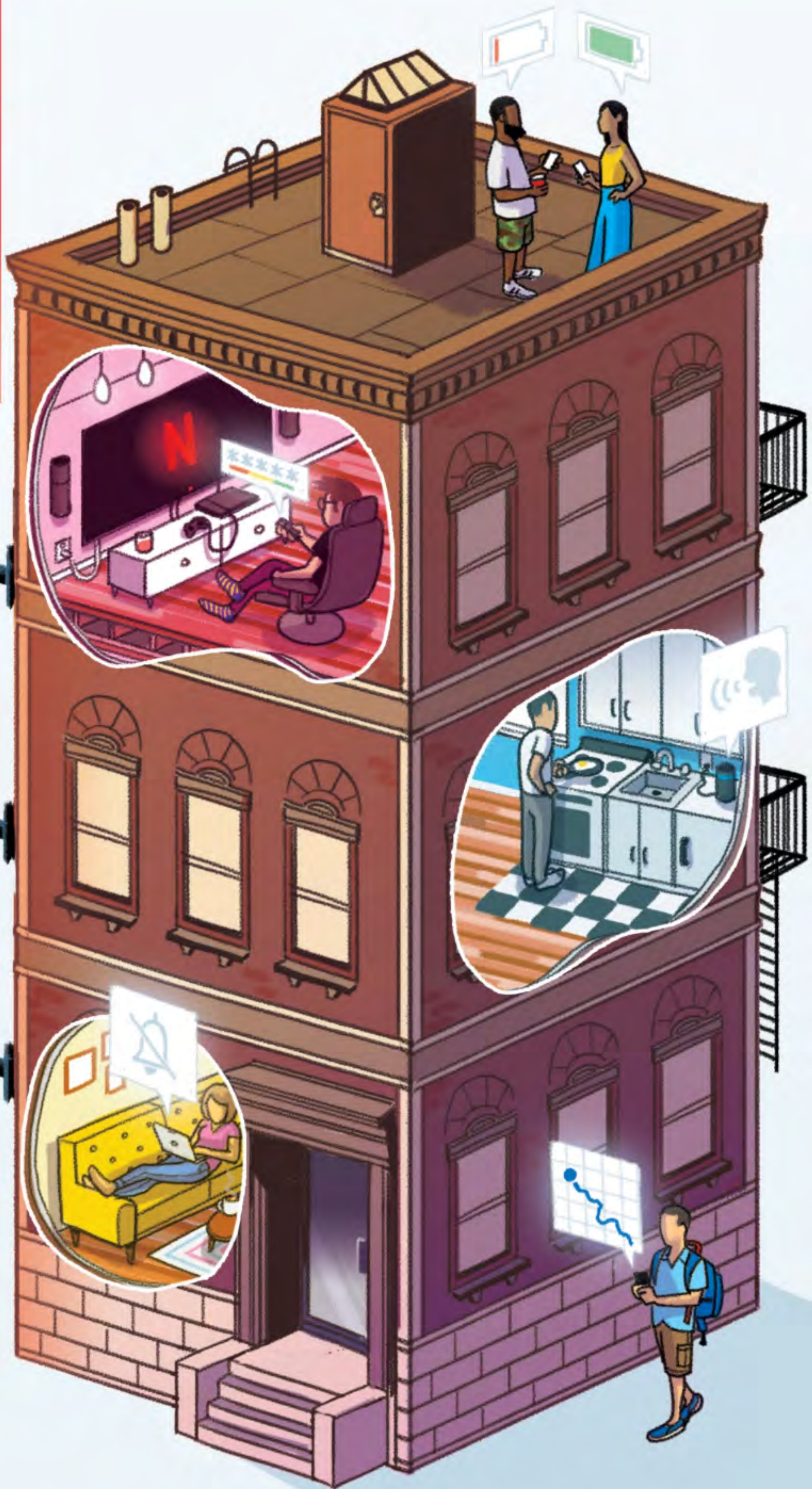


# PC

MACHINE

OUR EDITORS' FAVORITE

TECHTIPS



**COVER STORY**

**OUR EDITORS' FAVORITE TECH TIPS**

From the simple to the very specific, these gems will come in handy for everyone!



**FEATURES**

**AFROTECH FOCUSES ON ENTREPRENEURS WITH A DIFFERENT STORY TO TELL**

It's the biggest black tech conference in the nation, according to founders.



## WHAT'S NEW NOW



### **THE BEST OF IFA 2019**

We saw lots of noteworthy new tech at IFA, Europe's answer to CES.

### **HANDS ON: EA'S PROJECT ATLAS CLOUD GAMING SERVICE**

We tried EA's cloud gaming service on a variety of devices, including laptops, a TV connected to an Amazon Fire TV Stick, and an Android tablet.

### **HANDS ON: HP'S ELITE DRAGONFLY IS AN ABSURDLY LIGHT LAPTOP FOR HIGH-FLIERS**

An enterprise-minded 2-in-1 decked out in magnesium blue alloy and weighing just 2.2 pounds? Yes, please.



# REVIEWS

## CONSUMER ELECTRONICS

**Fibit Versa 2**

**Samsung Galaxy Note 10+**

**Roundup: Best Smart Displays**

## HARDWARE

**Panasonic Toughbook 55**

**Razer Blade 15 Advanced Model**

**Intel Core i9-9900K**

## SOFTWARE & APPS

**Apple Music**

**Keeper Password Manager & Digital Vault**



Samsung Galaxy Note 10+



Razer Blade 15

Apple Music



## OPINIONS

**CAROL MANGIS**

First Word

**READER INPUT**

**ADAM SMITH**

'I Agree to the Terms and Conditions:' One of the Largest Lies in Tech

**MAX EDDY**

Scammers Go Phishing With Deepfakes

**BEN DICKSON**

Keep Your Bitcoin Safe



**One of the biggest upgrades this year is to the iPhone cameras. That is, indeed, cameras plural.**



**CHANDRA STEELE**

The Why Axis

## TIPS & HOW TOS



### **HOW TO STAY ANONYMOUS ONLINE**

You won't have to ditch the internet entirely.

