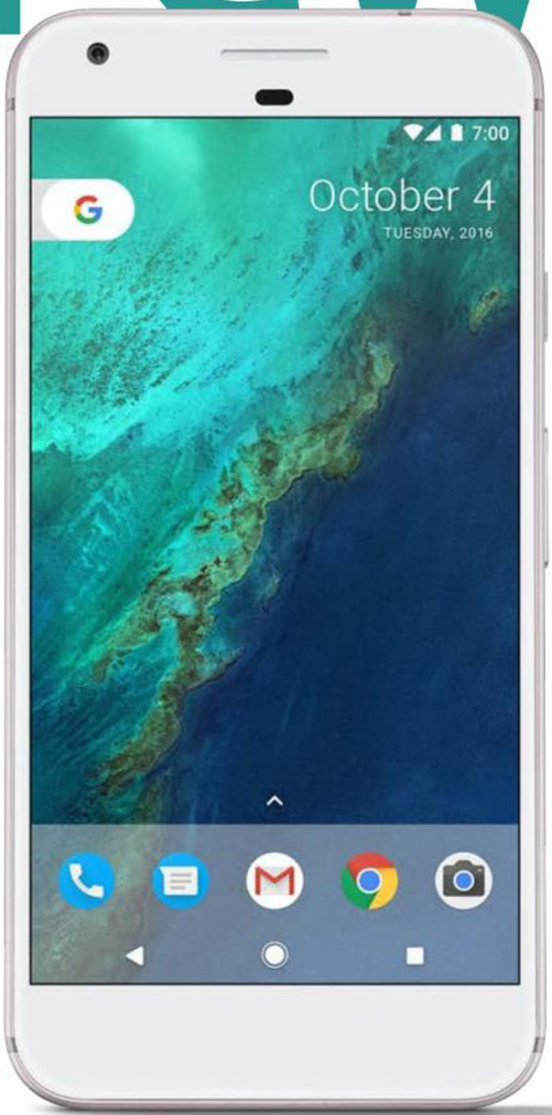
INSIDE: WHY AMD FREESYNC IS BEATING NVIDIA G-SYNC

PCWorld

NOVEMBER 2016 | FROM IDG



Phone-tastic!

Google's **Pixel XL** is the purest Android phone yet

PLUS

HP's **Elite x3** could be the last great Windows phone

ScanSnap

Business ready

iX100 wireless mobile scanner

Incredibly fast

Lithium-powered

Lightweight

http://budurl.me/pcwo

FUJITSU

TABLE OF CONTENTS

» DEPARTMENTS

» FEATURES

» COLUMNS

PCWorld

CCO & SVP, U.S. MEDIA AT IDG John Gallant
EDITOR IN CHIEF, CONSUMER BRANDS Jon Phillips
DESIGN DIRECTOR Rob Schultz

EDITORIAL

EXECUTIVE EDITORS Melissa Riofrio, Gordon Mah Ung
SENIOR EDITORS Michael Brown, Brad Chacos, Mark Hachman
ASSOCIATE EDITOR Caitlin McGarry
COPY EDITOR Sue Voelkel

DESIGN

DESIGNER Monica S. Lee

ADVERTISING SALES

SALES MANAGER Duane Hampson (415/978-3133)

PRODUCTION

DIRECTOR, PRODUCTION Nancy Jonathans

FOUNDERS

FOUNDER David Bunnell
FOUNDING EDITOR Andrew Fluegelman

INTERNATIONAL DATA GROUP, INC.

CHAIRMAN OF THE BOARD Walter Boyd
CEO, IDG COMMUNICATIONS Michael Friedenberg

REPRINTS AND PERMISSIONS

You must have permission before reproducing any material from *PCWorld*. Send email requests to permissions@pcworld.com; please include a phone number in your message.

BACK ISSUES

PCWorld back issues can be downloaded in digital format from www.zinio.com at $6.99 per issue.

SUBSCRIPTION SERVICES

Access your subscription account online—24 hours a day, 7 days a week. You can use online subscription services to view your account status, change your address, pay your bill, renew your subscription, get the answers to frequently asked questions, and more.

WEB pcworld.com/customer

EMAIL pcworld@emailcustomerservice.com

(Send your full name and the address at which you subscribe; do not send attachments.)

PHONE In the U.S. and Canada: 800/234-3498

QUESTIONS AND COLUMNS

Send material electronically to the appropriate online address listed below, or mail it to *PCWorld*. We reserve the right to edit letters.

ANSWER LINE answer@pcworld.com

MAILING LISTS

Occasionally we make our magazine subscribers' names available to other firms whose products may interest you. To have your name excluded from these mailings, send a request and your email address to PCWorld Subscriber Services at maghelp@pcworld.com.

CONTACT

PHONE 415/243-0500; **FAX** 415/442-1891

MAIL Editorial: 501 Second Street #600, San Francisco, CA 94107

STAFF ADDRESS To contact any *PCWorld* staff member, simply format the address as follows: *firstinitiallastname@idgcsmb.com*

PUBLICATION INFORMATION

Volume 34, number 11 *PCWorld*™ (ISSN 0737-8939) is published monthly at $24.95 for one year (12 issues) by IDG Consumer & SMB, Inc. Published in the United States.

NEWS

CONTENTS

HP's Spectre x360 puts Kaby Lake and Thunderbolt into a thinner, faster package

BY GORDON MAH UNG

HP'S SPECTRE X360 steps out with a major upgrade in its third generation. The latest version of the company's flagship convertible laptop gets thinner, lighter, and faster, and adds a wealth of check-off features. The new Spectre x360 went on sale October 12 starting at $1,049.

Still made of CNC-aluminum, the Spectre x360 slims down thanks to the use of a "micro-edge bezel" design. This eliminates the massive bezel of the previous version but still keeps the same 13.3-inch, touch-enabled screen. The only screen offered so far is a 1920x1080 IPS panel that uses direct bonding.

These improvements shave down the width from 12.79 inches to 12.03 inches, and the thickness from 16mm to 13.7mm. Weight drops to 2.85 pounds from 3.17 pounds.

The updated Spectre x360 features a "micro-bezel" that is far thinner than its predecessor's.

The updated Spectre x360 will feature four speakers that were tuned by Bang & Olufsen.

HP has announced only one model so far, and it uses Intel's Core i7-7500U. That's pretty much the top of the line for Intel's brand-new 7th-gen chips. From what we've seen in our review (go.pcworld.com/kabylakerv) of the new chip, it's a worthy upgrade unless your current

PC is pretty new. Storage options include up to a 512GB M.2 NVME SSD over PCIe.

We're especially pleased to see the adoption of Intel's high-speed Thunderbolt 3 (go.pcworld.com/tb3success) external I/O in the Spectre x360. With Thunderbolt 3, HP will also ditch the round-barrel charger and charge the Spectre x360 through one of two USB-C ports.

Sure, the bezel used in the Spectre x360 isn't quite as thin as the one used in its arch-rival, Dell's XPS 13, but that means HP can fit the webcam along the top instead of in the compromised lower-left corner location Dell uses. The space also accommodates an infrared camera that supports Windows Hello login.

The new Spectre x360 will last longer on battery, according to HP: up to 14 hours and 15 minutes. That's thanks to the 57.8 watt-hour lithium polymer battery, compared to the last gen Spectre x360's 56 watt-hour power pack, rated to last for 12 hours.

The Spectre x360's battery is rated to last more than 14 hours on a full charge.

Samsung's ArtPC Pulse is a cylindrical desktop PC with 360-degree sound

BY JON PHILLIPS

PERHAPS SAMSUNG HAS more pressing matters to address, and that's why we never received an official release on the ArtPC Pulse, a cylindrical desktop PC that's now available for pre-order on Amazon (go.pcworld.com/artpcamz). But if you're interested in computers with modern art aspirations, check out the product page and consider, well, what it all means.

Looking much like HP's Pavilion Wave (go.pcworld.com/hpwaven) (minus the Wave's more tasteful fabric covering), the ArtPC Pulse

stands 10.7 inches tall, and is designed with a full metal body and circular lighting. You also get 360-degree omni-directional Harmon Kardon audio, suggesting hints of the Amazon Echo (go.pcworld.com/amzechorv) and Google Home (go.pcworld.com/googlehomeho).

The Amazon listing advertises removable expansion modules, and notes that an optional 1TB hard drive module is available separately, though it's unclear exactly how the modular system works. Nevertheless, the $1,200 version of the PC comes with a 2.7GHz sixth-gen Core i5, a 256GB SSD, 8GB of RAM, and USB-C and HDMI ports. Graphics are handled by a Radeon RX 460 GPU.

There's also a $1,600 Core i7 model that keeps the 256GB SSD and RX 460 GPU, but specs a 1TB SATA hard drive and 16GB of RAM. Both models will be released October 28, so put on your edgiest art student garb, grab a shot of espresso, and prepare to ponder greater semiotic interpretations.

The story behind the story: It would be easy to call the ArtPC Pulse a rip-off of Apple's Mac Pro (go.macworld.com/newmacpro), but that position just ignores another competitor in the "let's make a computer shaped like a cylinder!" race. The HP Pavilion Wave is currently for sale in HP's online store (go.pcworld.com/hpwave), and, frankly, it looks way more sophisticated that Samsung's bid for exactly the same market.

Nvidia's GeForce GTX 1050 and GTX 1050 Ti can give prebuilt PCs a big boost

BY BRAD CHACOS

WHILE AMD'S ENTHUSIAST-CLASS "Vega" Radeon graphics cards are still a far-away dream destined to launch next year, Nvidia's putting the finishing touches on its killer GTX 10-series lineup with the release of a pair of new graphics cards: The GeForce GTX 1050 and GeForce GTX 1050 Ti.

These graphics cards are aimed toward giving prebuilt "big box" PCs enough oomph to game, with a mere 75-watt power draw that negates the need for extra power connectors. As such, they're suitably budget-friendly. The GeForce GTX 1050 Ti will cost $139 when it launches on October 25, and the GTX 1050 a mere $109 at its November 8 release.

Meet the GeForce GTX 1050

That puts the similarly priced Radeon RX 460 (go.pcworld.com/radeonrx480rv) dead in the GTX 1050's sights, but the rivals took two very different approaches to their affordable cards. While the $110 and $140 versions of the Radeon cards differ only in memory capacity—the former offers 2GB, while the latter packs 4GB—the two GTX 1050s offer different performance levels as well.

The 2GB GTX 1050 packs 640 CUDA cores clocked at 1,354MHz, and can boost up to 1,455MHz to increase performance. The 4GB GTX 1050 Ti, on the other hand, contains 768 CUDA cores clocked at 1,290MHz to 1,392MHz. (For comparison, the $200 3GB GTX 1060 [go.pcworld.com/evgagtx1060rv] holds 1,152 CUDA cores at up to 1,708MHz.)

Both are built around a new "GP107" graphics processor that offers all the same features as Nvidia's other "Pascal"-based GTX 10-series cards. That means goodies like Ansel super screenshots, Fast Sync, simultaneous multi-projection, performance-boosting multi-resolution shading (go.pcworld.com/multiresshading), and more, all of which we covered in detail in PCWorld's GeForce GTX 1080 review (go.pcworld.com/geforcegtx1080).

But enough with the numbers! What sort of gaming performance can we expect to see out of the GeForce GTX 1050 and GTX 1050 Ti? Nvidia claims you'll see a sizeable jump compared to its legendary GTX 750 Ti, another upgrade-centric card limited to 75W.

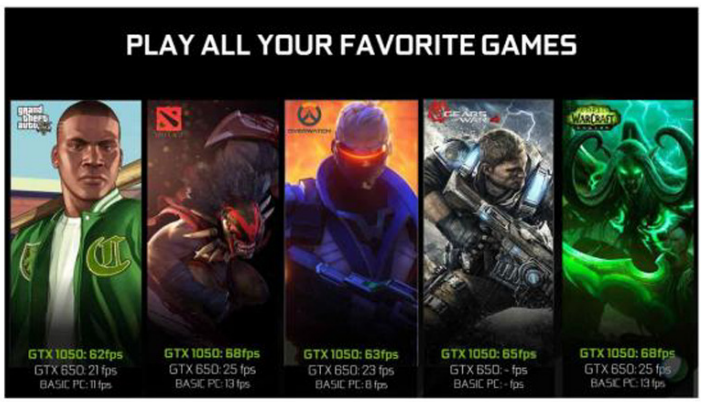
Note that Nvidia's graph doesn't mention the GTX 950 (go.pcworld.com/gtx950), which actually wasn't considered a GTX 750 Ti replacement. That said, some back-of-the-envelope math suggests

GeForce GTX 1050	GeForce GTX 1050 Ti
640 CUDA Cores	768 CUDA Cores
2 GB GS	4 GB G5
75W	75W
Oct 25th	Oct 25th
$109	$139

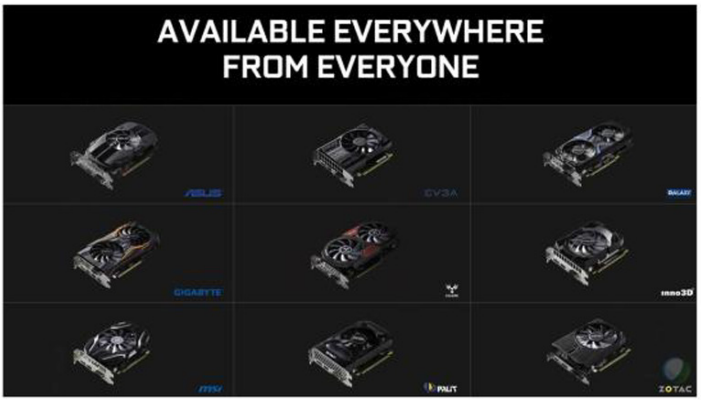
that if Nvidia's performance claims hold true, the GTX 1050 should outperform the GTX 950 as well.

Because the GTX 1050 and GTX 1050 Ti both consume under 75W, they can draw all needed power straight from a PC's motherboard, making the cards a hassle-free upgrade for people with prebuilt "big box" computers. Going from integrated graphics to a discrete GPU offers a hell of a performance jump, as you'd expect. Scads of GTX 750 Ti graphics cards were sold for just this purpose—heck, I coaxed a couple of people into buying them myself—and the GTX 1050 appears ready to seize the mantle from its predecessor.

Here's the GTX 1050's 1080p performance in actual video games. Be wary of Nvidia's numbers here: In a briefing, a representative said GTA V was run on Medium graphics settings, for example, while Dota 2 was cranked to High. That said, balancing between fidelity and frame rate's a necessary evil in graphics cards in this price range, and it's nice to see the GTX 1050 hitting 60-plus frames per second in major—though certainly not strenuous—games. It's worth noting that Nvidia's GeForce Experience 3.0 software (go.pcworld.com/geforceexp30) can optimize your games with a single click, though you'll likely to need to tinker further for best results (it often sets bizarre screen resolutions) and you need to register to use GFE now.



"Out of the box the GTX 1050 and 1050 Ti are both blazing fast, with the GTX 1050 Ti on average 40 percent faster and more than 128 percent more power efficient than the closest competitive product at



stock speeds," Nvidia's GTX 1050 announcement post brags, explicitly naming that "closest competitive product" as the Radeon RX 460 in the footnotes.

As for VR, it's uncertain whether the GTX 1050 series will be compatible with the Oculus Rift's newly lenient (go.pcworld.com/riftpricedrop) PC requirements. GeForce product manager Justin Walker says he'd expect the GTX 1050 Ti to meet the grade, but Nvidia is still working with Oculus to test the new graphics cards. If you're looking to get into VR we'd still suggest in investing in a $250 6GB GTX 1060 (go.pcworld.com/geforcegtx1060rev) or better, anyway.

Nvidia won't be offering Founders Edition versions (go.pcworld.com/nvidiafoundersed) of the GTX 1050 or GTX 1050 Ti. Instead, you'll see a slew of custom models from Nvidia partners like EVGA, Asus, and Zotac when the cards launch on October 25.

As with the deluge of Radeon RX 460s (go.pcworld.com/rx460list), some of the custom GTX 1050 cards will include an extra 6-pin power connector to push overclocking limits further. Interestingly, Walker says the frugal power needs of the GTX 1050 could make the card a potential fit for passive, fanless cooler designs—though there's nothing like that planned right now. Something for the future, maybe?

Report: Apple slams the brakes on electric Apple Car to focus on auto software

BY IAN PAUL

APPLE'S OFT-RUMORED (but never confirmed) car project (go.pcworld.com/applecarproj) is reportedly being scaled back. The effort, codenamed Project Titan, will now focus on creating an autonomous driving software platform as opposed to a full-blown car (go.pcworld.com/applecarrumor), according to Bloomberg (go.pcworld.com/bbapplecar).

The latest report from Bloomberg basically confirms the news organization's own suspicions back in July. At that time, Apple

hired Dan Dodge (go.pcworld.com/dandodgehire), creator of BlackBerry-owned QNX automotive software platform, which Bloomberg believed signaled a stronger focus on software.

However, Bloomberg said at the time that Apple was not abandoning car development, which no longer appears to be the case. Project Titan has been scaled back with "hundreds" of job cuts, and a declaration by project leader Bob Mansfield (go.pcworld.com/bobmansfieldac) that Apple was shifting to focus on the platform, Bloomberg reports.

The original plan—or so the rumors say—was for Apple to roll out its own car around 2021. In recent months, the general consensus was that this car would be of the self-driving kind. Autonomous vehicles are seen as the future of the car industry and many companies want a piece of that future. Google has been working on autonomous cars for years, more and more traditional car companies are working on autonomous vehicles, and even Uber has plans for an autonomous car by the 2020s (go.pcworld.com/uberautocar).

As it stands right now, however, Apple's self-driving plans will be more about partnering with other companies, or rolling out its own car at a much later date. That's if Project Titan even gets out of the development phase. Bloomberg says Apple executives have put Titan on a deadline. If the group can't prove the "feasibility of the self-driving system" and "decide on a final direction" by late 2017, Project Titan may never surface.

As it stands right now, however, Apple's self-driving plans will be more about partnering with other companies, or rolling out its own car at a much later date.

Why this matters: Just like any other technology company, Apple develops and prototypes devices and software all the time. Much of that effort never ends up as a fully realized product—the oft-rumored Apple television set (go.pcworld.com/appletvsetrumor) is a good example of that. The Apple Car is a little different since there's so much research and development into self-driving cars. Apple may feel a little more pressure than usual to keep pace with so many rivals hard at work on autonomous cars.

Apple Mac shipments take a beating in the third quarter as PC shipments decline

BY AGAM SHAH

SALES OF WINDOWS PCS fared better than Apple Macs during the third quarter this year.

Third-quarter PC shipments declined by 3.9 percent compared to the same quarter last year, but Mac shipments dropped by 13 percent. PC shipments totaled 68 million units, according to IDC.

The declines weren't as bad as expected, and were roughly 3.2 percent ahead of IDC's initial projections, the research firm said.

In the top five PC companies, fourth-placed Apple registered the largest decline, with the 13 percent drop in Mac shipments. Apple's Mac sales totaled 5 million units during the quarter, declining from 5.76 million units in the same quarter a year ago.

Many Mac laptops and desktops are due for an upgrade to Intel's Skylake and Kaby Lake processors. That could grow Mac shipments. IDC's numbers do not include detachable devices like the iPad Pro.

IDC analyst Jay Chou couldn't immediately say if Chromebook shipments outpaced Macs. The research firm will tabulate those numbers next month.

Chromebook shipments are growing at a fast rate thanks to their use in education and could outpace Mac shipments some day. IDC expects Chromebook shipments to be sluggish in the fourth quarter, however.

Chromebook shipments are growing at a fast rate thanks to their use in education and could outpace Mac shipments some day.

The rate of decline wasn't as bad for Windows PCs makers, spurred by Windows 10 upgrades and back-to-school season shipments. HP closed in on Lenovo's spot as the world's top PC maker. Lenovo beat HP to become the world's top PC maker in 2013, but HP is looking to regain the crown.

Slower growth in China hurt Lenovo, but the company's shipments in the U.S. continued to grow. HP had shipment gains across all geographies.

Lenovo's shipments totaled 14.5 million units, declining by 3.2 percent, a 21.3 percent market share. HP's unit shipments totaled 14.4 million units, growing by 3.3 percent, a 21.2 percent market share. Shipments for third-placed Dell went up by 6.2 percent to 10.8 million units, while PC shipments for fifth-placed Asus went up 5.2 percent to 4.7 million units.

How Alienware's 20-year history with PC gaming can help drive the future of VR

BY AGAM SHAH

ALIENWARE COFOUNDER FRANK Azor has fond memories of the company's early days. It was a wild time of building kick-ass PCs, gaming, lots of sci-fi shows, and generally, having a good time.

"It was four guys in a tiny little office, sending in a couple of review machines, magazines saying they were great, and the phone beginning to ring very, very slowly. We would sell about one computer every day, maybe," Azor said.

Alienware's "backpack PC" prototype for VR.

October 15 marked 20 years of Alienware's existence. Now a part of Dell, Alienware has matured into a PC gaming powerhouse. It is also driving big changes for virtual and mixed reality, which Azor believes will drive PC growth in the coming decades.

"We helped build the PC gaming industry to where it is today. By no means was it a single company effort, but we were a key contributor. We'll do the same for VR," said Azor, who is now general manager for Alienware and XPS PCs at Dell.

When Alienware opened its doors, gaming PCs were niche. Now, they are hot items: slick-looking and packed with the latest technologies. Gaming PC shipments are flourishing while the PC market is slumping. Top PC makers—which ignored the market—are scrambling to catch up with tricked-out laptops and desktops of their own.

One big reason gaming PCs are hot right now: cutting-edge performance makes them ready for VR, a big opportunity for IT vendors.

Azor draws parallels between VR and the gaming industry. As the VR community grows, there will be more investments, content, devices and user-friendly ways to experience 3D content.

"We saw this in gaming 20 years ago. We lived through it," Azor said. "VR and mixed reality are going to be as revolutionary to our lives, to the PC and the technology industry as gaming."

Dell is taking a measured approach to VR. Many issues regarding

headsets, pricing, and user experiences have yet to be resolved.

"There's so much to learn still. We don't want to be haphazard about jumping in and doing something careless and making some mistake," Azor said.

Dell's road to VR starts with Alienware PCs. The company has shown innovative, free-roaming VR systems that have small PCs slotted in backpacks. Dell works with Oculus and Vive on headsets, and doesn't plan to create its own head-mounted display.

But gaming remains top priority for Alienware, and it has amassed a large community of followers over the last 20 years. PCs like the Area 51 have iconic designs, and the alien logo is easily recognizable.

The sci-fi craze of the mid-90s gave Alienware its name. Cofounders Nelson Gonzalez and Alex Aguila were big fans of the Alien movie series and shows like The X-Files.

"Nelson's perspective was, we're going to build the most bad-ass, cutting-edge PC as we possibly can. We tend to think of aliens having superior technology to us," Azor said.

Alienware's early gaming PCs sold for more than $3,000, which was crazy at a time when the goal was to bring down PC prices.

A few small gaming PC companies like VoodooPC (now defunct) and Falcon Northwest were competing with Alienware on price and features. Over time, Alienware excelled on design, while desktops like the expensive Mach V from Falcon Northwest stepped ahead in performance.

Alienware started the "color revolution" in gaming PCs, noted Kelt Reeves, founder of Falcon Northwest. Gaming desktops mostly were dull, beige boxes, but Alienware added several ColorWare cases to desktops in 2000.

The Alienware Predator.

Bright, colorful gaming PCs are now commonplace. Ironically, Alienware is now conservative on color, and offers systems mainly in

black and silver, Reeves said. That is more in line with Dell's PC lineup.

Alienware's first gaming PCs were made of off-the-shelf components and cases that were validated, personalized, and sent to customers. A major breakthrough was the unconventional Predator desktop chassis, which was the company's first product designed in-house.

"We hadn't created a product from ground up and that really challenged us," Azor said. The Predator desktop took company officials to Asia to source components and learn about tooling, parts, and manufacturing.

Alienware in 2003 delivered another breakthrough product with the Area-51M laptop, which was one of the first laptops dedicated to gaming, with graphics that could be upgraded. It had impressive specs—a 15.4-inch screen, a 3.2GHz Pentium 4 processor, 1GB of RAM, a 60GB hard drive, and Nvidia's GeForce FX Go5600 GPU.

The biggest milestone was Dell's acquisition of Alienware in 2006, an event that legitimized gaming PCs as a major market.

"Before Dell's buyout, gaming PCs were thought of as niche products offered only by small independent companies to a few enthusiasts. A couple of big-box PC company attempts to make gaming PCs years

earlier had flopped, like the NEC Power Player system," Falcon Northwest's Reeves said.

At the time of Dell's acquisition, Alienware had annual sales of about $172 million and around 800 employees. Dell's acquisition inspired HP to buy Voodoo, which failed and was ultimately shuttered.

Ten years after the acquisition by Dell, Alienware has expanded its gaming offerings, experimented with new designs, and started targeting its PCs at an audience beyond avid enthusiasts.

Dell has continued to invest in Alienware, encouraging the development of unique products like the Alienware Graphics Amplifier, an adapter chassis to hook up the latest GPUs to laptops and desktops.

Ten years after the acquisition by Dell, Alienware has expanded its gaming offerings, experimented with new designs, and started targeting its PCs at an audience beyond avid enthusiasts.

Alienware is also coming out with risky products like the Steam Machine, which is a console-like Linux gaming PC based on a design from Valve. Steam Machine has a committed user base, though it's nowhere near as popular as Windows PCs for gaming.

"Steam Machine was a huge risk. It's a risk that hasn't necessarily paid off in terms of unit sales as much as everybody had hoped for, but it's a risk we continue to invest in," Azor said.

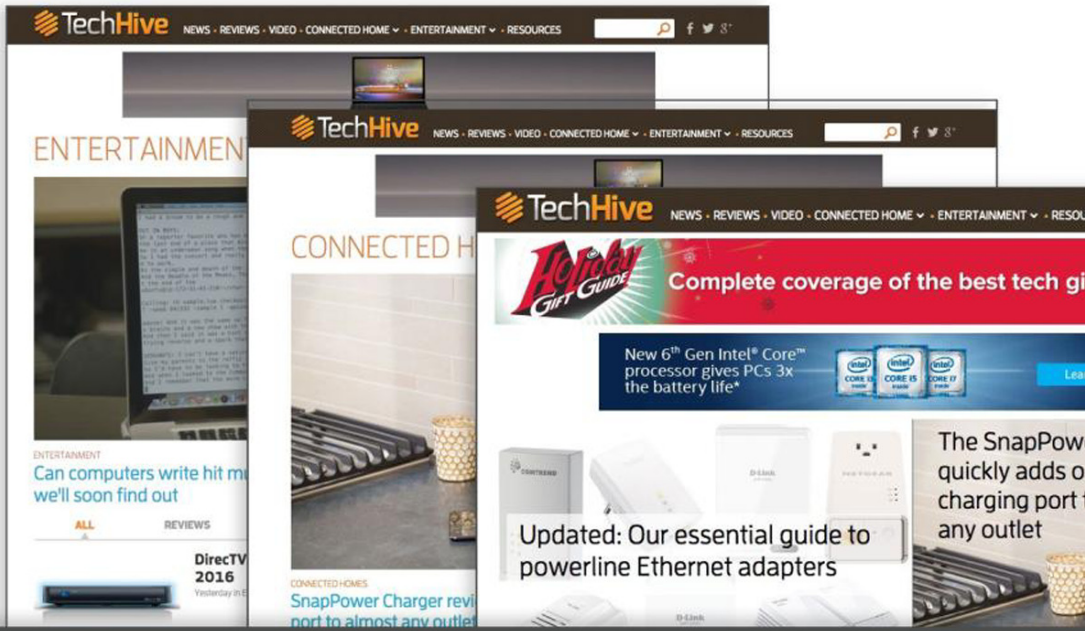
People love Steam Machine for its console-style interface and ability to play and share games bought years ago, Azor said.

In a way, Dell's ownership hasn't changed a thing at Alienware. For Azor, every day feels like going back 20 years when the company was born. The passion for gaming remains, but the surroundings have changed.

"I'm a father, I'm a husband, I'm a gamer. I go to work every day to go fuel my habits. Those are the three priorities for me."

TechHive

News, tips, and reviews about smart homes, home security, and home entertainment.



TechHive helps you find your tech sweet spot.

We steer you to smart-home tech products you'll love and show you how to get the most out of them.

www.techhive.com | Follow us

Samsung kills off the Galaxy Note7 to end the exploding battery debacle

Problems worsened for Samsung after reports that even replacement Note7 phones were catching fire.

BY JOHN RIBEIROT

SAMSUNG ELECTRONICS HAS discontinued production of its Galaxy Note7 smartphone, which has been plagued since its introduction in August by battery problems that caused fires and even explosions.

The company recently confirmed that it is discontinuing production, a day after it said that it had advised carriers and retail partners worldwide not to sell or exchange the replacement Note7 phones that were intended to solve an issue of overheating batteries in the previous version.

U.S. carriers including Verizon, AT&T, and T-Mobile had announced that they would stop the exchange of the smartphone after reports of fires and explosions involving the replacement smartphones, including a report of a Note7 that caught fire on a Southwest Airlines flight. Samsung said it was investigating the reports.

Samsung offered to give customers the replacement phones as part of a recall of about 1 million Note7 smartphones it announced with

Galaxy Note7 smartphone.

the U.S. Consumer Product Safety Commission. Other countries including Canada also announced similar recalls.

It became evident that matters were getting more difficult for Samsung when it was widely reported that the company was considering temporarily halting production of the replacement Note7 smartphones. Soon afterward, the company said it was "temporarily adjusting the Galaxy Note7 production schedule in order to take further steps to ensure quality and safety matters."

It appears that for customers the option now will be to take up Samsung's offer of a refund or a replacement of the Note7 with the Galaxy S7 or Galaxy S7 edge, which was part of the offer after the CPSC recall.

Samsung did not disclose which product line would be introduced to take the place of the Note7. It appears that for customers the option now will be to take up Samsung's offer of a refund or a replacement of the Note7 with the Galaxy S7 or Galaxy S7 Edge, which was part of the offer after the CPSC recall.

