comparing the display to that of the new Dell XPS 15 and the new Samsung Book 9 Pro, I found the backlighting to be even. There was some bleeding at the top left and right corners when I turned up the brightness in a dark room, but generally you won't notice it.

Naturally, the HP's panel wasn't as tack-sharp as the Samsung Book Pro 9's 4K Ultra HD screen when viewing high-resolution photos. Most people would need bionic vision to see the difference, however.

CPU performance: Four is better than two

For all its good looks, the Spectre X360 15T has a steep task before it: to convince people that it's worth giving up the performance that most companies are jamming into their top-end 15.6-inch laptops. Natural competitors like Dell's XPS 15, Samsung's Book 9 Pro, and Apple's MacBook Pro 15 all sport quad-core CPUs and discrete GPUs,

The four speakers are tuned by B&O, but I found the Spectre X360's sound inferior to that of the Dell XPS 15 and Samsung Book 9 Pro in volume and presence.



whereas the Spectre X360 15T packs a dual-core processor and integrated graphics.

Is that performance a big deal? In some tests, yes: It's as big a deal as Ron Burgundy is in his own mind.

First up is Cinebench R15, a real-world test based on Maxon's 3D rendering engine. Though the vast majority of people aren't doing 3D rendering on a laptop, the benchmark is a good way to measure pure CPU performance. The more cores you throw at it, the more performance you get.

Compared to other dual-core laptops, the HP actually represents well. With its Core i5-6200U, it's just a step back from a Surface Pro 4's Core i5-6300U chip. But against the quad-core systems, the story's different. The Dell and Samsung quad-core CPUs stomp the dual-cores into the dirt. But they are bigger and heavier, too.

For another practical test, we set Handbrake 0.9.9 to transcode a 30GB 1080p MKV video file to a 720p MP4, using the Android Tablet preset. Beyond giving you an idea of how long it'd take if you indeed used your laptop for video file conversion, this test is also a good indicator of video editing performance. As with Cinebench R15, you give up performance with that dual-core.

Graphics performance: Discrete > IGP

To get a quick look at the Spectre X360 15T's graphics performance against the rest of the pack, I used 3DMark's Sky Diver test, a well-respected synthetic graphics benchmark.

Again, the Spectre X360 15T does reasonably well, but it gets trounced by laptops with discrete graphics. The Surface Book, which has discrete graphics believed to be on a par with a GeForce GT 940, does

HP Spectre X360 15T

PROS

- Sexy, thin, and a tiny power brick
- Big screen with a dual-core price

CONS

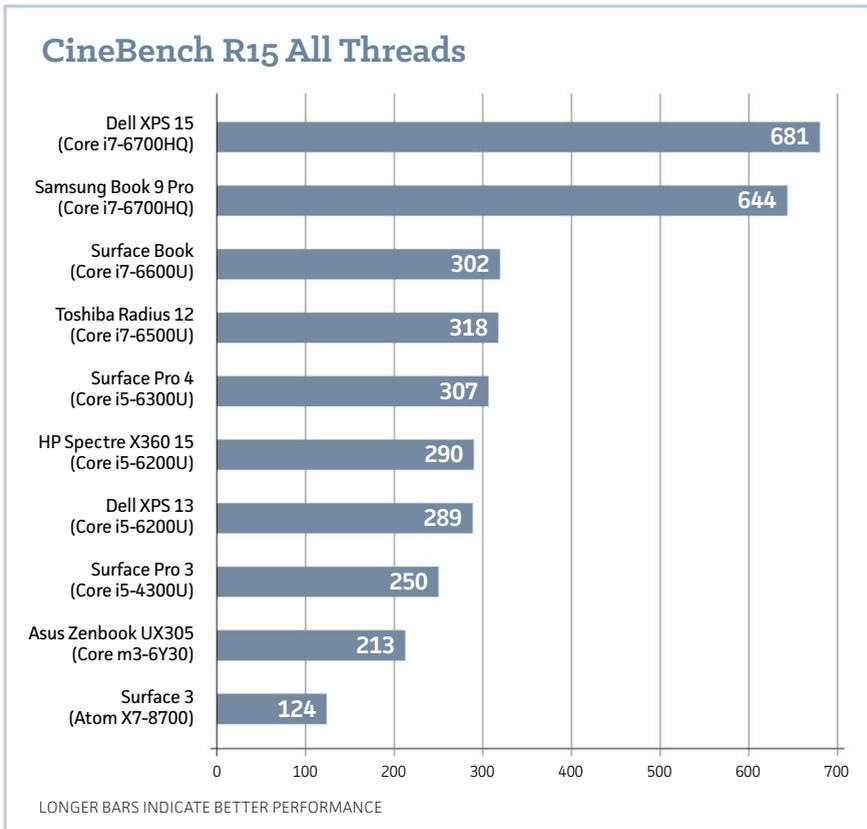
- Still very large footprint despite not having performance of competing laptops
- Dual-core gets smacked around by quad-core competitors

\$1,150



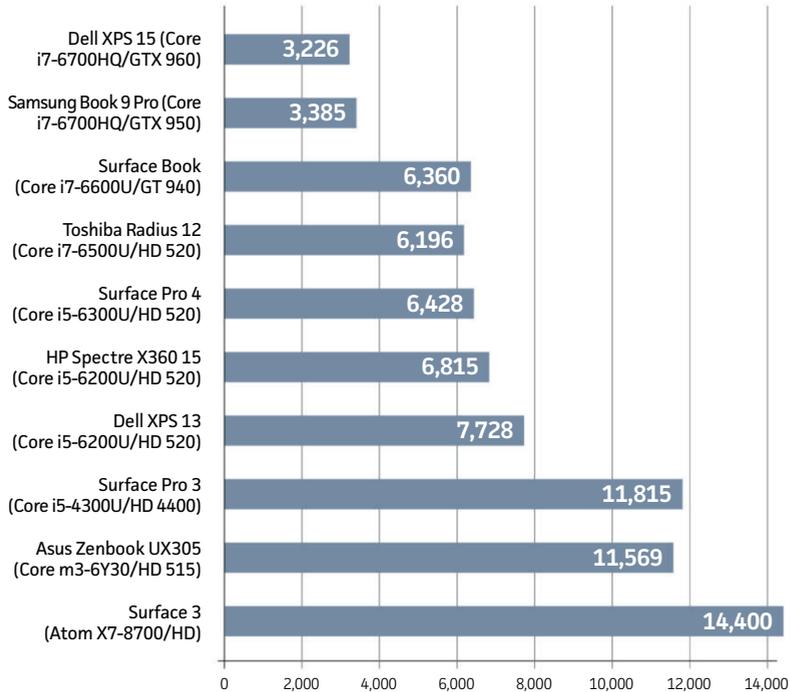
almost twice as well in Sky Diver. The Samsung and Dell boast even better discrete graphics chips, with the XPS 15 posting a score almost three times higher than the Spectre X360 15T. In general, that means you'll see better performance in games and in applications that use the GPU for computing tasks from these competitors.

For those of you who want a little more graphics pep, HP offers a dual-core Spectre X360 15T with Intel Iris graphics aboard. I can say that, yes, that's where you'll find the best integrated graphics



Don't think a quad-core nets you that much over a dual-core? Here's what you lose.

Handbrake 0.9.9 encode (sec)



SHORTER BARS INDICATE BETTER PERFORMANCE

If you're encoding on your laptop, you'll give up performance by going with a dual-core.

performance today, but it still won't outdo discrete graphics.

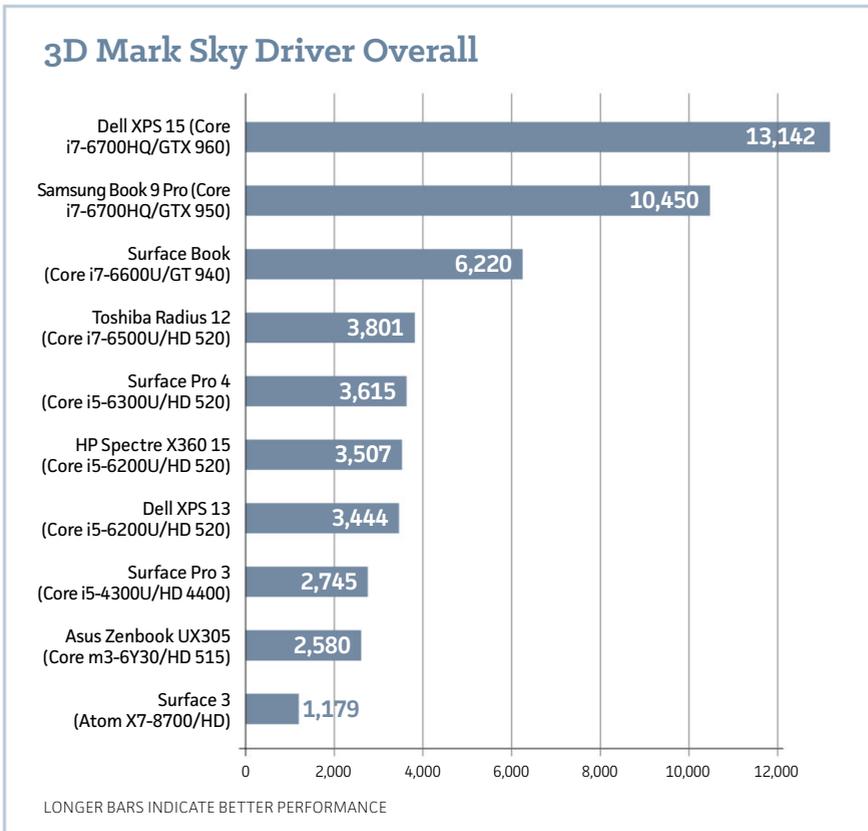
If you've looked at those CPU and GPU charts and turned up your nose in disgust, remember HP's angle here. This is not a laptop for people who need to do heavy-duty tasks.

This is why I like to show the results of the PCMark 8 Work Conventional test. Few people ever need more than a dual-core machine with a solidly fast SSD and sufficient RAM—as you can see in the PCMark benchmark, none of the hardware differences really show

during ordinary tasks on these laptops. The exception is the Surface 3 with its Atom X7-Z8700 processor. This is what HP hopes people realize when they do the obvious comparison between the Spectre X360 15T and systems like the XPS 15 and Samsung Book 9 Pro.

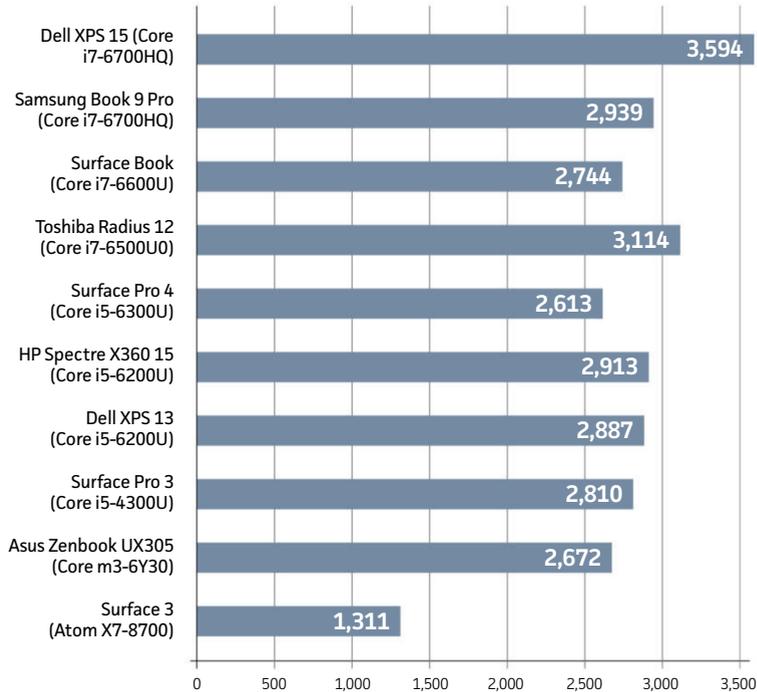
Battery life: Dual-core beats quad-core

There are some distinct advantages to a more modest configuration, as well. Shedding two cores and a discrete GPU can net better battery life. For our battery-life test, we play a 4K UHD resolution file using the



Here's how the graphics performance of the Spectre X360 15T stands against the pack.

PCMark 8 Work Conventional



LONGER BARS INDICATE BETTER PERFORMANCE

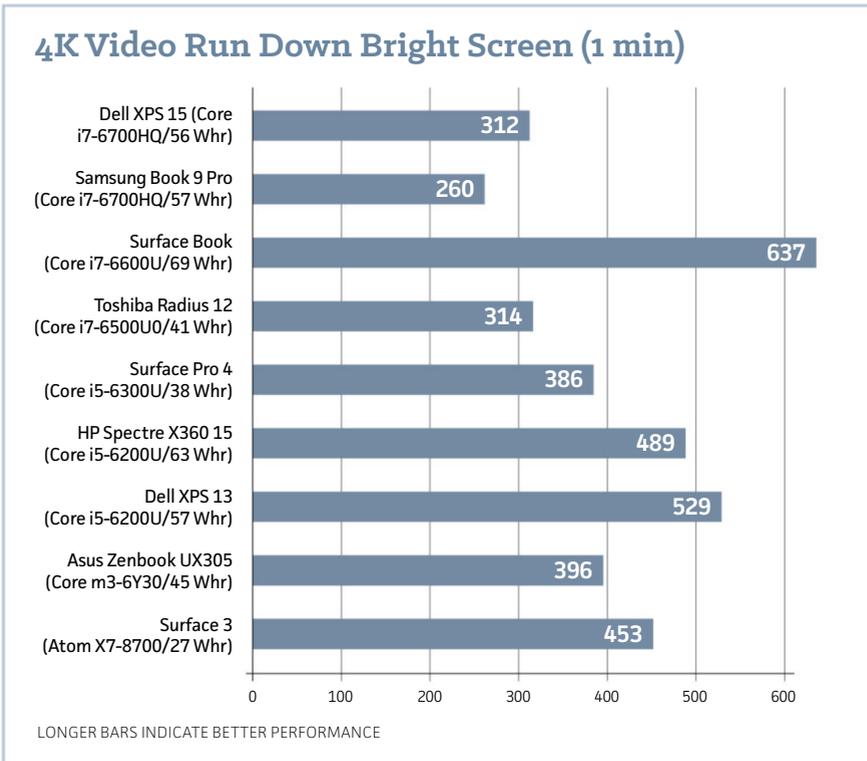
Quad-cores are nice, but if all you do are Office drone tasks and browse the Internet, you won't see much of a difference between a dual-, quad-, or even eight-core CPU.

Movies & TV player app in Windows 10, with the screen set at a fairly bright 250 to 260 nits. This brightness setting is akin to what you'd use when playing a video in an average office environment with the lights on.

The Spectre X360 15T bests the Samsung Book 9 Pro with its big 4K UHD touchscreen. It also nicely outpaces the Dell XPS 15. In fairness to Dell, our XPS 15 review model features the smaller battery option—there's an optional cell that's about 20 percent bigger. Even with the

bigger battery though, I'm not sure it would whip HP's laptop. The Spectre X360 15T does very well, especially considering it has a touchscreen, which consumes more power than a non-touchscreen.

Finally, there's the Spectre X360 15's price—maybe it's most compelling attribute. Without that fancy-schmancy quad-core processor and discrete GPU, you can save buckets of cash. The model with 8GB of RAM and a 256GB M.2 SSD lightens the wallet by \$1,150, whereas a Dell XPS 15 with the same amount of RAM and same-sized SSD pushes \$1,450, without a touchscreen. The Samsung Book 9 Pro is even more: \$1,500. That's almost as significant a difference in price as the performance deltas.



There is an advantage to a 15-inch laptop using a dual-core chip: battery life.



The large touchscreen on the Spectre X360 15T makes a compelling argument for using it in A-frame mode.



If you loved the original Spectre X360 but wanted a bigger screen, HP has obliged with the Spectre X360 15T.

Conclusion

Like all things in life, HP's Spectre X360 15T's appeal comes down to your personal needs. If you want a 15-inch laptop for video editing, photo editing, or other content creation tasks, opt for a more powerful CPU and GPU, like those found in the Samsung Book Pro 9 and Dell XPS 15.

But if you have a desktop for most of your "real" work and just want a laptop that's fairly light and thin, has a large screen, and offers good battery life, the X360 15T is worth a good look. 

Samsung Galaxy S7: A mild improvement, but it's still the best phone around

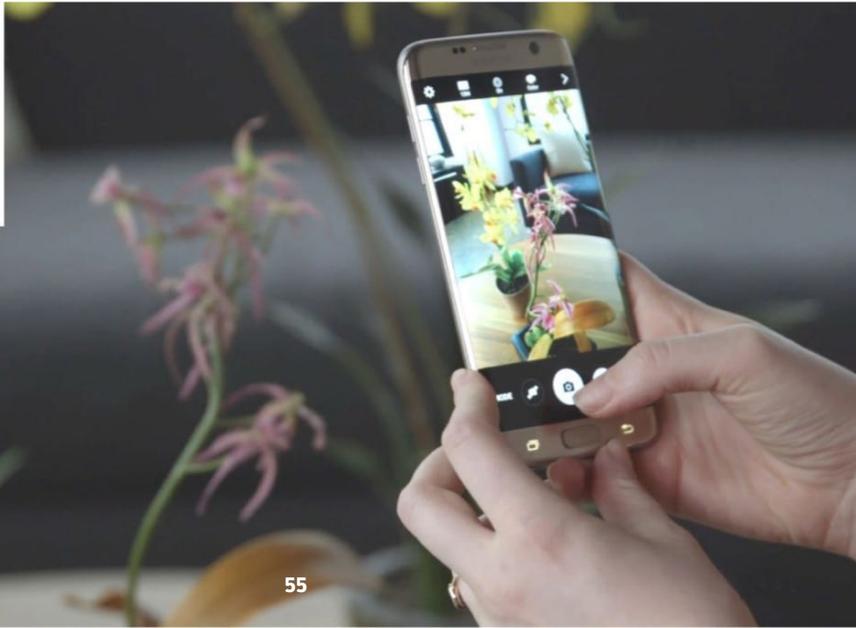
BY FLORENCE ION

I AM FACING a predicament here that I'm sure many of my iPhone-reviewing brethren have experienced before: The Samsung Galaxy S7 (go.pcworld.com/galaxys7) is merely an incremental update to its predecessor, which makes it hard to justify the upgrade considering the Galaxy S6 was the top contender for 2015's phone of the year. Is this what it feels like to review the "s" models of the iPhone?

If it were an iPhone, the Galaxy S7 would be called the Galaxy S6s. It offers minor improvements, including slightly better battery life, a



Watch the
video at
[go.pcworld.
com/samsung
gs7vid](http://go.pcworld.com/samsunggs7vid)



marginally better rear-facing camera, and a somewhat more refined metal-and-glass chassis. It also marks the return of the microSD expansion slot to Samsung's devices, as well as dust and water resistance. Despite all these marketable features, however, I don't think the Galaxy S7 offers enough of that "wow" factor to convince the Android-using population that it's worth springing for—especially if you're already wielding any of the major flagships announced in the last six months.

Real phones have curves

If you thought last year's Galaxy S6 was a fingerprint magnet, wait until you get your hands on the Galaxy S7. This year's model has all the same glass-and-metal trimmings as last year's marquee device, so it's an absolute magnet for finger grease. Regardless, it's an exceptionally attractive phone, albeit one you'll have to wipe down with antibacterial solution from time to time.