### **HOW TO KILL EMAIL WITH THE RIGHT PROJECT MANAGEMENT SOFTWARE**

Improve communication, too.

### **A BEGINNER'S GUIDE TO BITTORRENT**

How to use it and stay safe.



## Living your Best Tech Life

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**W**hen you work for a tech publication, word gets around. My family and friends ask me everything from “Should I upgrade my iPhone?” and “How do I keep my data from being stolen?” to “What on earth is 5G?” They know that even if I’m not sure of the answer, I’ll know someone who is. That’s because I’ve been at PCMag for most of the past 21 years.

In fact, I’m starting to think I have a geeky aura of some sort. At a bus stop the other day, an older woman without her phone saw me looking at mine and asked, “What time does your app say the number 10 will get here?” How did she know?! We spent the bus ride talking about various useful apps; she took some notes.

I’m not alone; just about everyone I work with is considered a tech guru by the people in their lives. And we’re all happy to share what we know. In fact, that’s what gave birth to the concept for this issue: We quizzed PCMag staffers about their several favorite tech tips, and here, we present them to you. Some of them directly relate to what the tipster does at PCMag, but a lot of them don’t: They’re gems we’ve discovered just by being around PC Labs and a lot of very smart people.

I didn’t include my own tips in the story (too busy editing them!), but I’ll sneak in a kind of wordy one here: Today’s technology is wonderful, invaluable, and sometimes nearly miraculous. But bear in mind that it can also be dangerous and

@cmangis

damaging when you don't handle it correctly or ethically, or understand its full effects—think social media trolling, ransomware scams, AI bias, and so on. In the end, tech is a tool. Use it. Don't let it use you.

*carol\_mangis@pcmag.com*



## Violence and Culture

Will Greenwald's column, "No, Video Games Are Not a Factor in Mass Shootings," started a heated conversation on our website, and lots of readers weighed in. All we can say about this sad debate is that we wish it didn't have to happen.

When I was young, every murder committed by a teen or young adult was blamed on Dungeons & Dragons. Now it is video games. There was no proof D&D was a cause of violence, nor are video games today. The same violent games are being played worldwide, and only in this country, where getting military-grade weaponry is easier than buying a car, does this happen. When you are being paid by the NRA to support the sales of guns, will you make up excuses to keep the cash rolling in? Now that the NRA is near-bankrupt, maybe things will change.

—*Thomas Kolakowski*

In my teens, I played many FPS [games], starting with Wolfenstein, Doom, and Rise of the Triad (ROTT). I remember playing ROTT for hours. I immersed myself into ROTT [to the point that when] walking down the road, I imagined firing the weapon on groups of people from the game! If that pixellated crap (by today's standard) could cause me to do this in the 1990s, just imagine today! To suggest that there is no correlation between these games and any shooting is dishonest... just as it is to suggest no correlation [between] gun ownership and shootings. The factors are many, and this cannot be ruled out as a potential cause.

—*Rohan Dixon*

Something is happening; kids are staying indoors, they are not socializing and building a sense of community. Instead, they're playing video games, on their phones, watching movies. Violence is



everywhere—the news, TV, video games, YouTube. You can't avoid it like you could in the past... We need to keep an open mind, not jump to any conclusions but realize that we don't know what role video games play. There may be a direct or indirect effect on a minuscule percentage of the population.

—*C.E. Barnes*

The comments here are predictably depressing. When it comes to guns, lots of people on the internet can never accept that a profusion of guns leads to an increase in gun deaths. The evidence is rock-solid, but it doesn't matter. Any evidence is "liberal bias," and the real problem is whatever made-up, evidence-free thought experiment is popular in conservative media.

—*Joel Hardman*

Well, I don't live in Japan, Germany or any of the other countries mentioned. But my sense is that our news media has an effect on the violence. They can't stop themselves from sensationalizing every evil that occurs. Sensationalize, restate, over and over and over. It sells commercials and it gets people riled up. Including goofballs, extremists, and the mentally ill.

—*njwhite2*

The idea that video games cause murder and mayhem is a trope—a recycled one. Before that, it was movies; before that, books and comics... America has a smaller video game community than many other first-world countries, including the UK, which is as culturally similar as you can get, and Japan, which is culturally different. Most other first-world countries have similar hobbies to ours. Psychological studies show levels of serious insanity to be very consistent across nation-states and cultures—so it is a stable characteristic, not a variable. Yet levels of gun violence and levels of murder are much higher here than anywhere else. To attempt to find some way to explain that away when looking at similar groups but getting different results is academically dishonest.

—*Reyn*



## Ask us a question

Have a question about a story in *PC Magazine*, one of the products we cover, or how to better use a tech product you own? Email us at [letters@pcmag.com](mailto:letters@pcmag.com) and we'll respond to your question here. Questions may be edited slightly for content and clarity.

# The Best of IFA 2019

BY PCMAG STAFF



**A** new September means a new IFA trade show in Berlin, where we get our annual taste of consumer tech coming to Europe and other parts of the world in the near (well, sometimes distant) future.

If the products we saw at this year's show share a common theme, it's one of refinement. Samsung's big announcement, the Galaxy Fold, is actually its second attempt to launch the phone after a botched rollout earlier this year. Similarly, LG's foldable G8X ThinQ can be seen as a more polished take on the V50 Dual Screen. The trend doesn't stop at smartphones: Lenovo's new Smart Display 7 is a much more functional update to last year's 8- and 10-inch models, and the "Ice Lake"-powered Razer Blade Stealth has finally come into its own as a legitimate gaming machine.

So while we may not have seen the most innovative new products this year, there's nothing wrong with a bit of fine-tuning. And it certainly didn't stop us from walking away from many booths on the show floor impressed.