"Samsung is doing what's needed here by containing the damage to the Note7 before consumer fear spreads to other Samsung products. Killing such an otherwise-promising product line is painful but perhaps necessary for the long term health of the company," said Bryan Ma, vice president for devices research at IDC.

Samsung still has its flagships, the S7 and S7 Edge, that users can turn to, said Ma, who added that if users are willing to switch from Android to iOS it could well benefit Apple. "Users that want to stick to Android have plenty of other Android flagships to choose from, be it from LG, HTC, Sony, Huawei, or even Google's recently launched Pixels," Ma said.

WHAT THIS PLACE NEEDS IS ACTIVE PLAY EVERY DAY.

Thanks to our work with NFL PLAY 60, we've brought fun fitness programs to more than 35,000 kids. And it can happen here too.

With the Galaxy Note7 dead, here are 7 other Android phablets to consider

BY IAN PAUL

IT'S OFFICIAL: THE Galaxy Note7 is no more. The company already pulled out a miracle with its unprecedented recall (go.pcworld.com/galaxynote7recall) to address the phone's defective battery, only to be scorched again when more units started igniting. Samsung has now stopped production (go.pcworld.com/galaxynote7stopped) and wants you to (again) power off your device for good.

By now you're probably tempted to leap to the dark side and get an iPhone 7 Plus. But don't give up on Team Android just yet. There are several good phones that either share the Note7 screen size or come in close at 5.5 inches, which might help you forget you had to nearly walk through fire to get one.

Google Pixel XL

This very well could be the ultimate Google phone. The Pixel has the highest-ever rating from DxOMark, and it comes with several software exclusives (go.pcworld.com/pixelhandson). The XL is just under the Note7's size at 5.5 inches, but the real star is the Google Assistant and the fact you'll get timely updates. Granted it's not yet for sale, but you can preorder it from the Google Store (store.google.com).

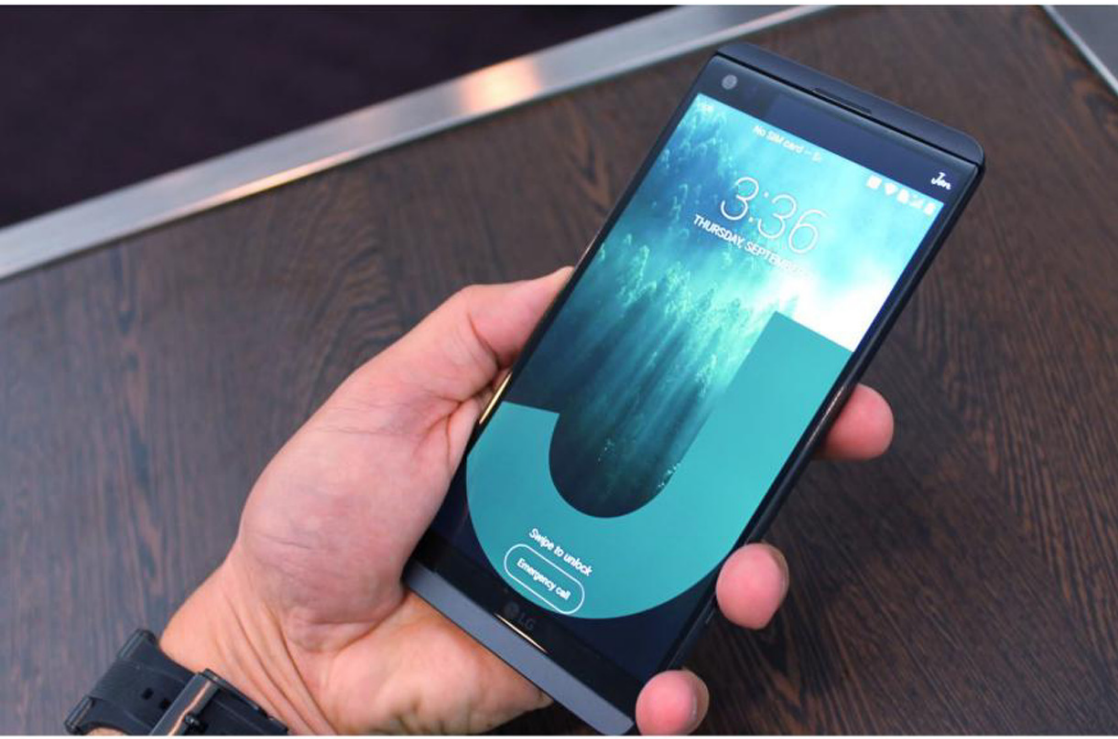
IMAGE COURTESY DEREK WALTER

Nexus 6P

It's nearly a year old now, but the Nexus 6P (go.pcworld.com/nexus6prev) is still a great phone. At 5.5 inches it also won't feel like too much of a drop down in size from the Note. And unlike Samsung's phones, which tend to languish without Android updates for months, you'll get the freshest goods right from Google.

The only caveat is the Pixel will be the first with the Google Assistant, though the company has pledged to make it available more widely and you can bet the existing Nexus phones will be the first (outside the Pixel) to get it.

IMAGE COURTESY FLORENCE ION



LG V20

This is another in the "coming soon" category. Our initial hands-on (go.pcworld.com/lgv20handson) found a lot to like in this phone that matches the Note7 with a 5.7-inch screen size. It comes with Nougat, has some fancy video tricks, and records HD audio. It's probably the closest you can get to a Note7 without throwing in a stylus and pen support.

IMAGE COURTESY JON PHILLIPS

OnePlus 3

The OnePlus 3 (go.pcworld.com/oneplus3rev) is both a solid option and cheaper, so you'll have plenty of leftover cash after your Note7 refund. It doesn't have the same kind of power features as something like the Note line, but it sticks close to stock Android and may be good enough that you'll be happy to have spent $300 less than you did for the Note7.

IMAGE COURTESY RYAN WHITWAM

Moto Z Force

The Moto Z Force (go.pcworld.com/motozforcerev) is an interesting option given that it's the best we've seen so far at successfully integrating modules (go.pcworld.com/modsmartphone). The 5.5-inch screen is a little smaller than the Note7 and the Force is a bit thicker than the Moto Z Play, although that comes with improved battery life and Motorola's claim of a "shatter-free" display. It's worth considering if you want to get crazy by slapping on a camera (go.pcworld.com/hasselbladmotoz) or turning your phone into a projector.

IMAGE COURTESY FLORENCE ION

Moto Z Play

If the Force is too big and bulky, or maybe you want some more cash left over after your Note7 debacle, consider the Moto Z Play. Our review (go.pcworld.com/motozplayrev) found it to be fast and reliable, and it offers amazing battery life. Moto also sticks close to stock Android look-and-feel and throws in a few helpful add-ons. The company has also pledged it will get Nougat, which will put you ahead of the curve compared to other phones that tend to languish.

IMAGE COURTESY JASON CROSS

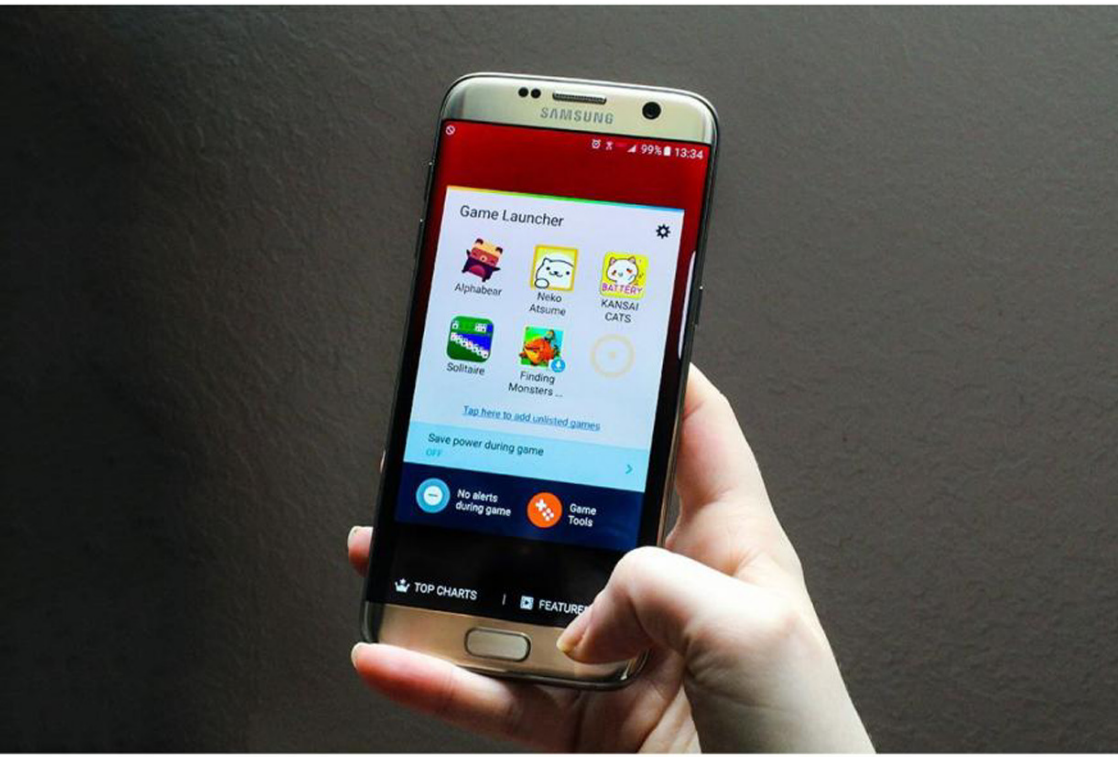
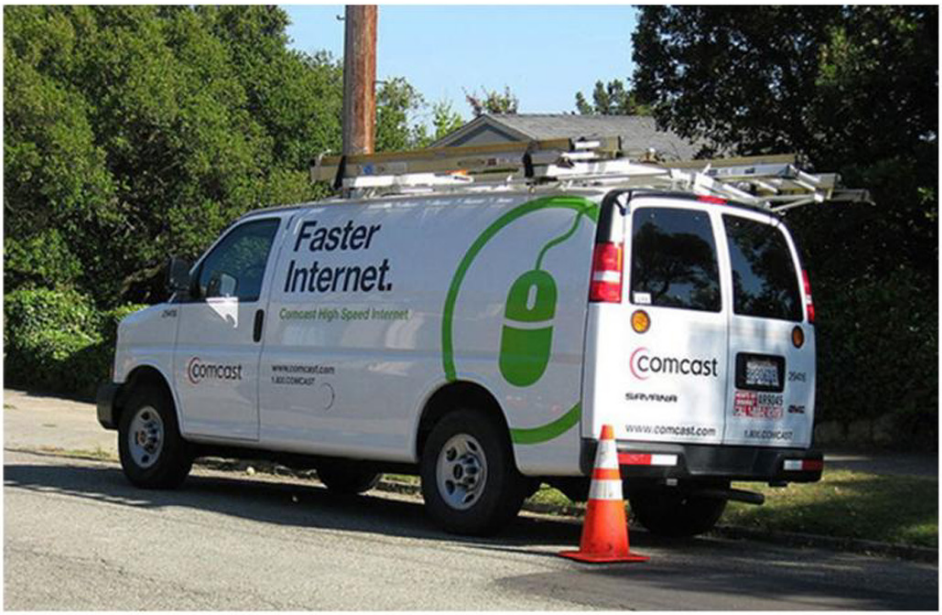


IMAGE COURTESY JASON CROSS

Galaxy S7 Edge

Unless you're feeling too burned by Samsung, the Galaxy S7 Edge (go.pcworld.com/galaxys7edgerev) is still a fantastic phone. It's essentially a smaller version of the Note7, without the stylus, iris scanner, and tendency to catch on fire.

It's currently my daily driver, and I still recommend it to anyone who asks. The camera is fantastic, particularly in low light. Nougat is unfortunately nowhere to be seen yet, but if you want to stick close to a Note7 experience it's worth considering.



Comcast's 1TB data cap starts rolling out across the U.S.

BY IAN PAUL

COMCAST SAID BANDWIDTH caps would be back before 2019, and now the company's living up to its promise.

The cable provider recently announced that its 1 terabyte bandwidth cap for Xfinity Internet subscribers would start rolling out more broadly. Comcast's data caps are currently in effect in 16 regions with another 18 regions getting the bandwidth cap on November 1. You'll find the complete list of current and upcoming bandwidth cap regions at the end of this article.

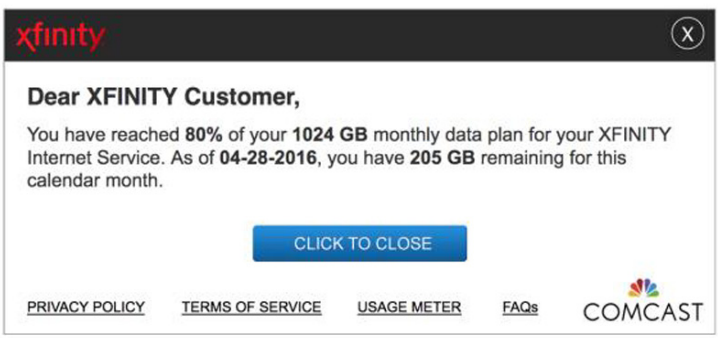
The company settled on the 1TB cap limit after experimenting with

various caps for several years in select areas. During that time, Comcast appeared to be favoring a 300GB cap, but never rolled it out nationwide. Then in April, Comcast bumped up the cap in its test markets to 1 terabyte.

Comcast says only a small minority (less than one percent) of its customers actually use more than one terabyte in a given month. For now, then, the data cap shouldn't be an issue for most people. One terabyte of usage is enough to stream 600 to 700 hours of HD video, play an online game for 500 days straight, or stream 15,000 hours of music, according to Comcast.

Anyone who wants to estimate their data usage can use Comcast's online tool. Xfinity customers can also look at their actual data usage online by logging into their account.

People who approach the limits of the 1TB cap will receive an "in-browser" notification like the one seen here, warning of impending overages. If you actually go over the limit, Comcast won't charge you any fees in the first two months of overages over a 12-month period. If there's a third month or more, however, you'll have to pay $10 per extra 50GB of usage, with an upper limit of an extra $200 per month.



The story behind the story: While Comcast's data caps may not be a big deal right now, that could change within a few years due to new technologies. Video streaming is morphing from 1080p HD to 4K streaming, which will require far more data—although the tech industry is working on more efficient compression for video streaming. In addition to streaming video, virtual reality for gaming and other uses may also drive up bandwidth requirements for the years to

come. Whether that will push people over the 1TB limit is not yet clear, but it's an issue to keep an eye on in the years ahead.

Current bandwidth cap locations:

- Alabama (excluding the Dothan market)
- Arizona
- Arkansas
- Florida (Fort Lauderdale, the Keys, and Miami)
- Georgia (excluding Southeastern Georgia)
- Illinois
- Northern Indiana
- Kentucky
- Louisiana
- Maine
- Southwestern Michigan
- Mississippi
- Tennessee
- Eastern Texas
- South Carolina
- Southwest Virginia

Effective November 1, 2016:

- Alabama (Dothan)
- California
- Colorado
- Florida (North Florida, Southwest Florida, and West Palm)
- Southeastern Georgia
- Idaho
- Indiana (Indianapolis and Central Indiana; Fort Wayne and Eastern Indiana)
- Kansas
- Michigan (Grand Rapids/Lansing, Detroit, and Eastern Michigan)
- Minnesota
- Missouri
- New Mexico
- Western Ohio
- Oregon
- Texas (Houston)
- Utah
- Washington
- Wisconsin

Yahoo Mail stops automatic mail forwarding as privacy controversies swirl

BY IAN PAUL

IN WHAT CAN only be called awfully suspicious timing, Yahoo has turned off automatic email forwarding—a crucial feature when changing email accounts (go.pcworld.com/newemailacct)—for Yahoo Mail users. Anyone who has already enabled the feature is not affected, but others cannot activate it.

On its help pages, Yahoo says mail forwarding is currently under development. "While we work to improve it, we've temporarily disabled the ability to turn on Mail Forwarding for new forwarding addresses," the help page (go.pcworld.com/yahoomailfwd) says.

Mail forwarding was turned off in early October, as first reported by The Associated Press (go.pcworld.com/apyahoomail). It's not clear if Yahoo turned off mail forwarding just before or just after news broke on October 4 of Yahoo's compliance with U.S. spy agencies (go.pcworld.com/yahoo emailspy) to scan users' mail. Yahoo later called those reports "mislead-

ing" (go.pcworld.com/yahooemailscan).

The spying controversy was preceded by news in late September that at least 500 million Yahoo user account details (go.pcworld.com/yahoodatabreach) were compromised by hackers.

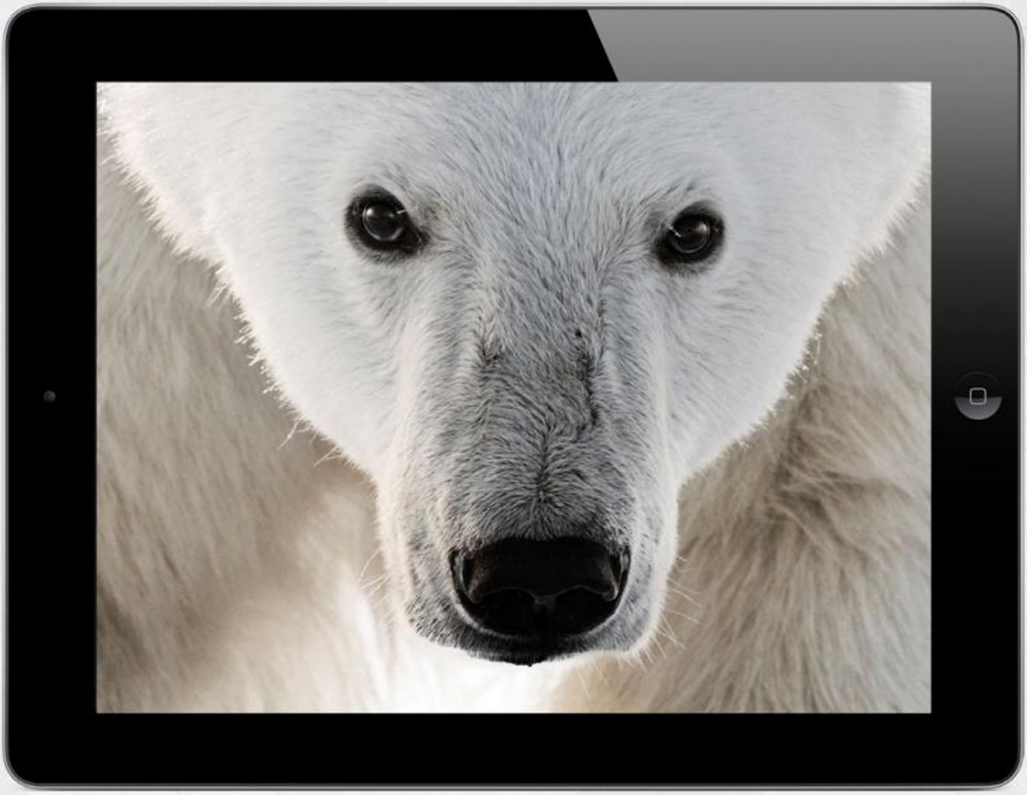
That's what makes Yahoo's mail forwarding suspension so curious. It comes just after two highly controversial disclosures—news that may have encouraged users to dump Yahoo Mail in droves for competitors like Gmail or Outlook.com, right at the time that Yahoo's finalizing a multi-billion dollar sale to Verizon. It's not clear if that's the case, but Yahoo's actions do make you wonder.

It's hard to believe that a company that works on PGP encryption features and killing the password can't figure out how to automatically forward email—a feature that's been standard for years.

A Yahoo spokesperson passed along the following statement:

> "We're working to get auto-forward back up and running as soon as possible because we know how useful it can be to our users. The feature was temporary disabled as part of previously planned maintenance to improve its functionality between a user's various accounts. Users can expect an update to the auto-forward functionality soon. In the meantime, we continue to support multiple account management."

The impact on you at home: It's hard to believe that a company that works on PGP encryption features and killing the password can't figure out how to automatically forward email—a feature that's been standard for years. Nevertheless, what's a Yahoo Mail user to do if they want to leave? Right now, the best solution is to use a mail client to obtain all your past mail via POP and then archive it. (Thunderbird can do the trick.) After that, you can set a vacation auto reply in Yahoo Mail with your new email address so that everyone knows where to contact you. During the first few days of the transition you'll probably have to check your mail regularly until everyone gets the message.



THE CLOSER WE GET, THE MORE WE SEE

Experience the world's most amazing animals in one app. **WWF TOGETHER** – the new free app from World Wildlife Fund. Download it today.

worldwildlife.org/together

WWF

REVIEWS & RATINGS

CONTENTS

Pixel XL review : Google's new phone isn't a Nexus—it's better

BY JASON CROSS

GOOGLE HAS BEEN selling phones since the Nexus One landed almost seven years ago. In fact, there have been eight Nexus phones, one each year through 2014, and two last year. They have generally been good phones, especially in the last few years. But the Pixel is not a Nexus. It's better.

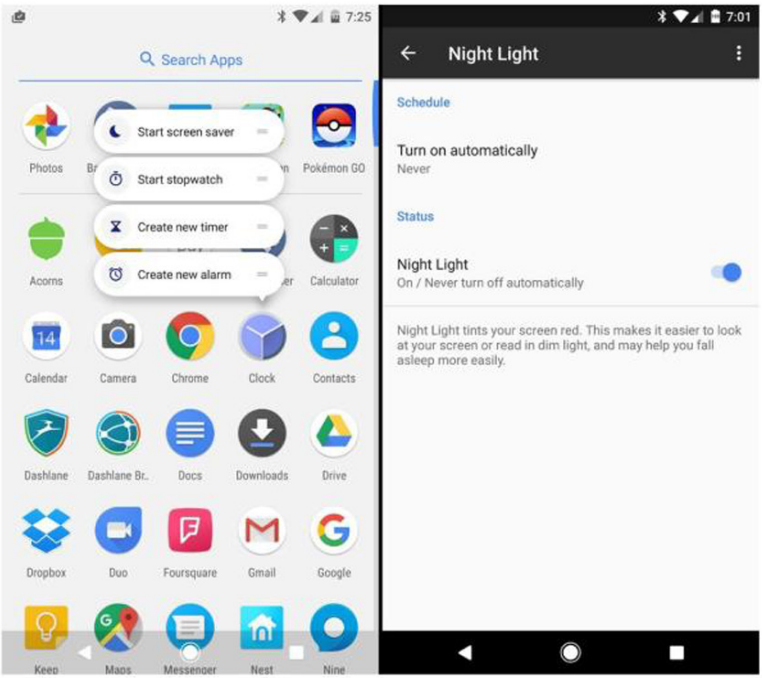
With the Pixel, Google did more than partner with a phone maker to slap Android on an already-designed handset. It created its own hardware and software innovations on top of stock Android. The result is a phone that may displease Android purists, but should delight everyone else. This is Google's first real attempt to push a phone to the mass market, and the Pixel competes directly with the iPhone as well as pricey flagships from Samsung and LG.

For this review, we're looking only at the Pixel XL. The Pixel is smaller, with a 5-inch 1080p display instead of the Pixel XL's 5.5-inch 1440p display. The Pixel's smaller display—along with its smaller battery—is the only difference between it and the XL model.

Not a Nexus

Nexus phones were built in partnerships with hardware partners like LG, Motorola, and Samsung. Google would take a mostly developed

The Pixel XL comes with a fast USB-C charger, two cables, and a transfer dongle.



Android 7.1 includes improvements like app shortcuts and Night Mode.

phone, and work a deal to make it the next Nexus. Google would then ask for a few tweaks, slap on stock Android and Google apps, and then resell it. But with the two Pixel phones, Google says it has had its hand on the wheel from the beginning, with HTC acting as a mere contract manufacturer. This is a longer and riskier process, but gives Google the opportunity to more tightly integrate its services, as well as tune hardware and software together.

The result is a phone that isn't "pure Android," and is frankly better for it. A devotee that only wants another Nexus—good hardware at an affordable price with stock Android—will surely cry foul. But if you can get past the idea that Google dared to produce a premium phone to showcase its own innovations in the same vein as Samsung or LG, you'll probably love the Pixel. The market is awash with quality Android phones in the $300 to $400 range, so Google doesn't need to push in

that direction. Rather, it needs to push the premium market away from bloatware and delayed updates.

Think about it. You can't get any other super-premium, $600-plus Android phone without suffering a litany of pre-installed apps from both the phone maker and carrier. Usually these apps can't be uninstalled, only "disabled." It's absurd!

With the Pixel, Google direct-sells (store.google.com/pixel_phone) a phone that works on any carrier, and is free of all that cruft. You can also get it exclusively through Verizon in the U.S. (the Verizon version is sold at Best Buy go.pcworld.com/pixelxlbb too). This version only installs three Verizon apps from the Play store when you activate the SIM: Go90, Verizon Messages, and My Verizon. All three can be fully uninstalled just like any other app. All Pixel phones, even Verizon's, will get Android updates at the same time. The Verizon version is even sold carrier-unlocked out of the gate, so you can jump ship if you want.

Smart software improvements

The Pixel doesn't come with stock Android. If it did, it would ship with Android 7.0 instead of 7.1, because 7.1 isn't quite ready for general release yet. So if you buy a Pixel, you get Android 7.1 ahead of the rest of the world. This point release includes a host of improvements like shortcuts when you long-press on app icons (similar to 3D Touch on iPhones), seamless system updates, and a Night Light mode to reduce blue light coming from the display late at night.

Some might argue that Google is playing games with the market, giving itself an artificial 7.1 head start to sell more phones. But I think Google's motivations are probably much more practical—that it's just easier to squash bugs and optimize an Android release on a single phone instead of a litany of devices.

Pixel XL

AT A GLANCE

More than just another Nexus, the Pixel has what it takes to compete with other high-priced premium phones.

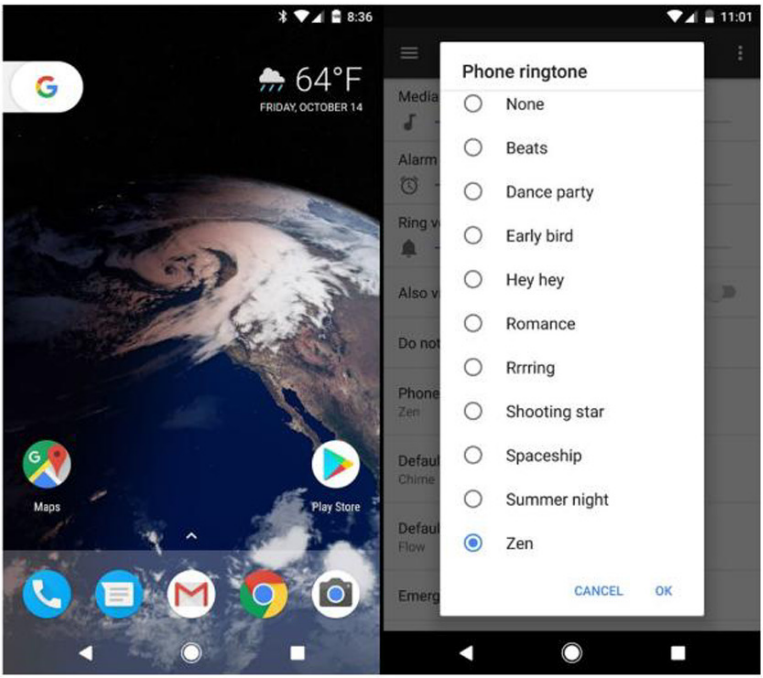
PROS

- Fantastic camera
- Super fast and responsive
- Unlimited online photo and video backup

CONS

- Not waterproof
- Very expensive
- No stereo speakers

$769



The Pixel doesn't use the stock Android launcher, nor its sounds, ringtones, or wallpapers.

This Nougat point release might simply be *ready* on the Pixel, and that's where it's landing first.

As all other Android phone makers do—and as Google avoided doing with the Nexus phones—the Pixel gets its own system tweaks. For starters, the Pixel launcher gets rid of the App Drawer button on the home row, and now a fifth app shortcut can appear instead. Just swipe up on the home row to see all your apps.

The Pixel launcher also ditches the big, full-width Google search bar. In its stead, you'll see a svelte Google button on the left, and a weather/temperature/date widget on the right. The launcher also makes use of the new circular icons being introduced in Android 7.1. It makes for nice visual consistency, but app developers will have to update their apps to make circular icons available. Right now you'll find a mix of circles and squares.

As you poke around, you'll notice little tweaks and changes throughout the OS. The ringtones and notification sounds are new and unique to the Pixel. There's also a set of the coolest live wallpapers I've ever seen. Thoughtful details are everywhere, from the little cable management clips on the USB-C cables in the box, to the quick transfer adapter that makes it a snap to get everything off your old phone—messages, contacts, photos, music, and even some of your device settings and app data. It even works with iPhones!

Every day, one of our top five most-viewed articles is "How to get

Thoughtful little touches like these cable management clips are what we expect from high-priced premium phones.

Google recognizes that getting your stuff onto a new phone is a drag, so it includes this transfer dongle.

Well-placed buttons with a good feel often go unappreciated.

everything off your old Android phone and onto your new one" (go.pcworld.com/androidxfer). This process is a serious pain in the butt for phone buyers. That Google understands this, and has a simple, straightforward solution included with every Pixel phone, says a lot about its desire to make this phone a success. And it's just one more example of how this isn't just another Nexus.

Here's something else no Nexus ever had: built-in support. Just swipe the Settings screen to the right to get 24/7 Pixel support, by phone or chat. You can even share your screen with the support rep during phone calls. No Genius Bar appointment necessary.

If there's one annoyance I wish Google would immediately fix with a software update, it's the Pixel's limited wake-up options. The Ambient Display feature on the Nexus 6P will wake the display when you receive notifications and when you just pick up the phone. On the

Pixel, it only wakes when you get notifications. There's no "double tap to wake" function, either. You have to press the power button or unlock the phone with the fingerprint sensor to wake it, which is a chore when you only want to check the time.