The Galaxy S7 looks and feels like an evolved, refined



The Galaxy S7 fits nicely in any hand.

Samsung Galaxy S7

AT A GLANCE

The Galaxy S7 is a near-perfect Android device, but you should only upgrade if your carrier is offering you a discount.

PROS

- Qualcomm's Snapdragon 820 is fast and powerful and perfect for mobile gamers and multitaskers alike
- Metal-and-glass chassis is dust and water resistant
- 12-megapixel rear-facing camera sensor with f/1.7 aperture offers the best low light performance of any smartphone
- The expansion slot is back! Which is great, because there's carrier bloat.

CONS

- You'll have to contend with unremovable bloat if you buy this phone through your carrier





version of the Galaxy S6. Samsung shaved a few millimeters off the edges—almost exactly a millimeter off each edge—and implemented the same curved back as found on the Note 5. You’ll also notice a subtle “bubble” effect made by the glass placed on top of the display as it sinks into the edges of the chassis. It shows incredible attention to detail on Samsung’s end.

The Galaxy S7 has all the same buttons and sensors as its predecessor: a power button on the right-hand side, volume rockers on the left, a heart-rate monitor built into the LED flash on the back, and a slightly raised Home button with a built-in fingerprint scanner. But after using the rear-facing fingerprint scanner on the Nexus 6P, Samsung’s implementation hardly compares. With the Galaxy S7, you’ll have to press the Home button and then scan in your thumb, which is just too much. I don’t like any scanner that doesn’t immediately launch to the Home screen. (It may also be time for Samsung to consider dropping physical navigation buttons altogether.)

Samsung heard your gripes. It brought back the expansion slot,

Siblings: the Galaxy S7 on the left and the Galaxy S6 on the right.

which rests comfortably next to the Nano SIM tray, and Samsung made the Galaxy S7 both water- and dust-resistant. The only caveat is that after you rescue your device from a pool of water, you'll have to give it some time before plugging it into the charger. It's a safety precaution, and it brings home the idea that Samsung paid great attention to detail when designing the device. This doesn't look like a phone that would be able to stand a dip in the water, but it is. I'm also glad to see that Samsung didn't just go the Sony route and put flaps over every port. It's better for my manicure.

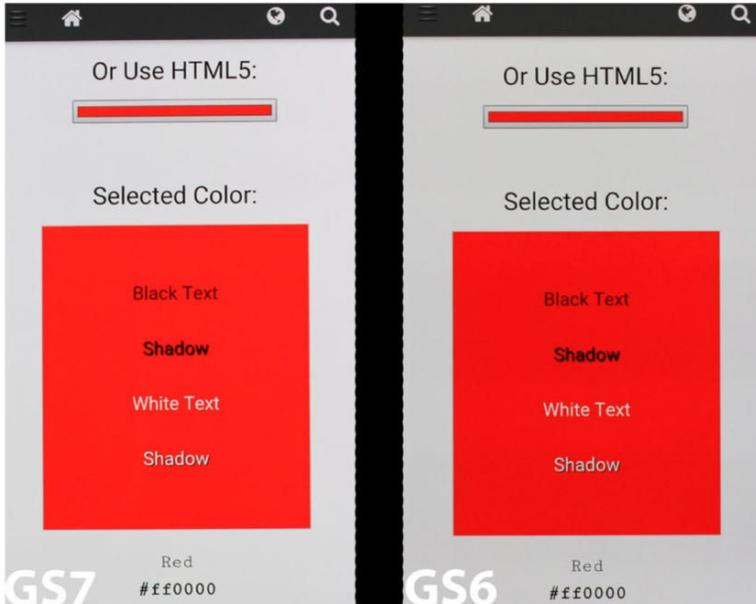
A brighter display

Samsung improved the Galaxy S7's 5.1-inch Quad HD Super AMOLED display by making it a bit brighter. It's especially obvious when it's side-by-side with the Galaxy S6, though I first noticed the extra brightness as I was using the phone before bed. There's also a personalized auto brightness feature, which remembers at which setting you like the screen for different lighting environments. This only works if you have auto brightness selected.

The Galaxy S7 also comes with the ability to enable an always-on

Sorry, kids. No USB Type-C on this year's Galaxy S7.





The display brightness level between the Galaxy S7 and Galaxy S6 is subtle, though it's especially obvious in dark environments.

display mode. This makes it so you don't have to fumble with the buttons on your phone just to check on the time or notifications, and it's similar to the feature already offered on the Moto X and Nexus 6P, except those phones will light up the display only when you pick it up or wave your hand over it. When enabled, the Galaxy S7 shows its always-on display all the time.

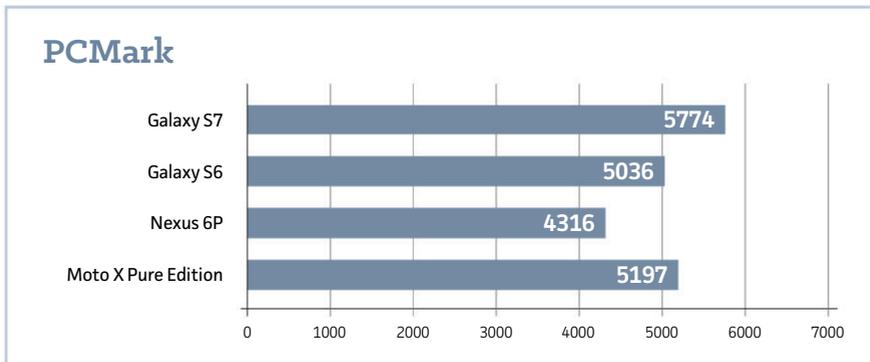
There are a few customization options for the always-on display, but you're limited to what Samsung provides. You can't import your own images for the background, for instance, nor will you see a preview of your notifications like on the Nexus 6P. I like the implementation on the Nexus devices the best.

A phone made for gamers

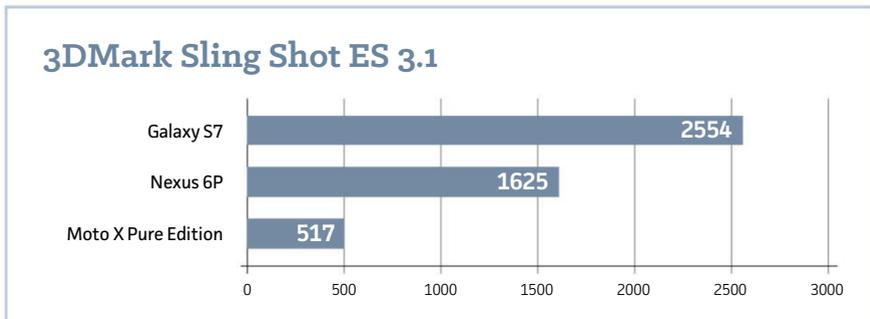
I had fun this past year uttering "Exynos" any time I mentioned the Galaxy S6—it's a fun word!—but Samsung is back to using Qualcomm's chipset in its smartphones. The 2.2GHz Snapdragon 820

is quite a performer. It offers all new faster “Kryo” CPU cores, and better image and graphics processing. Altogether, it’s an enticing package for anyone who needs a phone that’s fit for multitasking on a long train ride into the city, or for marathon mobile gaming sessions.

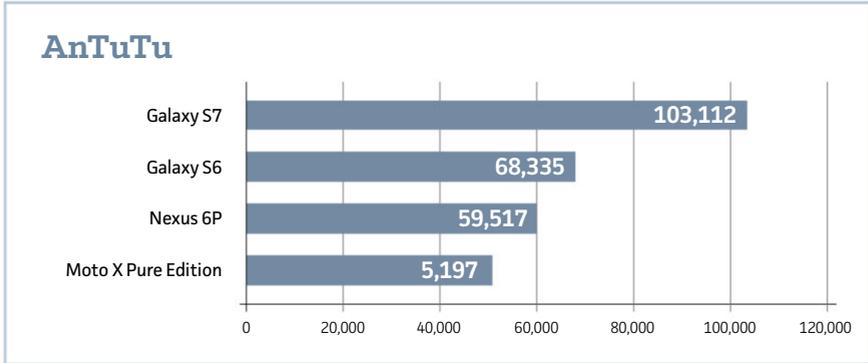
The Galaxy S7 whizzed by the Nexus 6P’s Snapdragon 810 and the Galaxy S6’s Exynos 7 Octa 7420. It’s fast, responsive, and especially quick at loading heavy applications, including large games. Apps loaded quickly and visuals were smooth—perhaps too smooth for



The Galaxy S7 is great at handling day-to-day smartphone tasks like posting to social media and editing photos.



Compared to the Nexus 6P and Moto X Pure Edition, the Galaxy S7 soars. As an added bonus, Samsung supports the new Vulkan API.



I **did a double-take** when I saw the Galaxy S7's score in AnTuTu.

gory games like *Mortal Kombat X*. In fact, I had a physical reaction to Takeda slicing the face off an opponent precisely because it was too realistic. It's certainly a testament to how far mobile gaming has come.

The Snapdragon 820 features a sealed copper cooling system, which is essentially a miniature, scaled-down version of a heat-pipe system you'd find in many notebooks. This is how the Galaxy S7's metal chassis manages to stay comfortably tepid as you're playing games or streaming video, though I'll be checking to see if the Galaxy S7 keeps its cool when the weather gets warmer.

The Game Launcher is my new favorite thing about the Galaxy S7—and this is coming from a person who tends to roll her eyes at this kind of stuff. This little folder houses shortcuts to all the games you've downloaded, excluding any games you may have side-loaded. (I tried getting a space for my Humble Bundle picks in there and it denied me.) From here, you can choose whether to enable Game Tools, which will pin a small red icon in the far corner of any game you launch from inside the Game Launcher. There's also an option that allows you to tweak the graphics performance, dialing it back to save on battery power. I'm curious about the actual battery life saved with this mode turned on, but I'll have to test this at another time.

The Game Tools overlay offers options for shutting off alerts during a game, locking the Recents and Back keys so you don't accidentally

bump one of them and exit in the middle of it all, minimizing a game so that it doesn't crash your system, and snapping a screenshot. There's even an option to record your game play, which you can then upload to YouTube or whatever video sharing service you prefer.

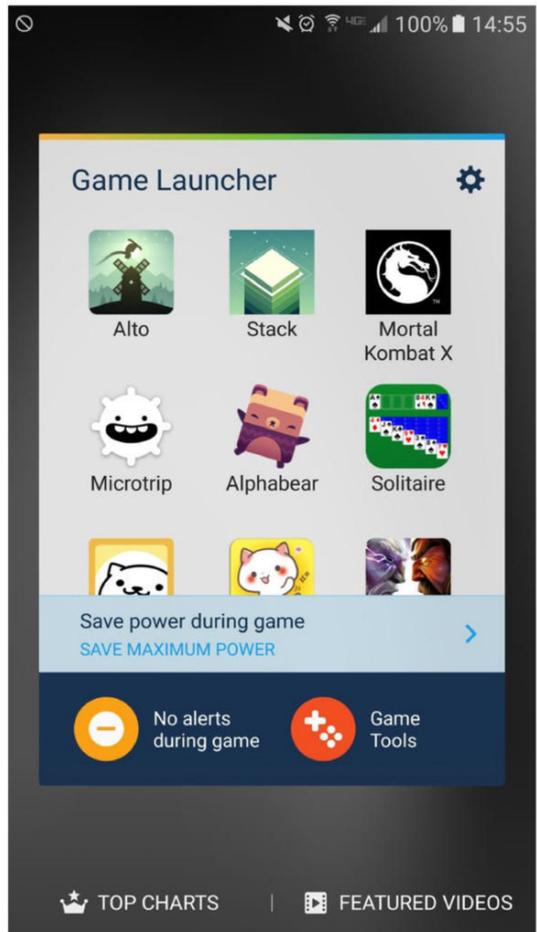
The Game Tools and Game Launcher features remind me of the types of add-on applets that my PC gaming pals would download to enhance their own gaming experiences. It's obvious that with these included software features, Samsung is making a play for the Twitch generation, and I think it's a smart move.

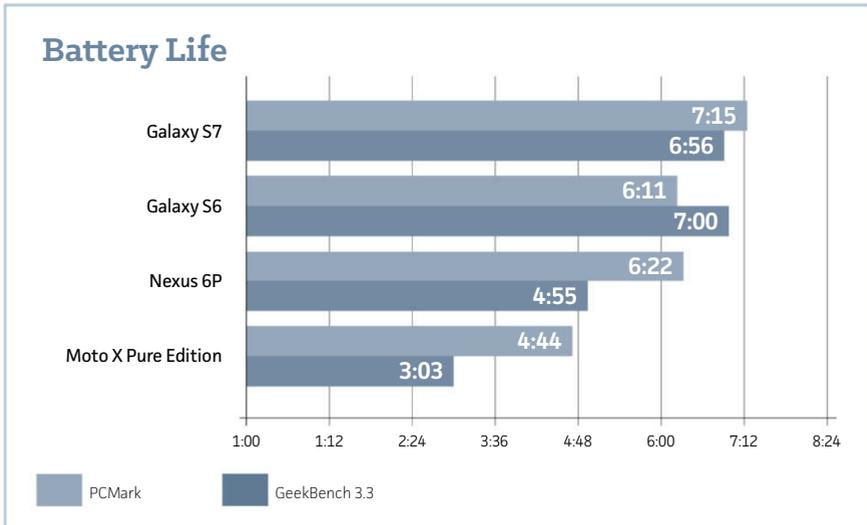
Made for people who stay out all day

The Galaxy S6's 2550mAh battery pack seemed promising after our initial battery tests, but things quickly degraded. I still can't leave the house with the Galaxy S6 Edge, for instance, without an external battery pack in tow.

I'd hoped for better results with the Galaxy S7's bigger 3000mAh battery pack. Like its predecessor, the initial results seem promising: the GS7 lasted seven hours and 15 minutes in our PCMark battery rundown test, and six hours and 56 minutes in Geekbench—about 50 minutes more than the Galaxy S6. I had about enough battery life at the end of the work day to commute home as I do with my Nexus 6P—about 40 percent—

The Game Launcher houses a shortcut for every game you've downloaded from the Google Play Store.





The Galaxy S7's 3000mAh offers fantastic battery life (though if you're a Verizon subscriber and battery life is your thing, you might want to check out the Droid Turbo 2 instead).

which actually sports a bigger battery.

On the weekend, I got to 40 percent after about four hours of use just by using Snapchat (a ton), Facebook, and Instagram on Wi-Fi—the social networking trifecta, if you will. Through the night, the Galaxy S7 barely used up any of its juice thanks to Doze mode. It used up maybe two percent of its battery while remaining dormant underneath my bed, and that's with the always-on display enabled.

One annoyance: the Galaxy S7 does not support Quick Charge 3.0. Samsung apparently nixed this because its Exynos chip overseas doesn't yet offer support for it. It still supports Quick Charge 2.0 and charges up quite fast, but it's a shame to see that the Snapdragon 820's charging performance might be held back for such a lame reason. Wireless charging returns from last year, and with the right charging pad, you can now get fast wireless charging.

Samsung claims the Galaxy S7 can manage up to 10 hours of video playback before petering out—that's enough for you to binge-watch

an entire season of *Game of Thrones*. I'll be testing this myself with ten of my favorite episodes of *Beverly Hills, 90210*.

Improving an already fantastic camera

I didn't think that Samsung could improve upon the 16-megapixel camera it packed into the Galaxy S6, but it outdid itself with the Galaxy S7. Samsung's latest phone features one of the best cameras on any phone, though it's only marginally better than its predecessor.

The Galaxy S7 employs a 12-megapixel rear-facing camera sensor with Dual Pixel technology, which is fancy lingo for the technology used inside most Canon DSLRs. Samsung's sensor has two photodiodes in every pixel of the camera sensor, which allows every single pixel to be a phase-detection autofocus point. That means faster, more accurate focus in all conditions.

I went for a walk around my hometown with both Galaxy devices in



The color and contrast differences between the Galaxy S7 (left) and Galaxy S6 (right) are subtle, but significant. The photo taken with the S6 isn't as lustrous as the one taken with the S7.



tow and was impressed by how much more well-contrasted the Galaxy S7's photos were. It appears Samsung also fixed the light leak issue that was prevalent in its last few phones, though it still needlessly bumps up the sharpness. This can be annoying if you're attempting to master some professional-level photography with your smartphone.

Our lab tests also showed that while the Galaxy S7's 12-megapixel sensor has an aperture of $f/1.7$, it's only marginally better in low-light situations against the Galaxy S6's $f/1.9$ aperture. Indeed, after shooting my own photos of my cat in my dark bedroom, I didn't notice a very significant difference in low-light performance.

The Galaxy S7 can shoot videos in UltraHD (4K). I didn't try this because, frankly, I don't have hardware that can display it. However, I did shoot a video in FullHD (1080p) at a concert I recently attended at The Fillmore in San Francisco, and I realized that tapping the screen to focus actually shuts off the autofocus feature. As a result, my video of the lead singer of St. Lucia wading through the crowd is blurry, and the

With the Galaxy S7, light leakage is not a common issue.

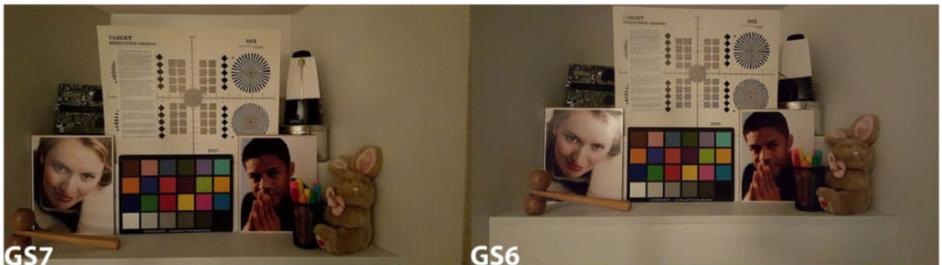
mic seemed to focus specifically on my singing along. This is where I wish the Galaxy S7 had manual video controls the way the LG V10 does. Maybe next time.

Samsung kept the 5-megapixel sensor for the front-facing camera, but added in a few software features for those who are particularly concerned with the way their selfies look. The Galaxy S6's "beautify" mode has been expanded to include a face slimming feature, eye enlarger, skin tone enhancer, and faux spotlight—similar to the effect you'd get if you were using a Lumee light case (go.pcworld.com/lumeegalaxy6). There's also a shape correction feature for when you're taking a selfie with multiple people. The features are subtle and might seem pointless, but I actually know a few people in my personal life who use these filters on their own photos.

Lastly, if you were hoping for front-facing flash for you and your



You can see the slight difference in the Galaxy S7's f/1.7 aperture versus the Galaxy S6's f/1.9 aperture.



The f/1.7 aperture is particularly helpful in low-light situations, though only marginally so compared to the Galaxy S6.



The Lock screen and Home screen on the Galaxy S7 (the latter of which has been customized with third-party apps).

friends to take photos in darker environments, you're out of luck. The Galaxy S7 uses screen burst to light up your face as the front-facing camera snaps a photo. It's awful and I am always blinded by it. It's too bad Samsung didn't spring for the front-facing LED like the Moto X Pure Edition.

Carrier bloat is still a thing

Say what you will about Touchwiz (I certainly have), but the truth is that there are people like my mother who aren't power users that find Samsung's version of Android to be more intuitive than stock.