## BEST PHONE

### The LG G8X ThinQ

Ready for your first folding smartphone? Although Samsung has made major improvements to the Galaxy Fold since it was initially released with disastrous results earlier this year, it's still a first-generation handset. The LG G8X ThinQ is actually LG's second folding phone for 2019, so the company has been able to work out many of the issues with its first attempt, the V50 Dual Screen. With flagship-quality hardware and a completely redesigned UI, the G8X has what it takes to compete with the top phones on the market. And the option to remove the second display when you don't need it makes the G8X ThinQ the most practical folding phone you'll find.—*Steven Winkelman*

## BEST TABLET

### Yoga Smart Tab

Fans of Android tablets will want to give the Yoga Smart Tab a look. With Google Assistant integration and an ambient mode that's triggered when the kickstand is open, it can easily do double duty as a smart display. And at \$249, it costs less than the entry-level iPad (\$329).—*SW*





## BEST LAPTOP

### **Asus ProArt StudioBook One**

Asus surprised us with the ProArt StudioBook One, which could very well be the ultimate content-creation laptop. It uses 9th Generation Intel Core i9 processors and is the first laptop to feature Nvidia's new, top-end mobile GPU for content creators, the GeForce Quadro RTX 6000. The 4K display features a 120Hz refresh rate and claims some serious color-accuracy cred: According to Asus, it can show the entire Adobe RGB gamut with a delta-E rating of less than 1. That should be music to the ears of creators engaged in precision graphics work.

It's sure to be one of the most powerful non-gaming laptops on the market and was definitely the most powerful one at this year's show. Perhaps the only missing feature is a touchpad that doubles as a second screen, which is available on the other, less powerful workstation that Asus announced, the new ProArt StudioBook Pro X.—*Tom Brant*

## BEST GAMING PC

### **Razer Blade Stealth (GTX 1650)**

Although the Blade 15 is Razer's true flagship gaming laptop, the updates to the company's Blade Stealth ultraportable make this 13-incher a legitimately capable gaming machine. The big change? The midrange (\$1,799) and top-end (\$1,999) models come with an Nvidia GeForce GTX 1650—not a barn-burner of a GPU but enough to run big-budget titles at smooth frame rates. For a laptop of this size, that's impressive, and it keeps the slim, premium build we've come to expect from Blade models. Add in Intel's latest (and still rarely seen) 10nm Ice Lake CPU, and we've got a potential portable-gaming winner on our hands.—*Matthew Buzzi*

## BEST STORAGE

### WD Black P50 Game Drive SSD

Western Digital used IFA to unveil its redesigned My Passport drives—its mainstream-staple backup portable hard drives that are now available in capacities up to 5TB. But more interesting is the company's new line of external WD Black models. Black is the company's performance line, and the P50 Game Drive SSD addresses an emerging market: PC gamers short on drive space for today's huge installs but used to SSD speeds for level loads and other in-game waiting periods. Those folks are increasingly seeing the 256GB or 512GB SSDs on their gaming laptops quickly eroded by 50GB install folders for single titles.

The WD Black P50 comes in 500GB, 1TB, and 2TB flavors and supports the confusingly named USB 3.2 Gen 2x2, for peak transfer rates of 20GBps. Pricing and availability are to come on the P50, which also sports a nifty industrial cargo-container look. The company also announced hard-drive-based versions in both portable and desktop form factors, each in separate versions for PCs and the Xbox One.—*John Burek*



## BEST DISPLAY

### Asus ProArt PA32UCG

Asus took aim at Apple this year with the introduction of its new ProArt PA32UCG professional monitor. Marketed at the creative set but fast enough to appeal those who game at night, the ProArt features a bright 1600-nit, 32-inch panel with support for HDR content. But that's where the similarities between it and the Apple Pro Display XDR end. Where the Pro Display is 6K, the ProArt is 4K; but while the Pro Display tops out at a 60Hz refresh rate, the PA32UCG achieves a maximum variable refresh of 120Hz. Other aspects are cutting-edge: a 10-bit IPS panel using mini-LED backlighting, support for HDR10, and the option for Thunderbolt 3 input.—*Chris Stobing*

## BEST PC COMPONENT

### Nvidia Quadro RTX 6000 Mobile

This year, Nvidia unveiled its newest top-end rendering and workstation GPU for mobile, the Quadro RTX 6000, leaving more than a few folks wondering: Do I need a desktop to create, anymore? This new laptop version of the Quadro RTX 6000 is barely a step down from its discrete-card cousin, according to Nvidia's specs unveiled at IFA: The basic ones are the same outside of power draw (295 watts in the desktop version versus 250 watts in the mobile chip), and maximum TFLOPs (14.9 TFLOPS in mobile against 16.3 in desktop).

The chip will make its debut in a handful of Nvidia Studio laptops, among them the new Asus ProArt StudioBook One (also a Best of IFA winner), an absolute powerhouse of a machine that features the world's first laptop-based 4K 120Hz screen. Both the ProArt StudioBook One and the mobile Quadro RTX 6000 will be available in October of 2019; pricing hasn't been announced yet.—*CS*



## BEST SMARTWATCH

### Garmin Venu

The Apple Watch might have a new competitor in the Garmin Venu. At \$399.99, Garmin's high-end smartwatch features a stunning 1.2-inch AMOLED touch display that can last up to five days on a single charge. Its fitness features go far beyond the basics to track respiration, hydration, and sweat loss estimation. With a sleek design that comes in a variety of color combinations, it's a watch you'll actually want to wear every day, too.—*Brenda Stolyar*



## BEST FITNESS TRACKER

### Asus VivoWatch SP

The Asus VivoWatch SP goes deeper than your average fitness tracker. Tucked into the sides of the case are two sensors that measure ECG and PPG with the touch of a finger. And in addition to your heart rate, it tracks autonomic nervous activity index, pulse O2 levels, and stress, and it comes with GPS and an altimeter to track workouts and stats such as speed, duration, distance and more. Even with all these sensors and features, it boasts an impressive 14 days' worth of battery life.—*BS*

## BEST SMART HOME DEVICE

### Lenovo Smart Display 7

With a cleaner, more modern design than last year's 8- and 10-inch models, the Lenovo Smart Display 7 is a product you'll actually want to show off in your house. Thanks to its reduced footprint, it's compact enough to place on the kitchen counter or nightstand without taking up too much space. But though it's small, the Smart Display 7 is packed with a ton of functionality. Aside from streaming videos and music, Google Assistant integration makes it easy to get plenty done via voice commands: tasks such as checking the weather, setting reminders, and controlling other smart home devices.—*BS*