Looks good on the outside, too

There are only so many ways to design a rectangular slab of glass and metal around a touch display. That said, the Pixel and the Pixel XL are reasonably attractive, premium-feeling phones. The only truly distinctive design element is the glossy area on the top third of the phone's back.

The buttons are well-placed and easy to reach on the right side. You'll find a headphone jack in the upper left—I'd prefer it on the bottom, but at least Google hasn't yet jumped on the "no more headphone jacks" bandwagon. It's probably inevitable, but it simply feels too soon.

Speaking of the bottom, there are two speaker holes, one on each side of the USB-C port. But you *don't* get stereo sound. Sound appears to come only from the left hole, and the other looks like it's just there

There are two speaker holes, but sound only comes from one.

There's no camera bump, but that's just a nice way of saying the phone is thick enough not to need one.

to maintain symmetry.

It's a very well-built phone, with tight tolerances along seams and no flex or bend. The metal frame conducts heat and can get a little warm when you're charging or making the processor sweat, but not more so than most metal phones.

The front face is covered by a single edge-to-edge sheet of Gorilla Glass 4, giving it a very smooth feel. And speaking of smooth, there's no camera bump on the back—a rarity in today's high-end phones. This is great for those who like to use their phone while its resting on a desk, but if you put a case on your phone, it's sort of a moot point.

The quad HD Super AMOLED display on the Pixel XL is gorgeous. Google claims its wide color gamut covers 91 percent of the Adobe RGB color range, and you can really see the richness of colors. It's bright and easy to see outdoors, though it doesn't get quite as crazy-bright in direct sunlight as the Galaxy S7 or S7 Edge.

If I wanted to pick nits, I'd say that the "chin" (the area below the display) is larger than it needs to be. Google seems to prefer on-screen buttons to capacitive touch buttons, but there's plenty of room on that chin for your back/home/recents. Why not give us the option of on-screen or touch buttons? Either do that, or shorten the chin.

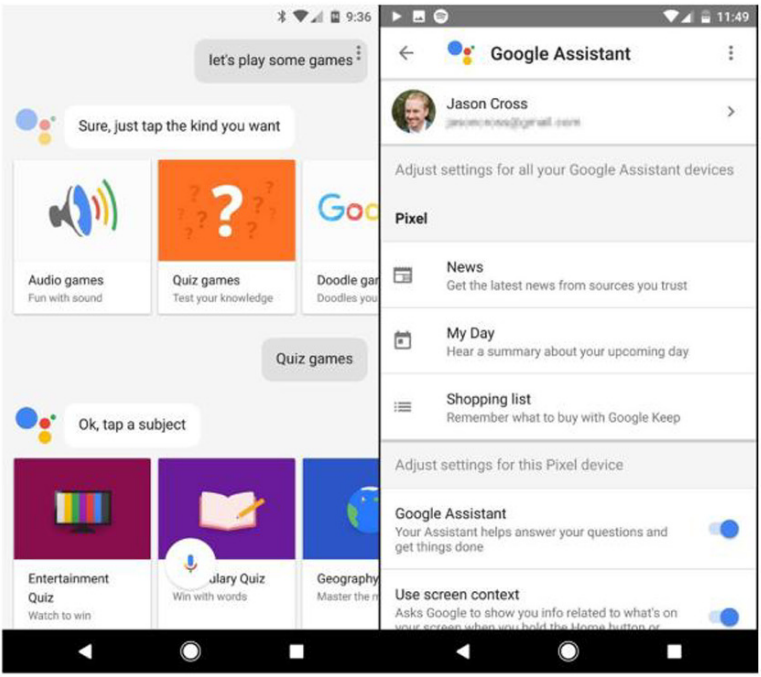
Still, big chin and all, the Pixel XL is a smaller phone than the iPhone 7 Plus, which also has a 5.5-inch display, and of course smaller than the Nexus 6P with its 5.7-inch display. It's slightly thicker than either one, but doesn't feel particularly bulky in the hand.

The only place where Google didn't keep up with modern design trends is in failing to make the Pixel waterproof. I don't need to go SCUBA diving with my phone, but I'd like it to survive a dunk in the sink. It's not as if the Pixel is going to melt if you get caught in the rain, but with Samsung and Apple both shipping comparably priced waterproof phones, Google needs to follow suit. It's one of those rare checkbox features that really could save someone hundreds of dollars.

Google Assistant is here to help

Google has had an "assistant" for a long time in the form of Google Now voice commands (go.pcworld.com/googlenowvc). The scope of voice commands and queries has become quite impressive, and my personal experience is that Google is simply in a whole other league

The Pixel XL is a big phone, but not as big as the iPhone 7 Plus or Nexus 6P. Image courtesy of Phone Arena's comparison tool.

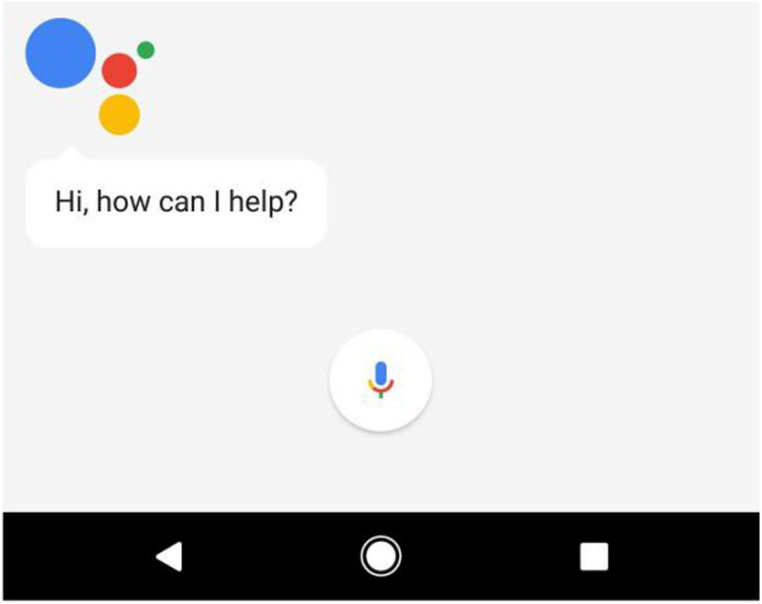


The Assistant does everything Google Now could do and more, including audio and trivia games and subscriptions. Say "good morning" and it reads you a customizable daily digest.

compared to Siri and Cortana.

Google Assistant (go.pcworld.com/gvoiceallotips), first introduced with the Allo chat app a month ago, takes Google Now and makes it a bit more conversational. After making a query or giving a command, you'll get a list of suggested follow-up questions. Google seems to think of it as a turning point in our AI-assisted future. I think of it as an upgrade to the already fantastic Google Now voice features.

Still, it's so much better than Cortana or Siri that it makes sense to put it front and center on the Pixel phones. No matter what you're doing, simply hold down the home button or say "OK Google," and Google Assistant pops up, listening for your question or command. Ask it to send a text, set an alarm, or show you good sushi restaurants nearby. Then get directions, make reservations, or check the weather—basically all the many and varied things you could do with Google Now, including device



Notice anything missing? If you said "text input," you win!

control ("turn the volume up" or "turn on Airplane Mode").

Google has added some fun games like trivia and vocabulary quizzes, but at its heart, Assistant is just a souped-up Google Now. That's not to knock it, because Google Now has become remarkably useful. That's just to say that if you're familiar with all you could do with your voice in Google Now, you'll have an idea of what to expect.

Unfortunately, Assistant as baked into the Pixel is a voice-only affair. After first speaking to Assistant, you can tap on suggested follow-up queries, but you can't simply type a question as you can within the Allo app. And those emoji-based games in Allo's Assistant are out the window, too. This is a real oversight. I don't want to talk at my phone at the gym or on the bus. The fix would be simple: Just let users swipe a microphone icon to either side to get a text-entry box. You can always launch Allo and type in its Assistant there, but that sort of defeats the purpose of making Google Assistant a systemwide feature.

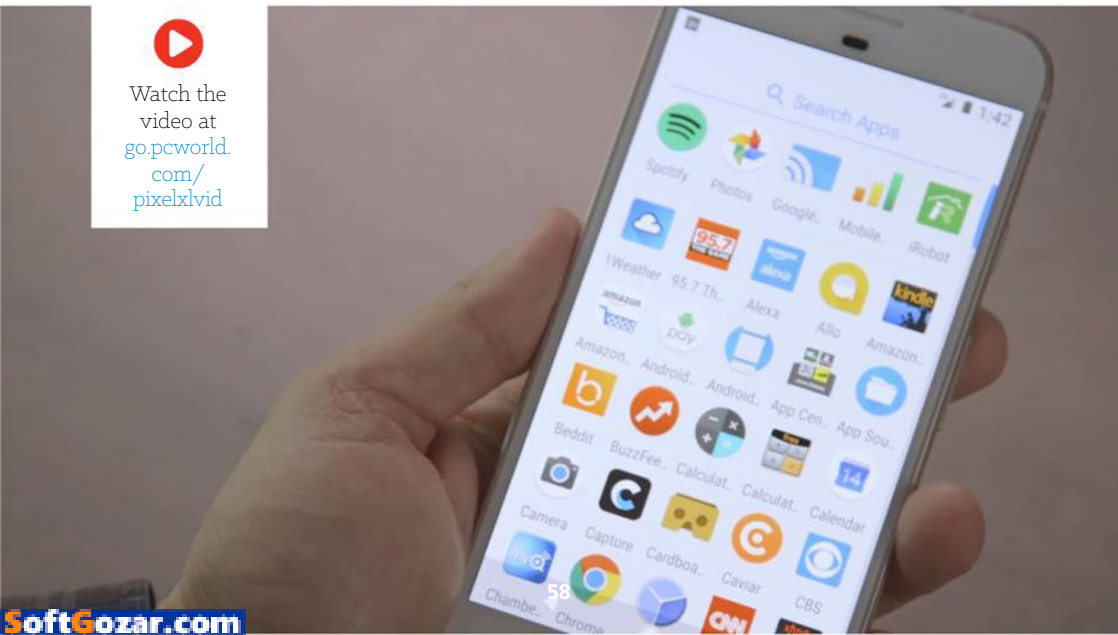
Next: The best camera ever? Maybe.

The best camera ever? Maybe.

Google makes a big deal of the fact that DxOMark has given the Pixel camera a rating of 89 (go.pcworld.com/pixeldxo89). its highest score ever for a phone (the iPhone 7 scored 86, but the iPhone 7 Plus has not been reviewed). Is it really the best camera ever?

That's tricky to answer. The 12-megapixel rear camera uses a top-of-the-line Sony IMX378 sensor with big 1.55 micron pixels and has an f/2.0 aperture lens. The photos it takes, particularly with auto-HDR enabled, are easily among the best I've seen from any smartphone. They rival the Galaxy S7 and iPhone 7—sometimes the Pixel shot is better, other times it's one of the other guys, but it's usually a close call. The Pixel excels in low light, with natural colors and good detail compared to most phones. In good outdoor light, color balance, detail, and exposure are spot on. No phone camera is going to compete with the dynamic range, focus, and adjustable aperture of a DSLR, but the Pixel beats most cheap compact point-and-shoots.

But final photo quality isn't all that matters. The photo-taking experience is defined by the design and function of the camera app,



Watch the video at go.pcworld.com/pixelxlvid

In this challenging shot, the only light is from the grow lamp. Neither phone has the necessary dynamic range, but the Pixel XL has better detail and color.

and the speed at which you can go from pocket-to-photo without missing a moment. Remember when I said that the Pixel gives Google the opportunity to more closely tie hardware and software together? The camera is a good example.

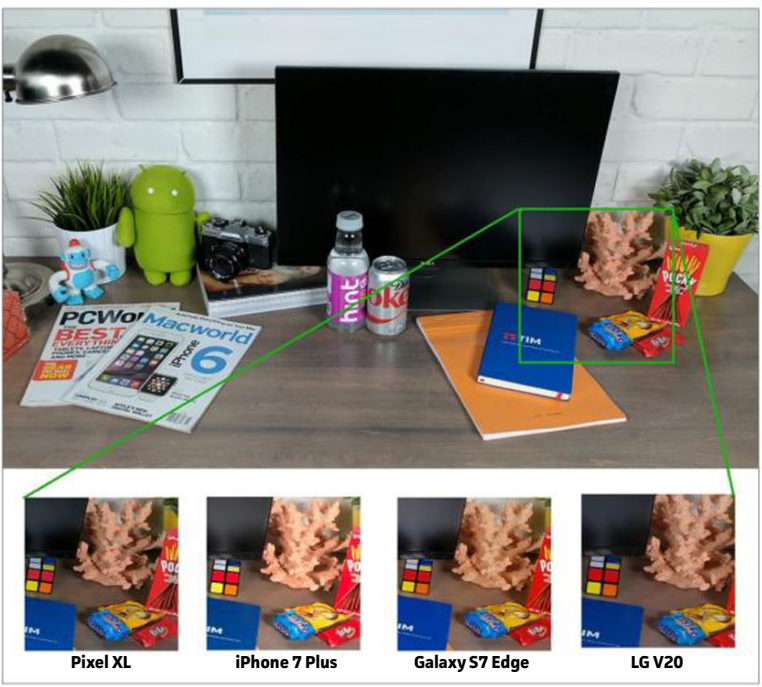
Google has gone beyond the "works on all phones" capabilities you find in the stock Android camera app, and now makes better use of the powerful ISP (image signal processor) in the Snapdragon 821 chip. As a result, it's HDR-Auto mode is now very fast, with almost no shutter lag, and image tone and balance are greatly improved. The burst mode is crazy fast, too. You can shoot video up to 4K at 30fps, and the excellent slow-mo mode gives you either 1080p at 120fps or 720p at 240fps.

While there's no optical image stabilization (OIS), the Pixel has a very sensitive, very fast gyroscope and accelerometer (also useful for VR) that it samples 200 times a second to perform some next-level electronic image stabilization. Like a true camera nerd, I was ready to hate it and proclaim OIS the only "real" way to stabilize photos and

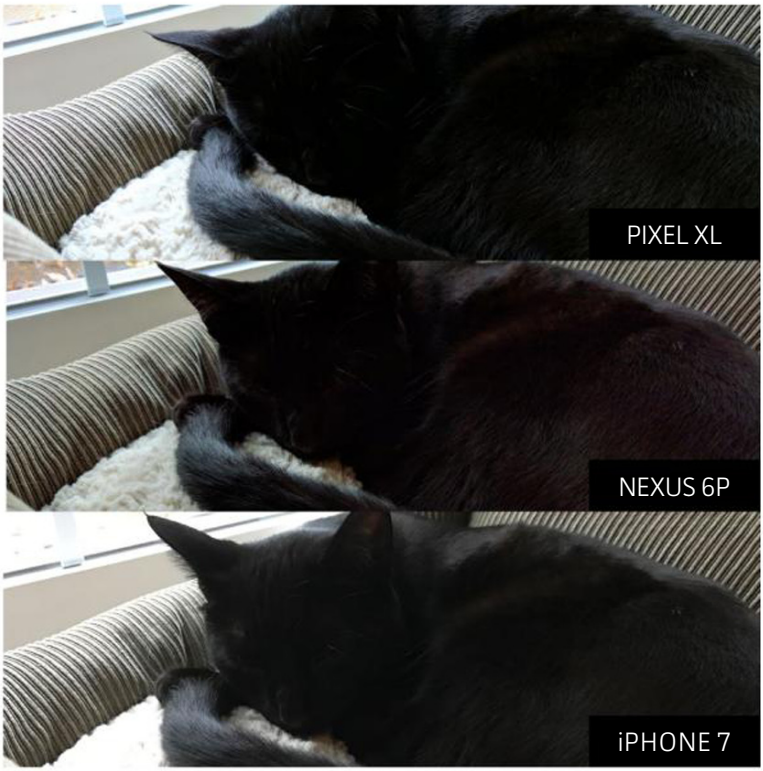
videos, but after trying it out, I'm really quite impressed. I'd still like to see OIS in tandem with fancy electronic stabilization in the inevitable Pixel 2, but I don't think most users are going to miss it here.

Just look at the example video of image stabilization (youtu.be/yi14arEk6xs). I walked forward a few steps, holding the phone in front of me. Google's fancy new video stabilization isn't perfect, but when it works well, it's *freaky*.

The camera app still needs a little work. While it is simple and intuitive, it lacks features for power users. At the very least, we deserve a "Pro" mode that gives us manual control over white balance, focus, ISO, and shutter speed. Still, the app launches *much* more quickly than it ever did on a Nexus phone, shutter lag is almost completely eliminated, and shot-to-shot speed has been vastly improved. The entire photo-taking experience is now a delight, while Nexus phones always felt bogged down in molasses.



In bright environments, the Pixel XL edges out its competitors for detail, clarity, and dynamic range.



Obligatory black cat in low light comparison. No phone nails this test, but notice how the Nexus 6P has a pinkish hue, and the iPhone 7 blows out the light areas of the bedding.

It's hard for me to emphatically claim that the Pixel has the best camera of all time, but it is at the very least among the best—together with the iPhone 7, HTC 10, and Galaxy S7. And the Pixel phones have one feature none of those others can touch: free, full-resolution backup to Google Photos of *every* photo and video you take. No downsizing or recompression, even for 4K video. Combined with Google's very impressive AI-assisted photo search, it's a real game-changer.

Really fast, not just 'benchmark fast'

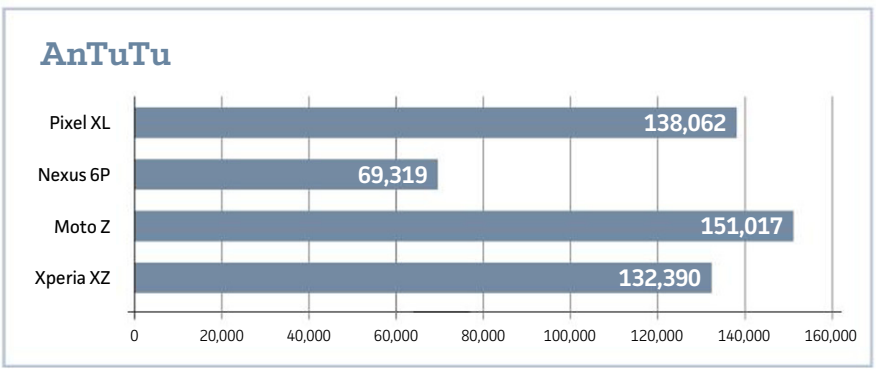
As you would expect from phones this expensive, the Pixels have high-end hardware. They're among the first to ship with Qualcomm's

Snapdragon 821 (a very slightly faster version of the 820), they've got 4GB of RAM, and either 32GB or 128GB of storage. The smaller Pixel and Pixel XL differ in exactly two ways: the Pixel has a 5-inch, 1080p AMOLED display and a 2770 mAh battery. The larger XL has a 5.5-inch 1440p display and a 3450 mAh battery. That may have an impact on battery life, and we'll test the smaller Pixel independently to see how much difference there is to longevity (if any). But they should otherwise perform identically.

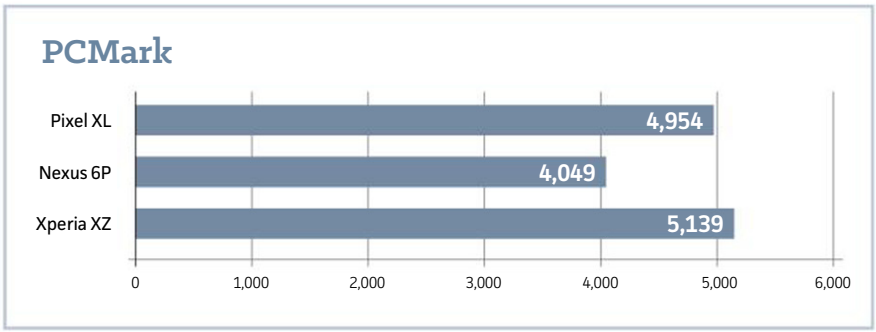
Interestingly, Google states the clock speed of its CPU is 2.15GHz—lower than Qualcomm's 2.4GHz official spec for the Snapdragon 821. Perhaps Google is backing off the throttle a touch to conserve battery life?

Regardless, the Pixel XL is fast. In benchmarks, the Pixel XL delivers results roughly equal to most other expensive flagship Android phones. It's a good deal faster than the Nexus 6P, especially when it comes to 3D graphics.

But benchmarks aren't what matters most. Android fans often complain about phones (especially Samsung's) that lead benchmark charts, but still somehow seem to stutter, chop, and sputter when you use them. The Pixel XL does none of that. At every turn it is smooth, fast, and most of all, responsive. Google says it has greatly improved touch latency (the tiny sliver of time between when you touch or move your finger on the screen and the system responds). Indeed, this may



Thanks in part to a much faster GPU, the Pixel XL crushes the Nexus 6P in some benchmarks.



In general app benchmarks, the Pixel XL is roughly comparable to other top-tier Android phones.

be the smoothest and most responsive Android phone I've ever used.

The iPhone tends to "feel" faster than Android phones in part because touch latency is so low and screen update time is so consistent. You feel like you're directly dragging, swiping, and pinching the items on the screen. The interface "sticks" to your finger, rather than lagging just a bit behind it. The Pixel XL is the first Android phone I've used that consistently gives me that same feeling.

Only time will tell if this performance holds up, or if, as with many other Android phones, it somehow feels a lot slower after six months of everyday use. Out of the box, the Pixel may not measure as the absolute fastest Android phone on the market, but it sure *feels* like it is. There's that software/hardware synergy thing again.

Battery life on the Pixel XL is good, but not industry-leading. Those smaller, midrange phones with big batteries, less powerful processors, and lower-resolution displays like the Moto Z Play (go.pcworld.com/motoplayrv) last a lot longer. But among high-end superphones, the Pixel XL avails itself well. In typical use, at mid-brightness with auto-brightness enabled and all networking features turned on, I got about 5 and a half hours of screen-on time (and many more hours of standby) before ending the day with critically low battery charge. That's doing a little bit of everything: catching Pokémon, browsing Twitter and Reddit, reading on the web, using the Google Assistant,

and taking photos.

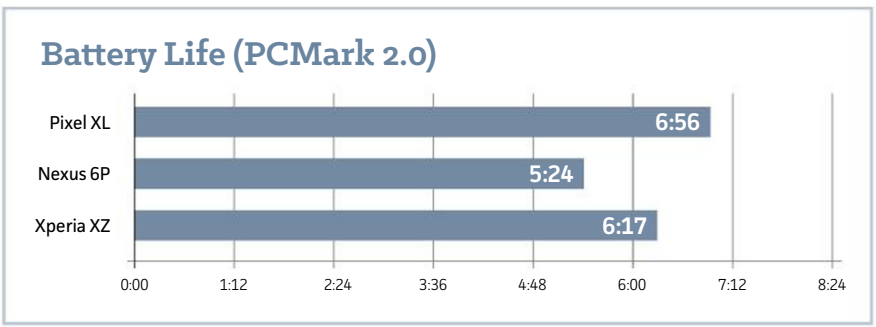
Leaving the phone unplugged on standby overnight, the battery lost about 12 percent of its charge. It's not the slowest standby drain I've ever seen, but again, I had everything enabled: always listening for "OK Google," all wireless radios, you name it. As with many expensive phones, you'll get through the day with average use, and heavy use (especially lots of gaming) will make you find a plug by mid-afternoon.

To that end, the charging speed with the included USB-C charger is fantastic. Google claims that a 15-minute charge will give you 7 hours of mixed use. I'm not sure what that means in real-world terms, but a 15-minute charge took me from 6 percent to 24 percent, and another 15 minutes got me up to 40 percent. Like all phones, charging speed slows down as the battery gets full, but a full charge will take about an hour and a half. That's fast.

VR coming soon

A major selling point of the Pixel phones is sure to be Google's Daydream VR (go.pcworld.com/daydreamvr) platform. Unfortunately, Daydream View headsets aren't due for another month or so, so I wasn't able to thoroughly test it out.

But I recently spent some hands-on time with Daydream VR (go.pcworld.com/daydreamvrhdson), and I can say that I came away



Battery benchmarks show the Pixel XL to last a long time, but it's not the longest we've seen. Note that this new PCMark version is not comparable to the old one.

impressed. It compares favorably to Samsung and Oculus's Gear VR, which is by far the best phone-based VR experience you can get today. The variety of content will take some time to catch up, but overall visual quality is about on a par with Gear VR. The Daydream View headset is more comfortable, and the Daydream's motion-tracking wand is a superior way to interact with the virtual environment.

It's a $79 item, and free as a preorder bonus "while supplies last." I think it will probably be a worthwhile purchase for every Pixel owner, and definitely worth mentioning as a potential reason to own the phone. Other Daydream-ready phones will hit the market soon, after Android 7.1 sees general release.

There's only room for a SIM card, no SD storage expansion. Though with free full-resolution photo and video backup, you may not need it.

The Pixel push deserves to succeed

Some see the Google Pixel as a simple re-branding of Nexus; a way to charge a premium price for something that should have been less

expensive. I'm not so sure I agree. The Pixel's software isn't *drastically* different from stock Android, but thoughtful improvements are apparent. More importantly, this feels like a better-optimized synergy between hardware and software than we've seen before.

There are good reasons to root for Google in its attempt to make the Pixel a mainstream luxury phone brand. Not the least of which is that this is the only high-end, premium phone you can buy at retail that doesn't come loaded with uninstallable bloatware, doesn't have carrier-disabled features, isn't locked, and won't wait for months to get Android OS updates. In fact, Pixel buyers are getting Android 7.1 *before* it's officially released to the rest of the world.

Android needs this. It needs a big manufacturer to flex its muscle and say, "no more." No more carriers delaying updates. No more forcing scores of unwanted apps on us that we can't delete. No more heavily skinned interfaces that don't look or act the way Android should. There's still plenty of room to innovate, and plenty of money to be made without all that stuff.

Google's Pixel deserves to be a success story, and not just because we all have a vested interest in a "no more crap" phone setting a new standard for Android phones.

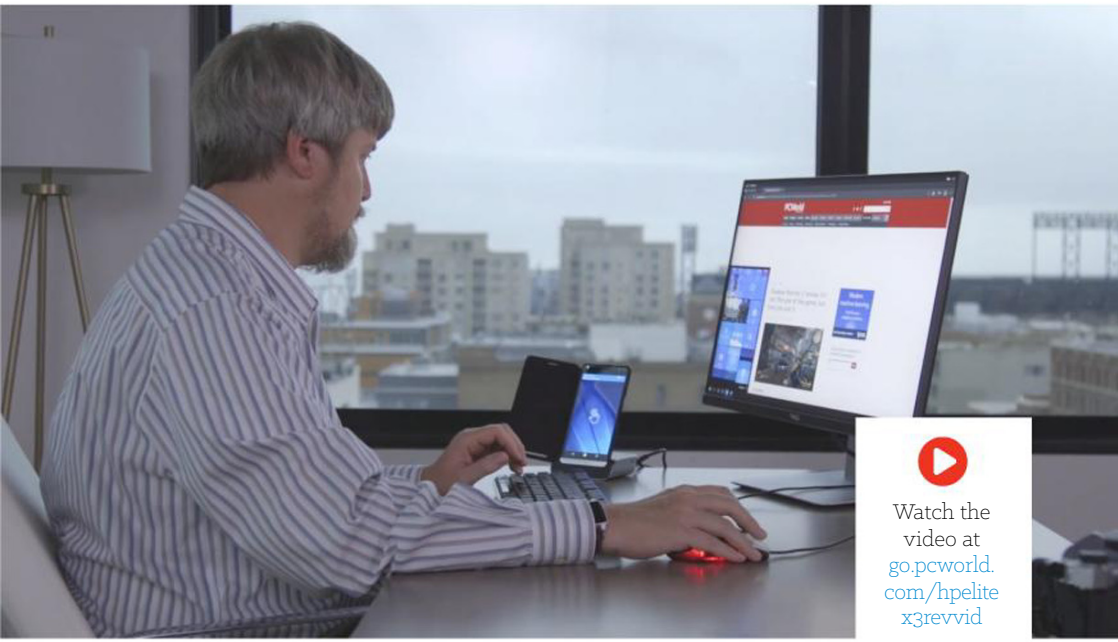
Yes, the Pixel has its warts. I could have wished for stereo sound or waterproofing. It really needs a software update to add a "lift to wake" capability, and preferably double-tap to wake as well. It's got no option to add storage via SD card and no wireless charging, although I would argue that free full-res photo and video backup and excellent fast charging make those less necessary.

You can get a longer list of features in a phone like the Galaxy S7 Edge, or unique innovations like the snap-on mods of the Moto Z. But those other premium phones also carry compromises the Pixel phones do not, like cluttered custom interfaces, messy bloatware, delayed updates, or missing headphone jacks.

Google's Pixel deserves to be a success story, and not just because

we all have a vested interest in a “no more crap” phone setting a new standard for Android phones. It should succeed because it’s honestly a great phone, worthy of its place among other pricey premium handsets. It’s got a nice design and great build quality, good battery life, fantastic responsiveness, and thoughtful features like the easy transfer tool and built-in live support with screen sharing.

The Pixel isn’t a slam dunk that suddenly makes all other premium Android phones obsolete. But if you want a high-end phone, it deserves to be on your short list. And if you’re sick of bloatware, heavily customized interfaces, and delayed OS updates, there’s really no other choice.



Watch the video at go.pcworld.com/hpelitex3revvid

HP Elite x3: This could be the last great Windows phone

BY MARK HACHMAN

HP'S ELITE x3 smartphone has achieved at least one thing: It has triumphantly realized Microsoft's dream of phones that could eventually replace your PC.

Microsoft's vision was meaningless unless those phones could support the PC's legacy apps. Microsoft's Continuum feature already allows you to connect a mouse and keyboard, giving the phone the look and feel of a desktop PC. HP designed the Elite x3 to evolve that concept. Pick any Win32 app you'd like—Photoshop, AutoCAD, even

Chrome—and HP's new Workspace feature will allow it to be run via your phone. Combine that with stellar battery life, truly useful utilities, and an (almost) elite set of hardware specs, and you indeed have a PC in your pocket.

It's a pity, then, that all this comes at a very elite, PC-like price. These costs relegate the Elite x3 to corporate use, where an IT department foots the bill.