For instance, Samsung added a blatant Notifications Settings option right below the notifications shade, which makes this new feature in Android Marshmallow more obvious to novices. I'd wager that some users have no idea that you can control the individual notifications

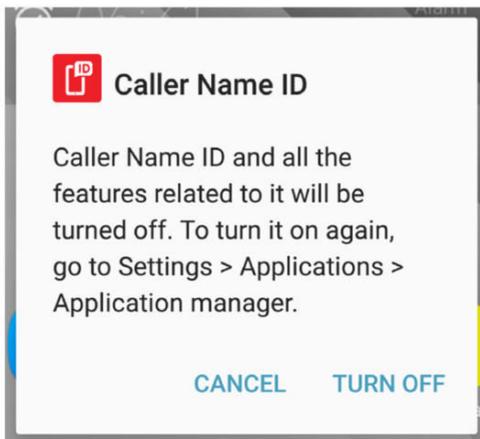
settings for each application, so it's nice to see that Samsung made some of Android's essential new features more easily discoverable. You can also long-press on a quick setting button to go to the relevant settings screen, rather than having to navigate there yourself.

Samsung also dialed down all the blue hue throughout the interface, though it held on to the messy, discombobulated application drawer of the past. I like Google's vertical horizontal scrolling application drawer better, with the search bar affixed at the top.

Also, be forewarned that if you're buying your Galaxy S7 through a carrier, you're going to get stuck with all the bloatware that comes as penance for not buying your phone unlocked. Alas, not all of us have the luxury of paying full price for a smartphone. You can't delete these apps, but Samsung lets you drag the icon to turn it off, essentially disabling it. You'll still have that application taking up precious storage space, though. When will the carrier bloat stop?

Samsung's bloat is still around, too, though the company's been slowly whittling down how much it crams in there. The Galaxy S7 comes preloaded with Samsung's own email client, file browser, S Voice, S Health, and Samsung Milk Music. The Verizon variant I reviewed also came with apps like go90 and the Gear app, both of which you also can't remove.

If you hate your bloatware, you can "turn it off" by dragging it to the top. It still takes up room on your device, though.



Is a flagship phone still worth the money?

Samsung still holds its spot as the top manufacturer in the Android world, but this is the year I'll be watching to see whether high-end, expensive flagship devices like the Galaxy S7 can withstand the onslaught of perfectly good, unlocked, less-expensive smartphones



What do you think? Does the Galaxy S7 match flannel?

making headway.

Here's the deal: if you've got a Galaxy S6 in your hands already, keep it. You're definitely good for another year, and some of the software features that come with the new S7 will eventually make their way to your phone. But, if you're still wielding a Galaxy S4 or Galaxy S5 or some other Android phone that's let you down too many times, this is the best it's going to get at this point in time—as long as you're still convinced it's worth spending gobs of money on a flagship device. If not, there's always the Moto X Pure Edition (go.pcworld.com/motopureed) or Nexus 6P (go.pcworld.com/nexus6prev), two perfectly alright smartphones free from bloatware that cost far less than what your carrier will sell you the Galaxy S7 for. 📱

Origin EON17-SLX: It sets new records, but calling it a laptop is a stretch

BY HAYDEN DINGMAN

SEVENTEEN INCHES WIDE. More than 10 pounds of heft. A socketed Core i7 Skylake CPU and a desktop GTX 980 card crammed inside. More graphics horsepower than any laptop we've ever tested. When does a laptop cease to be a laptop? Origin's EON17-SLX (go.pcworld.com/eon17slx) might be the answer.

Design

Origin has never shied away from sacrificing portability on the altar of power. I should know—I hauled an Origin laptop around for about a year and a half until I traded it for something a bit more back-friendly.



Watch the video at go.pcworld.com/origin/eon17vid

The EON17-SLX carries on Origin's proud tradition of making weight lifting/laptop hybrids with a 16.8-by-12-by-1.8-inch chassis, and a (literally) staggering 10.5-pounds of weight. And that's not counting the power brick cinder block, which adds another three pounds to the total.

I'm typing this review on a dainty 970M-equipped MSI laptop—you could fit two of these inside the EON17-SLX, with room to spare.

The result is a laptop in name only. You could tote the EON17-SLX around. You could use the EON17-SLX on your lap. But woe unto those who try. This is a machine meant for sitting on a desk. It might as well have a "Move only in case of emergencies" sticker on the outside.

That being said, it's perfectly inoffensive once you find a home for it. Bland, if you're feeling less charitable. Design has never

been Origin's claim to fame and the company has yet again made a laptop that's more serviceable than stunning. Origin has clearly taken some cues from Alienware, embedding two angular, color-changing LEDs in the lid. But other than that, it's a pretty generic-looking chassis. A chunky rectangle. A black box.

Even if you spring for colored metal (an extra \$225) or a custom paint job (an extra \$299), the EON17-SLX lacks the immediately identifiable cues of something like the Razer Blade or Alienware 17—which is a shame, given how much Origin's machines cost. I'd expect an above-average design.

And I hoped for a bit more inside, too. The IPS display is G-Sync-equipped, but its 1920 by 1080 resolution is a bit surprising given that's now the baseline for gaming laptops. I would've expected at least the option to go up to 1440p, if not 4K. The same goes for its 75Hz refresh rate—perfectly fine, but not impressive.

Still, color reproduction and contrast are on or slightly above average, even with the screen's matte finish, and I didn't detect any major issues. It's just a

Origin EON17-SLX

AT A GLANCE

For a machine that packs a socketed desktop Intel CPU and a full desktop GTX 980, Origin's EON17-SLX is barely a "laptop" at all.

PROS

- Desktop CPU, desktop GPU, desktop performance
- Semi-upgradable, if you're interested

CONS

- Massive
- Underwhelming screen, considering the price

\$3,500





shame that Origin didn't include a screen that matches the rig's performance-oriented components.

Down from the screen, tucked into the upper right and left corners, are two top-mounted and extremely loud speakers. They're heavy on the treble (especially as you increase the volume), so I wouldn't necessarily recommend serious gaming on them, but in a pinch they will fill a room—and then some. Even at 50 percent, the EON17-SLX was about as loud as I keep the speakers for my desktop system.

You have plenty of options for speakers, though. Four ports on the left side allow you to use anything from a standard analog headphone or microphone to a full 7.1 setup if you'd like. Also on the left are three USB 3.0 ports and two gigabit ethernet inputs. The right side plays host to another USB 3.0 port, a USB-C Thunderbolt port, two DisplayPort outputs, and an SD card reader. And on the back reside the power port, another USB 3.0 port, and HDMI-out. Phew.

Rounding out the design are a noteworthy keyboard and a

respectable touchpad. The keyboard is a high point, with slightly more travel than is found on other laptops. While it's a bit less crisp than your average scissor switch board, the extra room to maneuver meant my wrists/fingers felt less fatigued after long bouts of typing. My only issue is that there's an abnormal amount of space between the keys, due to some beveling.

The touchpad, on the other hand, could use more physical definition to make its presence more obvious. It's fairly large but built to blend right into the rest of the laptop, which can be awkward at night. I also needed to crank up the sensitivity a few notches, but that was an easy fix. It's not all bad, though: Physical mouse buttons are always a plus in my book, and the fingerprint sensor in the middle is easy to ignore if (like me) you don't care about that feature.

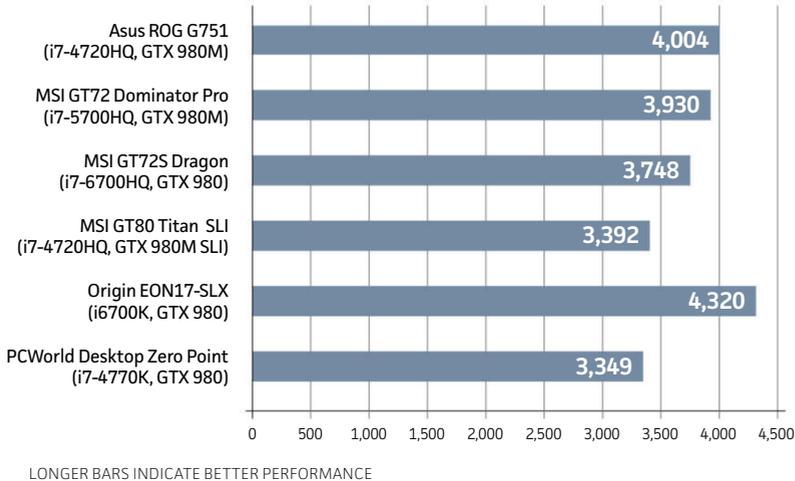
Performance

But who cares about the design? We're here because Origin promised desktop-level performance in a portable machine, and hot damn did it deliver.

To recap, the EON17-SLX contains both a desktop CPU and a desktop-performance GPU—an Intel Core i7-6700K and a GTX 980 in our model, to be exact. What's more, the Core i7-6700K we tested came overclocked at a zippy and stable 4.5GHz. Absolutely remarkable.



PCMark 8 Work Conventional



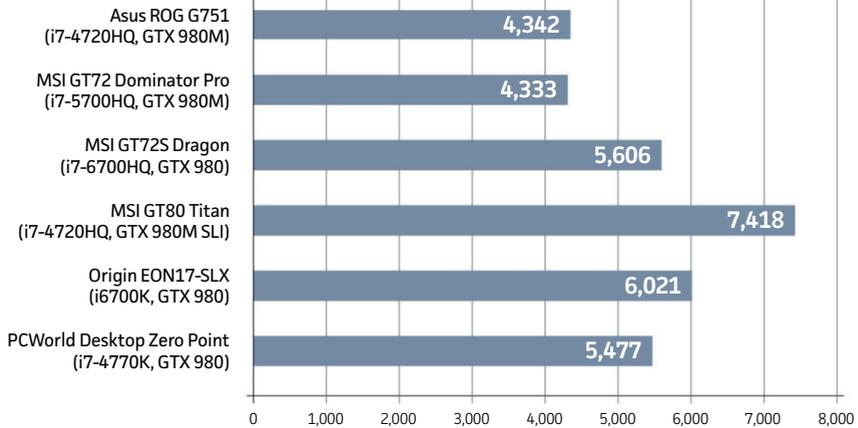
Our model also boasted 16GB of DDR4/2133 RAM (though you can opt for up to 64GB if you're crazy) and two drives—a 256GB Samsung 950 Pro PCIe m.2 drive and a 1TB 5,400rpm HDD. If you want to splurge you can opt for two m.2 drives and two 2TB Samsung 850 Pro SSDs (with the latter costing almost \$1,000 a pop).

It's a hell of a lot of fancy hardware, with our model coming in just north of \$3,000. Which—you're right—is an insane amount of money to pay for a laptop. But who am I to judge?

Performance is suitably incredible regardless, chewing through our benchmark suite and putting other laptops to shame. In PCMark 8, for instance, the EON17-SLX put up a Work Conventional score of 4,320. That handily beats out MSI's GT72S Dragon, which also featured a GeForce GTX 980 part (though a Core i7-6700HQ mobile processor).

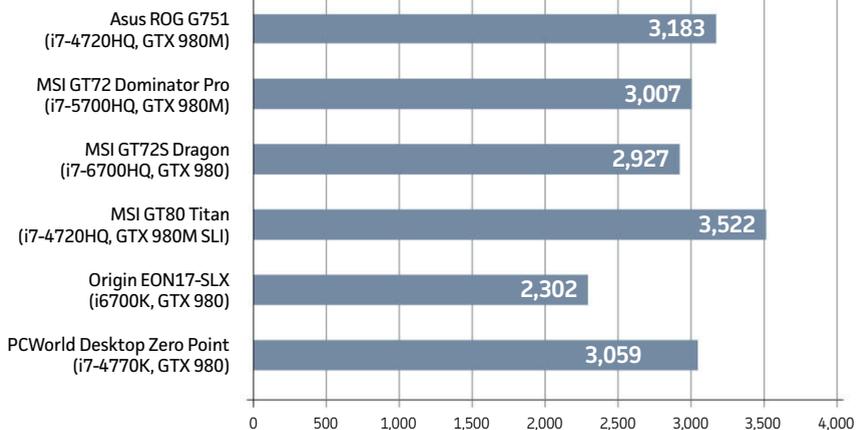
We also ran our standard Handbrake encode test, taking a 30GB MKV file and running it through Handbrake's Android Tablet preset. With Origin's 4.5GHz overclock, Handbrake finished encoding the file in a record 38 minutes and 22 seconds, or 2,302 seconds total. That score

3DMark FireStrike Extreme Overall



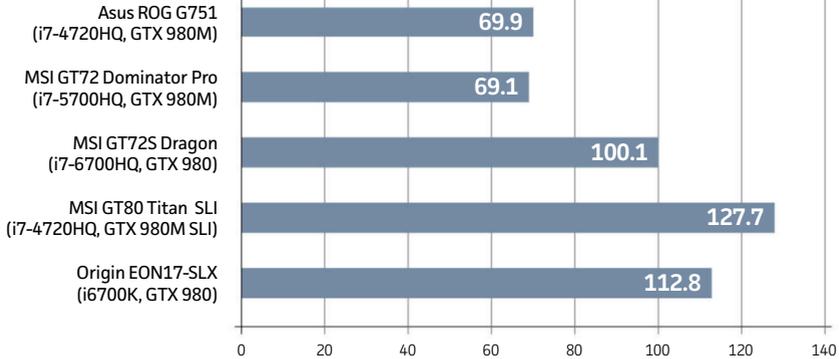
LONGER BARS INDICATE BETTER PERFORMANCE

Handbrake Encode 0.9.9 (sec)



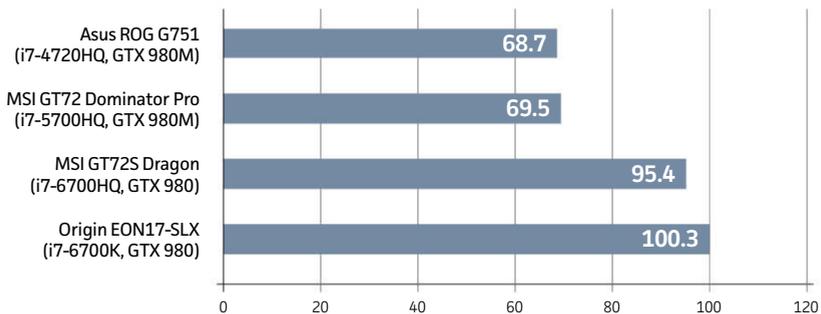
SHORTER BARS INDICATE BETTER PERFORMANCE

Tomb Raider Ultimate 1080p (fps)



LONGER BARS INDICATE BETTER PERFORMANCE

Shadow of Mordor 4K Textures and Ultra-quality at 1080m(FPs)



LONGER BARS INDICATE BETTER PERFORMANCE

takes a torch to the mobile quad cores we've seen running Broadwell and Skylake chips.

And when it came to graphics, the EON17-SLX set a blazing score of 6,021 in 3DMark's FireStrike Extreme test. That handily outstrips the

GT72S's 5,606 score and beats our GTX 980-equipped PCWorld Zero Point desktop.

Real-world performance is similarly impressive—112.8 frames per second in *Tomb Raider* on Ultimate (versus 100.1 for the GT72S) and 100.3 in *Shadow of Mordor* on Ultra with the 4K texture pack installed (95.4 for the GT72S).

The only downside to all of this muscle: heat. A lot of it. Day-to-day web and writing use is fine, but start gaming and you'll hear the fans spin up. Maybe the speakers are so loud because they need to drown out the jet engine roar of this system under load.

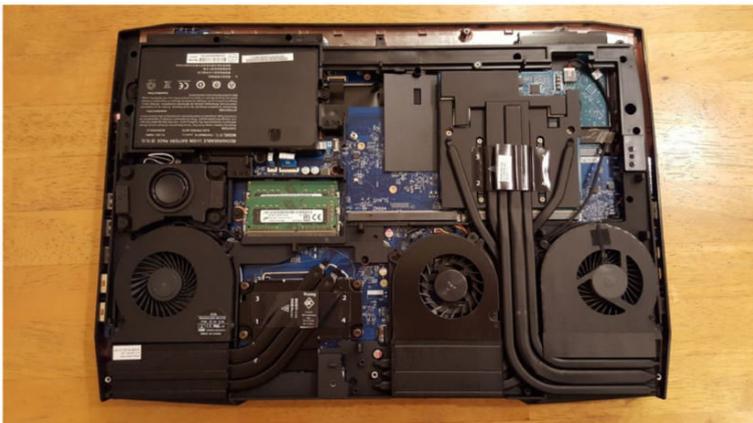
The upgrade factor

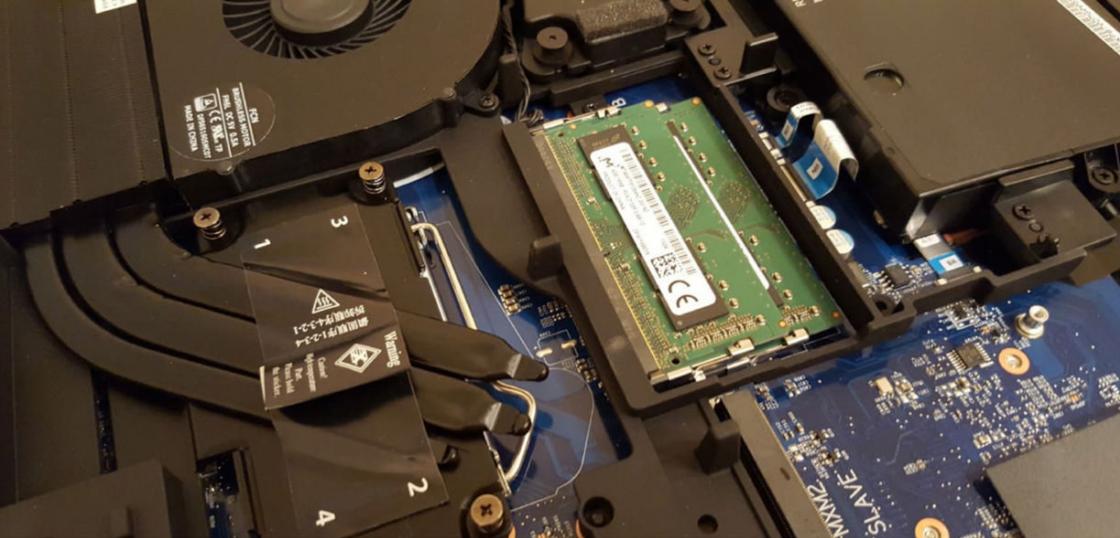
It has desktop parts. It has desktop performance. But does it have a desktop's signature upgradability?

Most of the time we'd accept that the answer is "No" and move on, but we were intrigued by the EON17-SLX's use of a socketed CPU. Provided it was easily accessible, that *would* technically allow for desktop-esque upgrades.

We cracked it open and...

Sure enough, it looks like you can remove the CPU heatsink with four or five screws, with the socket easily accessible underneath. We





stopped disassembling here, but as long as Intel's next processors use the same socket and are compatible with the chipset and BIOS, you could technically upgrade the EON17-SLX's processor.

Now, would you ever do that? Probably not. The Core i7-6700K is already a top-of-the-line chip, and it's doubtful you'd see a tangible boost from any upgrade before Intel changes its CPU socket again.

But the point is you can upgrade, and oftentimes with a PC, having the option is more important than taking advantage of it.