## BEST HOME APPLIANCE

### Samsung AirDresser

Imagine never having to go to the dry cleaner again. Samsung's AirDresser uses a Jet Air System and Air Hangers to sanitize and remove dust from your clothing. While this happens, a dust filter captures all the particles floating in the air to keep both your clothes and the dresser clean. It also comes with a deodorizing filter that removes odors and leaves your garments smelling fresh. After it's done cleaning, the AirDresser then dries them at a low temperature to reduce shrinkage. Its Crystal Mirror design also blends in nicely with other bedroom furniture.—*BS*





## BEST TV

### **Samsung 55-inch Q900 8K**

When it comes to TVs, bigger is often assumed to be better. But for Samsung, which is gearing up to push 8K into the mainstream, sometimes smaller is what you need. That's the thinking behind its most recent 8K television, the 55-inch Q900. While it also comes in much larger models, the smaller, \$3,500 version puts an 8K screen within reach of the same customers who might be thinking about picking up a high-end 4K model (like Samsung's excellent Q90).

While it's certainly not the most affordable television around, the Q900 has the potential to make 8K technology more readily available to more people, especially as Samsung is launching it in 50 countries across the world. For those that want to get into the game early, that makes it an appealing investment.

—*Adam Smith*

## BEST SPEAKER

### **Sonos Move**

Sonos has finally introduced its first battery-powered, Bluetooth-compatible, portable speaker: The Move is more of a “use on the back deck” speaker than a “take to the beach” speaker, at nearly a foot tall and several pounds. It's built for the elements, with an IP56 rating, which means it's safe from dust and splashes (but can't be completely submerged underwater), and Sonos says it's been extensively drop-tested to ensure ruggedness.

The Move is designed mostly to connect to Wi-Fi and supports dozens of streaming music services and Apple AirPlay 2. It even has a far-field microphone array for Amazon Alexa and Google Assistant voice commands. Of course, if you want to take it outside your Wi-Fi network, Bluetooth lets you play music anywhere from your phone. The Move is priced at \$399.—*AS*

# Hands On: EA's Project Atlas Cloud Gaming Service

BY MICHAEL KAN



**T**he most intense video games usually require expensive hardware to run smoothly—an Xbox One, PlayStation 4, or PC with a powerful graphics card. But I recently played Madden NFL 20 and several other high-profile titles on, of all things, an Amazon Fire tablet. And the gameplay was console-smooth, processed in a remote Amazon Web Services data center, and streamed to the tablet via Wi-Fi. All that was required was the EA app on the Android tablet.

That's the promise of EA's upcoming cloud-gaming service: You can game on any device, as long as you have a stable internet connection. About a year ago, the company teased the service as part of Project Atlas, an ambitious effort to offer cloud and AI technologies to power the game industry. EA remained relatively quiet on its progress until September, when it began recruiting gamers to test Project Atlas' cloud-gaming service on PCs.

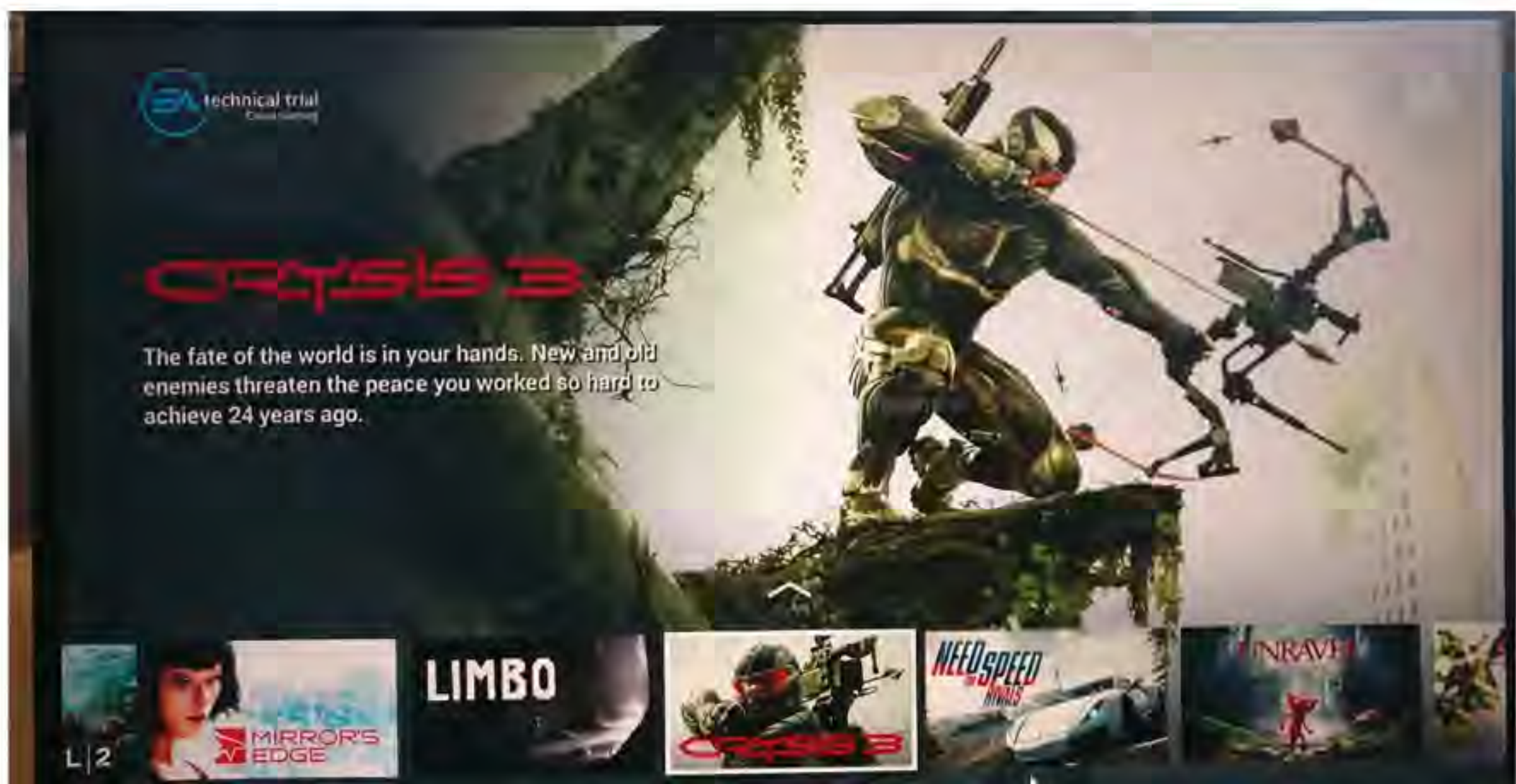
I tried Project Atlas on a variety of devices, including several TVs, a Windows laptop, and a Mac computer, in addition to the Android tablet. And overall, I was pretty impressed.