The Elite x3: A pricey phablet

Let's begin our tour of the Elite x3's formidable specs with perhaps the largest number of all: its price. I've always been a fan of large phones like the Nokia Lumia 1520 and the Samsung Galaxy Note series, but the Elite x3 pushes the limits of the "phablet" designation.

The phone's $699 price is well north of affordable—recall that we dinged the competing Acer Liquid Jade Primo (go.pcworld.com/acerliquidjaderev)for its $649 price tag (it's currently $449 in the Microsoft Store). HP's Desk Dock adds Continuum capabilities for another $150. Then there's the upcoming ultrabook-like Lap Dock, which at $500 brings the total bill to $1,299—just for the hardware. Gulp.

The phone itself is enormous as well: 6.3 x 3.29 x 0.3 inches, weighing a sturdy 6.9 ounces. Though the Elite x3 is slightly narrower and shorter than Nokia's massive Lumia 1520, both phones are just too large for me to use with one hand. The Elite x3's certainly larger than Microsoft's own flagship Lumia 950XL as well as the Acer Liquid Jade Primo.

The Elite x3's 5.96-inch, 2,560x1,440 AMOLED display has the same specs as the Lumia 950XL's, but it pushes more pixels than the Liquid Jade Primo's 5.5-inch, 1920x1080 display. Fortunately, it's also protected by Corning's Gorilla Glass 4, and unlike any

HP Elite x3

PROS

- Workspace virtualized apps are something special
- Desk Dock provides an excellent Continuum experience
- Two (not one!) ways to log in via Windows Hello

CONS

- Extremely high price out of reach for most consumers
- Workspace interface could use some ease-of-use refinement
- Mediocre camera

$799

★★★★½

other Windows phone, is both IP67 water-resistant and MIL-STD 810G drop-resistant, too.

If Microsoft had made this phone, it probably would have settled for midrange hardware to keep costs down. HP, though? Hell no. With a 2.15GHz quad-core Qualcomm Snapdragon 820 and an integrated Adreno 530 GPU, the Elite x3 opened apps without a hint of lag, and transitioned smoothly from one task to another.

The Elite x3 is also the only Windows phone with 4GB of RAM as well

as 64GB of internal storage. The Lumia 950XL and Liquid Jade Primo both include 3GB of RAM and 32GB of internal storage.

An SD card slot allows up to a theoretical 2TB of expansion, though that slot is shared with a second SIM. Other noteworthy features include 2x2 802.11ac Wi-Fi for better wireless reception, plus Bluetooth 4.0LE and Miracast. The phone also offers NFC, making the Elite x3 theoretically compatible with Microsoft's tap-to-pay Wallet app—though HP told us that feature hasn't been enabled. There's a 3.5mm audio jack, too.

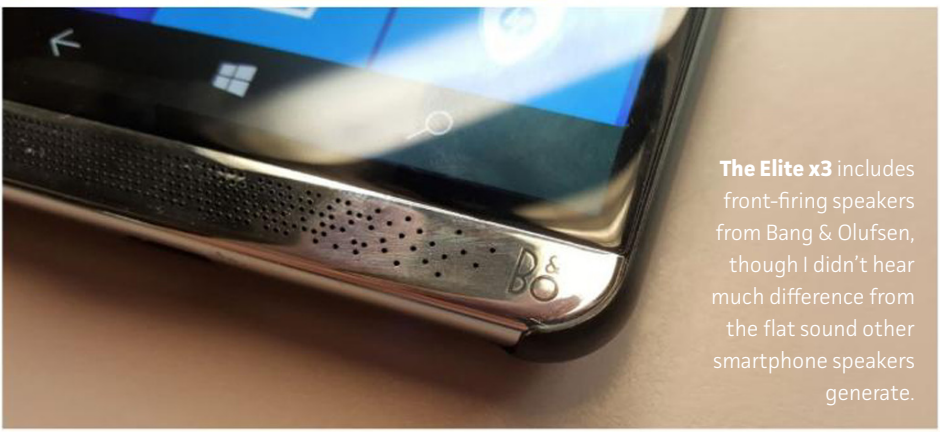
The HP Elite x3 is far larger than Microsoft's Lumia 950, to the left.

You may recall that I'm a huge fan of Windows Hello, the quick and easy way Windows recognizes you and logs you in. The Elite x3 does something few, if any, other phones do: it lets you log in via Hello with two biometric authenticators—an iris scanner and fingerprint reader. Both are competent, if not entirely predictable. Waking up the phone involved holding it with my finger over the reader, hoping that either it or the iris scanner logged me in—and they almost always did.

Benchmarks reveal the Elite x3's power

The Elite x3's performance lives up to its name. Benchmarked against the Lumia 950 and the Liquid Jade Primo (unfortunately we didn't have a Lumia 950XL to test), the Elite x3 proved it's the most powerful Windows phone on the market today. Pay attention to tests like JetStream 1.1, a browser-based artificial benchmark, where the Elite

We reviewed a dual-SIM model of the Elite x3. One of those SIMs can be used to hold an SD card, with capacity up to a terabyte.



The Elite x3 includes front-firing speakers from Bang & Olufsen, though I didn't hear much difference from the flat sound other smartphone speakers generate.

x3 is 70 percent faster. It's even consistently faster than the Samsung Galaxy Note 5, an Android phone. (Also take a sneak peek here at how apps run under the Workspace environment, which we'll discuss later.)

We've also broken out the AnTuTu benchmark on the three Windows 10 phones to offer a more direct comparison.

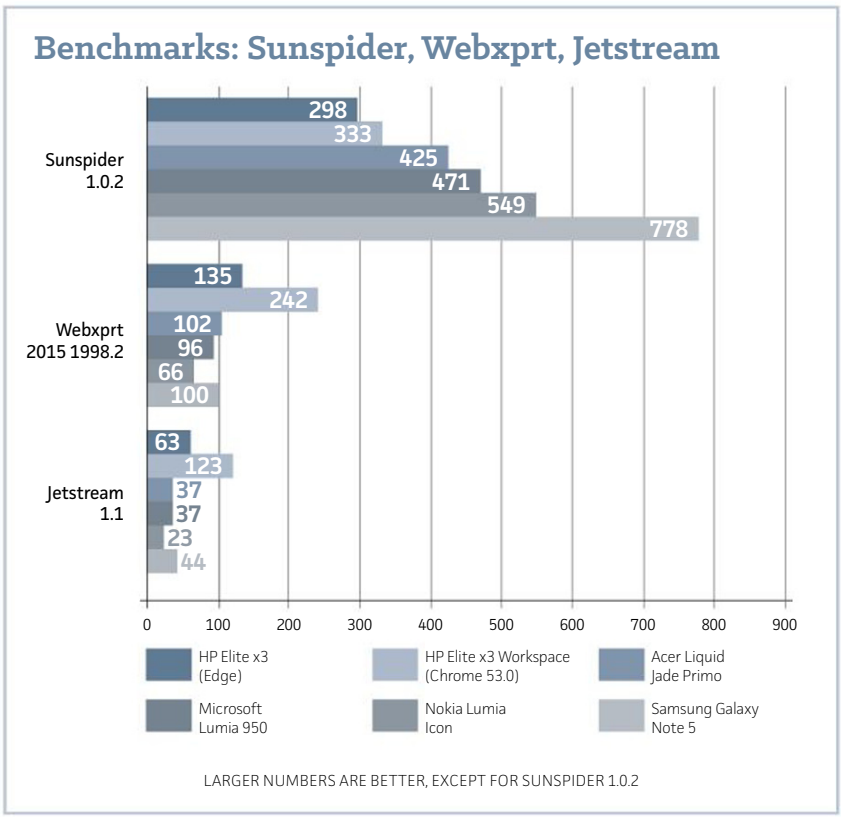
Battery life is another major plus for the Elite x3. Inside the phone is a massive (though, sadly, unremoveable) 4,150 mAh battery, with far more capacity than either the Galaxy 6s Edge (3,600 mAh), iPhone 7 Plus (2,900 mAh) Lumia 950XL (3,340 mAh) or Acer Liquid Jade Primo (2,870 mAh). In just 10 minutes, the Elite x3's quick-charge technology will fill the battery by 14 percent, good enough for a 2.5-hour call.

The Elite x3 looped a 4K test video repeatedly for an incredible 9 hours and 23 minutes, compared to just under 6 hours for the Acer

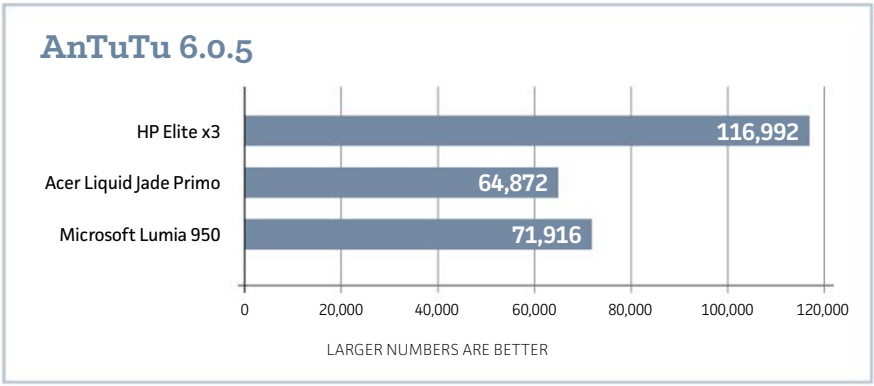
Liquid Jade Primo. It's clear that this is an all-day phone, and more.

I also spent some time with the Elite x3's camera, which, like Acer's Liquid Jade Primo, is one area where HP seemed to cut corners. If you were hoping that the Elite x3's 16MP rear and 8MP front-facing cameras would emulate an iPhone, say, with a pair of dual lenses, you'll be disappointed. C'mon HP, what's an extra few bucks for a great camera?

The test photos revealed a substantial flaw that had nothing to do with image quality: the time from which the camera icon was pressed to the time the picture was taken measured about a second. It



HP's Elite x3 sets a new benchmark for performance among Windows phones.



The Elite x3 enjoys a sizable lead over its competition.

hearkens back to the bad old days of Windows phones, where excellent color reproduction was marred by slow shot times. Optical image stabilization wasn't included, either. In my mind, the Elite x3's camera ranks above the Liquid Jade Primo's but below the Lumia 950's.

A marvelous Continuum experience

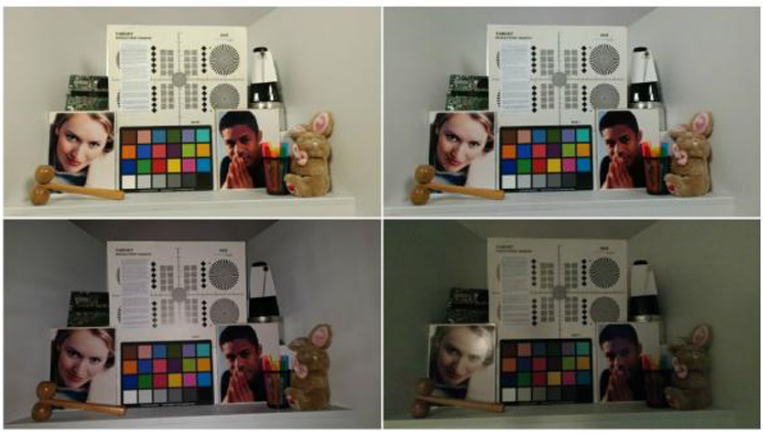
If the Elite x3 were an iPhone or an Android phone, we'd essentially end the review right here. The true advantage of Windows phones, however, is the Continuum experience, which allows a docked Windows phone to serve as a slightly degraded version of a desktop PC. HP over-engineered the Continuum experience with the same attention to detail as its other aspects, and on the Elite x3 it shines brightly.

Let's begin with the wedgelike Dock, a scant pound's worth of plastic and aluminum which could literally stand in as a weapon in a game of Clue. With two USB 3.0 ports as well as a USB-C port (which can be used for charging), the Elite x3 dock means business. In fact, the dock's commitment to productivity extends to the display connector—a full-sized DisplayPort connector, rather than the more common HDMI.

I criticized Acer's Liquid Jade Primo because if you used its bundled case, the phone wouldn't fit into the dock. HP's thought of that—oh boy, has it ever. HP's Elite x3 includes three sleeves that magnetically

slide over and on top of the dock: one designed to fit the bare phone, one designed to dock the phone within HP's billfold case, and a third that adds an extension cord so you can hold it in your hand while still using the phone's touchpad to navigate.

Connecting the phone via the dock works well. But the real innovation here is the wireless connection. All of the previous iterations of the wireless Continuum experience I've used ranged from laggy to downright unusable, partly because of the Miracast wireless technology that connected the two. HP's Elite x3 uses Wi-Fi to connect the phone to your computer's display, extending its range but also significantly reducing latency to just a smidgen. In fact, the



From top left, clockwise: studio lights, at full brightness and then at half brightness; lamplight, and lamplight with flash. Our studio has a white background.

An outdoor shot taken by the Elite x3 on a late afternoon in October.

HP's Desk Dock, which includes the full complement of ports.

If you want to be able to stand and interact with the Elite x3, there's an "extension cord" sleeve, too.

only lag I really noticed was from the phone itself, slowly loading pages over a wireless connection.

Unfortunately, HP didn't provide us with one of the key accessories for the Elite x3: the Lap Dock. Essentially, it's an improved version of the NexDock, a "dumb" ultrabook that's powered by your phone. In HP's case, the Lap Dock is a 2.3-pound, laptop-like device with a 46.5-Whr battery, three USB-C ports, and a 12.5-inch 1080p display. It eliminates the need to carry your mouse, keyboard, and Display Dock on trips.

HP's apps: No bloatware here

Normally, we'd be concerned with a smartphone maker who bundled additional apps with the phone. With the Elite x3, however, HP bundled an impressive selection of ten useful utilities, totaling a scant

4.4GB, and most of them uninstallable.

An HP Mobile Hardware Diagnostics app tests nearly every component for failure. HP's Device Hub app does what Microsoft should: provide a one-stop shop of your device info, with links to the user guide, regulatory and warranty information, and more. HP's Display Tools will override Windows' own settings to keep your screen from dimming or turning off when docked.

You might find the included WinZip and Salesforce apps unnecessary, as well as an app to control HP printers. HP Picks, though, provides a nicely curated list of business apps on the Microsoft Store.

And then, of course, there's Workspace, HP's gateway to virtualized Win32 apps that live in the HP cloud—and the entire reason to buy this phone.

HP's Workspace: Wow, Win32 apps on your phone!

Workspace makes your phone your PC—for real. Say what you will about Continuum, or how well HP has implemented it; you're still at Microsoft's mercy. And because Continuum only supports Microsoft's relatively new UWP apps, there's a vast body of apps that you simply can't use: browsers like Microsoft's Internet Explorer or Google

HP's Elite x3 Lap Dock will ship Nov. 14 from the Microsoft Store.

Chrome, graphics apps like AutoCAD, or collaboration apps like HipChat. Project Centennial (go.pcworld.com/projcentennial) may be bringing older Win32 apps to the Windows Store, but progress has been slow.

Workspace, meanwhile, can run these legacy apps in a virtualized cloud environment, just like they are on your PC. Though Citrix and its competitors have offered these capabilities to PCs and thin client devices for years, it's still a novel experience for phone users.

Unfortunately, an expensive licensing process overshadows what could be a transformational experience. Workspace is available in two tiers: Essential ($579 per year, per user, or $49 per month) and Premium ($939 per year, per user, or $79 per month). A year of VPN integration costs extra: $2,995. Each account tier comes with 24-hour support during the five-day workweek.

HP's throwback calculator app is an Easter egg of sorts.

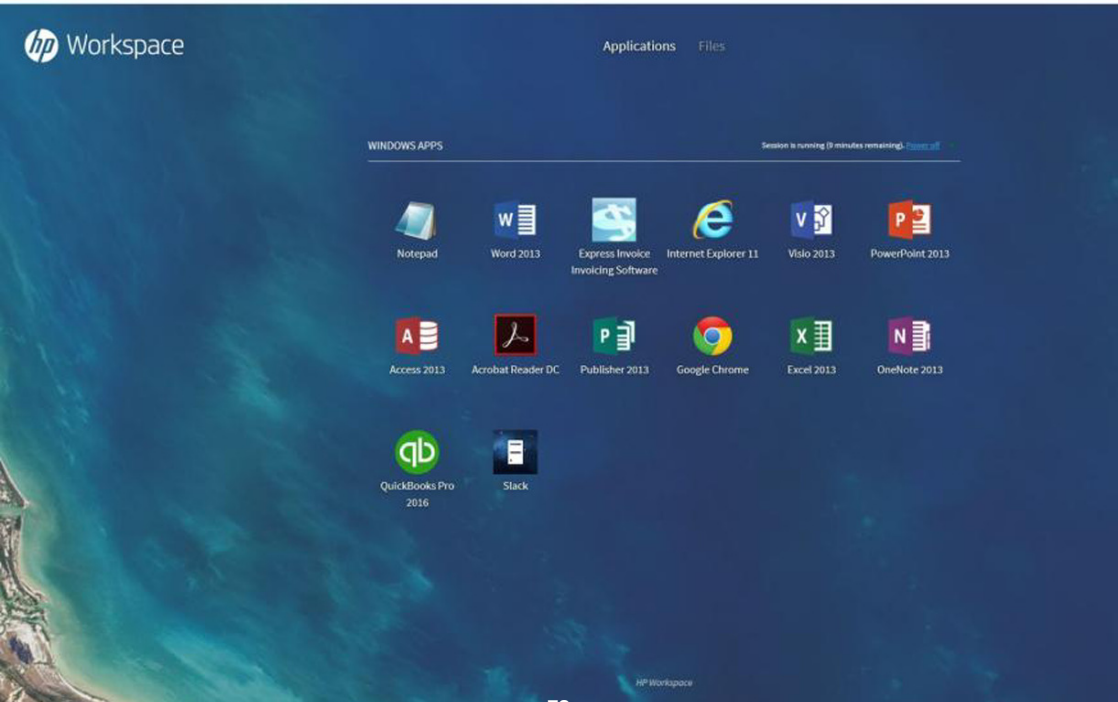
HP manages the installation of the apps you choose in its cloud. The Essential tier allows up to 10 apps; Premium users can select as many apps as they would like. HP runs the apps on a virtual CPU and dedicated memory (4GB or 8GB, depending on the tier) and interacts with them remotely.

Workspace was generally pleasant to use, even if it had its own little quirks. Not surprisingly, HP forces you to use Workspace in conjunction with a dock. HP supplied a login and password, which I had to manually enter each time. Workspace also encourages you to store files in cloud storage services like Box, Dropbox, or (soon) OneDrive. (HP does not supply any cloud storage within Workspace itself.) But there's no obvious way to actually access a Word file stored in Box unless you're in Word.

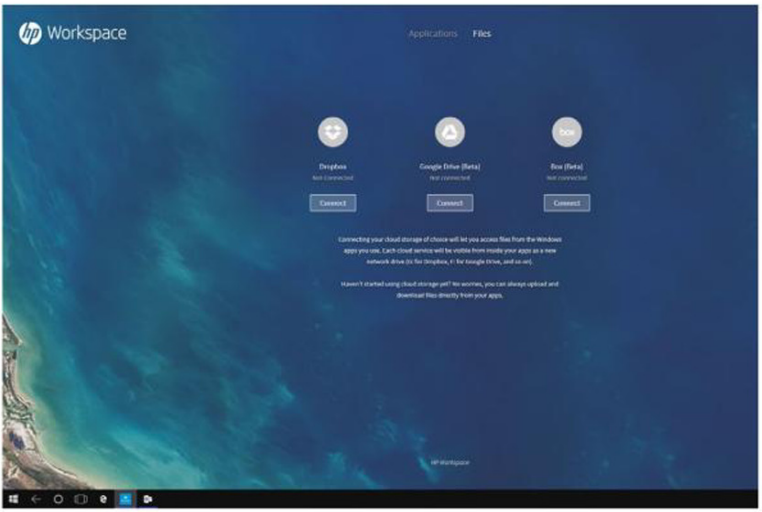
Once logged in, Workspace let me use more than a dozen apps that HP seeded for my use, including Chrome, Internet Explorer, Slack, the full versions of the Office 2013 apps, and even Notepad.

Because it's virtualized, HP keeps an eye on your usage. Go idle for more than nine minutes, and it logs you out. Windows itself will turn off the screen after five minutes by default, so if you don't have HP's own Display Tools configured properly, you'll have to log in again, then navigate to the Workspace app. And if you happen to close down all the Workspace virtualized apps, there is no obvious way to get back to the main Workspace environment, aside from a small Settings icon.

The real kicker, though, is the monthly usage: 40 hours per user for the Essential tier, and 80 hours per month for the Premium tier. Granted, that's a solid workweek for the Essential user. Still, I'd hate to be the mobile worker who comes to depend on Workspace and then runs out of their allocated time while on the road.



HP's Workspace app opens up your phone to pretty much whatever Win32 app you have a license for and can ask HP to load into the Workspace cloud.



There's no easy way to load individual files in Workspace. HP encourages you to store documents inside third-party cloud services, which are accessible as virtual drives from within the apps.

The best Windows phone

Windows phones are now the wild-eyed prophets of productivity, preaching Microsoft's "cloud first, mobile first" gospel to a largely uncaring world. If a review must end with a buy recommendation, for an individual, my answer is a regretful no.

For businesses with numerous Win32 legacy apps (and big IT budgets), it's worth considering. For them, maintaining access to those apps affects total cost of ownership, which goes beyond just the price of the phone.

Let's not forget Windows phone's distinguishing feature, Continuum. The HP Elite x3 is the best example yet of this phone-to-PC mashup, and it remains a feature that Android and iOS just can't match.

Speculation is flying about what's next for Windows phone: A Surface phone? Maybe. For now, HP's Elite x3 is the best Windows phone. Whether it's the last great Windows phone is the unanswered question.

Welcome to Greenbot, a website for Android enthusiasts.

We've got the 'droid info you're looking for. Helpful tips, critical reviews, and expert analysis for passionate Android users of every experience level.

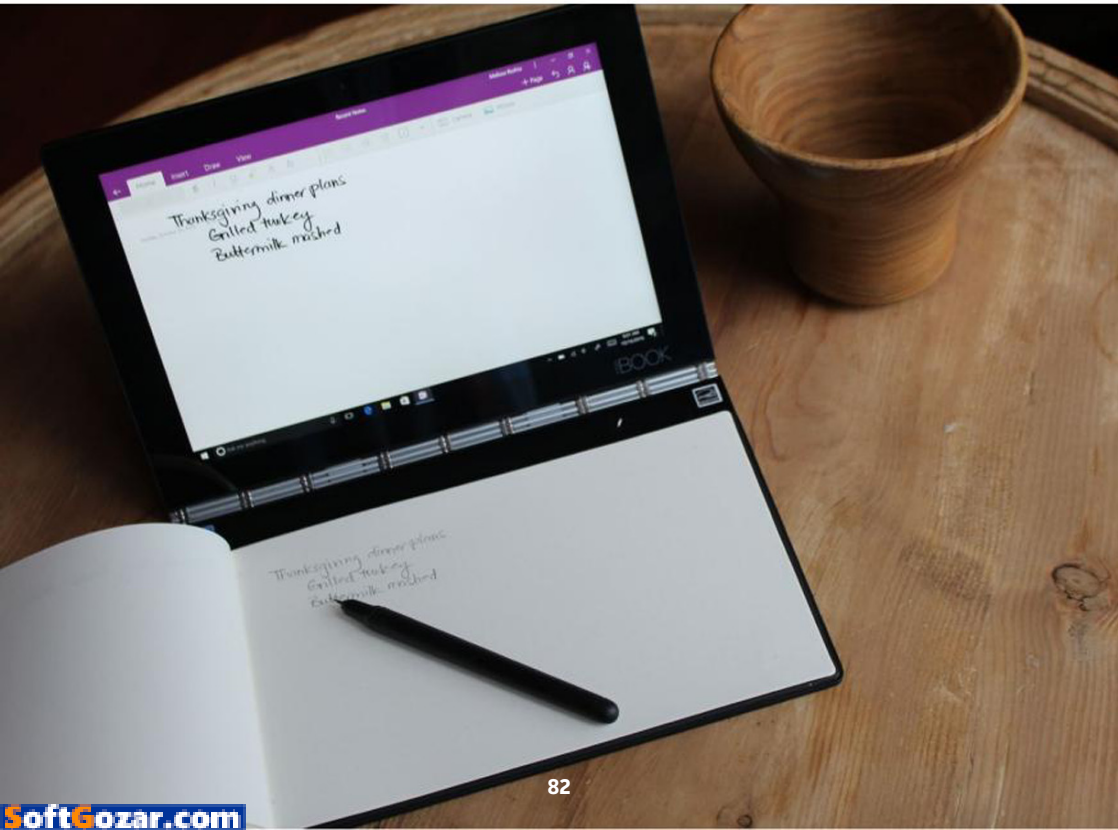
www.greenbot.com

greenbot
BY IDG COMMUNICATIONS

Lenovo Yoga Book: Unique touch features let you be hands-on creative

BY MELISSA RIOFRIO

LENOVO'S YOGA BOOK is for people who have never been content with just a keyboard and mouse to express their ideas. People who prefer to scribble on notepads or napkins. Who draw pictures to



illustrate ideas or create art. The $550 Yoga Book facilitates those practices by helping users produce and save that content digitally, taking fuller advantage of the stylus- and touch-friendly Windows 10 than any other device has. (There's also an Android version with the same capabilities, but different pricing and apps.)

Stylus computing is nothing new, but the Yoga Book's full commitment to it is. Its defining feature is a large, touch-sensitive surface that converts easily from a keyboard to a digital sketchpad. A proprietary pen, and a special way to use real paper with the digital sketchpad, turn the Yoga Book (go.pcworld.com/yogabooklnv) into a device where typing, drawing, and writing are equally welcome input methods. You can also write and draw on the touch display, of course, but we all know that holding one's hand in the air isn't as comfortable as working on a flat surface.

Reviewing a product that's the first of its kind requires some balance. You can't just give it five stars for being first. You also can't slam it for falling short of an ideal, because it can take a few iterations for a good idea to become great. Like most first products, the Yoga Book has some shortcomings. But after a week of using it, I'm more interested in how it lets me be more hands-on and tactile than I am disturbed by anything else. I felt the same way about HP's Sprout (go.pcworld.com/hpsprouthandson), which has a similar goal, tackled in a completely different way.

To show you what I mean, let's grab the pen and get started.

Writing and drawing naturally

The Yoga Book's touch surface consists of Gorilla Glass with a matte-painted, anti-glare finish. Tap a small pencil icon along the top margin, near the hinge, to

Lenovo Yoga Book

AT A GLANCE

Lenovo's Yoga Book is for people who need to scribble to express their ideas. Its huge touch surface helps users produce and save those ideas digitally, taking fuller advantage of the stylus- and touch-friendly Windows 10 than any other device has.

PROS

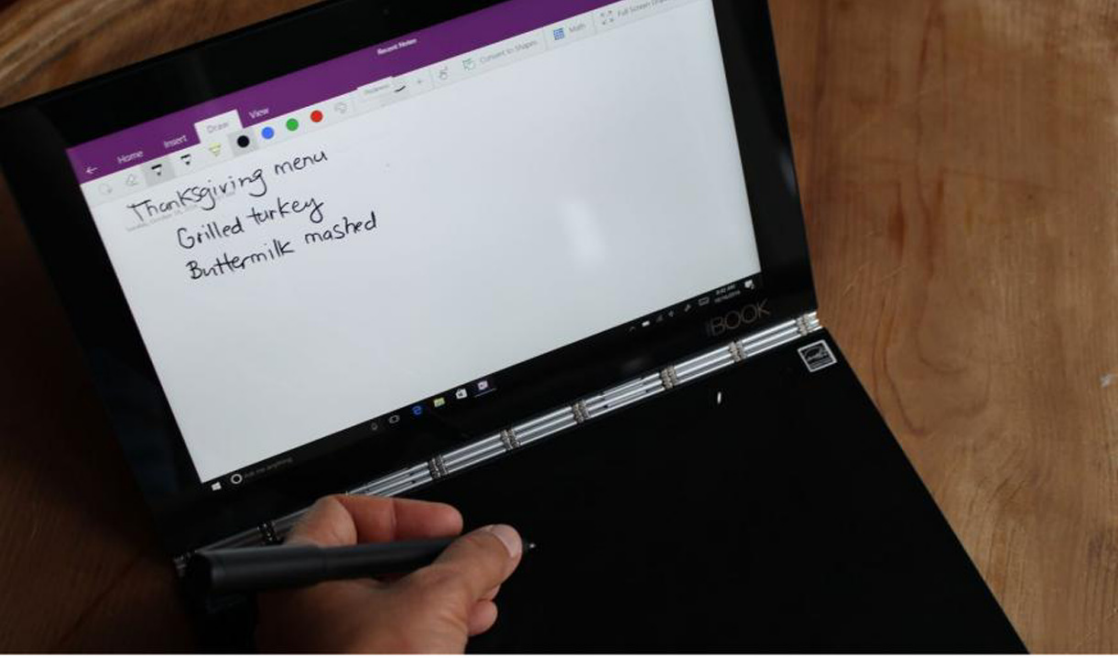
- Innovative touch surface enables typing, writing, and drawing
- Extremely thin and light

CONS

- Meager Atom CPU and 4GB of RAM hamper performance
- Writing and drawing accessories are a hassle to corral

$550

★★★½☆



The Yoga Book's Real Pen can use a stylus or an ink nib.

toggle between the backlit Halo Keyboard (which I'll describe later) and the Create Pad drawing surface, which offers 2,048 levels of pressure sensitivity. The pencil icon will light when Create Pad is active.

An electromagnetic resonance (EMR) film underneath the glass, driven by Wacom's Feel technology, lets the Create Pad work with the Yoga Book's included Real Pen (a $40 value). Unlike recent stylus models you've seen from Microsoft and Apple, the Real Pen does not need to be charged. You just choose your nib and use it—either the digitizing stylus for writing directly on the Create Pad, or the real-ink pen for writing on paper laid over the surface.