Bottom line

The EON17-SLX is the most desktop-y laptop to ever come through *PCWorld*. Sure, you can build an actual desktop for cheaper—my colleague Gordon Ung dove into that math when he reviewed MSI's similarly stacked GT72S (go.pcworld.com/msigt72srev). But that shouldn't take away from Origin's accomplishments here, especially because the desktop/laptop price disparity isn't as high as you might think.

Maybe you travel a lot, maybe you're a game developer in need of a mobile demo station, or maybe you've just got money to throw around. In that case, the EON17-SLX is a damn impressive piece of engineering and well worth a look. Just make sure you've been doing back exercises before you pick one up. 🛑

A closer look:

You can see the arm for the CPU socket peaking out from under the heat pipe.

Samsung T3: This 'USB 3.1' SSD is stupidly fast

BY JON L. JACOBI



The T3 has a USB Type-C connector and comes with a non-captive Type-C-to-USB-3.x-Type-A cable.

THE NEW SAMSUNG T3 (go.pcworld.com/samsungt3) and its predecessor, the T1, are the handiest and fastest USB SSDs on the market. Indeed, the T1 I've been using for the last year or so has saved me so much time moving data from PC to PC and installing software, I don't know what I'd do without it (other than waste a lot of time).

It's far faster than anything else I've tried, and the thin, wide profile doesn't make a lump in the pocket like the average thumb drive does.

At 2.3 inches wide, 3 inches long, and 0.4 inch thick, the T3 is slightly larger than the T1, has a new luxurious velvety texture, and, at 1.8 ounces, has a more reassuring heft. All nice improvements, but I was

hoping for just a bit more on the technology front. While the T3 is “USB 3.1” and has a USB-C port, I harbored fantasies that it might be a full-on SuperSpeed+ 10Gbps implementation, not the USB 3.1 Gen 1 SuperSpeed 5Gbps that we’ve grown bored with.

Well, it’s not. And yes, I said it. Bored. Like record seekers on the Bonneville salt flats, we’ve acquired a need for more speed. Jonesin’ man! Gotta have it!

OK, I’m back now, so I can tell you that aside from feeling more expensive than the T1 (which it’s not), the T3 is an even better performer, especially with smaller files and folders. The T3 is based on Samsung’s TLC NAND and uses a more refined version of the MGX controller found in the T1. However, the speed improvements may be due to the now-optional encryption that we left off. Full-time encryption or no, the T1 and T3 are the only drives I’m aware of that take full advantage of Gen 1 SuperSpeed USB, though that also depends on the grade of USB port you attach it to.

Performance

If the T3 is attached to a USB port that features UASP, then you can theoretically see up to 450MBps each way. That’s internal SATA SSD territory. Hot diggity dog. On a normal USB 3.x bus that will dip to around 350MBps (ironic sigh), and, of course, drop all the way down to around 50MBps via USB 2.0 (sincere sigh). By the way, UASP stands for “USB Attached SCSI Protocol.” If you spell it all out, you get “Universal Serial Bus Attached Small Computer System Interface.” I’ll stick with UASP.

In our tests, the T3 didn’t reach its theoretical

Samsung T3 USB 3.1 SSD (500GB)

AT A GLANCE

Quite frankly, the best portable storage product on the planet. Far faster than the average USB 3.x thumb drive, not that expensive (for an SSD), and available in capacities up 2TB—it’s the one you want. At least until the USB SuperSpeed+, Gen 2 version shows up in a year or two.

PROS

- Multiplies faster than the average USB thumb or hard drive
- Roughly on par with the price of internal SSDs
- Type C, USB 3.1

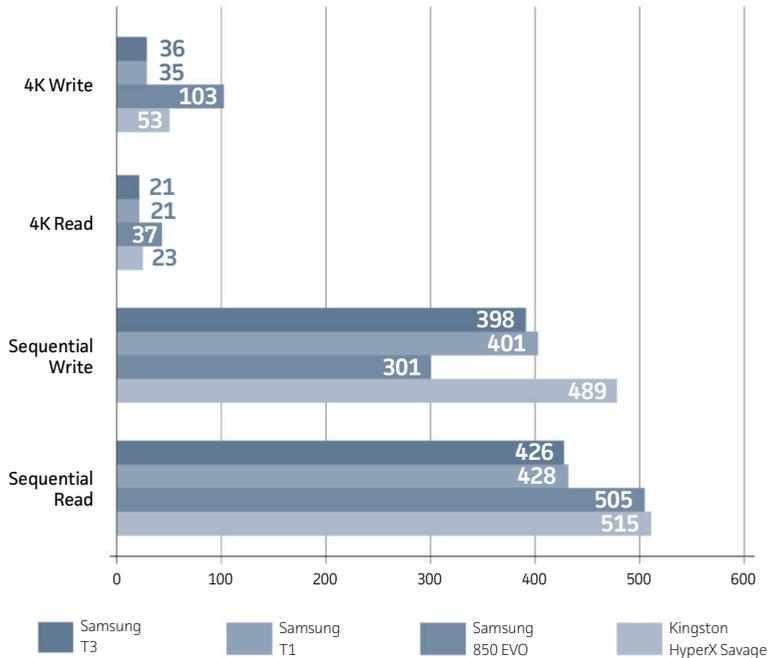
CONS

- Nothing to speak of

\$220



AS SSD 10GB Tests (MBps)

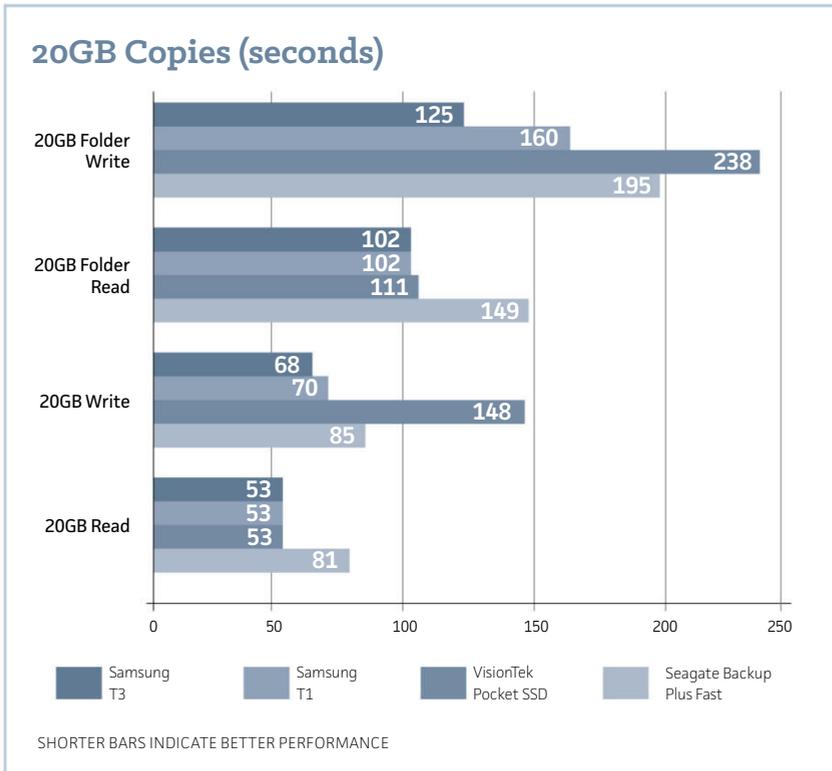


LONGER BARS INDICATE BETTER PERFORMANCE

maximums (few drives do), but it was darn close, as you can see in the charts that follow. Though not shown, on a non-UASP USB 3.0 port, transfers were almost exactly 300MBps each way. The numbers reflect NTFS performance.

Where the T3 seems greatly improved is in its handling of large batches of smaller files. Its large-file copy times were nearly the same as the T1, but thanks either to the improved controller or the disabled encryption, it hacked quite a few seconds off the T1's time with our 20GB batch of files and folders. It's fast. Fast enough that it doesn't

AS SSD rated the T3 as only marginally faster than the T1.



The T3 proved quite a bit faster than the T1 with our 20GB set of files and folders.

look completely mismatched against the Samsung 850 EVO or Kingston HyperX Savage, internal SATA 6Gbps drives in the chart above. But still...where's the SuperSpeed+?

Not just fast

The T3 is also enterprise/security-friendly. You can password-protect it with full 256-bit AES encryption, which is now optional, and not full-time as with the T1 (which again, may account for its faster times with files and folders). Said password is set via a utility provided with the drive, or with an Android app. (Sorry, iOS fans.) There's no FIPS 140

certification because there is relatively easy access to the hardware, but it's as secure as can be short of that.

The T3 isn't super cheap, but it's also not as pricey as you might suppose—just a tad over 40 cents per gigabyte once you get past the 250GB model. Specifically: The 250GB version is \$130; the 500GB model is \$220; the 1TB, \$430; and the 2TB, \$850. Yes, that's a lot of dough compared to a hard drive, but the T3 is potentially three times faster, super shock-resistant (no moving parts), and dead quiet. And, it's only 10 cents more per gigabyte than current bargain SATA SSDs.

The T3 carries a three-year warranty but Samsung didn't publish a TBW (TeraBytes that can be Written) rating. Given what I know about Samsung's TLC NAND, and most importantly, the fact that you won't be writing constantly to the drive as you would an internal SSD, I'd expect a decade of use at the very least.

Conclusion

Most people aren't used to the kind of USB storage performance the T3 can deliver. Really. So no matter what you do, don't buy a T3 (or a T1). Speed addiction is a scary thing. Seriously, if you buy a T3 and find yourself harboring a sudden urge to burn salt in Utah with a jet car, don't blame me. 🚫



Sapphire Nitro R9 Fury graphics card: Fast, furious, and ridiculously quiet

BY BRAD CHACOS

THERE ARE NO BAD GRAPHICS CARDS, only poorly priced graphics cards. Shifting MSRPs can sway recommendations in the blink of an eye.

Consider the fierce battle going on in the \$500 to \$600 range: When AMD's Radeon R9 Fury launched, it delivered great bang-for-buck for people wanting a bit more oomph than the GeForce GTX 980, but who couldn't drop \$650 on a GTX 980 Ti or Fury X. Unfortunately for AMD, a mix of supply issues and slashed costs on Nvidia's end made high-end, overclocked GTX 980s a more compelling option shortly thereafter.

But now, AMD's family of cards powered by robust Fiji chips with high-bandwidth memory can be found much more easily, and prices for Fury graphics cards have fallen as low as \$500. And Sapphire, one of AMD's initial Fury partners, recently released the new Nitro R9 Fury, which features some fairly substantial tweaks to its original Fury model. What better time to see if the tables have turned yet again?

Meet the Sapphire Nitro R9 Fury

At its core, the \$520 Sapphire Nitro R9 Fury (go.pcworld.com/saphirer9fury) is built around the default Fury configuration shown on page 86. But Sapphire's tuned and configured all sorts of things, from the physical design to clock speeds, to give this card an identity all its own.

If you've ever laid eyes on another Radeon Fury, the first thing you'll notice is how physically different the Nitro R9 Fury looks from AMD's reference design. That's because Sapphire designed a custom PCB for this card that's not only longer and leaner than normal, but also features a six-phase voltage regulator module packing Sapphire's "Black Diamond" chokes. That helps reduce VRM temperatures by 20 percent and, according to Sapphire's Ed Crisler, "allowed us to beef up the power subsystem of the card."

The design also increases the overclocking potential of the Nitro R9 Fury, which must sound like music to Radeon enthusiasts' ears, as AMD's Fiji chips are famously stingy overclockers. The Asus Strix Fury we reviewed at the Fury lineup's launch didn't even feature an overclock out-of-the-box, while we could only push AMD's flagship Fury X an extra 50MHz over factory settings. Sapphire's Nitro R9 Fury rocks a 50MHz overclock by default—pushing the 1,000MHz reference design to 1,050MHz. And between the refined power delivery, dual-BIOS support, and beefy

Sapphire Technology Nitro R9 Fury

AT A GLANCE

Sapphire's impeccably designed Nitro R9 Fury will handle high-end games without breaking a sweat or raising its proverbial voice.

PROS

- Top-notch performance
- Cool and quiet
- Beautiful, sturdy design

CONS

- Fat and long
- Consumes a lot of power
- Only 4GB of RAM

\$520



Tri-X cooling system, it's clear this card's designed to reach even loftier heights.

Speaking of the cooling system: It's no joke. Sapphire's graphics cards constantly amaze, and the triple-fan solution on the Nitro R9 Fury is clearly the pinnacle of the company's cooling tech. Underneath the trio of whirling, intelligently controlled blades that shut down completely at lower loads, you'll find a slew of thick copper heat pipes snaking through a heat sink that runs the length of the card and then some; if you flip the Nitro R9 Fury over, you'll see the heat sink extends far beyond the length of the PCB (which itself is covered by a snazzy aluminum backplate adorned with the Sapphire Nitro logo). This is a seriously well-built graphics card, and one that runs so cool and quiet, it almost feels like magic.

All that raw firepower and cooling hardware comes at a price, though. The Nitro R9 Fury is massive—we're talking over two slots deep and almost 13 inches in length (though it isn't nearly as wide as the Asus Strix Fury). You'll need a big honkin' case for this puppy.

AMD Radeon R9 Fury Graphics Product Specs

	Radeon R9 Fury
Process	28nm
Stream Processors	3584
Compute Units	56
Engine Clock	Up to 1000MHz
Compute Performance	7.2 TFLOPS
Texture Units	224
Texture Fill-Rate	224.0 GT/s
ROPs	64
Pixel Fill-Rate	64 GP/s
Z/Stencil	256
Memory Configuration	4GB HBM
Memory Interface	4096-bit
Memory Speed / Data Rate	500MHz / 1.0 Gbps
Memory Bandwidth	Up to 512 GB/s
Power Connectors	2 x 8-pin
Typical Board Power	275W
PCIe Standard	PCIe 3.0
API Support	Yes
Virtual Super Resolution	Yes
Frame Rate Target Control	Yes

Port-wise, you'll find HDMI (1.4a, so limited to 30Hz at 4K resolution, sadly), a trio of DisplayPorts (good for 60Hz/4K, and necessary for butter-smooth FreeSync monitors), and a welcome DVI-D port, which is missing from AMD's reference Fury design. The card sucks down 375W of power over a pair of 8-pin connectors. Sapphire throws in a full-sized DisplayPort cable, too.

Of course, as Fiji is AMD's latest and greatest GPU, the Nitro R9 Fury also supports AMD's latest and greatest software features, like FreeSync, Virtual Super Resolution, True Audio, the oh-so-yummy Frame Rate Target Control, Eyefinity, and more.

Sapphire Nitro R9 Fury benchmarks

As ever, we tested the Sapphire Nitro R9 Fury on *PCWorld's* dedicated graphics card benchmark system. Key highlights of the build:

- Intel's Core i7-5960X with a Corsair Hydro Series H100i closed-loop water cooler, to eliminate any potential for CPU bottlenecks affecting graphical benchmarks
- An Asus X99 Deluxe motherboard
- Corsair's Vengeance LPX DDR4 memory, Obsidian 750D full tower case, and 1,200-watt AX1200i power supply
- A 480GB Intel 730 series SSD





- Windows 8.1 Pro, in its last hurrah. The testing system will be upgraded to Windows 10 shortly, and we'll be re-evaluating our suite of games and benchmarks, as well.

We're comparing the \$520 Sapphire Nitro R9 Fury against a bevy of enthusiast-class graphics cards: the \$650 AMD Radeon Fury X, the Asus Strix Fury, the mITX Radeon Nano, and the \$440 Asus Strix R9 390X, as well as the \$650 Nvidia GTX 980 Ti, Nvidia's reference GTX 980, and EVGA's powerful \$520 custom GTX 980 FTW ACX 2.0. We already have a general idea of how the Fury performs, so we're specifically looking for two things with this review: How the Sapphire Nitro R9 Fury compares to the Asus Strix Fury, and whether the new lower pricing for AMD's Fury cards makes them more compelling cost-wise than a pedal-to-the-metal overclocked GTX 980 like EVGA's model.

Be sure to check out our massive roundup of graphics cards for every budget (go.pcworld.com/gcards), which includes both buying recommendations and benchmark results galore for GPUs ranging from \$150 to \$1000.

Every game was tested using its in-game benchmark and the default graphics settings, unless noted otherwise, with V-Sync and any vendor-specific features (including FreeSync/G-Sync) disabled. Both 4K and 2560 by 1440 resolutions were tested on these high-end cards. You

won't find any DirectX 12 benchmarks included because there aren't any available DX12 games. The DX12 benchmarks we've seen thus far have been synthetic tests or from early builds of games, and therefore are not an accurate example of real-world performance just yet. For our full graphic charts, see the benchmark charts (go.pcworld.com/saphirer9furycharts) on our site.

We test *Grand Theft Auto V* three ways: at 4K resolution with all graphics options and density sliders set to their maximum settings and FXAA enabled; at 2560 by 1440 with the same settings; and at 2560 by 1440 with the same settings and MSAA and reflection MSAA each set to x4. *GTA V* tremendously favors Nvidia cards, which is most obvious at 1440p without MSAA enabled. The Sapphire Nitro R9 Fury holds close at 1440p with MSAA enabled, however, and at 4K resolution without MSAA active.

Middle-earth: Shadow of Mordor is tested with the High graphics preset, then by cranking everything to its highest available option and using the optional (free) HD Textures Pack download, which utterly chews through memory. In fact, the game suggests only using the HD texture pack if you have 6GB of dedicated GPU memory or higher, but high-bandwidth memory's blazing speed holds up just fine despite being restricted to 4GB of capacity. The Sapphire card stomps the GTX 980 at High settings here, and comes within spitting distance of the powerful GTX 980 Ti at 4K resolution.

vBattlefield series. None of the cards clear 60 frames per second (fps) until you drop settings down to 1440p/High.

Likewise, the hard-core antialiasing methods in *Sleeping Dogs: Definitive Edition* hammer all of these cards at 4K resolution. The hefty overclock on the EVGA GTX 980 FTW helps it hang with the Fury duo, though the Radeons deliver far more performance—roughly 9fps, in the Nitro R9 Fury's case—than the reference GTX 980.

The Sapphire card stomps the GTX 980 at High settings here, and comes within spitting distance of the powerful GTX 980 Ti at 4K resolution.



We test *Metro: Last Light Redux*, which runs 4A Games' custom 4A engine, with the punishing SSAO antialiasing disabled, as it cuts frame rates in half and the increase in visual quality doesn't justify that sort of performance hit. If you want to clear 60fps—critical in a first-person shooter—you have to drop down to 1440p rather than 4K. Here, the Nitro R9 Fury delivers notably more performance than the turbo-charged GTX 980.

Alien Isolation scales like a champ and performs well on all graphics cards. The Nitro R9 Fury's performance falls squarely between the EVGA GTX 980 FTW's and the stock GTX 980 Ti. It's head and shoulders above the reference GTX 980, though.

Every card also handles *Bioshock Infinite* capably, which is to be expected—the game's incredibly popular and has been out for a while now. Nevertheless, it's a solid representative for the extremely popular *Unreal Engine 3*, which powers a slew of modern games. For some reason, the Asus Strix Fury beats the Nitro Fury here, if only by a hair.

We also test all cards using 3DMark Fire Strike, a synthetic benchmark, but one that's well respected and oft-used within the industry.

All of AMD's recent graphics cards use vastly more power than their Nvidia counterparts, full stop. The Nitro R9 Fury continues the trend, sucking down far more energy than the GeForce cards, and a full 159 watts more than the reference GTX 980 under load. Sapphire's card consumes slightly more power than the Asus Strix Fury as well, but that's to be expected given the 50MHz overclock.