When you think of cloud gaming, the natural inclination is to worry about lag and the graphics stuttering into a hazy mess. But I didn't notice any slowdowns as EA streamed games to an LG Smart TV and a separate display connected to an Amazon Fire TV Stick.

During the demo, I played FIFA 19 and the sci-fi shooter Titanfall 2, and it felt as though I was gaming on my PlayStation 4 at home. The experience was completely smooth, in crisp 1080p graphics, and the controls responded accurately with no lag.

But the process wasn't perfect. On a MacBook Pro, I opened first-person shooter Crysis 3 before moving on to Star Wars Battlefront II. And when a game started, I did notice some lag, which caused the game's introduction screen to stutter briefly. On the backend, EA's Project Atlas app was locating the nearest servers to my internet connection to help keep lag at a minimum.

A game of Madden NFL 20, meanwhile, abruptly ended due to a network error, even though the device was connected via Ethernet, so I had to load the game again. But aside from this minor hiccup, I didn't encounter any other problems. That said, my playtime was confined to single-player and two-player experiences, so I have yet to see how well the service performs with multiplayer gaming.



To play, download the Project Atlas app and log in with your EA Origin account. When you start up the app, the cloud gaming service shows you the games you can play; simply scroll through and pick one. It's like Netflix for games.

Project Atlas works only with a stable, unlimited broadband connection. EA's cloud gaming service will require at least a 5Mbps connection, which will enable game streaming at a 640-by-480-pixel resolution.

A faster connection, 30Mbps, will let you game at 720p and 1080p HD resolutions. But EA is well aware that some gamers have been saddled with data caps on their home broadband. That's why Project Atlas, for now, is not streaming games at 4K resolution. Not all games were streaming on the highest graphical settings, either: Better graphics consume more data, which can also drag down network bandwidth, prompting your housemates or family members to complain.



The features and customization options offered on Project Atlas are still being decided, which is why EA is conducting a public trial to gather data on how it will perform in the real world. Performance factors include which ISP you have, whether you're connecting via Wi-Fi or Ethernet cable, how many people are also on the connection, and even the age of your modem.

So far, EA has not announced when Project Atlas' cloud-gaming service will launch. But it will join a crowded market. Google is preparing to launch its Stadia service in November, and Microsoft's xCloud service is poised to begin a public trial this fall.

To make cloud gaming appealing, EA will also need to figure out how to price it. But so far, I like what I see. EA demonstrated that the technology works, and if it can offer an exciting catalog of games at a reasonable price, then cloud gaming may have a chance to shake up the industry and lure some consumers away from their consoles.



**EA has not announced when Project Atlas' cloud-gaming service will launch. But it will join a crowded market.**



# Hands On: HP's Elite Dragonfly Is an Absurdly Light Laptop for High-Fliers

BY TOM BRANT



**S**ales of convertible and detachable PCs are expected to grow by 5 percent over the next four years, even as overall PC sales are expected to decline, according to research firm IDC. And judging by the parade of both budget and high-end convertible laptops that marches through PC Labs every month, we're all spoiled for choice.

The HP Elite Dragonfly is different from nearly every one of these choices. Scheduled to go on sale on October 25, this head-turning laptop makes the fewest compromises of any 2-in-1 convertible we've seen to date. Start with its 2.2-pound weight, the impossibly thin borders around its 13.3-inch display, and its claimed 24-hour battery life. Move on to its gigabit LTE modem, its magnesium alloy construction, and its special "noise-canceling" keyboard. Finish with its Intel vPro support, integrated privacy filter, and BIOS protection.

We've seen most of these features before, and many are optional extras that will almost certainly take the Elite Dragonfly far above its \$1,549 starting price. But we haven't seen all of them together on a single laptop—one so wildly light that also incorporates the extra hardware required to transform itself into a tablet.

HP gave us some hands-on time with this sure-to-be trendsetter, which will appeal to digital nomads who also happen to work for companies with deep pockets and forward-thinking IT departments. Read on for our first impressions.

### A LOW-POWER DISPLAY

The Elite Dragonfly will offer three display options. The full HD panel (shown here) can be ordered in either a 400-nit version that consumes just a single watt, or a version with an astonishing peak brightness rating (1,000 nits) and an integrated privacy filter that can thwart snoops looking over your shoulder.

The third option is a 4K display, rated for 550 nits of brightness. All three panels use in-plane switching (IPS) technology to broaden off-axis viewing angles, and are coated in Corning Gorilla Glass 5. Also, all support touch input from either a digital stylus or a fingertip.

Lots of other laptops offer these display features, but few fit them into such a small area. The Elite Dragonfly's 13.3-inch screen covers 86 percent of the laptop's footprint, which means that the bezels have to be extremely thin. Even so, HP manages to fit in a webcam with IR sensors for face recognition. That's impressive.