The method of changing from stylus to ink is awkward. You use a hole in the top of the pen cap to pull out one nib and shimmy in another. I'm thinking of those four-color ballpoint pens, where you can extend or retract a color with a click, and wondering whether Lenovo could do something like that instead. At the least, it would be nice if you could store the unused nib in the pen—I don't want to have to keep track of (and most likely, lose) a skinny little thing like that.

You also need to be careful not to use the ink pen directly on the Create Pad—which I did many times. I'm not blaming the device for my own errors, but I'm suggesting the Real Pen could use more

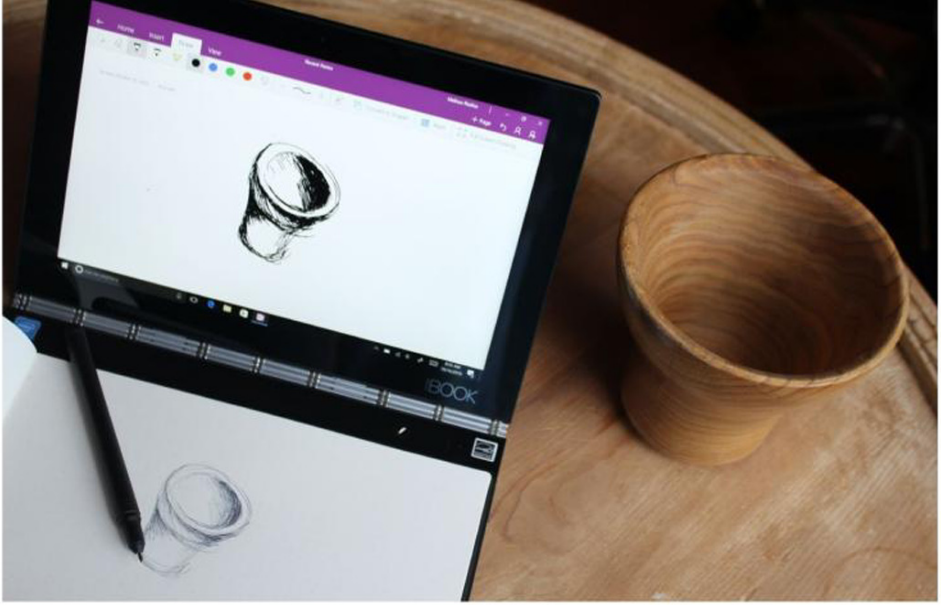
idiot-proofing.

When you toggle to Create Pad, it automatically opens Microsoft's OneNote application, where you can write notes or draw, saving everything to the cloud. The Create Pad's matte surface is easy to write on—not slippery, as tablet or smartphone glass can be. You can also use any other writing or drawing application, from something as simple as Windows' Sticky Notes to a dedicated creativity program like Art Rage, a trial version of which comes with the Yoga Book.

In another first for Windows devices, you can use paper on the Create Pad—any paper, placed atop the surface and drawn on with the Real Pen (and its ink nib). You could reasonably argue that there's no need to use paper with the Create Pad surface. I like having the paper option, though. It feels more natural to use a pen on paper and see what I'm doing directly underneath my hand, especially when I'm drawing.

Lenovo makes it easier to use paper with the Yoga Book by bundling Book Pad (a $20 value), a leatherlike base with brackets to hold small, A5-size notepads (similar to the 5x8-inch notepads used in the United States). The Book Pad gently affixes itself to the Create Pad with

You can write on the Create Pad surface with your stylus, and it transfers your work to the screen in any compatible application (such as Microsoft OneNote).



Drawing on paper felt more natural than drawing directly on the Create Pad.

magnets. Lenovo sells high-quality paper to go with the Book Pad (75 sheets for $15), but you can buy any kind.

While all of the Yoga Book's writing and drawing accessories are useful, their quantity could be a hassle. Start with the device plus the pen with two nibs. Add the Book Pad base and Book Pad (or other) paper, and of course, the AC adapter and cable. That's a lot to juggle, and the optional $35 cover for the Yoga Book doesn't seem to offer enough room to store them all.

Light typing duty

The Yoga Book is no more productive than a tablet unless you can type with it, and that's where the Halo Keyboard comes in. It's a backlit image that appears when you toggle off that pencil icon near the hinge. The keyboard is full-size, with function and cursor keys, as well as a small Windows key.

Keyboards are a very personal experience. I have many friends who hate touchscreen keyboards, and I do, too—if they're the smartphone or tablet experience on slick display glass. The Halo keyboard offers that matte texture for grip, plus audio and haptic feedback.

Typing will feel a little slow at first, but Lenovo created special algorithms to adjust the keyboard to your typing habits. I had almost

no trouble using this keyboard, and in fact I liked the relief from pounding on physical keys.

I've always loved using Windows 10's touch capabilities to navigate on screen, but the Create Pad and the Halo Keyboard on the Yoga Book let me do far more than tap icons. Lenovo needs to refine the accessories a bit, but the Yoga Book's still a superior implementation to what you might already have experienced with a touchscreen laptop or Windows tablet.

Thin design, thin performance

Having established the Yoga Book's stylus creds, it's time to look at its fundamentals. The specs are modest. It dwells in that gray area between computer and tablet where limitations are part of the package.

If Lenovo's goal was to get the Yoga Book close to the size and heft of a pad of paper, it got pretty close. This device is an extremely thin 10.1 x 6.72 x 0.38 inches. I can barely feel its 1.52-pound weight on my lap or in my bag. Thanks to its trademark Yoga 360-degree hinge, you can use the computer spread out flat, tilted like a clamshell, folded

The Yoga Book's Halo Keyboard is backlit and learns your typing style for better accuracy over time.

over like a notepad or tablet, or anything between.

The shell is a magnesium-aluminum alloy in just one color: carbon black. The smooth surface attracts fingerprints readily, which could explain why a small microfiber cloth comes in the box.

When a device is this thin, connectivity suffers. Some ports simply don't fit. The Yoga Book has a micro-USB and micro-HDMI port, and a slot that can take micro-SD (up to 128GB). Cameras include an 8MP rear and 2MP front. Finally, you get a 3.5mm headphone jack.

The display is a 10.1-inch FHD (1920x1200 per Lenovo's spec) IPS touch display, with 400-nit maximum brightness. It looks great, but note that a screen this high-res and this small means icons and text will be tiny (you can adjust the sizes for better visibility).

Inside you'll find a very basic computer: an Intel Atom x5-Z8850 CPU with 4GB of LPDDR3 memory and 64GB of eMMC storage. I started to benchmark the Yoga Book and just stopped after a few results, because guess what? It can't play Crysis. It can handle browsing and using a few applications at once, but don't overload it. The meager

The Halo Keyboard is capacitive and offers both haptic and audio feedback.

memory filled up, especially given the way I accumulate browser tabs. Under heavy use, it also tended to get warm in the upper margin of the bottom panel, near the middle of the hinge.

Lenovo says the 8500 mAh battery should last up to 13 hours. That may be true for a situation where the Yoga Book is used for lighter tasks with sporadic breaks. In our intensive video rundown test (with brightness set to 250 nits and headphones attached for audio), it took 7 hours and 39 minutes to drain the battery to a scant 13 percent capacity, at which time it projected another hour or so of use.

What the Yoga Book lacks in sheer performance, it makes up for in innovation. It opened my eyes to the possibilities of Windows' touch capabilities. I see it as a more productive alternative to a tablet, or as a supplementary PC—something easier to take to a meeting than my full laptop. But while productivity can be quantified, creativity cannot be—and it's the Yoga Book's encouragement of the latter that points in a very interesting new direction for Windows devices.

The Yoga Book's base has micro-USB, micro-HDMI, and a micro-SD/SIMM slot on its right side.

HP Omen 17: Great gaming performance at a great price

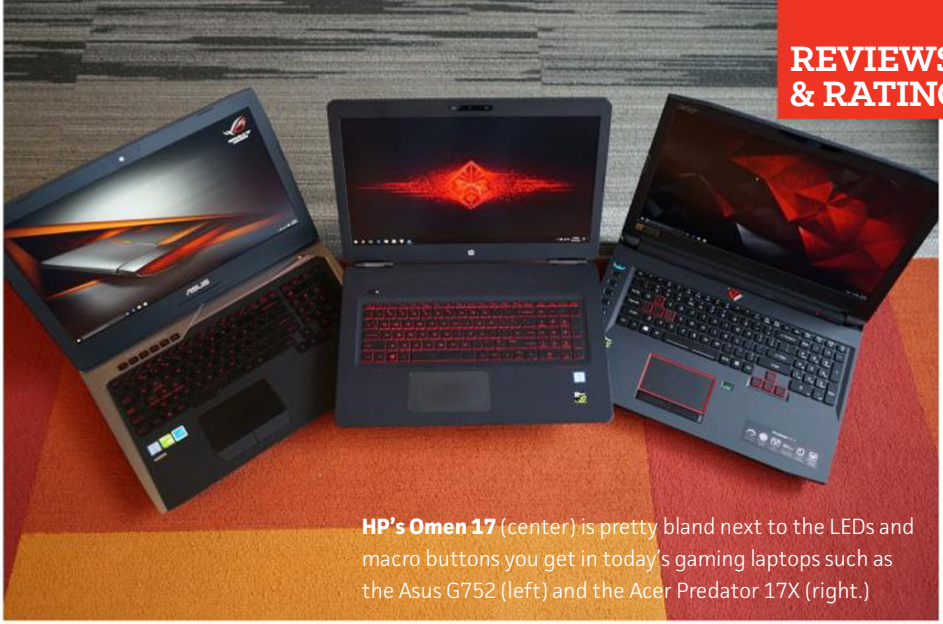
BY GORDON MAH UNG

YOU CAN THINK of HP's updated Omen 17 as that sleeper car that pulls up next to your tricked-out ride at a stoplight.

When the light turns green and you lay rubber, expecting to leave that tan sedan breathing your exhaust, you're instead shocked to see it hanging right next to you.

That's the HP Omen 17 in a nutshell. Sure, it carries the famous Omen brand and a couple of cues that it's a gaming laptop, but next to

PHOTOS BY: GORDON MAH UNG



HP's Omen 17 (center) is pretty bland next to the LEDs and macro buttons you get in today's gaming laptops such as the Asus G752 (left) and the Acer Predator 17X (right.)

just about all the other flashy gaming laptops, it's downright bland.

The good news for HP is that the flashing lights and oversize faux exhaust vents aren't what make a gaming laptop go—it's the parts inside.

This is where HP makes huge strides. The last generation of Omen gaming laptops topped out with Nvidia's GeForce GTX 965m GPU, which, when coupled with the laptops' 4K screens, made no sense.

The new Omen 17 turns the GPU dial up all the way to a GeForce GTX 1070 GPU. In Nvidia's pecking order of laptop graphics chips, only the GeForce GTX 1080 is faster.

The Omen 17 we reviewed was paired with an Intel quad-core Core i7-6700HQ CPU, a 4K G-Sync panel, 16GB of DDR4/2133 RAM, a 256GB M.2 NVMe drive, and a 1TB hard drive for bulk storage. Those looking for an optical drive will be disappointed, but our unit did come with a USB optical drive in the box. HP said it jettisoned the optical drive to make more room for the hardware and the coolers to keep it running.

OK, so you know you don't get the fancy programmable macro keys and multi-color keyboard,

HP Omen 17

PROS

- GeForce GTX 1070, 4K G-sync screen and Real Sense for less than two grand
- Reasonably compact and light for a 17-inch gaming laptop

CONS

- Despite the B+O branding, speakers are a little subpar and lack bass and presence
- No Thunderbolt 3 or USB 3.1 10Gbps port

★★★★½

but HP gives you one thing the others overlooked: An Intel Real-Sense camera. Paired with Windows 10's Hello function, you'll quickly forget you even have a password on the Omen 17.

As an infrared camera capable of sensing depth, the Real Sense camera can also be used to create a faux "green screen" and can automatically clip out the background when you're cutting your latest Twitch video.

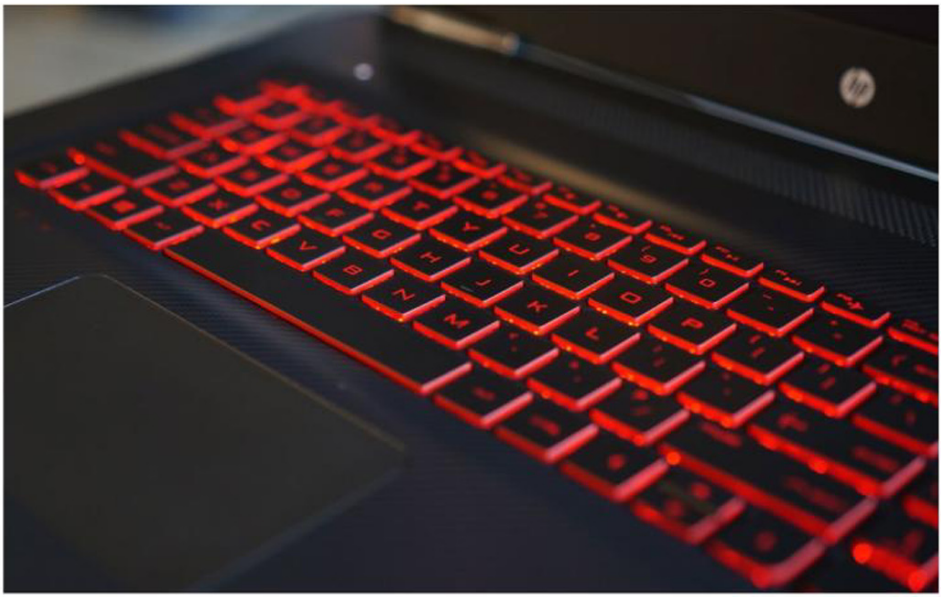
The other plus with the Omen 17 is its size and weight. At seven pounds, three ounces without its brick, the Omen 17 is almost two pounds lighter than the other 17-inch laptops we've seen. It's also quite a bit thinner, at just over 32mm. The Asus G752VS OC Edition, by contrast, pushes 50mm.

The Ports

In the port count, the Omen 17 gives you a reasonable but not overly generous selection. With a total of three USB Type A ports, HDMI and Mini DisplayPort, mic, headset SD card reader and gigabit ethernet, you'll mostly be happy.

Notably missing from the Omen 17 is Thunderbolt 3, which is rare

High performance gaming laptops today all seem to feature aggressive exhaust vents The Omen 17 on top? Not gonna play that game.



It's red, but there's no support for any other color nor zone lighting on the Omen 17.

not to find in a high-end gaming laptop. Thunderbolt 3's use on a high-performance laptop would be to transfer files at 40Gbps. If there's no Thunderbolt 3, HP could at least have integrated a USB 3.1 10Gbps controller to let you move files faster than the Omen's 5Gbps ports.

One other meh feature of the Omen 17 is the audio. The laptop has Bang & Olufsen tuning, but I found the audio lacking when compared to other 17-inch laptops. It just can't bring the beat. It wouldn't have been as bad for a mainstream laptop, but I expect more from big gaming laptops.

The most important matter in a gaming laptop is how well it performs in games. The Omen 17 doesn't disappoint there.

To see just where the Omen 17 and its GTX 1070 falls in the pecking order, I compared it to a spate of old and new burly gaming laptops. To get a feel for how much performance is available from each level of GPU, I threw in the tiny Razer Blade 2016 and MSI's new GS63VR Stealth, the latter of which I'm currently reviewing.

The test is 3DMark FireStrike Extreme, and I'm reporting only the

graphics sub-score, which isolates the GPU performance a little more.

For the most part, the Omen 17 hangs slightly behind the Asus Republic of Gamers G752VS OC Edition that we reviewed. That's no surprise, as the Asus has the same GeForce GTX 1070 GPU.

The Omen 17 and its GTX 1070 flatly leave the older GTX 980m and even the GTX 980 sucking exhaust.

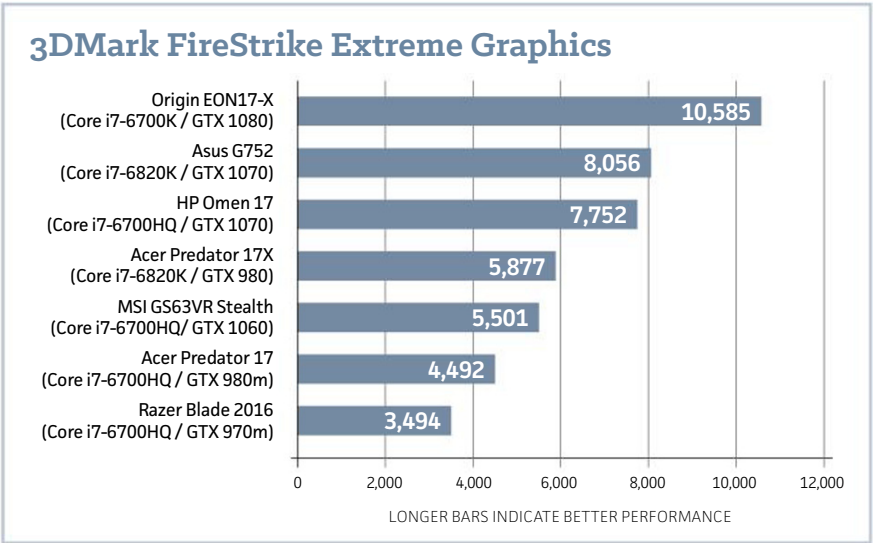
The test on the next page is 3DMark FireStrike Extreme. I'm reporting only the graphics subscore, which isolates the GPU performance a little more. Because many people have access only to the 3DMark FireStrike Extreme Overall score, I'll also provide that data. Even though it factors in the CPU a little, it's still mostly a graphics score and doesn't change much.

Tomb Raider Performance

Even though 3DMark is a very reliable test, it's still synthetic. People want to see performance based on actual game play. I ran the numbers in *Tomb Raider* set to Ultimate quality level and 1920x1080 resolution.

The results mostly mirror the 3DMark scores: GTX 1080 is on top by a comfortable margin, followed by GTX 1070, GTX 980, GTX 1060 and then GTX 980m and GTX 970m.

You get a gigabit ethernet port, an HDMI 2.0 port, two 5Gbps USB Type A ports, a Mini DisplayPort, and an SD card reader on the right side of the Omen 17. The left side adds one more USB Type A and two analog audio ports.



The Omen 17 is slightly slower than the Asus G752VS OC edition in 3DMark FireStrike Extreme Graphics.

The performance you get from the GTX 1070 in the Omen 17 is just plain impressive.

Rise of the Tomb Raider Performance

Tomb Raider is an elderly game at this point, so I also crunched the numbers in the fairly new *Rise of the Tomb Raider*. At 1920x1080, the Omen 17 is pushing nearly 95 fps, far more than you need. The bad news? It's about 10 percent slower than the Asus G752VS OC Edition, which I'd attribute to the higher clock speeds of the GPU in that model. I didn't happen to have scores for the GTX 980m and GTX 970m available in this test, but you can assume both of them would be slower.

Middle-earth: Shadow of Mordor 4K performance

As the Omen 17 has a 4K display I also wanted to see how it would game at its native resolution. For that I fired up *Middle-earth: Shadow of*

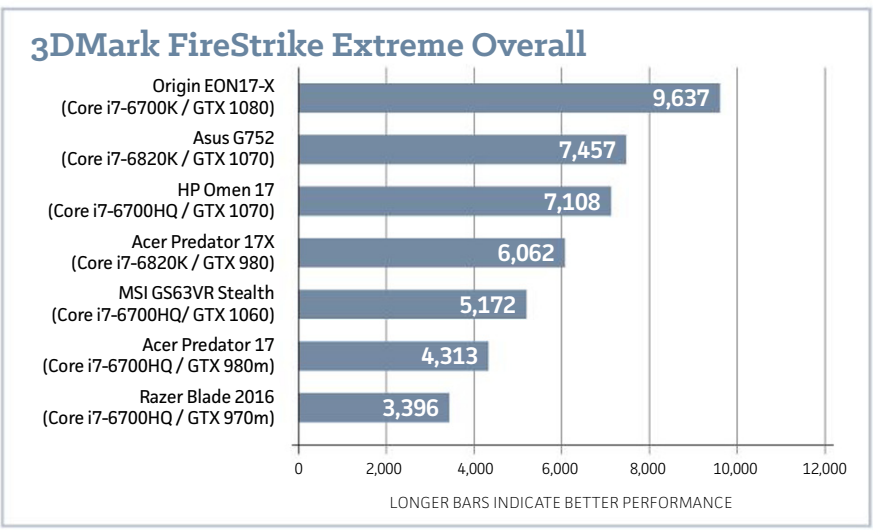
Mordor with the 4K textures installed. The performance, again, just trails the Asus G752VS OC Edition a tad. It's not huge, but it's still roughly 5 percent slower.

Rise of the Tomb Raider 4K performance

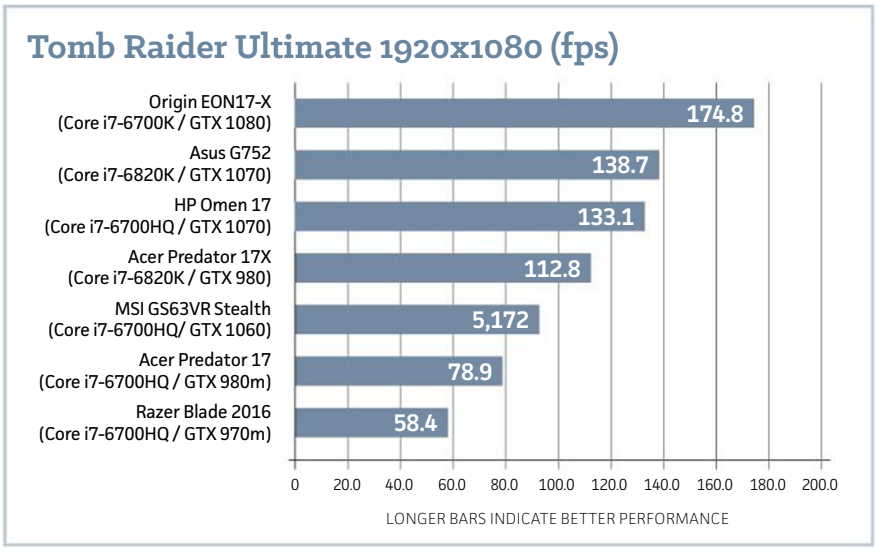
I also ran *Rise of the Tomb Raider* at 4K set to Very High. The result drags the laptops down even further. In fact, I'd recommend trimming some game settings if you really want to play on the Omen 17. At this resolution, you really need at least a GTX 1080 to hit the magical 60 fps. The good news for the Omen 17 is that 4K panel supports G-Sync, which smooths out low frame rates exceptionally well. It's enough that playing games in the 40 fps range isn't as atrocious as you might imagine.

HandBrake encoding performance

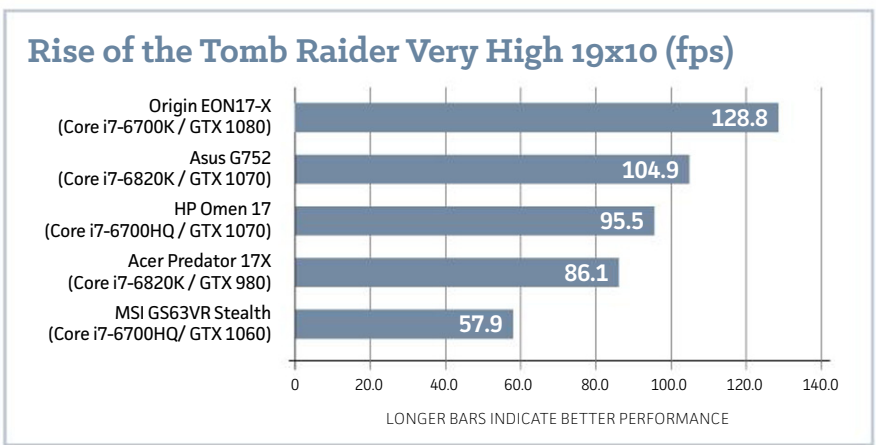
I don't believe in the 100-percent gamer, because everyone does something besides gaming on a PC once in a while, right? That means the CPU still matters. To test the CPU performance of the Omen 17, I ran our



3DMark FireStrike Extreme's overall score counts the CPU and GPU performance but it's still mostly a graphics tests.



The performance you get from the GTX 1070 in the Omen 17 is just plain impressive.

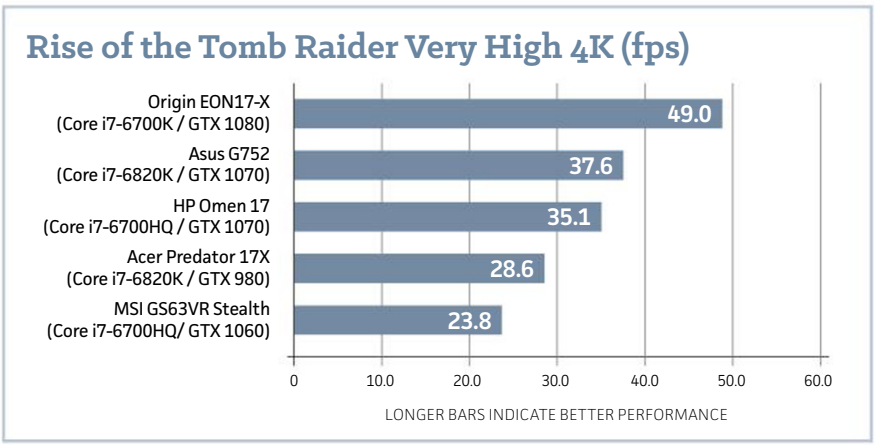


Rise of the *Tomb Raider* is newer than *Tomb Raider* and you see you need a bigger GPU to run it.

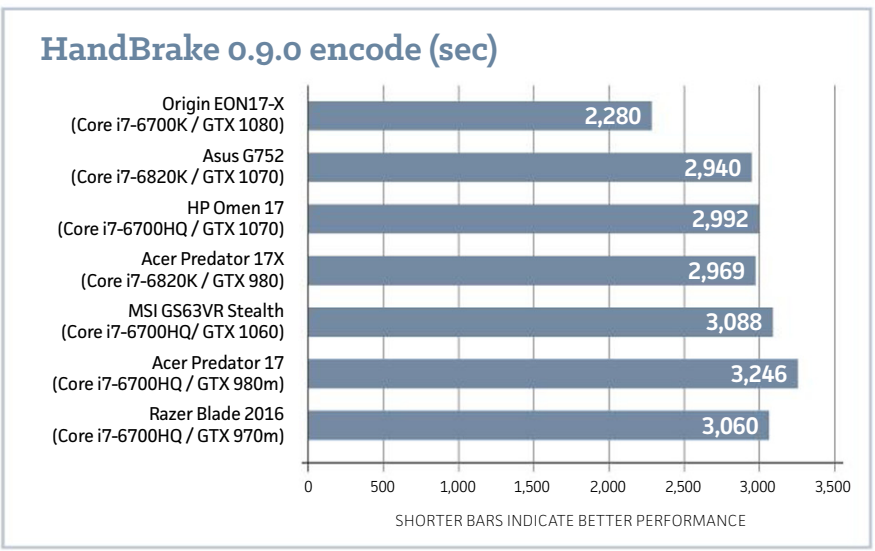
HandBrake 0.9.9 and encoded a 30GB 1080p video file using the built-in Android tablet preset.

Because every laptop here save the Origin EON17-X (review forth-

coming) used Intel mobile Skylake quad-core CPUs, the performance was pretty much a tie when the Predator 17X and Asus G752VS OC Edition were run at their out-of-the-box stock speeds. Overclocking



***Rise of the** Tomb Raider* should probably be run with a few settings trimmed down at 4K resolution on all but the GTX 1080.



Our HandBrake tests puts the quad-core mobile CPUs all in a similar performance range.

would lower their scores, but none of them would likely touch the Origin EON17-X, which has a desktop Skylake quad-core CPU in it.

Serviceability

Small laptops might as well be iPads for all the upgrades you can perform. Big gaming laptops usually offer some ability to service the interior, but the Omen 17 is an exception, unless you love removing a lot more screws. There is a single door on the bottom, but removing it gives you the ability to upgrade the RAM, and that's it. Hint, HP: people like to upgrade the storage subsystems and maybe clean the fans out on occasion, so make the access door bigger.

Conclusion

Despite the sedate style, the simple truth with the Omen 17 is that you're getting top-of-the-line performance at a pretty good price. Our review model, for example, with its GTX 1070, quad-core CPU, 16GB of DDR4/2133 RAM, 256GB SSD, and 4K G-sync panel is $1,800. To get those parts in a 17-inch laptop from other vendors might cost you another $200 to $400.

Of course, those other vendors will give you a more aggressive look, more flashing lights and more bling, but is it really worth it? That's ultimately up to you. As it stands, the Omen 17 is hella fast and a hella good deal.

OCZ VX500: A featherlight SATA SSD that's ideal for laptop upgrades

BY JON L. JACOBI

TOSHIBA/OCZ HAS STRUCK again with its latest 2.5-inch SATA 6Gbps MLC SSD, the VX500. Released hot on heels of the RD400 (go.pcworld.com/oczrd400) (a fast M.2 NVMe drive), the mainstream VX500 delivers solid overall and sustained performance, and is featherlight—a boon for anyone looking to upgrade a laptop.

Retail packaging for the Toshiba/OCZ VX500, which includes a license for Acronis True Image 2016.

Capacity and price

The VX500 (ocz.com/us/ssd/vx500-ssd) is available in four capacities: 128GB, 256GB, 512GB, and 1TB, with prices ranging from approximately $70 up to $350 (for the 1TB version on Newegg go.pcworld.com/oczvx5001tbnwgg). You pay a slight premium for the 1TB drive, but it's still just 35 cents per gigabyte. And we're talking about MLC (Multi Level Cell/2-bit) NAND, not slower TLC (Triple Level Cell/3-bit), which requires cache to attain 6Gbps-like write performance. Drives using TLC write substantially slower when the cache is full. Writing three bits simply takes longer than two.

At a hair under two ounces, the VX500 is one of the lightest 2.5-inch SSDs we've ever encountered. Indeed, I was concerned OCZ might've sent me a mockup when I first held the unit. Its lack of heft and 7mm profile make the VX500 particularly suitable as an upgrade for laptops. And cloning the hard drive it replaces will be a snap since OCZ bundles a license for Acronis True Image 2016.