Power is measured by plugging the entire system into a Watts Up meter, then running a stress test with Furmark for 15 minutes. It's basically a worst-case scenario, pushing graphics cards to their limits.

But seeing the Nitro R9 Fury blow through that much power drives home just how efficiently its custom cooling system performs. Despite the steep power draw, the card runs cooler than any other of these air-cooled heavyweights, with only EVGA's custom cooling solution coming close. That's incredible—and the Nitro R9 Fury runs very, very quietly as well, only becoming noticeable after topping temps of roughly 71 degrees Celcius, which it rarely tends to do unless you're absolutely hammering it for an extended time. Of course, the Fury X and its integrated closed-loop water cooler stays chilliest of all.

Despite the steep power draw, the card runs cooler than any other of these air-cooled heavyweights, with only EVGA's custom cooling solution coming close.

Bottom line

Many of the key takeaways from our original AMD Radeon R9 Fury review (go.pcworld.com/amdradeonr9furyrev) still apply here.

While AMD and Sapphire promote the Fury as an entryway to 4K gaming, it's better to consider it as an option for top-notch, take-no-prisoners 1440p gaming, as the card struggles to hit the Holy Grail of 60fps at 4K resolution. Many barely squeak past 30fps at 4K, in fact, and don't forget that games will only become more graphically demanding over time, which doesn't make the 4GB of RAM feel very future-proof despite its blistering-fast speeds. For 4K, you're probably

better off buying a GTX 980 Ti for \$650, or dropping \$550 to \$600 for a pair of 8GB Radeon R9 390s.

If you do plan to pick up the Nitro R9 Fury for 4K gaming, I'd strongly suggest picking up a FreeSync monitor to go with it, as a monitor that syncs with the GPU to enable buttery-smooth, tear- and stutter-free visuals will go a long way toward making the 30 to 60fps at ultra HD resolutions more palatable. Seriously, FreeSync and G-Sync monitors (go.pcworld.com/gvsfreesync) feel like magic.

It's cool, quiet, and impeccably designed.

All that said, there's a whole lot to like in Sapphire's Nitro R9 Fury. It's cool, quiet, and impeccably designed. The 50MHz factory overclock gives the card enough extra oomph that it clearly tops the Asus Strix Fury in performance (albeit only by a few frames per second), whumps hard on the reference GTX 980 Ti, and comes uncomfortably close to the \$650 GTX 980 Ti and Fury X. Sapphire's custom board tweaks should help you push performance even further, too, if overclocking's your thing.

And now that stocks are free-flowing and the Fury pricing has dropped from stratospheric levels, this card compares very well against monster GTX 980s, too—beating the similarly priced EVGA GTX 980 FTW across the board except in GTA V, which heavily favors Nvidia hardware. Most high-end GTX 980s with overclocks in excess of 1,275MHz (similar to the EVGA FTW) cost more than the Nitro R9 Fury's \$520 these days, too. So Sapphire's graphics card outpunches its beefiest GeForce rivals, for the same price or less.

If Nvidia's exceptional software ecosystem and vast energy efficiency lead appeal for a specific reason, the GTX 980 may still be the graphics card for you. (Note that GTX 980s with monster overclocks will give up that low-power advantage!) But if you're looking for pure performance, cool temperatures, remarkably quiet noise levels, and superior multi-GPU scaling, the Sapphire Nitro R9 Fury comes highly recommended—for 1440p gaming, at least. The tables have turned yet again. 🏆

Asus Zen AiO Z2401C: A high-res all-in-one with class. Like, you know...an iMac.

BY JON L. JACOBI

THERE ARE TIMES when Asus's designs rival Apple's. Indeed, anything with "Zen" in front of it at least attempts the feat, and the company's Zen AiO Z2401C (go.pcworld.com/zenaioopro) all-in-one has come close to capturing that iMac-like magic. Out of the box, we were impressed with this all-in-one's attractive design and aluminum chassis.

After firing up the Zen AiO we were doubly impressed. Apple would rattle on about "retina," but in PC-land what you're talking about is a 3840 by 2160 UHD resolution display (commonly known as 4K). The





The Zen AiO has state of the art ports, but all of them are on the back.

high density of the pixels makes everything super smooth-looking, and if you throw a UHD demo file at it. . .yowser! If there were HDMI input, I'd say the Z240IC might make sense as a dorm-room entertainment center. As is, it'll have to settle for close to perfect.

Performance and components

Every component aboard the Zen AiO is near state of the art: a Skylake Core i7-6700T CPU, 16GB of DDR4/2133 system memory, an Nvidia GeForce GTX 960M GPU (as well as the integrated HD 530 graphics), and—the cherry on top—a 512GB PCIe-based M.2 Samsung SM951 SSD. That's good stuff right there. Just in case 512GB isn't capacious enough to hold all your stuff, there's also a 1TB hard drive on board. There's little chance the average buyer will want to upgrade those components. A good thing in an all-in-one, because, without exceptional skills—you can't.

The Zen AiO's port selection is top-notch as well: four USB 3.0 ports,

one USB 2.0 port, and one USB 3.1 type-C port. There are also headset and mic jacks, two HDMI 1.4 outputs, one gigabit ethernet port, and an SDHC card reader. My only gripe here is that they're all on the back, which makes the simple act of inserting a thumb drive a lot harder than it should be. Get a USB 3.0/3.1 dock while you're shopping.

One port I did miss, as I said up front, is HDMI input with HDCP 2.2 support. That puts a damper on my vision of the Z2401C as a future-proof dorm-room entertainment center. Much of the upcoming UHD content will be copy-protected with the latter, and it would be nice to be able to play it on this display.



Though they're colored to match the system, the mouse and keyboard would look even better if they were "brushed" like the chassis.

Performance

Aside from some initial Intel driver issues (graphics and RealSense) the Zen AiO experience was butter. It posted a 2,930 in PCMark's Work conventional test and a 3,386 in the Creative conventional test. That basically means it's far beyond good enough for most desktop chores.

3Dmark scored the 960M at 4,076 in *Firestrike* (not Extreme or Ultra), 13,262 in *Sky Diver*, and 17,433 in *Cloud Gate*—meaning it's good for moderate gaming loads at moderate resolutions. *Tomb Raider* benchmarked at 30fps at 2160p and 92fps at 1080p. *Bioshock* ran at 102fps at 720p, 147fps 1080p, and 46fps at 2160p. For the price, the

Zen AiO is an able gamer as long as you're willing to drop the resolution down to 1080.

The Samsung SSD read sequentially at 1,888.4MBps and wrote at 1,511.1MBps with ridiculously low access times. If you've never seen the stats for a PCIe SSD, those are not misprints. It makes the entire Windows experience pretty much wait-free.

Note: Our first unit's display would black out with no way to reactivate it, and the second unit's flickered due to immature Intel drivers. If you get an early version of the Zen AiO, update these before you call service.



The UHD display has better color than most, and there's no pixelation as with lower resolution displays.

Input ergonomics

The Zen AiO Z2401C has a ten-point touchscreen and ships with a matching (mostly) wireless keyboard and mouse. I enjoyed the typing feel of the Chiclet-style keyboard, and the mouse was fine, but I do have two slight nits. Both plastic peripherals could use just a bit more solidity-evoking heft. And, though the colors of the keyboard and mouse match that of the main unit, they lack its brushed-aluminum texture. That minutiae may not seem worthy of comment, but when you're competing with a company such as Apple that sweats the details, these things matter.

Price and advice

The Zen AiO rivals an iMac, but you definitely get more bang for the buck.

Where a similarly equipped 21.5-inch iMac costs \$2,400 these days, the Z240IC costs \$1,899. And the former has no discrete

GPU for gaming, has a smaller screen and uses a 5th-gen Broadwell CPU versus the Zen AiO's 6th-gen Skylake chip. That's a pretty hefty savings and a big hardware difference. But in my opinion, an iMac delivers a sense of elegance that Asus hasn't quite captured. Then again, no PC vendor has.

I like the Zen AiO Z240IC. I like it a lot. It's stylish, it has a fantastic display, and it's fast for both everyday use and gaming. Truly, if my only complaints concern the placement of ports and the paint on the mouse and keyboard, you know it's a pretty darn good all-in-one. 

Where a similarly equipped 21.5-inch iMac costs \$2,400 these days, the Z240IC costs \$1,899.



Razer BlackWidow Ultimate 2016 Edition: The small improvements that matter

BY HAYDEN DINGMAN

THE RAZER BLACKWIDOW Ultimate 2016 Edition (go.pcworld.com/blackwidowrazer) gaming keyboard is the epitome of an incremental upgrade—and that's absolutely fine. Take the totally competent keyboard we saw in 2014 (go.pcworld.com/blackwidowrazer2014), make a couple of smart tweaks, and put it back on the market.

Voilà, you're done.

Familiar faces

So what are those smart tweaks? I've identified two small but notable changes. Namely, no macro keys and a refined Num Lock/Caps Lock/Game Mode indicator tray.

Per the first: The 2014 BlackWidow Ultimate (and RGB-enabled BlackWidow Chroma; go.pcworld.com/blackwidowchroma) had a column of five macro keys arrayed down the left side of the board. They're gone. There are no dedicated macro keys on the 2016 BlackWidow Ultimate.

That's surprising, given how long macro keys have been a standard feature on gaming keyboards. For Razer—which made its name on gaming peripherals—to eliminate them means it's following a trend I've noticed lately: Manufacturers are moving toward more refined, all-purpose designs. High-end, even.

What do I mean? Sleek. Black. Something you could probably use in the office without raising an eyebrow. This seems to be the latest design mantra for everyone from Razer to Logitech to Corsair. The days of the twenty-button mouse and “extreme” peripherals are over.

Personally, I'm a fan. Barring the pervasive neon-green backlighting of the 2016 BlackWidow, this looks like your average, everyday keyboard. The typeface etched into each keycap is maybe still a bit too “Video Games!,” but otherwise this peripheral is one of Razer's most professional-looking devices.

Who would've guessed so much could be gained from eliminating five keys?

Aside from ditching dedicated macro keys, the 2016 BlackWidow also overhauls the Caps Lock indicator panel in the top right. Well, the Caps Lock/Num Lock/Scroll Lock/Game Mode/Macro Recording

Razer BlackWidow Ultimate 2016 Edition

AT A GLANCE

Razer's 2016 BlackWidow Ultimate offers minor changes to its 2014 predecessor, but it's still a solid choice and all-around improvement.

PROS

- No more macro keys
- Gaming-friendly switches
- Professional-looking design

CONS

- I'd still rather have Cherry Blues
- Stuck with Razer's standard black-and-green scheme

\$100





panel. On both the 2014 BlackWidow and the BlackWidow Chroma, Razer finished this panel with some sort of translucent plastic. The idea seemed to be that you couldn't see the indicators there until you turned one on.

Unfortunately, reality didn't quite match the concept. Illuminating Caps Lock or Game Mode or whatever caused a faint, blurry icon to appear. The "C" for Caps Lock was barely legible, the "M" for Macros looked like a busted McDonald's sign, and the fuzzy "G-inside-crosshairs" (Game Mode) gave the impression that you should buy a better keyboard.

Someone's been listening to my complaints, because the 2016 BlackWidow Ultimate has a more standard light-up inset instead of the 2014 model's translucent plastic. Now each icon is precisely stenciled and backlit, and the whole keyboard benefits. Again, it looks sleek and professional.

Well, mostly sleek and professional. Maybe Razer could ditch the "G-inside-crosshairs" icon. But I'll leave that for the 2018 BlackWidow Ultimate to rectify.

Those two changes make up the bulk of the 2016 overhaul. The only other tweak I spotted is so small that it's almost not worth

mentioning, but the Function key now lights up. Don't act too excited.

The remaining features are pretty much identical to the 2014 BlackWidow—same fabric cable sheath, same diagonal cutouts in the lower corners, same media keys. And with the design having changed so little, that also means this keyboard still packs Razer's own mechanical switches—the model we reviewed had Greens.

I've come to accept Razer's switches. I can work with them. But I don't like them. In my opinion, they're bargain-basement Cherry MX Blues. They require the same force to press as Cherry MX Blues (50 cN) and feature the same kind of clicky feel, but with a slightly higher actuation point and a lower reset point. This means you get a lot of resistance up front and nearly none after a key press registers.

Razer claims this design is good for gaming: You can double- and triple-press Razer's keys a bit faster than standard Cherry Blues. That's great if all you do on your PC is games, games, games.

But as I discussed in my review of the 2014 BlackWidow and as I've said on *PCWorld* time and time again: A keyboard is for more than just gaming. Presumably, you don't want to drag a different keyboard out of the closet each time you browse the web, do your taxes, write the

I've come to accept
Razer's switches. I
can work with them.
But I don't like them.



next Great American Novel, or what have you.

However, no matter which keyboard you choose, you make compromises. I'd rather err on the side of comfort and use real MX Blues instead of worrying about shaving milliseconds off my double-taps (and bottoming out keys more often in the process), but that's ultimately your call. As more manufacturers move away from Cherry switches in favor of cheaper alternatives, it's becoming harder and harder to find a solid MX Blue board anyway.

Bottom line

We're two years into Razer's "We'll make our own mechanical switches" experiment and I'm still not sold on the idea. However, among gaming keyboards under \$100, the 2016 BlackWidow Ultimate's a solid choice and an improvement (however small) on its predecessor.

You'll miss out on all the rainbow-lighting craziness afforded by Razer's RGB-enabled Chroma line, but, well, maybe you didn't want all those tacky lights anyway. It's okay to admit it. 



Superhot: The most innovative shooter we've played in years

BY HAYDEN DINGMAN

SUPERHOT. IT'S A REAL GAME, FINALLY—nearly three years after the original demo emerged on the Internet (birthed from the 7 Day FPS Challenge game jam) and two years after the developers raised \$250,000 on Kickstarter. That original *Superhot* demo is still up. You can play it: go.pcworld.com/superhotdemo, if you're curious. (You'll need the Unity Web Player installed.)

But if you missed the zeitgeist: It's a first-person shooter, except time only moves full-speed when you move. Stand still and everything slows to a crawl. Bullets hang in the air, red trails stretching out behind.

People are practically motionless, frozen mid-charge.

Lucky for you, because the odds are overwhelming. You're a one-man army, taking out anonymous red enemies en masse, watching bullets idly twirl past your skull, exchanging shots with statues. Pause.

Running out of ammo and then throwing your gun at the nearest foe, putting him off guard just long enough for you to sneak in a punch.

Pause. Grabbing his pistol out of the air as he falls. Pause. Spinning and shooting two more who'd snuck up behind. Pause. Dodging out of the way of two bullets arcing your direction. Pause.

This start/stop rhythm is the core of *Superhot* (superhotgame.com)—more puzzle game than first-person shooter, more *The Matrix* or *Equilibrium* than *Call of Duty*.

And that core's been carried over largely intact from the original demo. *Superhot* in 2016 plays much the same as it did in 2013, though there are now thirty-odd stages to play through. (The demo had three.) Office buildings, alleyways, bars, mansions, border crossings—they're all represented here,



Superhot

AT A GLANCE

Superhot's time-freezing antics are finally a full-length game. No plot. No nothing. Just killing red guys.

PROS

- Slow-motion shooting just as enthralling as the original *Superhot* demo
- Gets in and gets out before the gimmick gets too stale

CONS

- Hitboxing can feel off at times
- Needs a bit more to flesh out its two-hour run





though the setting is largely inconsequential. Your goal is the same regardless. Still, I'm impressed how much story *Superhot* is able to wring from a bunch of mute, featureless dolls. One level, for instance, starts in an elevator. Three baddies slowly raise their guns to aim at your head. There's no time to think—you steal the gun from one, dodge a bullet, shoot, and your slow-motion battle commences.

But with just a few pieces *Superhot* tells a complete story—a tale of betrayal, an “Et tu, Brute?” in one act. It's a simple story, sure. We've no idea where this betrayal began or who the key players are, but it doesn't really matter. Not for *Superhot's* purposes, anyway.

There's also a more traditional framework wrapped around these thirty implied stories. Parodying the way *Superhot's* demo originally spread word-of-mouth through the gaming community, the game crafts a meta-narrative about itself.

“You playing Superhot yet?” the anonymous person asks. “I've never seen anything like it.”

“No idea what you're talking about,” you respond.

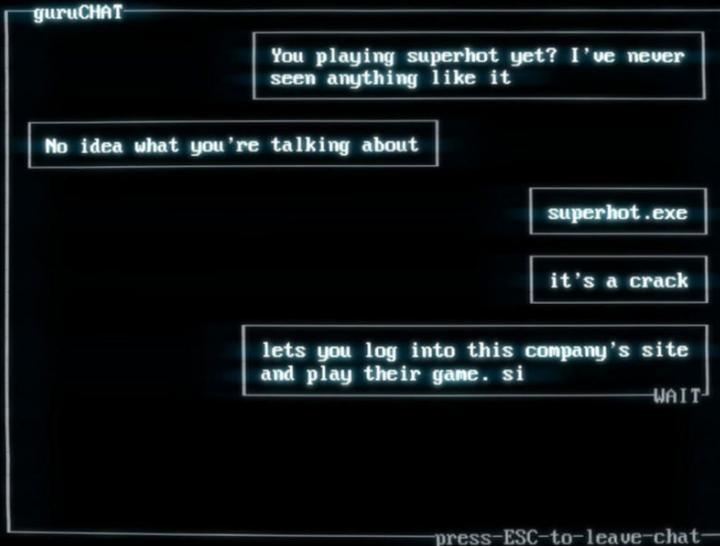
He/she sends you SUPERHOT.EXE. “It's a crack. Lets you log into this company's site and play their game. I'm sending you the files. Check it out.”

It only gets weirder. To say too much is to ruin it, but suffice it to say I

didn't expect such concise commentary from *Superhot*, of all games.

Don't get me wrong—*Superhot* is still mostly style-over-substance, mostly concerned with making the minute-to-minute action look cool than it is with making grand statements about “Video Games As Art” or some such tomfoolery. It's dodging bullets and throwing swords and shooting two guys while you float lazily through the air in slow motion. It's the deep voice yelling “SUPER. HOT. SUPER. HOT.” after a stage is cleared, in a weirdly apropos parallel to the whining noise at the end of each *Hotline Miami* level.

But a surprising amount of story work went on here. The game is short. Two hours, maybe, which is in line with the *Portal* comparison the devs made in the past. It's an interesting two hours though, and kept me sufficiently hooked even as the time-stopping gimmick started to grow stale (which for me was about an hour and a half in).





Bottom line

Is there enough here? I think so. *Superhot* is a gimmick game, and it was always going to be a gimmick game. I never expected otherwise. But as far as one-trick ponies go, this one is pretty stellar, doing its damndest to make you feel like the consummate badass and leaving you with all sorts of “That was amazing” moments, feats that could never be pulled off at full-speed. Or, at least, not on purpose. And at two hours it gets in, hits hard, and then knows when to get back out again. A rarity, in games.

It’s—pardon the cliché—the most innovative shooter I’ve played in years. You’ll have to experience it for yourself to understand. 🎮

TESTED: HOW MANY CPU CORES DO YOU REALLY NEED FOR DIRECTX 12 GAMING?

We benchmark an eight-core CPU in three DirectX 12 tests, and the results may disappoint you.

BY GORDON MAH UNG





Just how many CPU cores do you need for PC gaming? The conventional wisdom for the last few years has been four or even two cores—if you have Hyper-Threading.