## AN OLEOPHOBIC COATING

The Elite Dragonfly will come in a single color scheme (dark blue), and most of its exterior is covered not in plastic or aluminum but in magnesium alloy. HP uses a unique CNC milling process for the alloy, which means that it feels tough and durable instead of soft. The company also applies an oleophobic coating to the exterior, which should help reduce the amount of skin oil that accumulates on it and keep it from looking smudgy.

Tests back up the durable feel. HP says the Elite Dragonfly passed 19 tests outlined in the MIL-SPEC 810G standard, a rite of passage for high-end enterprise laptops. Alas, I didn't get the chance to bang it around during my brief demo.

## TENT MODE AND STYLUS

Even though the hinge rotates 360 degrees, and the Elite Dragonfly is light enough to be held in one hand, I suspect most users will prefer propping up the laptop like a tent instead of using it as a tablet. This mode is useful for displaying a presentation on a conference table, watching a movie, or sketching using the optional digital stylus.

The Elite Dragonfly's chassis is too small to stow its pen inside its body, so you'll have to find somewhere else to put the stylus. That's one of the laptop's few compromises.





**The laptop's microphone array detects keystrokes and filters them out when HP's audio driver is running.**



## **A NOISE-CANCELING KEYBOARD?**

One of the reasons the Elite Dragonfly weighs so little is a redesigned keyboard deck. The deck, the keyboard itself, and the touchpad are all at least 20 percent lighter than the ones used on HP's existing 13-inch business convertible, the EliteBook x360 1030. After making a few keystrokes, my impression is that the keyboard doesn't suffer from its diet. It feels sturdy, and the keys bottom out with a satisfying thud.

If you're videoconferencing—perhaps with a business associate or a potential employer—they might not have to hear those thuds. That's thanks to an ingenious bit of noise-canceling: The laptop's microphone array detects keystrokes and filters them out when HP's audio driver is running before passing along your voice to whichever videoconferencing app you're using.

## **EXTREMELY LIGHT—BUT NOT ESPECIALLY THIN**

As light as it is, the Elite Dragonfly, at 0.63 inches thick, is actually slightly thicker than many premium ultraportable laptops. The good news is that the extra girth is put to good use: HP manages to squeeze in a full-size USB Type-A port, which is sorely missing from many ultraportables these days (even those that have room for one). The chassis also has a power button and a SIM-card slot on this edge. HP will offer either Cat 9 or Cat 16 (gigabit) LTE options.

## AND OVER HERE, THUNDERBOLT 3

You'll also find two Thunderbolt 3 ports, either of which can be used to charge the laptop, as well as a full-size HDMI output. The latter is an essential feature on a business laptop in 2019, a year in which myriad wireless-presentation options in conference rooms, boardrooms, and classrooms still fail far too often.

## A SPEAKER MADE OF RECYCLED PLASTIC

A few years ago, HP started sourcing plastic trash that had washed onto the shores of earthquake-ravaged Haiti. The recovered plastic, mostly discarded bottles, initially found its way into the company's printer ink cartridges to the tune of a million bottles a day in 2017.

Now HP's effort is expanding into its laptop components, too. The Elite Dragonfly's four speakers are made of this recycled PET plastic. An HP spokesperson said its engineers are hopeful about expanding the use of this plastic to other laptop components.

## TWO BATTERY OPTIONS

To get the promised 24 hours of battery life, you'll need to configure the Elite Dragonfly with what HP calls its "performance battery." This is a four-cell, 56-watt-hour (Whr) battery that, when coupled with the low-power display option, returned the 24-hour result on HP's internal tests. The other option will be for a two-cell, 38Whr battery that HP says will last up to 16 hours on a single charge.

Estimating battery life is notoriously difficult, since no single test can approximate the specific workflow of each individual user. PCMag's battery test involves looping a locally stored video file until the battery is exhausted. We'll have to wait until we can get an Elite Dragonfly into the lab to run this and our other performance tests.



**A few years ago, HP started sourcing plastic trash that had washed onto the shores of earthquake-ravaged Haiti.**



# Terms of Service: One of the Largest Lies in Tech

**T**he internet is a complex organism. Most people don't know how to manipulate YouTube keywords, so children are tricked into watching violent content and adults are sent down a path of radicalization. Most don't know exactly how much their data is worth and what data Big Tech is gathering about them—terms of service changes are agreed to without a second thought.

Services exist to solve these problems: Jumbo lets users take back control of privacy settings; DoNotPay translates legal language and provides burner payment cards so you don't have to hand over real credit card data to get a free trial; and Terms of Service; Didn't Read (ToS;DR) explains the terms and conditions of some of the biggest websites on the internet.

That's nice, but consumers should not have to rely on startups to fix technical problems that could be easily solved by Twitter, Facebook, Amazon, Google, Apple, and their armies of engineers and developers.

## TAKING CONTROL OF YOUR DATA

Jumbo's free iOS app performs an audit that runs through the permissions you've granted to Amazon, Facebook, Google, or Twitter. It then



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offers to turn off the permissions or delete the data they've collected. (An Android version is also in the works.)

In my Google account, Jumbo found that Google Chrome had saved 11 webpages I visited and Maps had saved 98 activities. Underneath each message is a button called "Why you should care," which describes what Google does with the information. Google tracking my location means it can better target me with ads, which could encourage me to spend money and even change my behavior.

Data skeptics warn that if you're not paying for a product, then you *are* the product. Jumbo CEO Pierre Valade assures me this is not the case, though; the company will make its technology open-source to prove it isn't spying on you.

"We will never have access to your data. We don't have any servers that are processing or storing any of your data. All of the processing is coming from the phone," Valade says.

Valade envisions an enterprise version of Jumbo for companies struggling to comply with large-scale regulation such as GDPR or California's Consumer Privacy Act, but for now, it's funded by over \$3 million in venture capital.

Theoretically, you could manually do everything Jumbo does, but it can get complicated. In Facebook's app, you need to navigate between menus for managing the privacy of what you post on the site, the settings that handle what Facebook knows about you, and the ad-tracking

data Facebook holds on you. For Google, it can be equally difficult to manage your privacy among the search giant's numerous services, including Maps, Search, and its voice assistant.