OCZ VX500 SATA SSD

AT A GLANCE

This 7mm, 2.5-inch SATA 6Gbps SSD is a good performer, and possibly the lightest SSD we've seen.

PROS

- Good overall performance
- Weighs less than two ounces

CONS

- Slow for MLC when reading our 20GB group of small files and folders

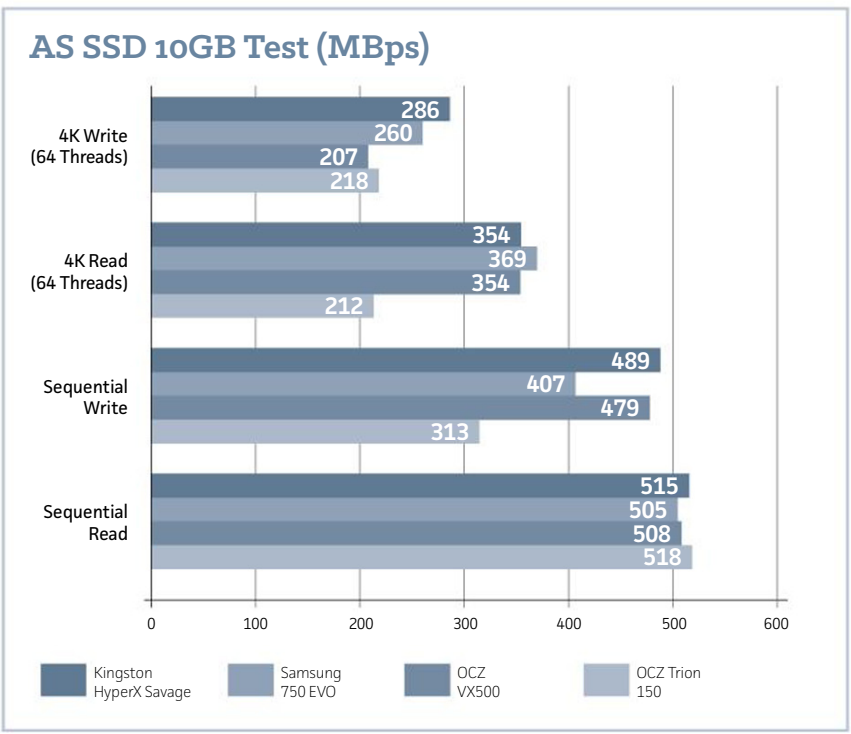
★★★½☆

Performance

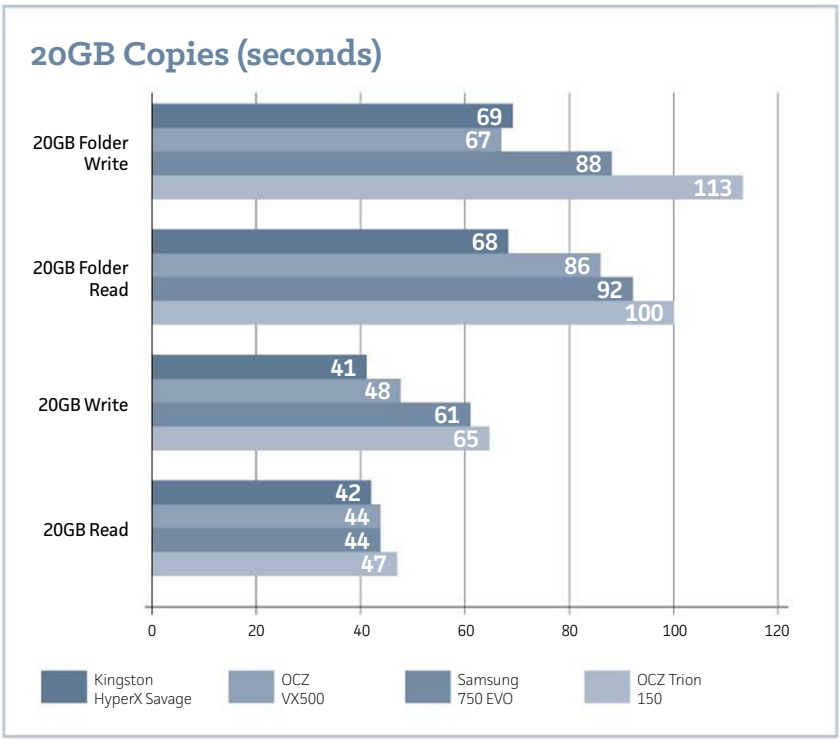
By and large, the VX500 performed as expected for a modern MLC drive. AS SSD rated its sequential reads and writes at 508MBps and 479MBps, respectively—a very good pace. Access times were scant, as with any SSD.

The VX500 performed nicely in our real-world 20GB large-file read and write tests, as well as the 20GB small-file and -folder write test. However, for some reason, small-file and -folder read performance was closer to what we see from TLC drives than a top MLC drive like Kingston's HyperX Savage.

The VX500 has a five-year warranty, and its endurance is rated for 74TBW (terrabytes written) per 128GB of capacity. The drives are also



Unlike its TLC cousin, the Trion 150, the VX500 sustains its performance during long writes and is a worthy competitor to top-notch MLC drives like the Kingston HyperX Savage.



We were a bit disappointed by the VX500's small-file read performance, but otherwise it maintained pace.

covered by Toshiba/OCZ's advanced warranty program. It should probably be called "advance," because if the company determines that the drive is defective after you consult with a tech, it will advance you a return shipping label for free.

Conclusion

Though we weren't overly impressed with the VX500's small-file read performance, its overall and sustained performance still easily exceeds that of TLC drives. When comparing it against other MLC drives, consider the overall performance and cost. If you're upgrading a laptop, factor in the VX500's light weight too, which should put it over the top.

Nixon Mission: A hardcore Android Wear watch for surf and snow

BY JON PHILLIPS

TWO YEARS AGO, the first Android Wear watches rolled out as unrepentant nerdware. Since then, Google's smartwatch platform has been embraced by mainstream fashion and lifestyle brands, and today we have much more fashionable options from TAG Heuer (go.pcworld.com/tagwearbl), Fossil and Michael Kors (go.pcworld.com/mkorswearbl). And then there's the Nixon Mission (go.pcworld.com/nixonmission), a ruggedized $400 Android Wear watch designed specifically for snow and water sports.

PHOTO COURTESY OF NIXON

Dude. This watch is actually pretty cool.

I neither shred nor surf, so I couldn't

get any immediate use from Nixon's custom software, which provides a bunch of data on surf and snow conditions. If you're looking for a review of the Mission's action-sports experience, you should check out reviews written by surfers and boarders. But I have tons of smartwatch experience, and I like a lot of what the Nixon Mission brings to Android Wear's table. The 48mm case may be huge, but at 3.7 ounces, the Mission actually weighs less than the more fancy-lad Michael Kors Access, which hit 4 ounces on our postal scale. The

PHOTOS BY JON PHILLIPS

The Unit watchface shows just the basics, along with current temperature, and whatever the hell animation is going on in the lower left.

Nixon Mission

AT A GLANCE

It's bulky and aggro-looking, but the Nixon Mission is a solid Android Wear watch—and probably a great smartwatch for surfing and snow sports.

PROS

- Water-resistance to 10 ATM.
- Almost endless customization options.
- Great battery life and charging adapter.
- Perhaps the perfect smartwatch for action-sports enthusiasts.

CONS

- Big and bulky, with a polarizing design.
- Poor legibility in direct sunlight.
- Occasional issues with voice recognition.

$400

★★★★½

The silicone band is quite comfy. You can choose from 24 different color options.

Mission will dominate skinny wrists, but it's remarkably comfortable for its size.

Design and comfort

Nixon eschewed an all-metal design, and instead opted for a shockproof polycarbonate case topped by a surgical-grade stainless steel bezel. The result is a sporty, purposeful look that pairs well with Nixon's custom watch faces.

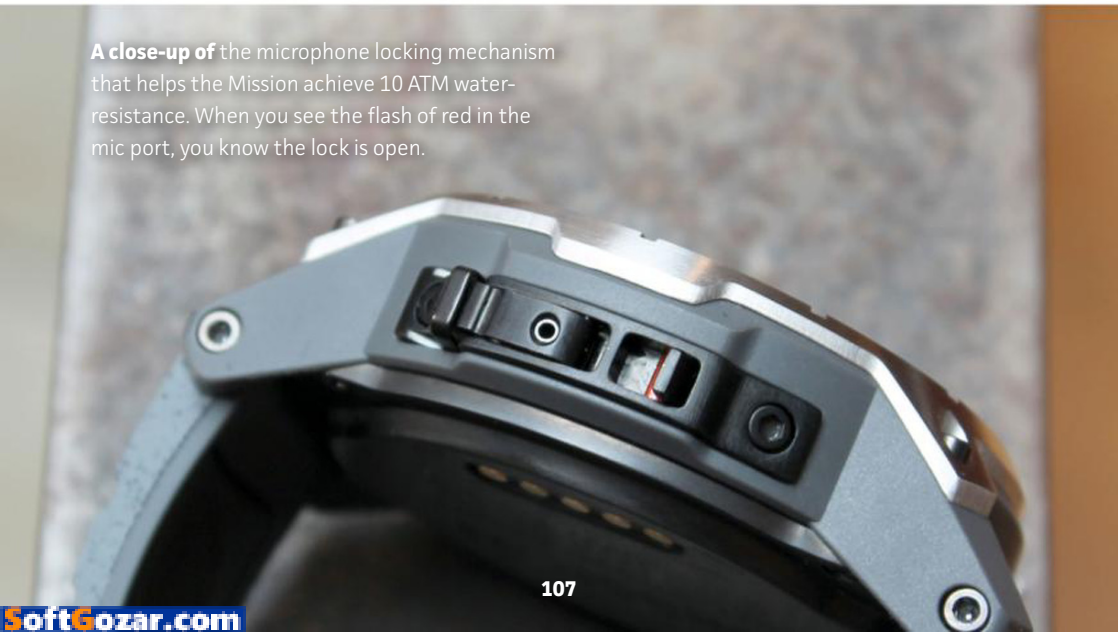
The stainless steel bezel is locked down by four allen head screws, with a gasket sandwiched against the crystal.

My review specimen came with a brushed stainless steel bezel, but when you order the watch, you can choose from 12 different bezel looks—five brushed steel options, and seven matte cerakote (go.pcworld.com/cerakote) options. The bezel is held down by four easily removed allen-head screws, but there's really no reason to disassemble the watch, as Nixon isn't selling the bezels as standalone items for customization.

Nonetheless, I did remove the bezel to test its durability, and yep, the sucker is strong—or at least resistant to torque. The bezel didn't bend when I tried to give it a purposeful twist, but it did suffer some nicks when when I whapped it with a metal ruler. Worried about durability? Well, the crystal is made of Gorilla Glass, and it's also recessed a bit beneath the bezel. This should give the screen some extra protection if you slam the Mission against a river rock.

The water-resistant MicLock

Most smartwatches offer some degree of water-resistance. For instance, if your watch is good for 5 ATM, it can survive splashes of



A close-up of the microphone locking mechanism that helps the Mission achieve 10 ATM water-resistance. When you see the flash of red in the mic port, you know the lock is open.

water in the shower. But Nixon wanted a watch that could survive wipeouts and turtle rolls. Enter Nixon's MicLock mechanism, which helps the Mission achieve a 10 ATM rating. In theory, this means the watch can survive submersion under 330 feet of water.

As the name implies, the MicLock covers the watch's microphone port, the one point of entry where water can penetrate the case. You know the MicLock is open when you see a flash of red in the microphone port.

To lock the watch down tight, you slide a little metal band off a tiny metal lever, lift the lever, shut the door that's over the microphone port, and then refasten the band on the lever. The parts are small, and you better have some fingernails handy, but it's all pretty simple once you do it once or twice.

I can't promise that the Mission can withstand a full day of surfing, but I submerged it in water for 15 minutes, and it was none the worse for wear. The MicLock is certainly an interesting innovation that should appeal to Nixon's target customer, and I love seeing Android Wear watches branch out into niche categories. That said, the Mission

Thanks to Nixon's MicLock, the Mission is water-resistant to 10 ATM—that means it can withstand the pressure of being about 330 feet underwater.

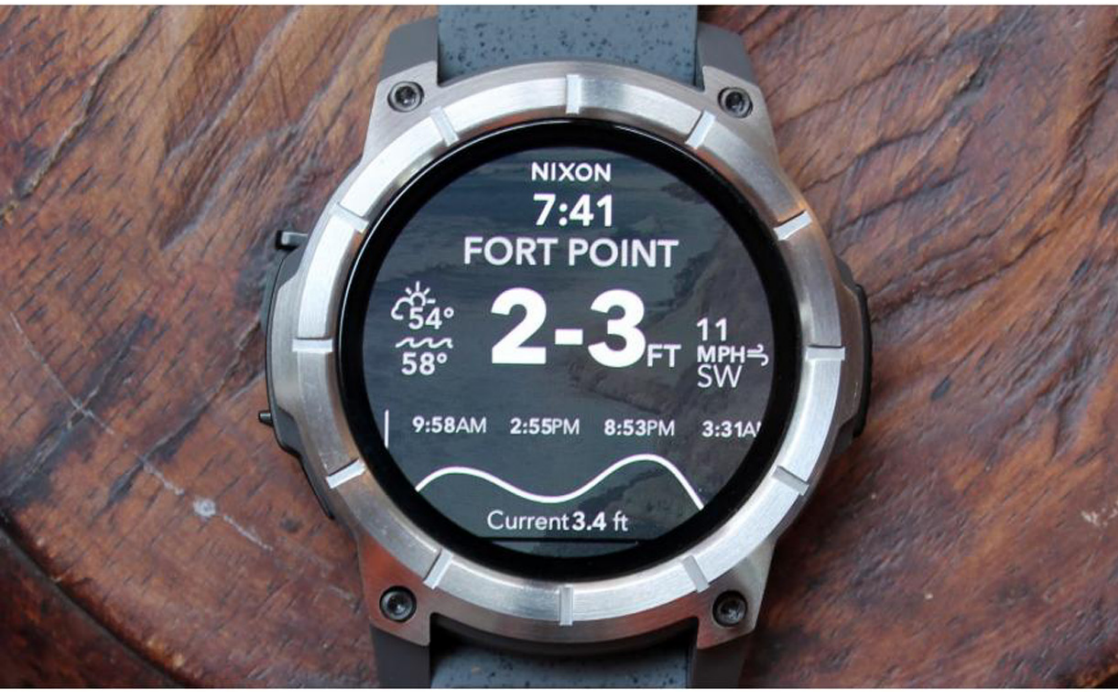
was less responsive to voice commands compared to other Wear watches. I don't know if the MicLock or some other factor is to blame, but the issue was big enough to warrant mentioning here.

Custom watch faces for surf and snow

Besides the usual assortment of Android Wear watch faces, the Mission comes with six custom faces. It's a relatively small assortment, but if you're interested in snow or water sports—or simply need to make a statement—the Nixon dials may be exactly what you're looking for.

Let's start with Nixon's Unit face, which is definitely the watch's most aggro design. Vaguely reminiscent of the head-up display in Predator, it shows you day and date; hours, minutes and seconds; your local temperature; and an inexplicable animation in the lower left of the dial. You can choose between deep red graphics and a color that looks similar to what my favorite car manufacturer calls krypton green

The green-themed Unit face certainly has…a look.



The Mission Pro watchface up close. You can define multiple surfing spots in your area, and then swipe through locations to see what's happening where.

(go.pcworld.com/kryptongrn). It's not the watch face you wear to the symphony, but that's not Nixon's scene, if you dig.

If you're looking for something more traditional, you can opt for The Mission face, which is illustrated in my bezel dissection shot on page 106. With this face, you can customize the colors of your background, hands and digits, and also define the data displayed by three subdials. I've chosen battery status, steps and local weather, but other subdial options include date, next calendar event, distance walked, calories burned, world time, a chronograph, and surf height or snow levels at predefined locales.

To reiterate, I don't do action sports. But I know a few surfers, and I think at-a-glance wave reports would be very useful in helping them decide when to suddenly fall ill and call in sick.

Now, if you're *really* serious about action sports, you can choose the

Mission Pro watch face—which is barely even a watch face at all. As you can see from the image on page 110, the current time is totally de-emphasized. Instead, the watch face hooks into the Surfline (go.pcworld.com/surfline) platform to deliver detailed data on local surfing spots, including current temperature and cloud conditions; wave height; wind direction and speed; and tidal information. Scroll down further on the watch face, and you can see information for tomorrow.

If your interests are more geared toward snowboarding or skiing, you can set the watch for snow reports (powered by the Snocountry snocountry.com platform) instead. You'll get data on the current temperature and cloud cover; wind direction and speed; new snowfall in inches; projected snowfall in inches; and details on base depth, open trails and open lifts.

And, finally, the Mission hooks into Trace (traceup.com), a sensor-driven

The Trace app pairs with an external physical sensor that you affix to your snow of surf board. From there, you can record a bunch of data from your sessions.

The Mission's charger attaches with a relatively strong magnet, and has a durable braided cord.

platform for measuring performance in action sports. TraceSnow, for example, can track session time, calories burned, altitude, maximum speed and total distance.

Display, CPU and battery

Aside from its aggressive look and action-sports leanings, the Mission is a fully modern Android Wear watch that advances the Wear story in some areas, but falls a bit short in others.

The 1.4-inch, 400x400 AMOLED display looks quite sharp, but it's not bright enough to be legible on clear, sunny days. The Mission has an ambient light sensor, but it doesn't matter if you set the watch to auto-brightness or its maximum setting, it still can't cut through direct sunlight. To this extent, I'd rather have a Wear watch with a transflective display.

On the flipside, battery performance was impressive relative to other Android Wear watches I've tested. I never finished a full day of frequent, punishing use with less than 30 percent battery capacity remaining, and I often found myself making it through a day and a half without a recharge.

The Mission comes with a 400 mAh battery, but the watch also benefits from the Qualcomm Wear 2100 (go.pcworld.com/qcomwear2100) processor, a chip expressly designed to consume less power. I also really liked the watch's charging adapter. It snaps to the Mission

with a strong magnet, and its braided cable feels like it's ready to suffer some abuse.

512MB of RAM? Check. 4GB of storage for apps and music? Check. The Mission also has a built-in GPS, an essential sensor for various workout apps.

Bottom line

The Mission is a perfectly fine Android Wear device. It even has some really nice features. But I doubt any "mainstream" Android enthusiasts—and, yes, that's probably an oxymoron—will be buying the Mission unless they really, really like the Nixon aesthetic. But surfers and snowboarders who've already joined Team Android? I can totally see them digging the Mission and getting real value from it.

Forza Horizon 3 (PC): Get ready to make your graphics card sweat

BY HAYDEN DINGMAN

EVER SINCE MICROSOFT announced its Xbox Play Anywhere program—a fancy name for "We're porting all our first-party titles to PC"—the game I've been looking forward to most is *Forza Horizon 3*. Bombing through the back-country of Australia at 144 frames per second, music thumping, tires squealing, reflections…reflecting.

And after spending most of a night with the game, I can confirm it's gorgeous. The Twelve Apostles look particularly lifelike, white sandstone set against the brilliant blue ocean. I must've taken a dozen screenshots of that area alone.

You're going to need one monster of a PC, though. My home

machine is running on an Nvidia GTX 980 Ti (with the brand-new Game Ready drivers, go.pcworld.com/geforceGTX980Ti) and my jaw dropped when I booted up *Forza Horizon 3* and it recommended I run everything on Medium settings. That estimate ended up being a bit conservative—I can eke out an almost-steady 60 frames per second on High—but the fact remains this is one demanding game.

Now, it still looks great on lower settings. Hell, it still looks good on the Xbox One and that's about as low as you can go. Be ready to dial in your settings though, as racing games rely on a steady frame rate more than perhaps any other genre.

To that end developer Playground Games has equipped *Forza Horizon 3* with a full bevy of graphics options, far surpassing what we got with Microsoft's *Quantum Break* and *Gears of War: Ultimate Edition* earlier this year. *Forza* even packs a built-in frame rate counter, since external solutions don't play nice with UWP (go.pcworld.com/rebranduwp).

I admit I'm a bit frustrated with how many options require a full restart to take effect, however. Anything that affects draw distance or level geometry means closing the game down and waiting for it to load back up again—a lengthy process, even on an SSD, and one that becomes progressively more frustrating the longer you spend trying to nail down your settings. And while MSAA doesn't require a full restart, it does require a load screen that seems to stretch on into eternity.

Plus you haven't really lived until you've driven The Twelve Apostles in a wood-panel Lamborghini.

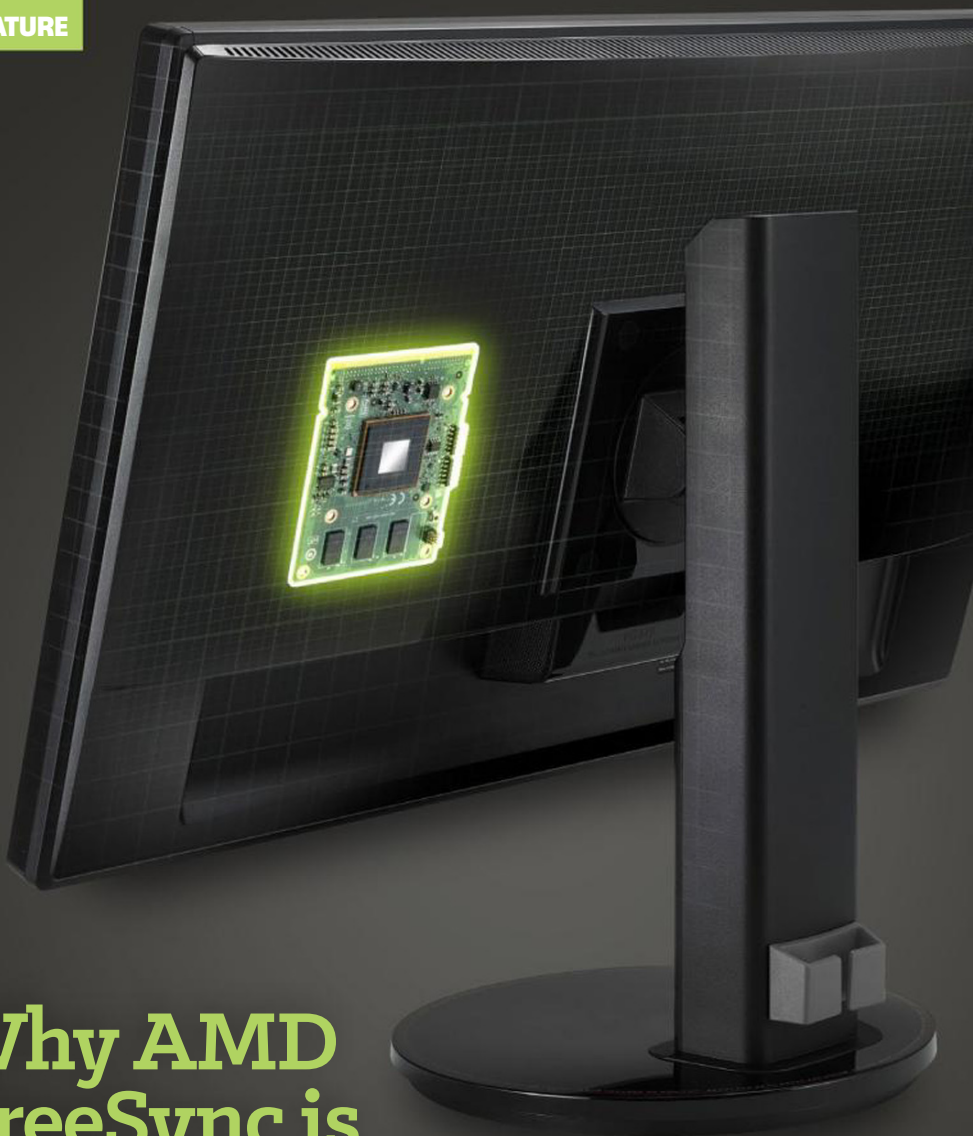
Loads in general seem slow, actually—both the initial start-up and

load-streaming. No matter my frame rate, I seem to see slight stuttering as new areas are pumped in. And worse, you'l encounter sluggish menus, particularly when customizing your car. I spent last night tricking out a 1969 Charger, and it took about twice as long as it should've because each part-swap took a second or two to load in. That's not much in isolation, but repeated a hundred times it's a bit aggravating.

We'll have a lengthier review up soon, and I'm planning to dig into the game's performance quite a bit more. This is merely my impressions after two or three hours of playing—I was admittedly pretty worried when Microsoft didn't get PC review code out day-and-date with the Xbox One evaluation copies. As it stands, those fears seem largely baseless. *Forza Horizon 3* could use a bit more optimization perhaps, but it's a far cry from broken. Just intimidating.

Take time to be a dad today.

fatherhood.gov
877-4DAD411



Why AMD FreeSync is beating Nvidia G-Sync on monitor selection and price

HINT: It's not just the cost of the proprietary module. BY JARED NEWMAN

Let's say you've just bought one of Nvidia's slick new Pascal-based GeForce graphics cards (go.pcworld.com/pcgc) such as the GTX 1070 (go.pcworld.com/gtx1070), and now you're seeking a G-Sync monitor to go with it.

Looking at what's available, you'll probably become envious of PC gamers on the Radeon side of the fence. Compared to G-Sync monitors, displays supporting AMD's FreeSync adaptive sync tech are generally much cheaper, with a wider range of vendors and tech specs to choose from. The website 144HzMonitors lists 20 available G-Sync monitors (go.pcworld.com/gsync), versus 85 FreeSync monitors (go.pcworld.com/frees), the latter showing more combinations of screen size, refresh rate, and resolution.

Why the disparity? The conventional wisdom is that Nvidia's proprietary G-Sync hardware module raises the monitor price due to licensing fees, but that's not a satisfying explanation. Nvidia is still far and away the market share leader (go.pcoworld.com/mktshare) in graphics cards, so you'd think that most monitor makers would create G-Sync variants of their FreeSync displays and at least give GeForce users the option of absorbing the module cost.

The real reason for G-Sync's limited availability is as much about design and development concerns as it is about the price of the module itself.

As I started talking to monitor makers, a more complicated picture emerged. The real reason for G-Sync's limited availability is as much about design and development concerns as it is about the price of the module itself.

G-Sync vs. FreeSync refresher

PCWorld has already published a detailed primer on G-Sync and

FreeSync (go.pcworld.com/sprimer), but the gist is that both technologies allow the graphics card to adjust the monitor's refresh rate on the fly, matching it to the PC's current framerate. This prevents the screen tearing effect that occurs when refresh rate and framerate fall out of sync, and (mostly) eliminates stutter, creating a buttery-smooth gameplay experience.

G-Sync accomplishes these variable refresh rates with a proprietary hardware module, which is built into every supported monitor. With FreeSync, no such module is required, because it uses the variable refresh rate tech that's part of the DisplayPort standard (and, more recently, HDMI as well [go.pcworld.com/dphdmi]). But again, the lack of extra hardware is not the only reason FreeSync monitors are cheaper and more readily available.

Design costs

Some display makers say Nvidia's module requires more room inside the monitor enclosure. While that may not seem like a big deal, creating a custom product design for one type of monitor raises development costs considerably, says Minhee Kim, a leader of LG's PC

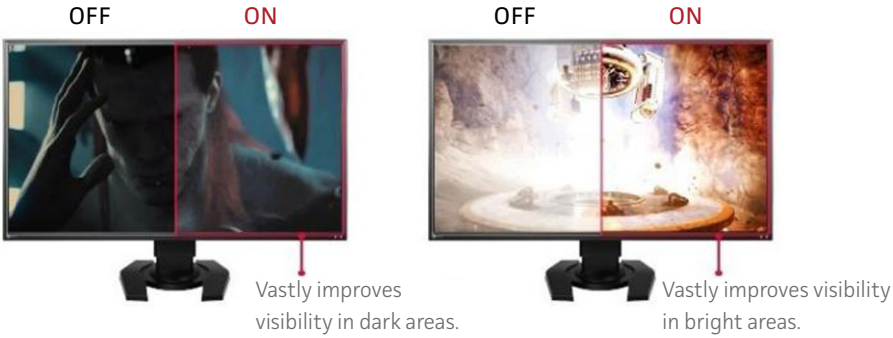
The cheapest ultrawide 1080p G-Sync monitor will set you back nearly $1000.

and monitor marketing and communications. By comparison, Kim says, AMD's approach is more open, in that monitor makers can include the technology in their existing designs.

"Set makers could adopt their technology at much cheaper cost with no need to change design," Kim says. "This makes it easier to spread models not only for serious gaming monitors but also for mid-range models."

LG's FreeSync monitor selection bears this out: The company offers several 1080p monitors under 30 inches diagonal with an ultrawide 21:9 aspect ratio, priced as little as $279 (go.pcworld.com/279). With G-Sync, the only 1080p ultrawide monitor is a 35-inch curved panel from Acer with a much higher refresh rate. The cost? $900 (go.pcworld.com/900).

Even if monitor makers proceed with the necessary research and development, the resulting product will be more expensive, which



inevitably means it will sell in lower volumes. That, in turn, means it's harder for monitor makers to recoup those up-front development costs, says Jeffry Pettinga, the sales director for monitor maker Iiyama.

"You might think, oh 10,000 sales, that's a nice number. But maybe as a manufacturer you need 100,000 units to pay back the development costs," Pettinga says.

Meanwhile, he says, monitors are constantly improving in other areas such as bezel size. As monitors shrink from wide bezels to slim bezels to edge-to-edge displays, the risk is that a slow-selling G-Sync will become outdated long before the investment pays off.

"Let's say you introduced, last year, your product with G-Sync. Six months of development, and you have to change the panel. You haven't paid off your development cost," Pettinga says. "There's a lot of things going on on the panel side."

G-Sync doesn't allow monitor makers to offer their own color adjustments, like Eizo does.

Limited flexibility

Costs aside, some monitor makers feel restricted in how they can differentiate their G-Sync monitors.