That convention got upended with DirectX 12's ability to use multicore CPUs more efficiently than previous DirectX versions. But how many more? I broke out the latest gaming benchmarks to find the answer.

From left to right we have a 2nd-gen Core i7-2700K, a 4th-gen Core i7-4790K, the 6th-gen Skylake, and the gigantic Haswell-E Core i7-5960X chip.

HOW I TESTED

For my test I used the latest build of Windows 10 on a PC with an eight-core Core i7-5960X, 32GB of DDR4/2133 RAM, and an AMD Radeon Fury X GPU. To see the effect of losing cores, I manually switched off cores and Hyper-Threading while running the test.

Note that as you scale back the core count on the chip, Turbo Boost reacts by giving you a little more clock speed. Rather than turn off Turbo Boost, I'll just note that up to two cores with Hyper-Threading, the chip runs at 3.5GHz. Beyond that it ran at 3.3GHz. In an ideal world, I'd use different CPUs, as each specific chip reacts a little differently, but this is a pretty reasonable approximation.

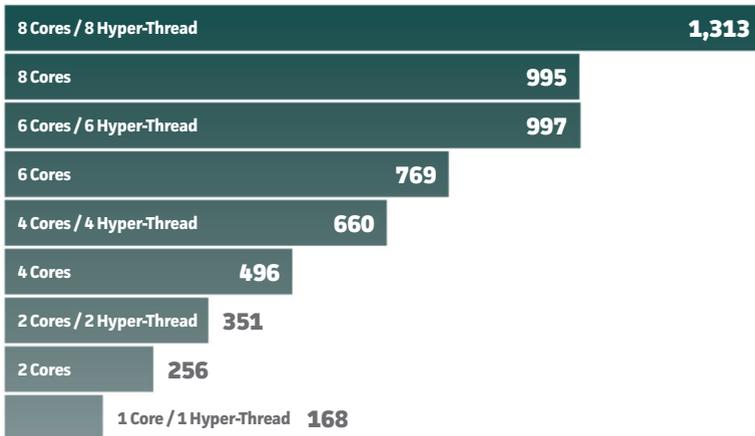
The first test I ran was Maxon's Cinebench R15. It's a great real-world benchmark that gives you an idea of how more threads could pay off. It doesn't scale forever, as I discovered when testing the Falcon Northwest Tiki (go.pcworld.com/falconnwrev), but here with a "mere" eight cores, it climbs for the stars.

The 18-core Xeon
E5-2699 V3 (left) is actually physically larger than the 8-core Core i7-5960X (right). But are either really worth it for gaming?



CINEBENCH R15 PERFORMANCE ALL THREADS

Longer Bars indicate better performance



Cinebench R15 is a 3D rendering benchmark that likes a ton of CPU cores thrown at it. It's not about gaming but it shows how some workloads will climb for the stars.

Cinebench R15's rendering test, though, is a pure CPU test. What about gaming? For that, I first turned to 3DMark's API overhead test. This was one of the first showcases for all that is possible with DirectX 12, and when I tested it last year I found that a quad-core with Hyper-Threading paid huge dividends over a dual-core. The chart pretty much proves that cores matter more than clock speed.

YOU WANT TO SEE EIGHT CORES IN DX12?

Last year, unfortunately, I didn't have an eight-core chip available and had to settle for quad-core numbers. This time, with an eight-core rig up and running, the results are far more interesting. 3DMark's feature test shows DirectX 12 scales very nicely as you add Hyper-Threading and core counts. Unfortunately, it hits a wall at about six cores. Adding

DX12 MULTI-THREADING PERF. 3D MARK

Longer Bars indicate better performance. * = simulated CPU.

2.9GHz Celeron G1850*	5,110,314
3.5GHz Pentium Core i3-4330*	7,120,692
3.2GHz Pentium G3258*	5,722,745
4.8GHz Pentium G3258*	7,234,710
3.5GHz Core i5-4670K*	10,980,800
3.5GHz Core i7-4770K	13,419,183

These are tests of DirectX 12 performance differences between various thread counts and clock speeds on simulated CPUs.

3DMARK API OVERHEAD FEATURE TEST 1.2 DX12 MODE

Longer Bars indicate better performance

8 Cores / 8 Hyper-Thread	17,554,746
8 Cores	17,739,357
6 Cores / 6 Hyper-Thread	17,671,589
6 Cores	17,790,993
4 Cores / 4 Hyper-Thread	16,390,707
4 Cores	13,203,714
2 Cores / 2 Hyper-Thread	9,351,874
2 Cores	6,261,114
1 Core / 1 Hyper-Thread	5,238,437

FutureMark's API overhead feature test seems to top out at fewer cores than we expected.

Hyper-Threading and more cores made no difference.

That's a bit of a bummer, but at least it's better than the results for the same tests using DirectX 11. As you can see in the chart, you

3DMARK API OVERHEAD FEATURE TEST DX11 MODE

Longer Bars indicate better performance

8 Cores / 8 Hyper-Thread	1,097,409
8 Cores	1,098,616
6 Cores / 6 Hyper-Thread	1,103,267
6 Cores	1,113,996
4 Cores / 4 Hyper-Thread	1,105,294
4 Cores	1,093,886
2 Cores / 2 Hyper-Thread	1,059,644
2 Cores	769,473
1 Core / 1 Hyper-Thread	598,086

We can't complain because this is what PC gaming has lived with for a long, long time.

pretty much top out at a dual-core with Hyper-Threading. In today's conventional wisdom, that's correct for most games. A few games will overload that dual-core with physics or even audio chores, but a good dual-core with Hyper-Threading still works for many people in the vast majority of games today.

ASHES OF THE SINGULARITY PERFORMANCE

There's still hope for your eight-core CPU. The second test I ran was the recently released Ashes of the Singularity Beta II test. The upcoming game is a showcase of DirectX 12's capabilities, such as being able to use a GeForce alongside (go.pcworld.com/radeongeforce) a Radeon card. It's also a multi-threading wonder, so I had high hopes for my eight-core chip.

Again, like 3DMark, I ran the test with a single AMD Radeon Fury X card and varied the CPU and Hyper-Threading. What you're seeing is



the “average CPU frame rate” result, which the developer Stardock said is an indicator of performance if you had infinite GPU resources. To make the GPU even less of a factor, I also ran the test at a sedate 1920 by 1080 resolution with the “high” preset that’s two notches down from the top.

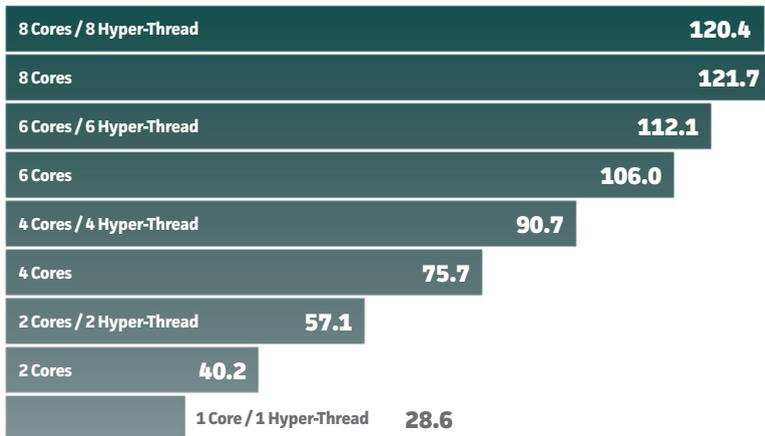
The result is, unfortunately, a cliffhanger as dramatic as Han Solo’s frozen fate in *The Empire Strikes Back*. You can see nice scaling as I turn up the number of CPU cores and turn on Hyper-Threading. The dividends, however, start to slow down beyond eight cores with Hyper-Threading. While you get nice dividends at the lower-end, Hyper-Threading just doesn’t give you much as you move past six cores. It’s pretty much flat going from eight cores to eight cores plus Hyper-Threading.

The premiere DirectX12 example is *Ashes of the Singularity* which scales all the way up to my 8-core chip just fine.

ASHES OF THE SINGULARITY BETA II

AVG. CPU FRAME RATE

Longer Bars indicate better performance



I threw the latest Ashes of the Singularity beta benchmark at our 8-core rig to find out how many cores we'll need for DX12 gaming.

Here's the "will Han Solo ever get out of that carbonite" moment, though: I think there's a very good chance that Ashes of the Singularity would have scaled if I'd had two more cores to throw at it. You know, like maybe in Intel's upcoming Broadwell-E. If AMD gave gamers 10 for a song and a dance, or offered a 12-core part, it could likely have a hit with the high end.

GEARS OF WAR ULTIMATE EDITION PERFORMANCE

Ashes of the Singularity is probably a best-case scenario for DirectX 12. It's been in development for a long time, with much thought put into supporting all the goodness of the CPU cores in today's PCs.

But not all games are going to be Ashes of the Singularity, even if they carry the DirectX 12 label. In fact, the first major DirectX 12 game

is Microsoft's new Gears of War Ultimate Edition. The game and how you buy it is currently mired in somewhat of a controversy (go.pcworld.com/shakeupashes), plus there are the big, ugly bugs. Still, as the first DirectX 12 game, I thought it would be worth spooling up on the same hardware.

My testing had its snags. The game clearly has issues on AMD hardware today. Even when you set it to uncap frame rates, the game still tops out at the monitor's refresh rate. To get around that, I swapped in a G-Sync panel with a 144Hz refresh rate. Yeah, I know it's weird that I used a Radeon with a G-Sync panel, but the max refresh rate shouldn't change it, and by going from the 60Hz panel to 144Hz, I was able to exceed 60 fps. I also didn't want the GPU to be a factor, so I ran it at 1920 by 1080 resolution at the game's preset of Medium.

Sadly, the result looks like a flashback to the benchmark for 3DMark's API Overhead test in DirectX 11. And no, I wasn't hitting some odd frame rate cap, as lowering the resolution and image quality

GEARS OF WAR ULTIMATE EDITION

DX12 19X10 MEDIUM (FPS)

Longer Bars indicate better performance

8 Cores / 8 Hyper-Thread	82.7
8 Cores	82.8
6 Cores / 6 Hyper-Thread	82.6
6 Cores	82.7
4 Cores / 4 Hyper-Thread	82.7
4 Cores	82.9
2 Cores / 2 Hyper-Thread	82.8
2 Cores	78.7
1 Core / 1 Hyper-Thread	74.5

Microsoft's Gears of War Ultimate Edition is touted as a DX12 game but the built-in benchmark mode makes it look more like a DX11 game.

pushed performance up to 125fps. It makes you wonder what exactly lets Microsoft label it as a DirectX 12 game. I've asked Microsoft for clarification, but I have yet to hear back.

To be fair to Gears of War, my testing was done solely in the game's built-in performance benchmark. While multicore efficiency is one of the feature achievements of DirectX 12, other aspects of the new API would give Gears of War the DirectX 12 checkoff. All I know is the performance benchmark doesn't seem to improve as you increase CPU cores.

WHAT YOU SHOULD BUY FOR DIRECTX 12

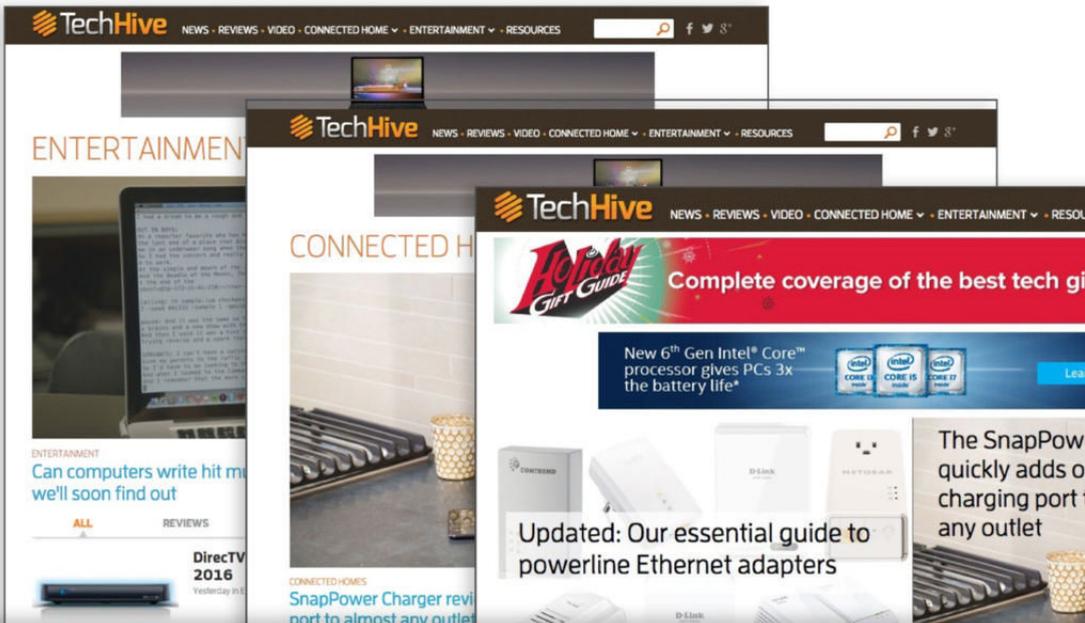
It's really pretty early to make any solid recommendations based on one synthetic test, one beta, and one game. But that doesn't matter, because you still want to know what to buy before the money burns a hole in your pocket.

I'd say for the vast majority of gamers, the sweet spot lies somewhere between a quad-core with Hyper-Threading and a six-core on the Intel side of the aisle. A Skylake Core i5-6600K will be fine for DirectX 11 games and probably the vast majority of the early DirectX 12 games, but the lack of Hyper-Threading will eventually hurt. For AMD fans, that means a six-core FX or eight-core FX part is recommended. 



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More space!

How Windows 10's storage analysis helps you free up your hard drive

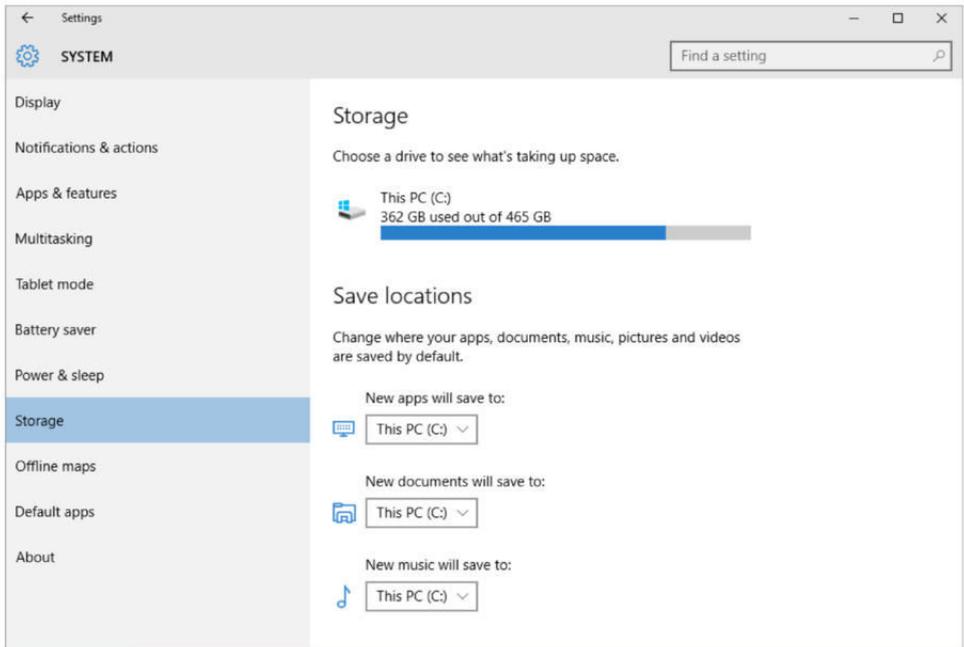
BY IAN PAUL

ILLUSTRATION BY KYLE FEWELL

Windows 10 has a great high-level tool to analyze what's taking up all that drive space. Here's how to use it.

Managing hard-drive space is always a pain. Who among us doesn't regularly check out the little blue line for the C drive in File Explorer to see how much space is left for a new game, movie...whatever?





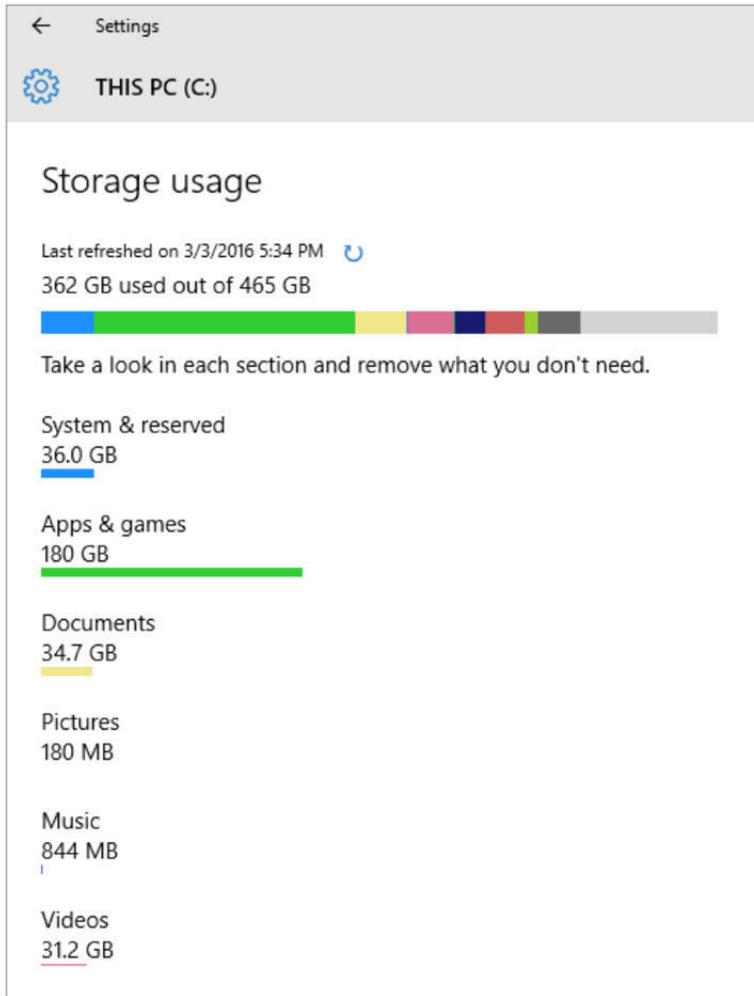
But in Windows 10, that little blue line is just the beginning when it comes to seeing what's sucking up your storage. The operating system includes a new way to drill down deeper and figure out how much space you have left on your drive, and where you can make room.

The new feature is in the Settings app under *Start > Settings > System > Storage*. At the top of the screen you'll see the familiar blue line showing how much storage you have left and how much you've used.

That's nothing new, but clicking on that reveals a detailed breakdown of your storage usage that's very similar to the Windows 8.1 disk-space feature (go.pcworld.com/w81diskspace). It shows all your disk usage based on the various folders you have on your PC.

In Windows 10, however, clicking on each of those segments brings you to a new screen where you can manage those particular file types on your hard drive.