Even if you think you've been thorough, there's always the chance that you missed a section. With Jumbo's automated service, one or two button presses (instead of dozens) can give you back some control over your information.

That's not to say there aren't risks—for Jumbo. Valade has said previously that Facebook, Twitter, and other services with which Jumbo interacts could take legal action against it. Valade and Jumbo's lawyer would not elaborate, but they say there's a concern these companies "don't have a business interest in people."

"We recommend...that [people] block [targeted advertisements], and most people follow recommendations. Maybe that makes Facebook, from a business point of view, less valuable to advertisers. And as we are installing more phones to protect more people, they may see this as a business risk—that we're lowering the amount of money they can generate out of the data we're giving to them," Valade says.

### **WHEN A 'FREE TRIAL' IS ACTUALLY FREE**

DoNotPay recently launched a new feature that allows customers to use a virtual payment card when signing up for free trials.

Many companies count on people signing up for trials and then forgetting about them. A 2017 poll found that 35 percent of Americans had inadvertently set up an account that enrolled them in automatic payments, and 42 percent said it was difficult to turn off the continuous payments. DoNotPay, however, stops that from happening. It generates a fake name and email address linked to a Visa-backed card, which allows DoNotPay to "act as an agent paying for consumers"—but only for payments where no money is involved.

Earlier this summer, founder Josh Browder told *Wired* he was concerned that banks would shut down DoNotPay if they discovered how they were being used to game this system. But Browder recently

told PCMag that DoNotPay's banking partners do not have any problem with the service, though they declined to be named publicly.

This isn't the first instance in which DoNotPay has fought the powers that be, so to speak. The app began life in 2018 as a way to "sue anyone by pressing a button." Browder described to *Vice* how he racked up numerous parking violations while living in London—some warranted, some unjustified—so he built the app to help people who did not have the legal know-how to fight their fines. An AI chatbot asked a few questions before drawing up documents, filling in details, and even creating a script for the plaintiff to read out loud in court, if necessary.

But why do we need artificial intelligence to translate our own laws? Can we not simply write them in a way average people can understand? If all the problems in the world could be fixed, Browder says, DoNotPay wouldn't have to exist. But he doesn't think that's going to happen any time soon.

### **CUTTING THROUGH THE LEGAL JARGON**

Nobody has time to thoroughly read every online legal disclosures; it would take 25 days (or 76 work days) to read the privacy policy of every website you visit regularly, according to 2012 data.

That's why projects such as Terms of Service; Didn't Read exist. Maintained by a network of volunteers acting like Wikipedia for terms of service agreements, it translates these complex legal documents into bullet-point lists and grades them from A to F.



**Why do we need AI to translate our own laws? Can we not write them in a way average people can understand?**



For the team, it's difficult to know when to stop digging. "How do we look at web apps versus native mobile apps, and the permissions they request on the device? Should [we] restrict ourselves to reviewing what we read in the Terms and Conditions of a service or also include information about how the service is run in practice?" asks co-founder Michiel de Jong.

ToS;DR isn't a legal resource. It's not backed by AI, which occasionally means the humans at the controls get it wrong. But Jong thinks the benefits outweigh the negatives.

"You can compare it to how WikiTravel gives you advice directly from other travelers rather than an expert travel guide writer. Or OpenStreetMap instead of Google Maps," Jong says. "Sometimes, some data may be out of date or incorrect, but then the crowd can easily go in and actively fix the information. And the reviews you get reflect what people like you, who came before you, thought was noteworthy, so in a way that gives the best balance of topics."

DoS;TR has plenty to keep it busy, Jong says, since internet privacy issues—from Edward Snowden and Cambridge Analytica to GDPR—have dominated headlines in recent years.

### **A MARKET FOR MISTAKES**

In a statement, a Facebook spokesperson said the social network is "always trying to give people more clarity on how their information is used on Facebook and how they can control it. Over the past 18 months, we have made our policies clearer, our privacy settings easier to find and introduced new tools for people to access, download, and delete their information. We will continue to work on new ways to give people greater transparency and control over their privacy on Facebook."

Still, as more companies offer internet-based subscription services, those without a legal background will have to engage with contracts they don't understand.

“I agree to the terms and conditions” is one of the largest lies in tech, and that needs to change. But despite Silicon Valley’s endless talk about transparency, it’s not in the best interest of Facebook or Google, for example, to make their privacy settings easier to understand, since they make money from our data.

Jumbo, DoNotPay, and ToS;DR show that solutions are possible. But there should not even be a market for apps that make sense of data privacy or translate terms and conditions you’ve already accepted and that could change on a whim. If these small companies can do it, why can’t the big ones?

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**It’s not in the best interest of Facebook or Google, for example, to make their privacy settings easier to understand.**





# Scammers Go Phishing With Deepfakes

I don't get a lot of questions about my job from my family. They are, understandably, far more interested in the hijinks of my rats and my dog. But when I do get asked about security, they invariably want to know why the bad stuff happens. There are a lot of answers to that question, but the one that I always come back to is simple: money.

Ransomware? Easy cash for attackers. Phishing? Nothing but cash. Spam? All kinds of ways to monetize people clicking links. Data breaches? That stuff gets used for fraud, and the rest gets sold off (to be used for more fraud). Nation-state attacks? Sure, there's ideology, but when you consider that US sanctions no doubt played a part in Russia's motivation for attacking the 2016 election, money is in the equation. And that's not to mention nation-state hackers moonlighting for extra cash.

Not on that list is deepfakes: videos that have been tampered with, generally using AI-driven technology. We've seen celebrities' faces swapped onto pornstars' bodies and politicians' faces and voices manipulated to make them appear to say things they didn't actually say. Sometimes they're made to promote wildly inflammatory conspiracies; more insidious are the times they're



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manipulated to say things suggestible viewers might have trouble distinguishing from the truth.