Costs aside, some monitor makers feel restricted in how they can differentiate their G-Sync monitors.

Display maker Eizo, for instance, has a feature in its gaming monitors called Smart Insight that adjusts gamma and brightness on the fly, helping to improve visibility in light and dark areas. This feature wouldn't be possible with G-Sync, says Keisuke Akiba, Eizo's product &

marketing manager, because Nvidia's module handles all the color adjustments itself.

"The G-Sync module accepts color adjustment in the module, not an outside chip," Akiba says. "Our color adjustment needs power and flexibility so we've gone for FreeSync."

Monitor makers also have limits on what video inputs they can include. All G-Sync monitors have one DisplayPort input, and in some cases they also include an HDMI input that doesn't support variable refresh rate. You won't find any G-Sync monitors with more than two inputs (or with support for DVI). Also, G-Sync doesn't support variable refresh rate over HDMI. That means every G-Sync monitor must include DisplayPort—again raising the cost to manufacture.

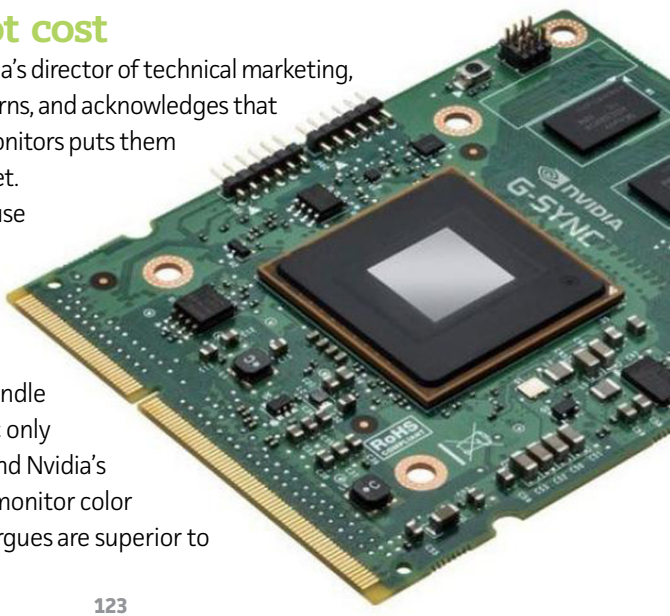
"DisplayPort is relatively expensive on a monitor because of the cable—it's a quite expensive cable if you include a cable—and the board design itself. So DisplayPort adds a lot more to the cost than HDMI," Pettinga says.

Nvidia says the proprietary module is not a major contributor to the cost of G-Sync monitors, especially since it replaces some other standard components.

Nvidia's answer: It's about value, not cost

In an interview, Tom Petersen, Nvidia's director of technical marketing, doesn't dispute any of these concerns, and acknowledges that the high cost to develop G-Sync monitors puts them into a pricier segment of the market.

But to Nvidia, that's okay, because G-Sync is supposed to be a premium product. The company points to several ways in which G-Sync is superior to FreeSync, including its ability to handle any drop in refresh rate—FreeSync only works within a specified range—and Nvidia's complete control over things like monitor color and motion blur, which Petersen argues are superior to



what monitor makers are offering outside the module.

For those reasons, Petersen says any price disparity between comparable G-Sync and FreeSync monitors is not due to the module, whose cost he says is "relatively minor," but due to monitor makers' decision to charge more.

"To me, when I look out and see G-Sync monitors priced higher, that's more of an indication of value rather than cost," he says. "Because at the end of the day, especially these monitors at the higher segments, the cost of the components don't directly drive the price."

If you want G-Sync, be prepared to jump into the deep end of luxury gaming monitors, because the technology isn't going downmarket anytime soon.

Perhaps that's a fair point for higher-priced monitors, but as we've heard from monitor makers, the bigger issue is that the module is inherently harder to include in lower-priced options. With G-Sync, for instance, you can't buy a 60Hz monitor in less than 4K resolution, whereas FreeSync offers plenty of options in 1440p and 1080p.

Nvidia's Petersen suggested that addressing these mid-tier markets isn't a priority. "I think over time, you'll see lower-priced monitors that are lower-featured, that include G-Sync, but it's not our goal," Petersen says. "Our goal is to provide a premium gaming experience, and the premium gaming experience requires a lot of hands-on work from Nvidia, and that's where we're going to continue to focus over time."

Of course, some monitor makers would prefer that Nvidia supported DisplayPort's adaptive sync standard, so users could ,at least enjoy some anti-tearing benefits even if they didn't splurge for a G-Sync monitor. To that, Petersen says "never say never," but right now he argues there's no benefit to doing so.

"I'm worried that by just throwing it out there, we could be delivering the same less-than-awesome experience that FreeSync does today," he says, "and that's just not our strategy."

For loyal Nvidia customers, the takeaway is clear: If you want G-Sync, be prepared to jump into the deep end of luxury gaming monitors, because the technology isn't going downmarket anytime soon.

YOU DON'T HAVE TO BE PERFECT

TO BE A PERFECT PARENT.

There are thousands of kids in foster care who will take you just the way you are.

888. 200. 4005 AdoptUSKids AdoptUSKids.org

8 times Google savagely burned Apple during the Pixel announcement

BY LEAH YAMSHON | ILLUSTRATION BY DAVID CURTIS

It burns! It burns!!!

HOT ON THE heels of Apple's big fall event, Google held an event of its own. The company announced a plethora of new products, including two new Android phones (the Pixel and Pixel XL), an updated Chromecast dongle (the Chromecast Ultra), a VR headset (the Daydream View), and some connected-home devices (Google Home and Google Wifi).

Both Google and Apple are known for taking subtle digs at each other's products during events and marketing campaigns, so we were expecting some shade to be thrown…but boy, Sundar Pichai and pals took it to a whole new level. They kept the zingers coming throughout the entire event. Read on to see some of Google's sickest burns against Apple.

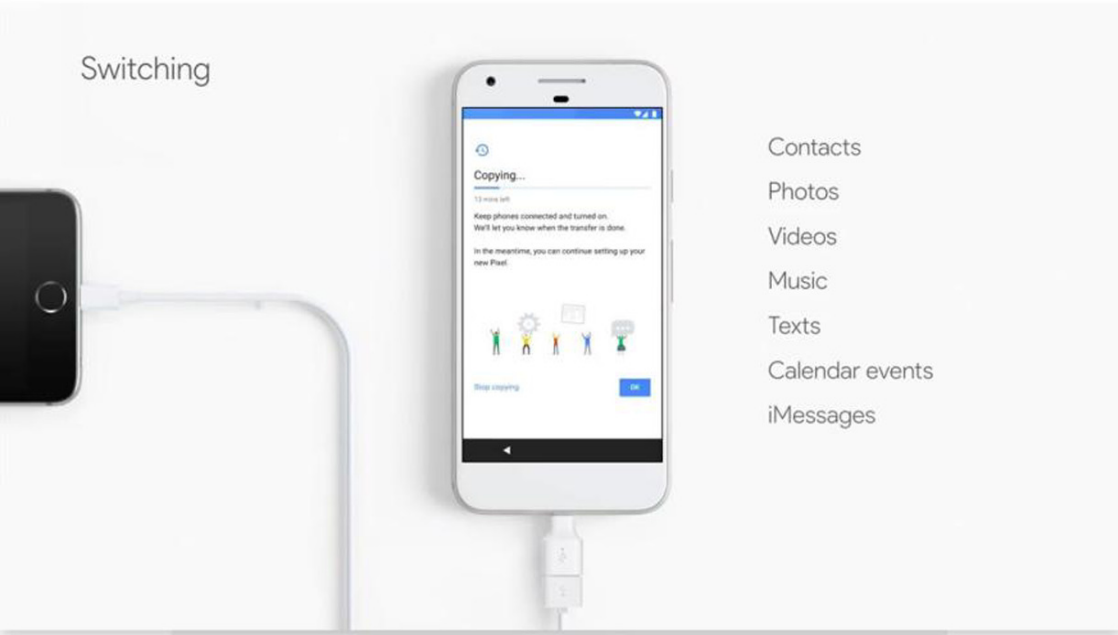
Camera bump

We'll start with the low-hanging fruit: The camera bump. The iPhone has one; the new Pixel does not. Yet, this feature came up again and again on stage during the live demos. Google even slid it in its new promo video for the Pixel.

The iPhone 7's camera bump is a little annoying, but nowhere near a deal breaker—and iPhone sales numbers prove that. Plus, slapping a case on your phone will solve this problem.

Yawn. On to the next.

BURN RATING:



Blue bubbles to green bubbles

iOS and Android devices both include software to help users switch from one platform to the other. For example, iOS has a dedicated app for new iPhone owners to port their apps and data over to their iPhone from their old Android phone. With the Pixel, Google is going straight for the jugular: Its switching software can even copy over iMessages, and the phone ships with a Quick Switch adapter so that you don't have to perform the data transfer over the air.

BURN RATING:

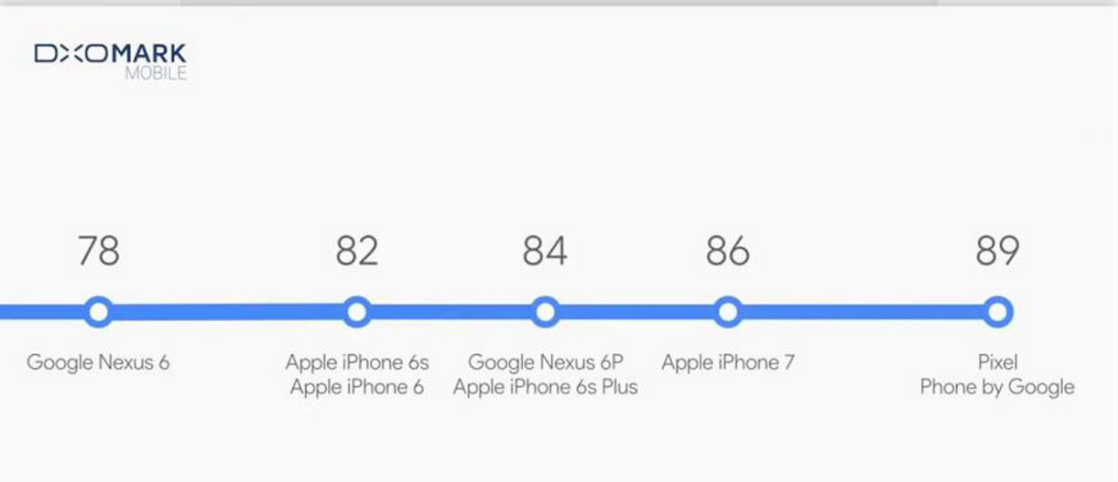
Best camera ever?

On stage, Google execs bragged about the Pixel's camera, stating that it was the best-performing smartphone camera on the market based on shoot-out benchmarking done by DxOMark. The Pixel got a score of 89 out of 100, where the iPhone 7 scored an 86.

Can you guess what phone was curiously missing from Google's intel? Yep—the iPhone 7 Plus, which rocks a two-camera system that's far superior to that of the iPhone 7. True, DxOMark hasn't reviewed the iPhone 7 Plus's camera yet, but Google certainly used that to its advantage during the event.

Ahem. Moving on!

BURN RATING:



Limited storage

Speaking of the camera, Google had One More Thing to add: "We think people are going to use this camera a lot, so as a special bonus for Pixel owners, we're including free unlimited storage for photos and videos at full resolution," said Brian Rakowski, Google's vice president of product management. Could this be a dig at Apple's iCloud Photo Library and iCloud Drive, which cost extra for iPhone owners if you want more than 5GB of storage? Hmmm.

If that isn't, then this definitely is: "You can say goodbye to those painful Storage Full popups." Ouch.

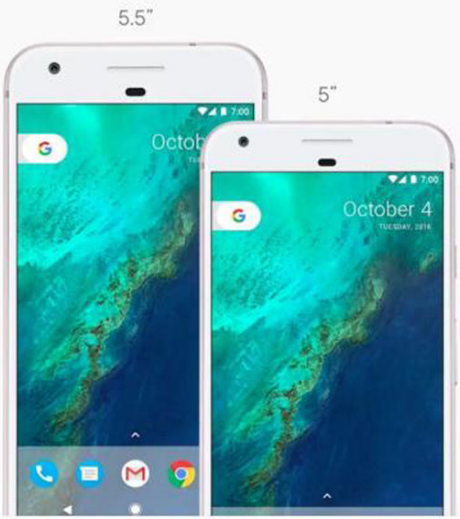
BURN RATING: 🔥🔥🔥

Different size, same specs

The Pixel is available in two sizes—the 5-inch Pixel and 5.5-inch Pixel XL—similar to Apple's 4.7-inch iPhone 7 and 5.5-inch iPhone 7 Plus. However, the iPhone's two sizes vary slightly in specs, namely when it comes to battery life and camera capabilities. But the Pixel and Pixel XL?

"All the great features you heard about today work on both, and both of these sizes come with all of these amazing hardware specs," Google product manager Sabrina Ellis said during the presentation.

BURN RATING:

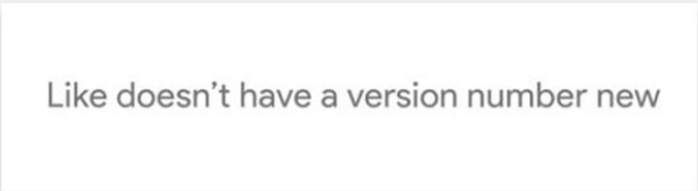


Really Blue

OK, this may not have been a total jab at Apple, but Pixel's color varieties seem…a little shady. Instead of picking between jet black or black, or between rose gold or gold (all iPhone finishes), the Pixel comes in Quite Black, Really Blue, and Very Silver.

We get it, Google. Very clever. Wow. Amaze.

BURN RATING:

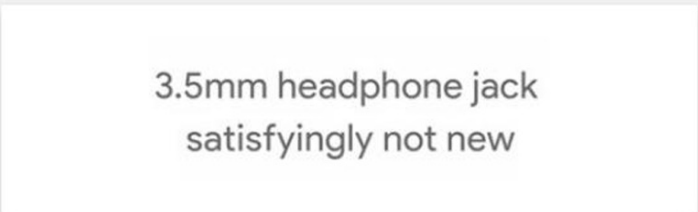


Like, new new?

"Need a new phone? Like new new? Like doesn't have a version number new?"

Fine, Google. Talk to us in a year when your next Pixel phone comes out.

BURN RATING: 🔥🔥🔥



Enough with the headphone jack

This zinger from one of the Pixel promo videos is probably the sickest burn of them all: "3.5mm headphone jack satisfyingly not new."

This one is too fresh. It still stings!

BURN RATING: 🔥🔥🔥

SHELTER PET & GLOBALLY RECOGNIZED PIANIST

Amazing stories start in shelters and rescues. Adopt today to start yours.

KEYBOARD CAT 8M+ YouTube Views

Ad Council

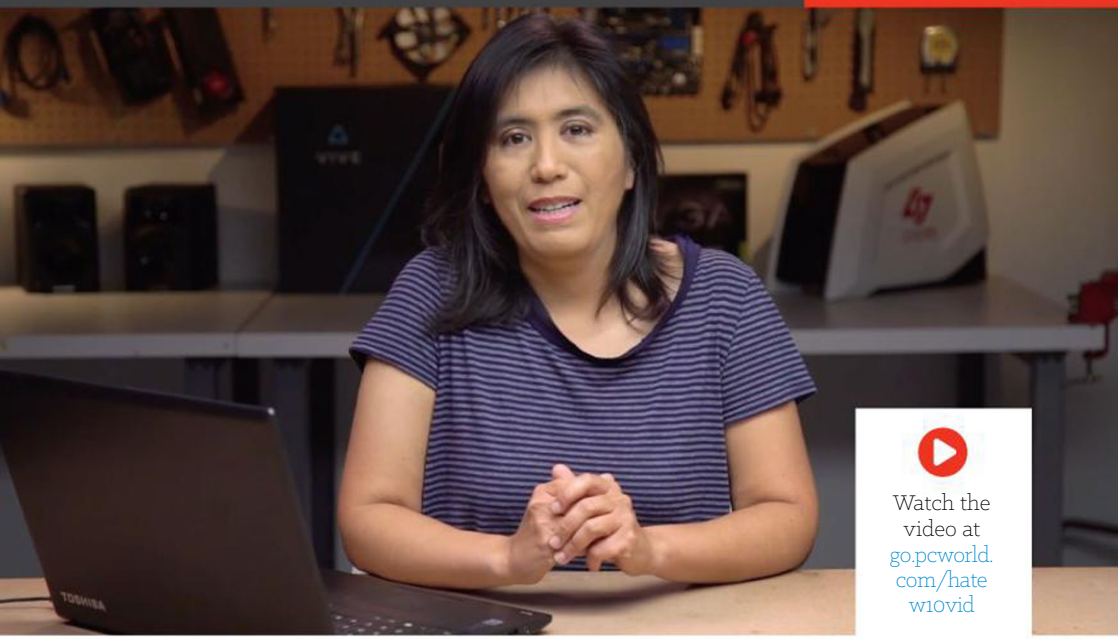
THE HUMANE SOCIETY OF THE UNITED STATES

Maddie's Fund

Start A Story. Adopt
theshelterpetproject.org

HERE'S HOW

CONTENTS



Watch the video at go.pcworld.com/hatew10vid

What to do when you hate Windows 10

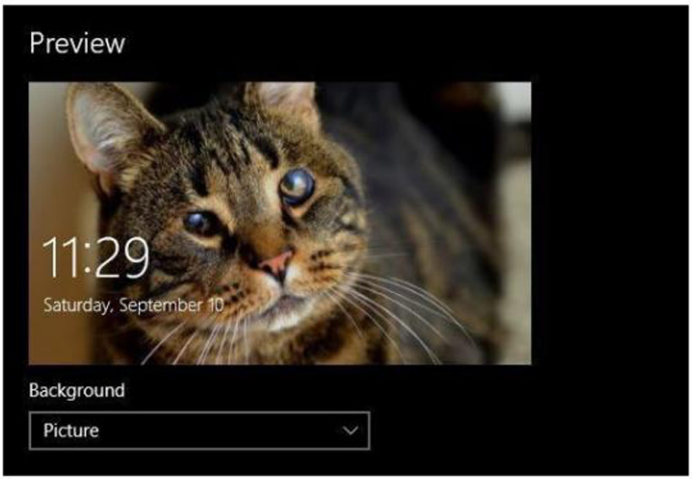
If you're unhappy with Redmond's latest, you have a few options.

BY JOSH NOREM

I USUALLY START this column with "so and so needed something done to their PC," but if I were to include the names of all the people who have written me about how unhappy they are with their Windows 10 "upgrade," the file would be so large the server that hosts this page would need a new hard drive. I've been inundated with unhappy Windows 10 users for the past two months, and my heart goes out to these folks. A lot of them were upgraded unsuspectingly, and

Microsoft deserves a ton of scorn for its malware-like Windows 10 upgrade tactics. That said, now that you have Windows 10 on your PC and you're not happy, here's what you can do about it.

1. Keep it, but make some changes



Dark mode—give it a try!

I know this is probably not what you want to hear, but overall I don't think Windows 10 is a bad OS like Windows 8 was when it launched. It's essentially a hybrid version of Windows 7 and Windows 8.1, and it's going to be around for a very long time in one form or another so you might as well get comfortable with it now. It also offers a lot of tweaks that could help it grow on you. Here are some of my favorites in Digging Deep into Windows 10 (go.pcworld.com/w10tips):

- Enable Dark Mode
- Disable Quick Access in File Explorer
- Muzzle Cortana
- Customize the Start Menu
- Enable tracking for your laptop
- Use virtual desktops
- Tweak your desktop colors
- Snap your windows (go.pcworld.com/w10snapwindows)

And that's just scratching the surface. For a ton more tips, check Windows 10 tools for hardcode PC enthusiasts (go.pcworld.com/w10tools) and features that eliminate everyday hassles (go.pcworld.com/win10features).

2. Go back to your old OS, aka the Nuclear Option

If you have a copy of your OS on disc or digital media, you can always just nuke and pave, as we say. That means you will wipe the hard drive and reinstall the OS from scratch. We generally don't recommend it, however, because it's a huge hassle. If your data files such as music, documents, pictures, and such are on the same partition as your OS, you'll need to back up everything first, reinstall your OS from scratch, and then migrate everything back. Now, if you followed our previous advice about keeping your OS and data on separate partitions (go.pcworld.com/win7datapart) you're in better shape, and a situation like this is exactly why we deploy this strategy. You can reinstall your OS without touching any of your precious data.

3. Restore from Factory OS partition

This one is tricky. Say you have a PC from a company such as Dell, Lenovo, or HP. They will typically ship the PC with a recovery partition, meaning an image of the system as it left the factory is stored on a small partition, and you can restore the PC to that factory condition by using a built-in utility that you launch at boot. I have not been able to test this, but if that partition is for Windows 7 or 8, it seems that installing Windows 10 might render that "old" partition unusable. In this forum thread (go.pcworld.com/oemrecovpart), the moderator states, "If you upgrade using Windows Update or the .ISO media, your recovery partition will become inoperable." Therefore, if you have a Windows 7 or 8 recovery partition, be sure to create recovery media before the upgrade, just in case. If you have physical media that came with your PC you can also use that.

4. Isn't there an easier way to go back to my old OS?

Not anymore, there isn't. There was a period during the "free upgrade" era when Microsoft allowed people to try Windows 10 for 31 days and go back if they were unhappy, but that window has closed. So for now you're stuck with it.

Get more Edge extensions by installing beta versions

BY IAN PAUL

MICROSOFT IS MAKING a really weird choice with Edge extensions (go.pcworld.com/edgeext) right now. The company is testing new additions within the Windows Insider program before releasing the extensions to mainstream Windows users. That means new extensions are slow to come to the Windows Store. Hopefully, this is

only a short-term strategy for Microsoft as it figures out how make extensions work in Edge.

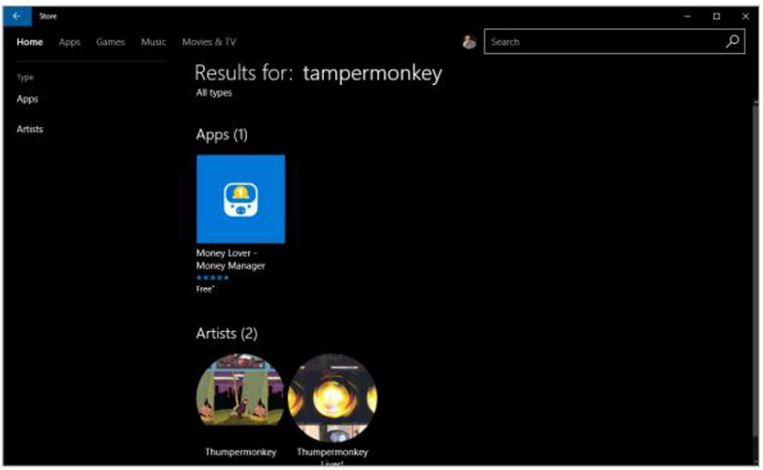
Nevertheless, you can still install unreleased Edge extensions, as long as you can get them to open in the Store. Recently, I installed Tampermonkey and Turn off the Lights in Edge even though they're not officially available in the Windows Store.

If you're not familiar with them, Tampermonkey is a popular user script extension that can add unofficial features or different looks to websites. You can use Tampermonkey to add a black theme for Facebook, for example, or remove "soft" paywalls on certain news websites. Turn off the Lights, meanwhile, dims extraneous parts of a website like YouTube or Vimeo when you're not viewing a video in full-screen mode.

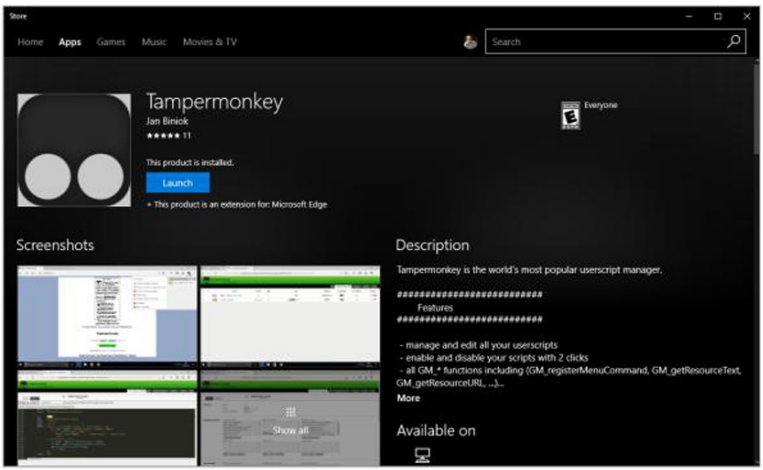
How it works

Before we get into the details, keep in mind that these new Edge extensions in the Insider program are still in beta mode, so they may be missing features or capabilities. Let's dive in, using Tampermonkey as our example.

If you search for Tampermonkey in the Windows Store, you'll notice that the store doesn't bring up any results.



No visible way to find Tampermonkey in the Windows Store.

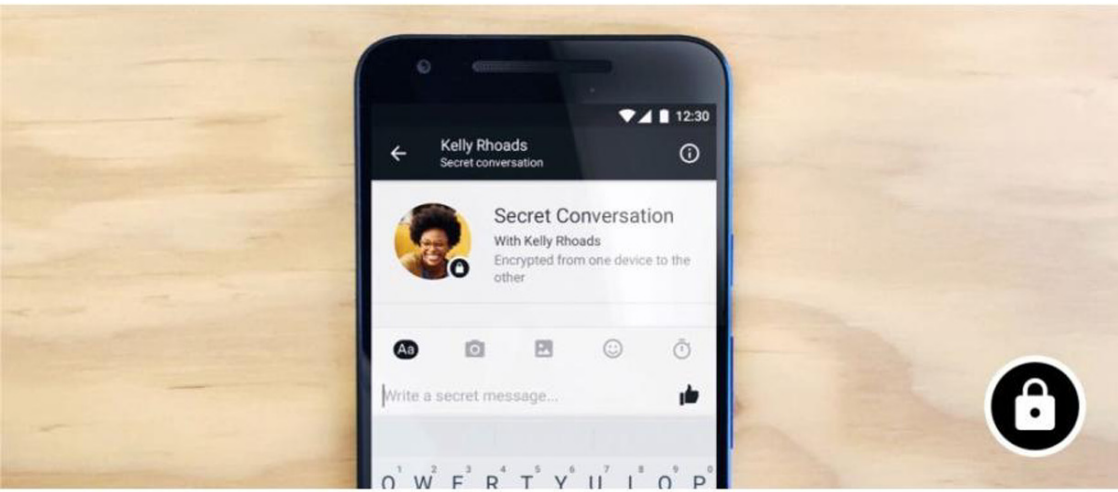


Tampermonkey in the Windows Store in build 14393.

However, if you follow this link to Tampermonkey (go.pcworld.com/tampermonkey) in the Windows Store, it will bring you to the Tampermonkey page in your browser, and then the Windows Store app should open automatically.

TIP: This won't work if you've disabled the ability for links to the Windows Store to automatically open the Windows Store app.

Once the Store is open, you will probably have to wait longer than usual for the Install button to show up. After you see it, however, you can download and install Tampermonkey just like any other Edge extension.



How to encrypt your Facebook messages with Secret Conversations

BY IAN PAUL

GOOD NEWS, PRIVACY enthusiasts: Facebook's one-on-one encrypted messaging feature called Secret Conversations (go.pcworld.com/fbsecretconv) is now live for all Android and iOS users.

Secret Conversations allows Messenger users to send end-to-end encrypted messages to their Facebook friends. There are a few caveats, however. First, it only works on a single device. Facebook says it doesn't have the infrastructure in place to distribute encryption keys across your phone, tablet, and PCs.

You also have to explicitly start a Secret Conversation in Messenger. Encryption isn't the default mode, and encrypted messages are not

integrated into the primary thread of your conversations with a given contact.

In other words, if Alice and Bob have been chatting for years on Messenger, they'll have to start a separate encrypted thread, and that encrypted thread will never integrate with their original, unencrypted thread.

That approach is very unlike what Facebook-owned WhatsApp is doing. The popular messaging platform automatically encrypts messages for all users if they have an encryption-compatible version of WhatsApp on their phone.

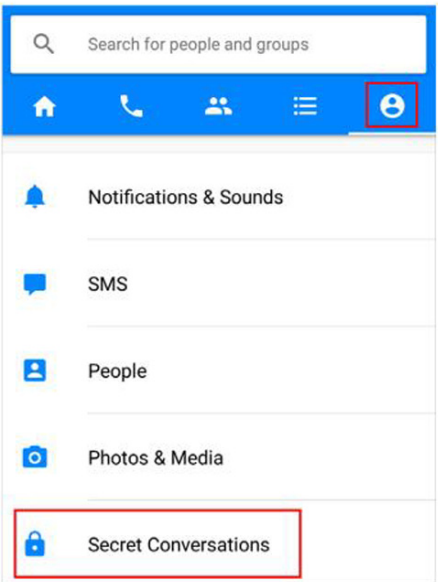
The final caveat for Facebook Messenger is that encrypted messaging only works in one-to-one messaging. Group conversations are not included in Secret Conversations.

A beta version of Secret Conversations on iOS.

Now that we've got the preamble out of the way, here's how to use Secret Conversations. For our example, we're using Messenger for Android but Messenger on iOS works similarly.

How to use Secret Conversations

From the Messenger landing page, tap on your profile section, which is the person icon on the upper right of the screen. Scroll down until you see Secret Conversations and tap it. On the next screen, make sure the Secret Conversations slider is activated. Once it is, Secret Conversations



are enabled for your device.

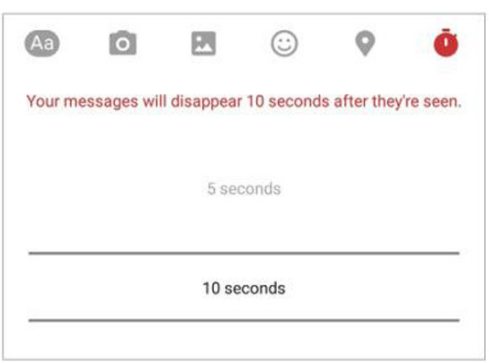
There are two ways to start an encrypted conversation in Messenger. The first is to create a new message as you usually do. Right at the top of the message-creation screen you'll see a lock icon next to a slider button. Click that and the screen theme changes color from blue to black. Now, choose the contact you want to start an encrypted conversation with, and you're on your way.