Clicking the Apps & Games section right at the top, for example, shows a list of any Windows Store apps, desktop software including plug-ins, and games you've installed on your PC. This is the section of the settings app that doubles as the Control Panel's "uninstall programs" section. By default the apps and games list is sorted by



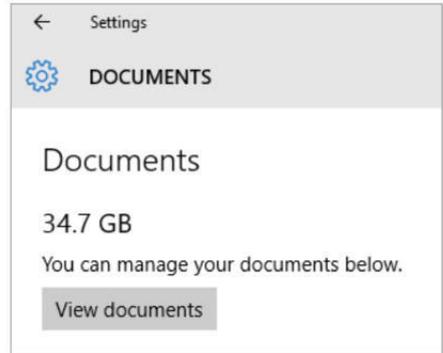
name, but you can also choose to sort it by size or install date. Click on an individual item and you'll see an option to uninstall it from your system.

Going back to the main storage settings screen, you can also drill down into your various folders. Unlike the Apps & Games section, you won't see a list of all your pictures or all your music if you click on these items. Instead you'll be taken to a (mostly useless) screen with a View

(pictures, music, documents, etc.) button that launches File Explorer.

The few exceptions to that are down at the bottom, where you see options for Temporary Files and Other. Click on Temporary Files and you'll be able to delete any temporary files on your PC, empty the Recycle Bin, or view your downloads folder.

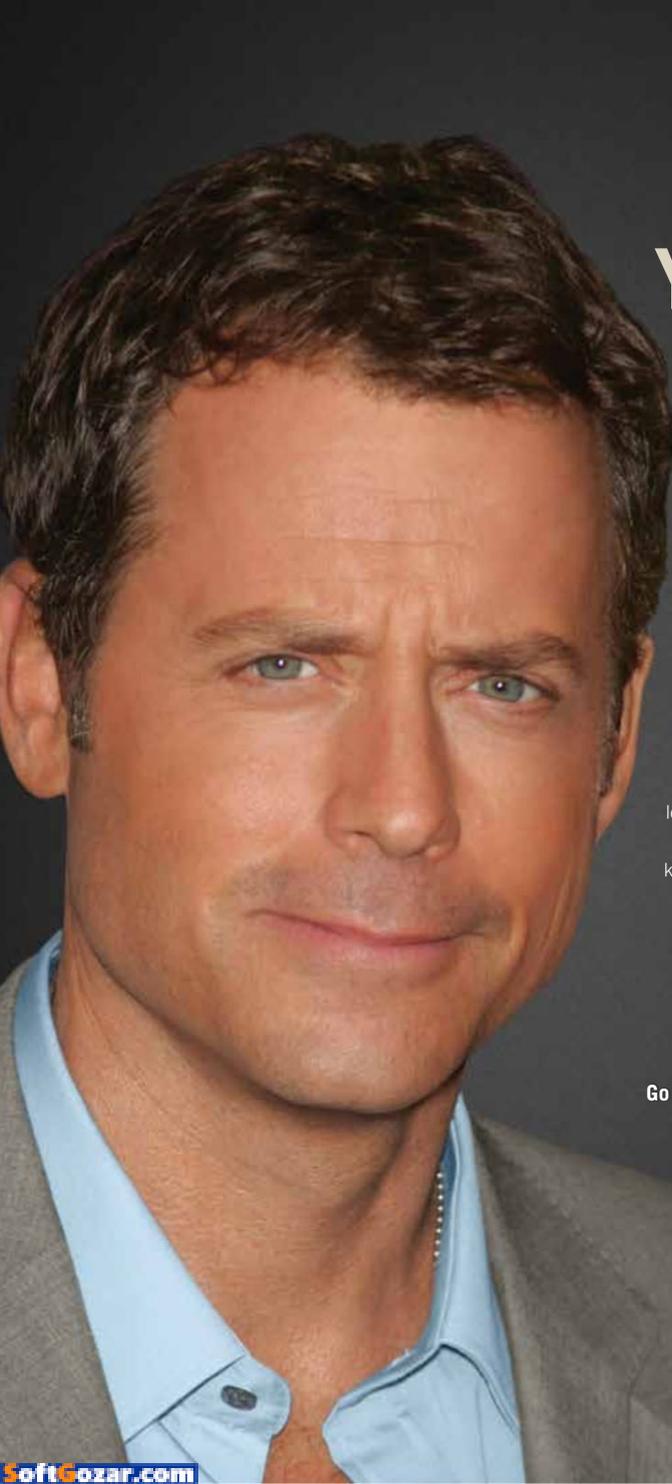
Click on Other and you see yet another list of miscellaneous folders on your PC taking up significant space, such as a virtual machines folder or GPU drivers. Click on any item within the Other list and you'll once again launch File Explorer to manage your files.



GOING DEEPER

The new storage feature in the settings app can be a great way to quickly figure out where you can make space on your drive, but it's effective only for higher-level folders such as Documents, OneDrive, and Desktop.

To really get into the nitty-gritty of every folder and file on your PC, nothing beats embracing a good ol' fashioned utility. Check out *PCWorld's* quick tip on using WinDirStat (go.pcworld.com/windirstat) to drill down even deeper into the files taking up space on your PC. 



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COLORECTAL CANCER
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Today, colorectal cancer (CRC) is the second leading cause of cancer death in the United States,* but that may be changing. Research shows that knowing the genetic and molecular makeup of your colorectal tumor may lead to safer, more effective treatment, just for you. Make it personal. It's your tumor.

Talk to your doctor about testing your tumor.
Speak up. Ask questions.

Go to SU2C.org/colorectalancer to learn more.

Greg Kinnear, SU2C Ambassador



Stand Up To Cancer is a program of the Entertainment Industry Foundation, a 501(c)(3) charitable organization.

*According to the Centers for Disease Control and Prevention (CDC), colorectal cancer is the second leading cause of cancer death in the United States when men and women are combined.

HERE'S HOW

CONTENTS

- | | | | |
|-----|--|-----|--|
| 126 | How to speed up Windows 10 boot times with Fast Startup | 139 | Hassle-Free PC
Three easy ways to paste plain text into Word |
| 129 | What to do with Excel 2016's new chart styles | 141 | Answer Line
3 ways to speed up Windows 10 without buying new hardware |
| 134 | 6 tips for mastering navigation on an Android or iOS device | | |

How to build, maintain,
and fix your tech gear.

HERE'S
HOW



How to speed up Windows 10 boot times with Fast Startup

Shave seconds off Windows 10 startup times with this one simple setting.

BY JARED NEWMAN

SHOW OF HANDS: Who feels like it's too inconvenient to fully shut down your computer at night?

Sure, you might save some energy or battery life with a full shutdown, and the system might appreciate having a fresh start in the morning. But who wants to wait around for Windows to boot from scratch?

Windows 10 has an answer to this dilemma with Fast Startup. Much like

Fast Boot in Windows 8, Fast Startup creates a master file during shutdown that stores certain system files such as the Windows kernel and device drivers. Upon startup, the system loads those files back into RAM. The result is a shutdown process that closes all applications, files, and user accounts, but doesn't require a complete reboot.

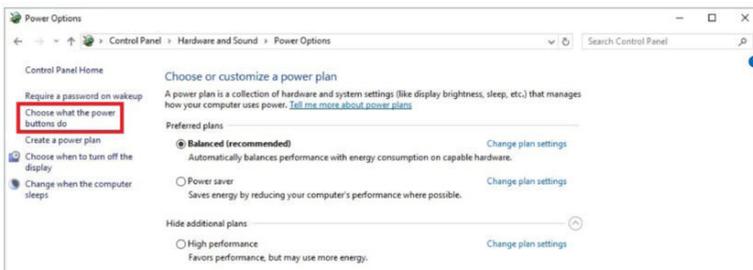
What sort of savings can you glean from Fast Startup? In my personal experience on an SSD-based desktop, enabling this feature shaves about five seconds from the startup process, making an already speedy boot process that much faster, but of course your mileage may vary. The benefits should be even more pronounced on systems that use a mechanical hard drive rather than an SSD.

If you bought a PC with Windows 10 pre-loaded, Fast Startup is likely enabled by default, and the same may be true with upgrades from Windows 8. But users who are upgrading from Windows 7 may have to enable this feature through Control Panel. Here's how to do it:

First, head to Power Options in Windows 10's Control Panel. The easiest way to get there is to open a search, type **power**, then select Power Options under the Best Match search results.



First, head to Power Options in Windows 10's Control Panel.



From the left sidebar, select the Choose What The Power Buttons Do option.

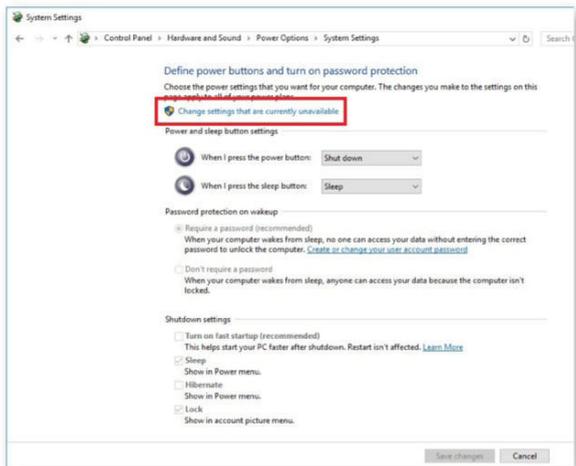
Select the Choose What The Power Buttons Do option from the left sidebar.

If the settings on the bottom of this menu are greyed out, click Change Settings That Are Currently Unavailable near the top of the screen.

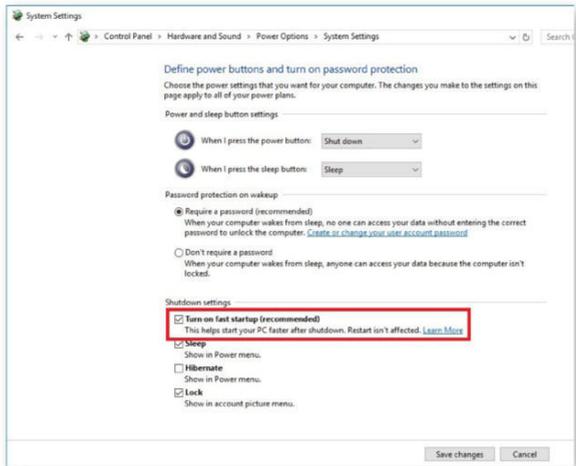
Finally, check the Turn On Fast Startup (Recommended) box near the bottom of the screen. Don't forget to click Save Changes when you're done.

Why *wouldn't* you enable Fast Startup? HowToGeek has a helpful explainer (go.pcworld.com/htgfaststartup) on some of the downsides for power users—for instance, it can mess with dual-boot systems because of how it locks down the Windows hard disk—though most normal users shouldn't run into any show-stopping issues.

For more Windows 10 tips, check out *PCWorld's* guide to the operating system's best tips, tricks, and tweaks (go.pcworld.com/w10besttweaks). There's a lot of power hidden inside Windows 10's nooks and crannies. 



If the settings on the bottom of this menu are grayed out, click the Change Settings That Are Currently Unavailable option near the top of the screen.



Don't forget to click Save Changes when you're done.



What to do with Excel 2016's new chart styles: Treemap, Sunburst, and Box & Whisker

These new chart styles make it easier to compare data and show hierarchies and other relationships.

BY JD SARTAIN

EXCEL 2016'S MANY new features include six new chart types. We'll go over three of them here and talk about how they could be used with your data.

Treemap: Designed to show hierarchies

Treemap has nine variations, all of which show a hierarchical view of the target data and how the sections of that hierarchy compare in size to each other. The main branches of the tree are displayed as large rectangles, with sublimbs branching out into smaller rectangles.

The best applications for this chart design are data with categories/groups and subcategories/subgroups. Examples would include organizational charts, product inventory; numbers per capita, percentages per area; budgets, sales; battery, disk, or memory usage.

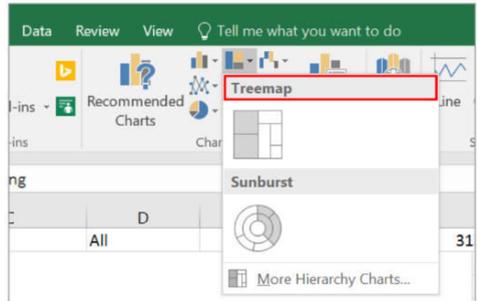
1. Open your spreadsheet, select the target data, and click Insert > Insert Hierarchy Chart > Treemap.

The chart drops in and opens the Chart Tools/Design Ribbon menus. Scroll across the Design options and select one that fits your project.

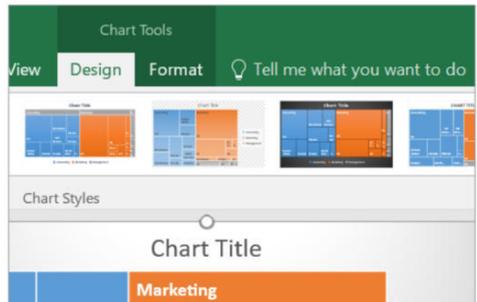
2. Click the + sign to edit the chart elements: Chart Title, Data Labels, or Legend. Then click the paintbrush to change the chart's design, such as location of the legend, or font attributes.

3. Right-click any of the rectangles on the chart and select Format Data Series.

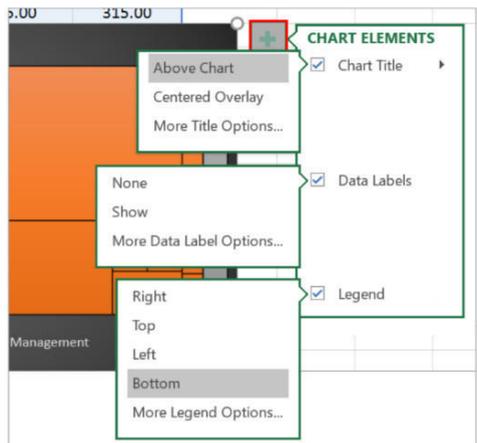
4. In the Format Data Series pane, click Series Options (the chart icon). Click the



Treemap 1. Insert the Treemap chart.



Treemap 2. Treemap chart Design options



Treemap 3. Modify chart elements.

Series Options down arrow and browse through the menu choices: Chart Area, Chart Title, Data Labels, Legend, Plot Area, and Series. Once you're satisfied with your changes, close the panel.

Sunburst shows hierarchies and relationships

Like Treemap, Sunburst shows visual comparisons of relative sizes, but Sunburst also display the links between the groups and sub-groups. Each level of the hierarchy is represented by one ring or circle with the innermost circle at the top. This visual representation provides deeper, more thorough analysis capabilities, such as identifying the largest contributing elements within a hierarchy of numerous levels.

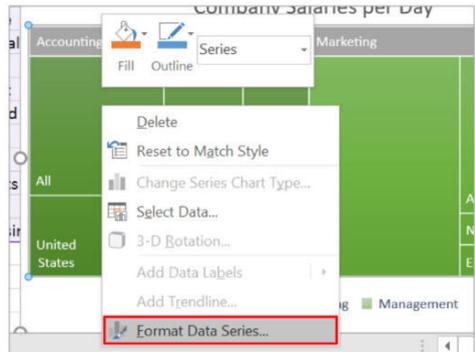
1. Open your spreadsheet and highlight your data. Click *Insert > Insert Hierarchy Chart > Sunburst*.

The chart drops in and opens the Chart Tools and Design Ribbon menus. Scroll across the design options and select one that fits your project.

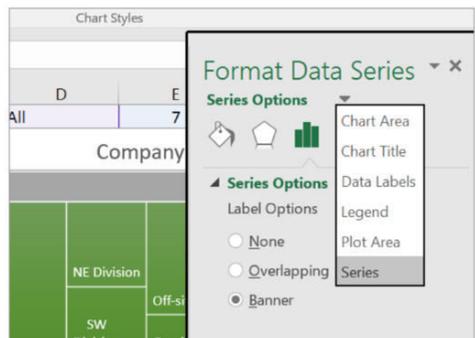
2. Click the + sign to edit the Chart Elements: Title, Data Labels, or Legend. Then click the paintbrush to change the chart's design.

3. Right-click any of the rectangles on the chart and select Format Data Series.

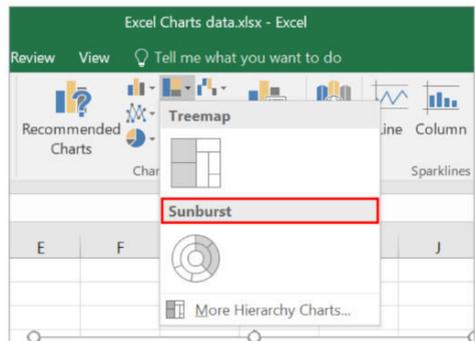
4. In the Format Data Series pane, click Series Options (the chart icon). Click the



Treemap 4. Format Data Series on the chart



Treemap 5. Format Data Series options



Sunburst 1. Insert the Sunburst chart.

Series Options down-arrow and browse through the menu choices: Chart Area, Chart Title, Data Labels, Legend, Plot Area, and Series. Once you're satisfied with your changes, click the X to close the panel.

Box & Whisker compares sets of data

The Box & Whisker chart (like the Histogram chart) shows the distribution of information, but this chart delves much deeper into analysis. For example, it can quickly and easily emphasize the most unique methods of data distribution such as the mean (average), quartiles, median, and percentile groupings, and it can identify outliers.

Box & Whisker is best for comparing characteristics between different sets of data, as opposed to Histogram and Pareto, which only provide visuals for one dataset.

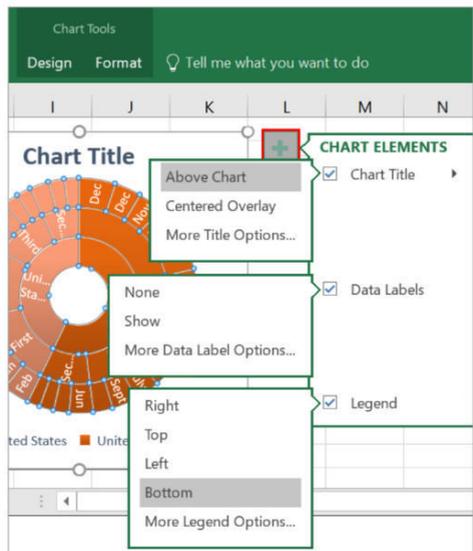
1. Open your spreadsheet and highlight the target database. Click Insert > Insert Statistical Chart > Box & Whisker. The chart appears and opens the Chart Tools/Design Ribbon menus. Scroll across the Design options and select one that fits your project.

2. Click the + sign to edit the Chart Elements: Axes, Axes Titles, Chart Title, Data Labels, Gridlines, and/or Legend. Then click the paintbrush to change the chart's design.

3. Right-click any of the rectangles on the chart and select Format Data Series.



Sunburst 2. Select the Sunburst Design options.



Sunburst 3. Select the Sunburst chart elements.

4. In the Format Data Series pane, click Series Options (the chart icon). Click the Series Options down-arrow and browse through the menu choices. Make the necessary changes, then click the X to close the panel.

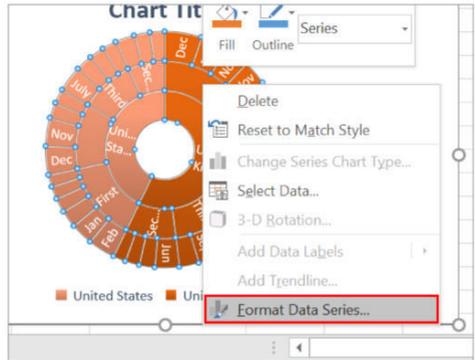
5. Right-click the chart, then click the Select Data button under the Data Type group.