After you send an encrypted message the person receiving it will have to agree to use the Secret Conversations feature. Once they do, they'll see your message.

The second way is to initiate an encrypted conversation from a pre-existing message thread. Tap the *i* icon in the top right-hand corner of the message thread, and on the next screen tap Secret Conversation. The screen will turn to a black theme again, and you're good to go.

To view an open secret conversation thread just choose it from the list of open message threads on the main screen of the app.

Secret Conversations work almost like regular Facebook messages but not



Secret Conversations has a self-destruct setting.

quite. You can send text, emoji, stickers, and pictures; however, gifs, videos, voice calling, and payments are not supported.

Secret Conversations also offers a Snapchat-style self-destruct setting that you can adjust on a per-conversation basis. Open a secret conversation and then tap the stopwatch icon on the far right of the text entry area. This lets you set how long your messages remain visible on the other person's device once they're read. You can let them last from 5 seconds to one day, or turn off the self-destruct setting altogether.

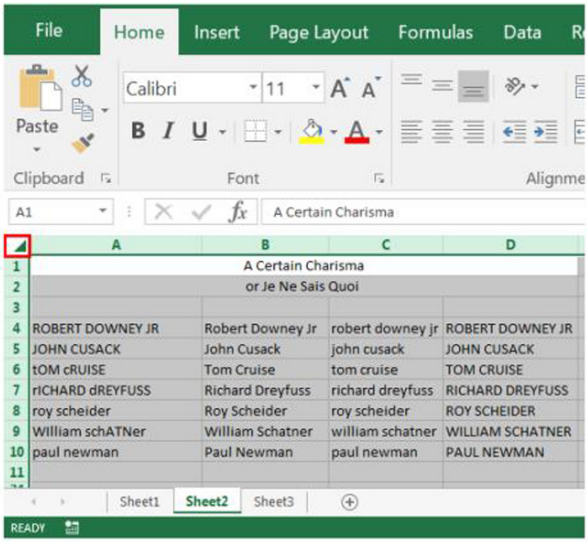
That's about all there is to the new Secret Conversations feature. You can use it as the standard way you talk to people on Messenger—though that's a conscious choice you'll have to make every time you start a new message thread—or just use it for sensitive topics.

Excel tips: 6 slick shortcuts, handy functions, and random-number generators

BY JD SARTAIN

SIMPLER AND FASTER is always better in Excel. We start with some of my favorite shortcuts, then move on to using Excel for everyday situations such as finding random numbers for passwords, or random numbers within a range, or discovering how much your monthly payments will be for a car or home loan.

1. Shortcut: Select the entire spreadsheet

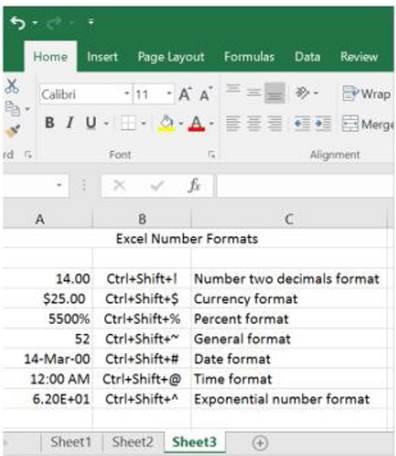


Everyone knows that Ctrl+A selects the entire spreadsheet, document, email, etc. In Excel, however, there's an even faster way: Click the small green arrow in the square space between the row numbers and column letters.

2. Shortcut: Number formats

Which is faster—the mouse or the keyboard? Those who use both work faster than either one or the other alone. Try these shortcuts: After you enter a number or column of numbers, highlight the target cells and press:

Ctrl+Shift+! (exclamation point) to display the Number format with two decimal points,



Ctrl+Shift+$ (dollar sign) to format the selected cells as currency,

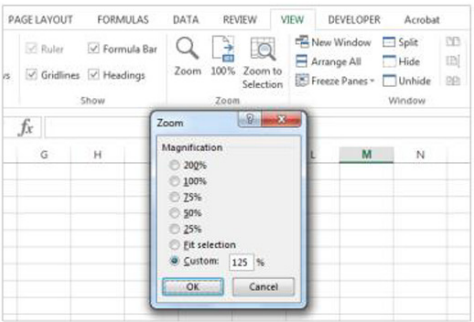
Ctrl+Shift+% (percent sign) to format as percentages,

Ctrl+Shift+~ (tilde) for the General format,

Ctrl+Shift+# (pound sign) for the Date format,

Ctrl+Shift+@ (at sign) for the Time format, and

Ctrl+Shift+^ (caret) for the Exponential number format.



3. Shortcut: Quick Zoom

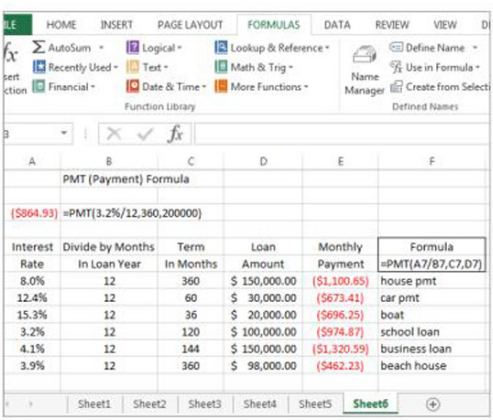
If you want to zoom in or out of your spreadsheet, you have to perform several steps: First select the View tab, then select the Zoom button in the Zoom group, then select a Zoom Magnification from the Zoom dialog box (or click Custom and type a Zoom Magnification size in the field box), then click OK. Whew!

How about this simple shortcut instead: Hold down the Ctrl key and roll the mouse's scroll wheel forward to zoom in or backward to zoom out. Easy.

Note: This shortcut also works in Word, Outlook, PowerPoint, Windows, and web browsers (i.e., Internet Explorer, Chrome, Mozilla Firefox, etc.).

4. The PMT function

Ever wonder how much your house or car payment would be for a specified loan amount? Imagine having the tools to determine if you can afford a Prius or a Camry; a house or a condo? Say, for example, the house cost $200,000 for a 30-year loan at 3.2% interest? Use the PMT formula to find out. In cell A3, enter this formula: **`=PMT(3.2%/12,360,200000)`**.



Use the PMT function to calculate loan payments.

Note the answer is ($864.93). Why is it displayed as a negative number? Because it represents money that you pay out (as opposed to money you receive).

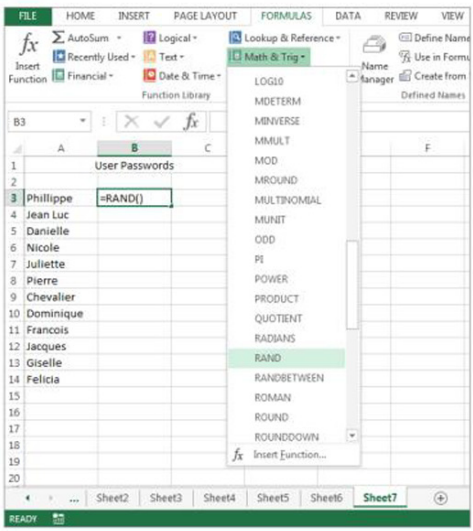
Now, instead of piling all the information into a single formula, place the data into separate cells so you can change the numbers and play around with the payment amounts. For example, enter the following field names in columns A, B, C, D, and E: Interest Rate, Divide by Months In the Loan Year, Term (in Months), Loan Amount, and Payment.

Now enter some data into these fields; for example: in A7 enter the current market interest rate. Next (in B7), if the rate is per year (which is almost always), enter 12 (for 12 months in the year). In column C, enter the term or length of the loan (in months, not years). Last, enter the loan amount in D7. Then enter this formula in the Payment field (E7): **`=PMT(A7/B7,C7,D7)`**. The answer is ($1100.65).

Now you can change the values in A7 through D7 (or copy the information down) and enter different interest rates, loan amounts, and terms to find out how much the payments are for your next house, car, boat, or any other loan.

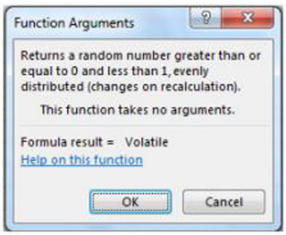
5. The RAND function

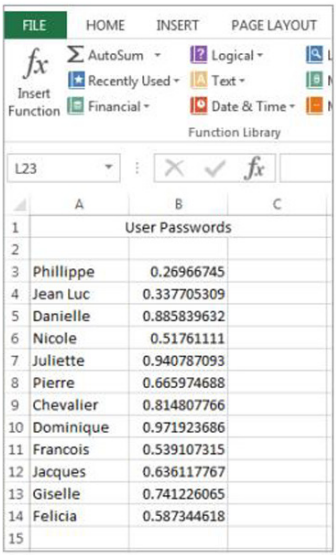
If you're one of those disciplined few who changes your password every week or month, or you manage the passwords of users on a network; the RAND function is your best friend because the numbers really are random. You can create a list in Excel, use this function to create the passwords, then pass them out to your staff. And because Excel recalculates formulas every time you press the Enter key and every time you save and exit, the numbers will never be saved anywhere.



Note: RAND numbers are between 0

and 1. You can remove the preceding decimal for your passwords.



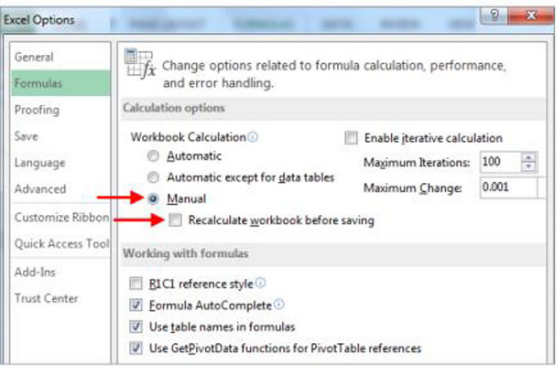


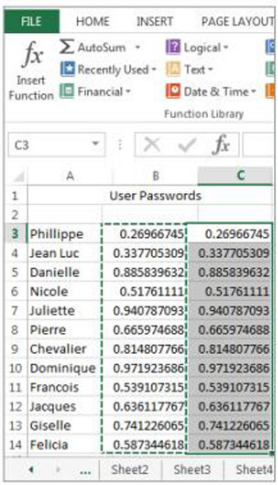
	A	B	C
1	User Passwords		
2			
3	Phillippe	0.26966745	
4	Jean Luc	0.337705309	
5	Danielle	0.885839632	
6	Nicole	0.51761111	
7	Juliette	0.940787093	
8	Pierre	0.665974688	
9	Chevalier	0.814807766	
10	Dominique	0.971923686	
11	Francois	0.539107315	
12	Jacques	0.636117767	
13	Giselle	0.741226065	
14	Felicia	0.587344618	
15			

Enter 12 names in cells A3 through A14. Move your cursor to cell B3. Go to Formulas > Function Library > Math & Trig, and select the RAND function from the drop-down menu. Note the dialog box says "This function takes no arguments." That means you don't have to do anything except click OK. Copy the function from B3 down to B14. Notice that every time you press Enter, the numbers change.

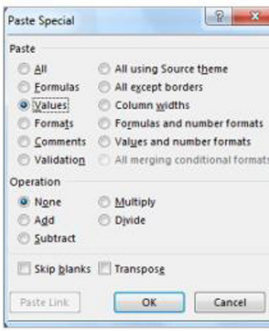
To keep a record of the random numbers, use the VALUE() command or Copy > Paste > Paste Values to create a static list of the numbers in column B. However, you must first turn off the Auto Calculation (set it to Manual), or the random numbers/passwords will change the second you press Enter.

To change Auto-Calc to Manual, select File > Options > Formulas. At the top of the screen under Calculate Options, check Manual and





	A	B	C
1	User Passwords		
2			
3	Phillippe	0.26966745	0.26966745
4	Jean Luc	0.337705309	0.337705309
5	Danielle	0.885839632	0.885839632
6	Nicole	0.51761111	0.51761111
7	Juliette	0.940787093	0.940787093
8	Pierre	0.665974688	0.665974688
9	Chevalier	0.814807766	0.814807766
10	Dominique	0.971923686	0.971923686
11	Francois	0.539107315	0.539107315
12	Jacques	0.636117767	0.636117767
13	Giselle	0.741226065	0.741226065
14	Felicia	0.587344618	0.587344618



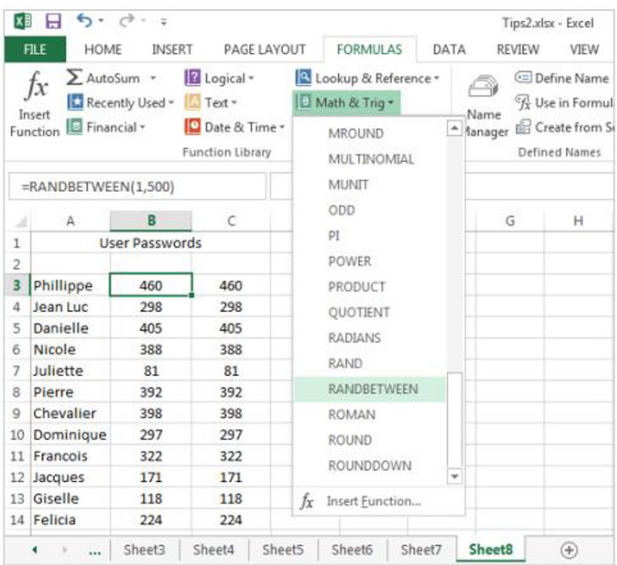
uncheck Recalculate Workbook Before Saving. Now you can copy the random numbers/passwords in column A to column B. Highlight A3 through A14. Type **Ctrl+C** for Copy. Move to B3 and select Paste Special from the Home tab's Clipboard group. Then check Values in the Paste Special dialog box and click OK. Now you have a copy of the random numbers in column A.

Press F9 to recalculate the spreadsheet while in Manual Calc mode, or you can change the Manual Calc back to Auto Calc.

Note: The Option settings are based on the spreadsheets that are open at the time. In other words, if you open a Manual Calc spreadsheet first, the Options will still be set to Manual Calc. Any other spreadsheets you open (at the same time) will also be set to Manual Calc. But if you open a new, blank spreadsheet (or another Auto Calc spreadsheet) first, where the default Auto Calc is set in the Options, all other spreadsheets you open simultaneously (even this one) will be set to Auto Calc.

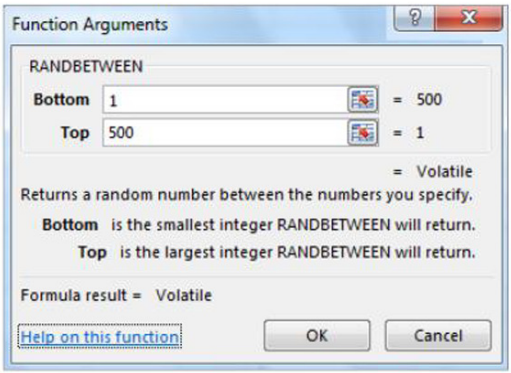
6. The RANDBETWEEN function

The RANDBETWEEN function is just like the RAND function, except you get to choose the range of numbers—for example, between 1 and 500, or 10 and 1,000. Once you remove the decimals in the RAND command, the random numbers created are good for most all situations. But if you specifically want four-digit or six-digit numbers only, use RANDBETWEEN and choose a range of numbers



that fall into that requirement.

Note: The same rules apply for Manual Calc and using Copy > Paste > Paste Values to make a copy of the random numbers before they change again.



Use the same names as in the previous spreadsheet (on cells A3 through A14). In cell B3, select the RANDBETWEEN function from Formulas > Function Library > Math & Trig. In the Function Arguments dialog box, enter the bottom (lowest) number of your range and a top (highest) number of your range, then click OK. Copy the formula from B3 down through B14, then press F9 so the formula calculates. Then move to C3 and Copy > Paste > Paste Values.

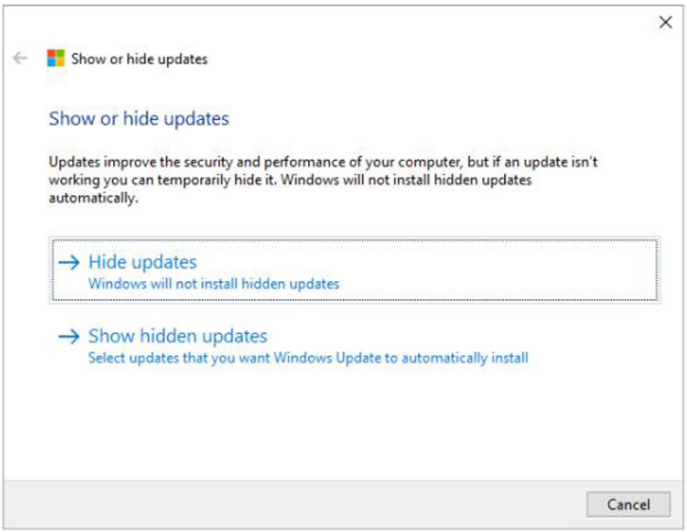
How to stop failing Windows Updates from bothering you

THERE'S A BUG going around that's affecting some Windows 10 Anniversary Update users (including me), making it impossible to install update KB3194496 (go.pcworld.com/kb3194496) from September. Microsoft says it's working on a fix that will roll out soon. Until then, I'm stuck as Windows will try and download and install the update every time I want to reboot or shut down my laptop.

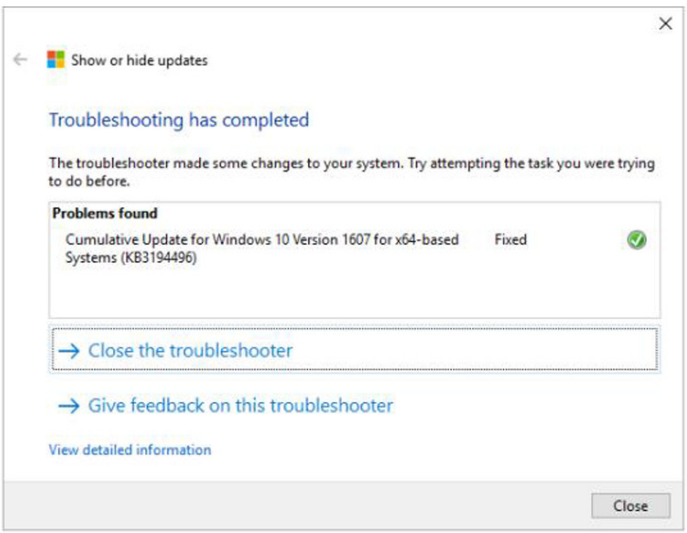
Luckily, there's an easy way to hide that Windows update (go.pcworld.com/w10blockupdate) until Microsoft gets its act together.

First download the Show or hide updates troubleshooter (go.pcworld.com/w10blockdriver) from Microsoft. Note there are special

versions for Windows 10 pre- and post-Windows Update. The download is a DIAGACAB file, which Microsoft uses for its troubleshooting programs. Just click on the file as you would with any other program you're trying to launch.



In a few seconds, it should be ready to go, and you'll see a welcome screen. Click *Next*. The troubleshooter will now scan for updates that you can suppress. This may take some time so be patient. Once it's ready to go, click Hide updates.

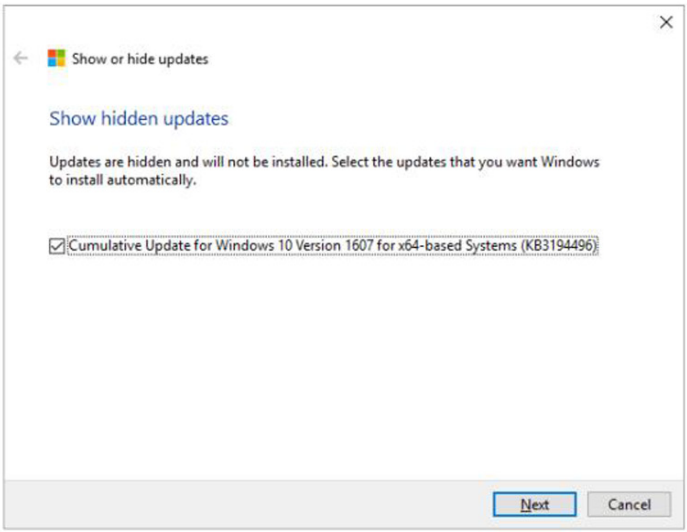


Now you'll land on a screen that lists all the possible updates you can hide. In my case, I needed to scroll down all the way to the bottom to find the troublesome KB number. Click the checkbox next to the troublesome update and then click Next.

You'll return to a screen that's similar to what we saw earlier, as the

troubleshooter attempts to solve the problem for you.

If all goes according to plan, the final screen should look like the screen on the previous page. To get out of the troubleshooter, close the window or click Close at the bottom.



Now you can restart or shut down your PC without going through a pointless update process. Note that because you've hidden the update, you'll also have to keep an eye on Windows news to see when Microsoft fixes the problem. At that point you may have to stop hiding your update.

To do that, go back to one of the first troubleshooter screens that has two options: Hide Updates and Show Hidden Updates.

Select the latter, and you'll be shown all your hidden updates. Click the checkbox next to the one you no longer want to hide, click Next, and then wait for the troubleshooter to finish. Once again you'll be taken to a screen confirming the issue was "fixed" as we saw in the final step for hiding an update.

That's how you can hide and later reveal problematic Windows 10 updates.

If Microsoft's troubleshooter doesn't solve your problem, check out our tutorial on how to troubleshoot Windows 10 update problems (go.pcworld.com/w10updprob).

PCWorld digital edition

With our Digital All-Access Pass, you can read PCWorld on all your devices.

All-Access Pass for only
$19.97 a year

Get it here: go.pcworld.com/digital

How to know when your SSD could die

JEFF WANTED TO know whether his SSD was "okay" or whether he should back it up, or if it's somehow different from a hard drive.

SSDs are fundamentally different from hard drives, and they can, in fact, die in one of two ways. In this column I'll explain this difference, how SSDs can die, and how you can check yours to make sure it still has plenty of life.

The main difference between hard drives and SSDs is this: The area of a hard drive that can hold data can be rewritten as many times as is needed, and will always be usable as long as the drive is functioning (bad sectors aside). This is not the case with SSDs: Each cell that holds data can only be written to, or programmed, a finite number of times before it is effectively dead. That's because every time a write operation needs to be performed, any data in the cell has to be erased before it's used. This process of writing/erasing/rewriting essentially

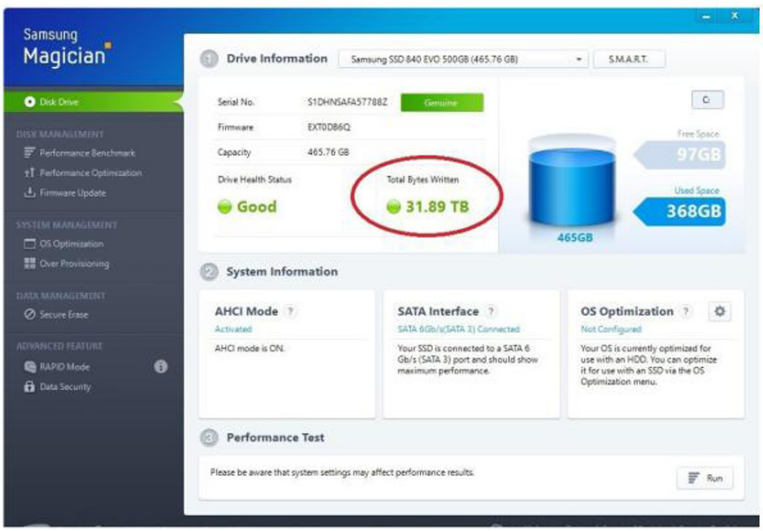
causes wear and tear on the cells and erosion of the insulator between cells. Eventually individual cells can no longer hold a charge.

Different types of flash memory have different life cycles depending on how many bits there are per cell. Fewer bits equal fewer problems over time, and more bits cause more issues.

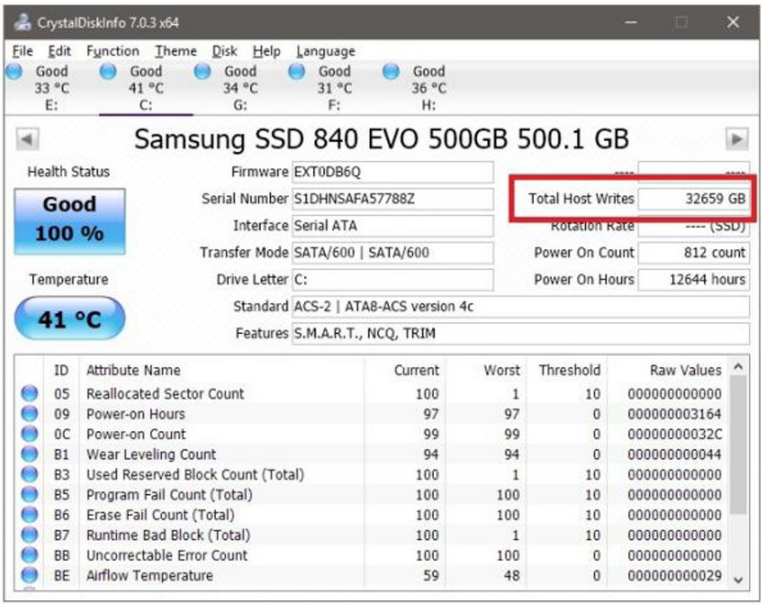
The most common form of flash in SSDs is called MLC, which stands for Multi-Level Cell. This means each cell can hold two bits of data, and this type of flash, generally speaking, can handle 3,000 or so cycles of erasing the cells and reprogramming them.

More recently, SSD manufacturers are using a type of flash called TLC, which stands for Triple-Level Cell (go.pcworld.com/flashtlc). This adds one more bit to each cell, thus improving density—but at the cost of endurance. This type of flash can generally withstand 1,000 cycles, or about one-third the endurance of MLC. Note, too, that I'm talking two-dimensional or planar flash, not 3D NAND (go.pcworld.com/3dnand2tb), which is a whole different animal that I won't get into here.

All this means is your SSD has a finite lifespan, usually measured in "terabytes written" (TBW). Manufacturers don't often quote these numbers, and your SSD might die way before it hits this magic number,



Most SSD software will tell you the terabytes written (TBW).



Crystal Disk Info can tell you how much data has been written to your SSD.

or long afterward, depending on a multitude of factors.

For example, Samsung lists 150 TBW as the endurance figure (go.pcworld.com/samsung850evo) for its 850 EVO SSDs. For most SSDs it's somewhere between 75 and 150 TBW.

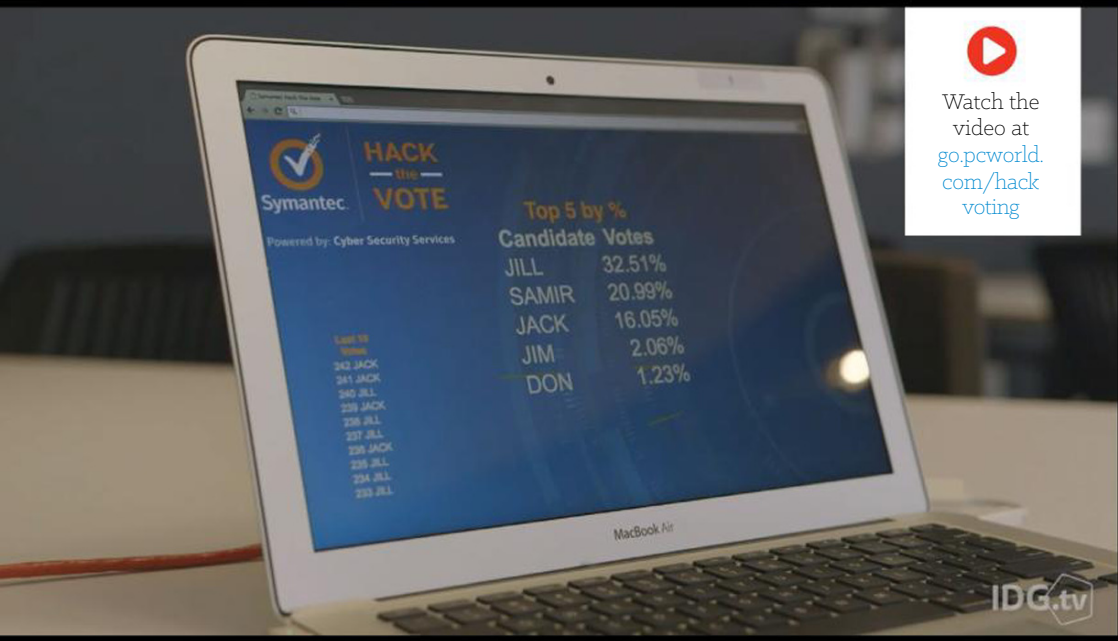
Most SSDs include software that will tell you how much data has been written to your drive. For my Samsung SSD it's right out in the open on the main page of its SSD Magician (go.pcworld.com/samsungssdtools) software.

That's my two-year old SSD, and so far I've written almost 32TB. If that number were higher, like 60TB, I'd be concerned, but apparently my drive has plenty of life left. I still have a backup of it, though, as you should (not of my drive, but of yours).

Different brands of SSDs offer their own utilities. Here are links for Crucial (go.pcworld.com/crucialssdtool), SanDisk (go.pcworld.com/sandiskssdtool), and Intel (go.pcworld.com/intelssdtool). You can also use the third-party Crystal Disk Info (go.pcworld.com/crystalmarkinfo)—as you can see on the screenshot above.

Tech Spotlight

A video showcase of the latest trends



Watch the video at go.pcworld.com/hack voting

Demo: **Hacking a voting machine**

» Hack the election? Sure. Symantec shows us exactly what to do: Shop for used election hardware online. Confuse the machine into letting you vote multiple times. Now do that for every voting machine in your precinct without getting caught.