6. The Select Data Source dialog box appears. Under Legend Entries (Series), select Series 1 (or 2, or 3, etc.), click the Edit button, then click OK.

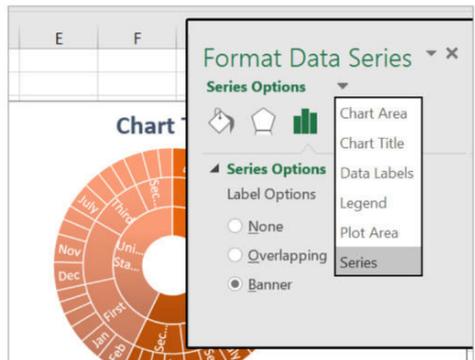
7. In the Edit Series dialog box, under Series Name, type the name of this series group (in this case, U.S. Market, European Market, or Asian Market). Note that the Series Names are the Markets, not the Genres (SciFi, Superhero, Fantasy).

8. If you need to alter the data range for any of the series, just enter the new range (or values) in the Series Values box.

And that's all for the new Treemap, Sunburst, and Box & Whisker charts. 🔌



Sunburst 4. Format Data Series



Sunburst 5. Select and modify the Sunburst chart Format Data Series options.



6 tips for mastering navigation on an Android or iOS device

BY BEN PATTERSON

DON'T FEEL DUMB if you're sometimes flummoxed by the navigation in an iPhone or Android app, or even within iOS or Android itself. It happens to the best of us. You're happily tapping around when, quite suddenly, you reach a dead end. Maybe you're trying to find the Settings menu, or you want to change the font on a message. Maybe you just want to go back where you came from. But there's no obvious way to do it.

The sleek, minimalist designs of the Android and iOS ecosystems,

while certainly attractive, are notoriously tricky to navigate. But there's a method to the madness, and knowing how common buttons and visual cues function in Android and iOS will make it much easier to achieve your goals.

1. Take a bite from the 'hamburger'

You're digging around an app looking for something resembling the main menu—a place where you might find the Settings, your account information, document folders, or help. The answer lies in a three-line button that's typically (but not always) sitting in a top corner of the screen.

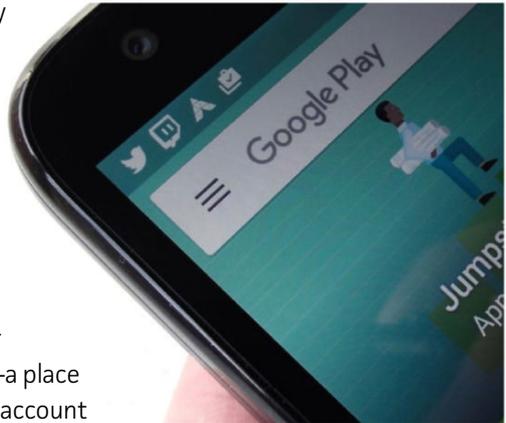
The button looks a bit like an abstract hamburger—and indeed, it's called the “hamburger” in app-development circles. Generally speaking, tapping the hamburger opens a drawer from the side of the screen with all your main menu and navigation items, making it a great place to start if you're looking for, say, your Gmail conversation labels, or your Recent Items in Google Docs.

While the hamburger typically sits in the top-left corner of an app's main interface, there are plenty of exceptions. One notable example is the Facebook app for Android and iOS, which has (confusingly) two hamburger buttons: one which opens the chat sidebar, and another which opens the standard drawer full of newsfeed filters, privacy options, app settings, and so on.

If you tap the hamburger button but don't find what you need, there's another menu you can try...

2. Peek into the 'overflow' menu

I tend to call the hamburger's little brother the “three-dot” button—that is, the button with a stack of three dots that usually sits opposite the hamburger, or perhaps in a corner all by itself.



You'll typically find the three-line button called the “hamburger” sitting in the top-left corner of an app's main interface, but there are plenty of exceptions.



Tap the overflow button to find options that didn't merit a spot on the main interface.

This three-dot button is actually called the “overflow” button—or, to be even more precise, the “action overflow” button. Tap it, and you’ll find a series of options that didn’t merit a spot on the main interface. Think “more,” and you’ve got the general idea.

Tap the overflow button in Chrome for Android, for instance, and you’ll find features such as New Tab and Bookmarks, as well as Find In Page and Recent Tabs. But sometimes, you’ll find items you might have expected to see under the hamburger button, such as Settings and Help. And don’t be surprised if you find an app interface that’s cluttered with overflow buttons—in the case of Google Docs, one overflow button for each document.

There are (confoundingly) more exceptions, too. Facebook’s Pages Manager app for iOS boasts an overflow button in the bottom corner of the screen, while Spotify for iPhone has one in the top corner. In both cases, the three-dot overflow button has its dots arranged horizontally rather than vertically, almost like an overflow/hamburger hybrid.

If you’re confused about the difference between the hamburger and overflow—er, action overflow—buttons, join the club. The best I can do, as one smartphone user to another, is to advise you to take a peek at the overflow menu if the hamburger button doesn’t satisfy.

3. Try the 'action' button (iOS only)

While you'll find the hamburger and the overflow buttons on both Android and iPhone/iPad apps, iOS has its own unique button where important features tend to hide: the action button.

Similar to the action overflow button, the iOS action button (which looks like a square with an arrow pointing up) opens a menu that often includes a dozen more buttons—everything from Copy and Print to sharing options like Message, Mail, and Twitter.

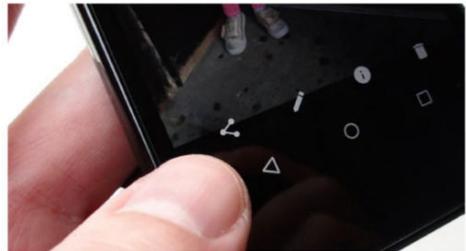


The iOS action button opens a menu that often includes a dozen more buttons—everything from Copy and Print to sharing options like Message, Mail, and Twitter.

The options under the action button change depending on the application you're using. In iOS's Safari web browser, for example, the action menu includes features such as Add To Reading List (which saves the current webpage for offline reading), Request Desktop Site (if you'd rather skip the mobile-optimized version of a page), and Add To Home Screen (to pin an icon for the current page to your home screen). In the Photos app, though, the action button will let you assign a snapshot to a contact, use a photo as your wallpaper, or start a slideshow.

4. Share (and share alike) with the 'share' button

While the action button is the go-to place for iOS users who want to share something (like a webpage or a photo), Android users looking to share with the world should keep an eye out for a different button: one with three dots connected by two lines, vaguely arranged in a C shape.



Android's share button looks like three dots connected by two lines in a C shape.

Just tap the share button to reveal a menu with (quite often) dozens of sharing options, from Dropbox and Facebook to Gmail and Messenger.

5. Tap or scroll to reveal missing toolbars

Android and iOS apps like Chrome, Safari, and Google Maps may seamlessly slip into a full-screen mode while you're scrolling down a page or swiping around Street View. It's a great way to get an immersive view of a webpage or a map, but confusion can easily arise when all the on-screen buttons and toolbars disappear.

Before you press the Home key to return to familiar ground, try tapping the screen once—or, if that doesn't work, scroll up or down a bit. Doing so will typically make toolbars and action and overflow buttons slide back into view.



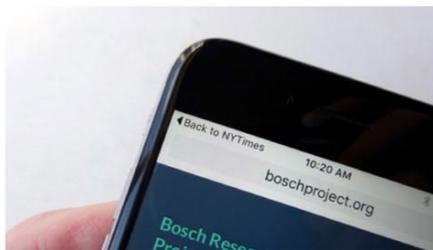
Wondering what happened to the toolbars in Safari? Reveal them by scrolling up a bit on the webpage.

6. Follow the breadcrumb (iOS only)

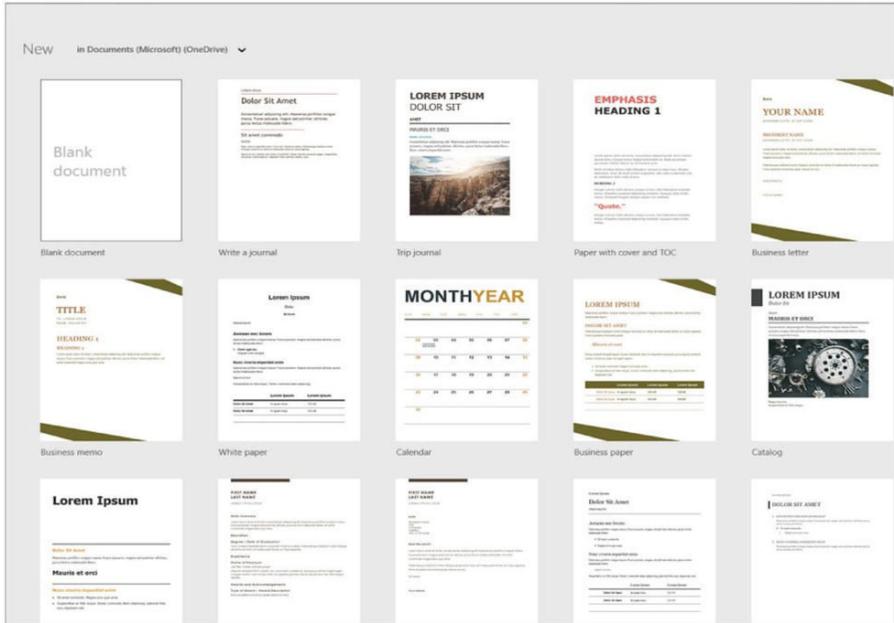
Every once in awhile, a button or a link in an iOS app will lead to another app. For example, a link in a news app might take you to YouTube, or an iMessage alert might lead you away from a webpage in Safari.

When that happens, you might spy a little navigation aid sitting in the top-left corner of the screen—perhaps, say, a tiny back arrow labeled Back To Safari.

That little button is called a “breadcrumb,” and it'll let you retrace your steps whenever you've been shuttled from one app to another. Tap the breadcrumb, and you'll end up right back where you came from. 🏠



If an iOS app or notification takes you directly to another app, you can tap the breadcrumb to go back to where you came from.



Three easy ways to paste plain text into Word

FORMATTING IS EASILY one of the biggest annoyances when copying text from the web into a local document. That's not a problem if you're using a plain text editor like Sublime Text, but it becomes a big hassle in programs like Microsoft Word.

Here are several ways you can make sure you get plain text and not words in bold, italics, or a different font every time you paste text.

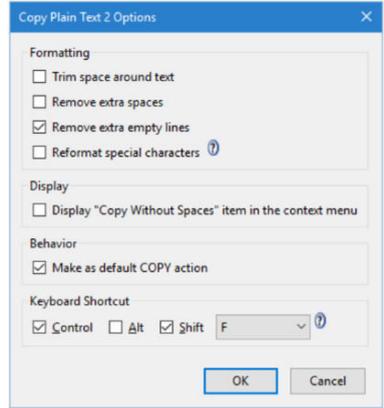
Word 2013 and 2016

If you're running a newer version of Word, Microsoft offers a built-in solution to strip text of its original formatting. When you right-click

to add text to your document you'll see three options: paste with the formatting from the source, paste with the formatting of your document, and paste in plain text only.

The last option is the easiest to use, but if you want to keep hyperlinks, bold, or italics choose the Merge Formatting option so it blends in with your document's text.

To set your paste options so it automatically pastes plain text only click on File > Options > Advanced, and then under the Cut, Copy, And Paste subheading choose the paste options you want.



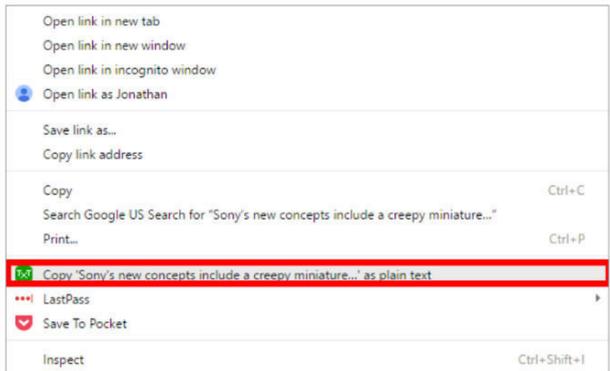
Copy Plain Text 2 add-on for Firefox

Browser add-ons

Another option is to have your text automatically stripped from the site through the magic of web browser extensions. Firefox users can try Copy Plain Text 2 (go.pcworld.com/ffcopyplaintext2). Once it's downloaded and installed type **about : addons** in the URL bar.

Find the entry for the add-on and click Options. Under Behavior, check the box that says Make As Default Copy Action. That way everything you copy will be automatically stripped of text. Google Chrome users can try Copy As Plain Text (go.pcworld.com/amazincopyplaintext). Unlike the Firefox option which works behind the scenes, this browser extension adds a new option to the context menu for copying in plain text, as pictured here. 

Copy as plain text



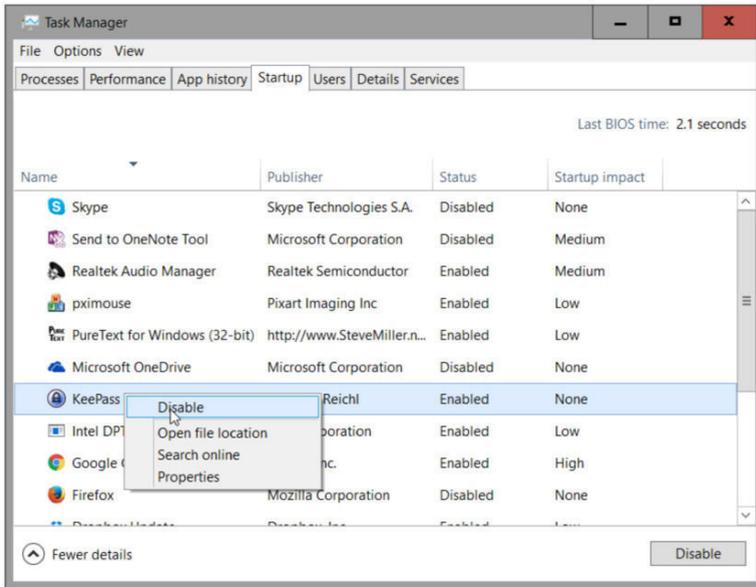


3 ways to speed up Windows 10 without buying new hardware

Why wait? A few simple tweaks will improve Windows 10's performance without an expensive hardware upgrade.

Gabe Gerzevske asked how he could speed up Microsoft's new operating system.

No one likes to click a weblink, open a program, or type a word...and then wait while their computer ponderously considers performing that task. If Windows is taking too much time to do its job, a few modest setting changes can help speed it up.



If you don't recognize the name of an autoloader, right-click it and select Search Online. That should help you find information on it.

1. Remove unnecessary autostarters

You might be shocked to discover how many programs load automatically every time you boot. Each one slows down the boot process a bit, and some may continue to slow down Windows after the boot, as well.

To see how bad the situation is, right-click the taskbar and select Task Manager. Click the Startup tab. (If you don't see any tabs at the top of the window, click More Details in the lower left corner.)

The Startup tab will show you all of the autoloading programs. As you examine the list, think about what programs really need to be running at all times. Your antivirus program qualifies, so it's a valid autoloader.

But some programs, even good ones, don't really need to run all the time. To stop one from loading automatically, right-click its entry on

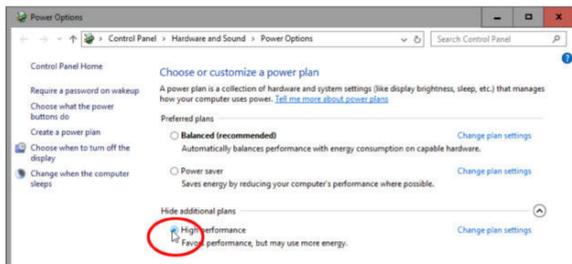
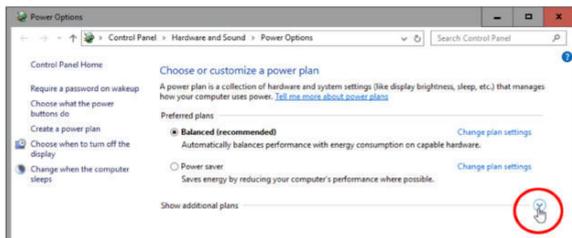
You might be shocked to discover how many programs load automatically every time you boot.

the Startup tab and select Disable.

If you don't recognize the name of an autoloader, right-click it and select Search Online. That should help you find information on it.

2. Change power settings

Windows may assume that you'd prefer an energy-efficient computer to a fast one—especially if you have a laptop. There are good reasons to go with energy efficiency, but not when the PC's slow performance is driving you crazy. Right-click the Start button and in the resulting—but ugly—menu, select Power Options. In the resulting Control Panel window, pull down the Show Additional Plans option. Then select High Performance.

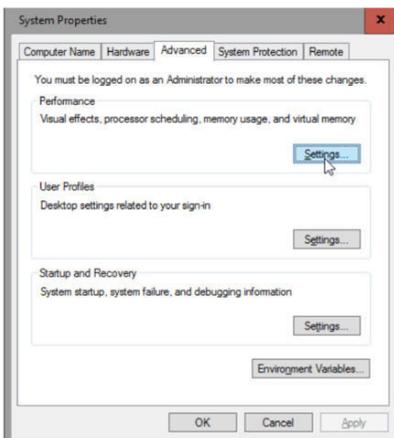


In the resulting Control Panel window, pull down the Show Additional Plans option. Then select High Performance.

3. Get rid of fancy animations

There's a lot of code in Windows that just makes things look nice. If your PC is underpowered, you may want to skip the aesthetics and gain some speed.

Right-click on Start, and select System. In the resulting



If your PC is underpowered, you may want to skip the aesthetics and gain some speed.

Control Panel window's left pane, select Advanced System Settings.

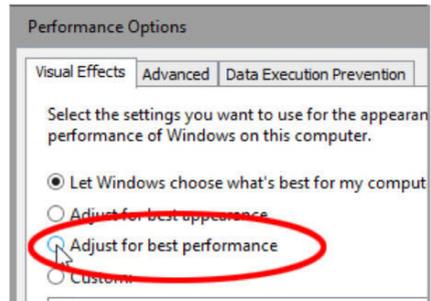
This brings up the System Properties dialog box. Click the Advanced tab, then the Settings button in the Performance box (the first of three Settings buttons on this tab).

This brings up another dialog box. Select Adjust For Best Performance.

I made this adjustment on my own little, underpowered laplet, and the improvement was significant.

For more speed-up suggestions, see Preston Gralla's article (go.pcworld.com/w10speeduppc). 

Have a tech question? Ask PCWorld Contributing Editor Lincoln Spector. Send your query to answer@pcworld.com.



Select the **Adjust For Best Performance** option.

Tech Spotlight

A video showcase of the latest trends



Watch the video at go.pcworld.com/fbbutton



Facebook's new **Reaction buttons** are a hot mess

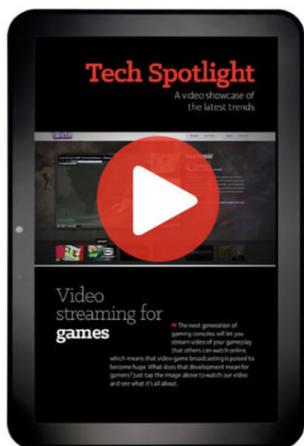
» Yes, you can, in fact, have too much of a good thing. Here's why the five new Facebook reaction buttons are poised to wreak social media havoc.

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