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Deepfakes have been much talked about in recent months out of fear that they could be used in misinformation campaigns to confuse voters. That hasn't happened on a large scale (yet), but pornographic deepfakes have already damaged many individuals. So why do we call deepfakes an emerging threat? Probably because there wasn't an obvious way to directly monetize them. But that changed in September: It was reported that deepfakes have been used to fleece corporations for hundreds of thousands of dollars.

### NEW TOOLS, SAME OLD CON

In hindsight, we should have seen it coming. Social engineering—a fancy way of saying “tricking people”—is a time-honored tool for breaching digital security or simply for making money fast. The addition of deepfakes to the trickery is a perfect fit.

*The Wall Street Journal* reported that some clever attackers built a deepfake voice model used to convince an employee of a UK energy company that they were speaking to the company's CEO. The employee then authorized a wire transfer of some \$243,000 to a secret account. In its reporting, the *Washington Post* wrote, “Researchers at the cybersecurity firm Symantec said they have found at least three cases of executives' voices being mimicked to swindle companies.” The estimated haul is measured in millions of dollars.

For my own edification, I sat down and tried to trace the history of deepfakes. Truly a concept for

the fake news era, it began in late 2017 in a *Vice* article about face-swapped pornography posted on Reddit. “Deepfakes” was actually the username of the individual posting the pornographic videos, which featured the faces but not the bodies of Gal Gadot, Scarlett Johansson, and others.

In just a few months, the concern over deepfakes moved to politics. Videos appeared lampooning political figures, and this is where I (and most of the rest of the security community) got stuck. In the wake of the misinformation from Russia during the 2016 US election, the idea of near-indistinguishable fake videos flooding the 2020 election cycle was a dire one. It still is. It also grabs headlines and is one of those projects for the public good that security companies really like.

I would be remiss if I didn’t point out the limitations of deepfakes. For one thing, you need audio clips of the person you’re trying to impersonate. This is why celebrities and politicians in the national spotlight are obvious targets for deepfakery. Researchers, however, have already demonstrated that only about a minute of audio is required for creating a convincing audio deepfake. Listening in on a public investor call, news interview, or (God help you) a TED talk would probably be more than enough.

Also, I wonder how well your deepfake model even needs to operate in order to be effective. A low-level employee, for instance, might not have any idea what the CEO sounds like or even looks like, which makes me wonder if any reasonable plausible and authoritative voice is enough to get the job done.

## **WHY THE MONEY MATTERS**

Criminals want to make as much money as they can, quickly, easily, and with the least amount of risk. When someone figures out a new way to do those things, others follow. Ransomware is a great example.

Encryption has been around for decades, but once criminals began to weaponize it for easy cash, we experienced an explosion of ransomware.

Deepfakes being used successfully as a tool in what amounts to a specialized spearfishing attack is proof of a new concept. Maybe it won’t

pan out in the same way as ransomware—it still requires considerable effort, and some simpler scams work well. But criminals have proved that deepfakes can work in this novel way, so we should at least expect some more criminal experiments.

Instead of targeting CEOs, scammers could target regular folks for smaller payouts. It's not hard to imagine a scammer using videos posted to Facebook or Instagram to create deepfake voice models to convince people their family members need a lot of money sent by wire transfer. Or perhaps the thriving robocall industry will get a deepfake layer for added confusion. You might hear a friend's voice in addition to seeing a familiar-ish phone number. There's also no reason why these processes couldn't become automated to a certain extent, churning out voice models and running through prearranged scripts.

None of this is to discount the potential damage of deepfakes in elections or the money tied up in those operations. As criminals become more adept with deepfake tools, and those tools become better, it's possible that a marketplace of deepfakes-for-hire could emerge. Just as bad guys can lease time on botnets for nefarious purposes, criminal corporations dedicated to creating deepfakes on contract may appear.

Fortunately, a monetary incentive for the bad guys creates one for the good guys. The rise of ransomware led to better antimalware for detecting malicious encryption and preventing it from taking over systems. There's already work being done to detect deepfakes, and hopefully, those efforts will be supercharged by the arrival of deepfake phishing. That's little comfort for the people who have already been scammed, but it's good news for the rest of us.

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# How to Keep Your Bitcoin Safe

**B**itcoin is on another rollercoaster ride. Over the past few months, the cryptocurrency's value spiked from \$3,000 to over \$13,000; at this writing, it stands near \$10,000.

Such circumstances encourage people to buy bitcoins in the hope of coming out ahead. But Bitcoin's rising price also draws malicious hackers who see an opportunity to steal the funds of unwary users who don't know the basics of Bitcoin security. If you're new to Bitcoin, these tips will help you protect your digital fortune.

## PROTECT YOUR ONLINE WALLET

The easiest way to get started with Bitcoin and other popular cryptocurrencies is to sign up with an online wallet such as Coinbase or Binance. Online wallets hide many of Bitcoin's technical challenges, such as handling private keys and addresses, so they're an attractive option for people who are less tech-savvy or new to Bitcoin. Signing up for most online wallets takes no more than a few minutes, and accessing your account requires only a browser, username, and password.

Online wallets, however, are not the safest place to store your cryptocurrencies. Anyone with your



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email and password can access and steal your coins, and bad actors can accomplish this with something as simple as a phishing email. Also, unlike with traditional payment systems, recovering lost bitcoins is virtually impossible.

Here are a few best practices that can improve your wallet's security.

**Enable two-factor authentication (2FA):**

Most online wallets support some form of two-factor or multi-factor authentication. Enabling 2FA links your account to a phone, mobile app, or physical dongle. If a malicious hacker obtains your username and password, they'll still need to have that extra factor to access your account.

**Don't use your phone number for 2FA:**

Most sites support several forms of two-factor authentication, but not all 2FA methods are equally secure. If you rely on SMS passcodes to secure your account, crafty hackers will be able to hijack your phone number and intercept your 2FA passcode. If you're associating a phone number with your account, it would be best to use a separate, secret SIM card.

**Use a separate email for your Bitcoin**

**wallet:** Most of us have a primary account for our daily communications—but we use the same email address for our Facebook, Twitter, and PayPal accounts. We share it with friends, family members, and coworkers. They might share it with other people, and eventually, a malicious hacker might obtain it. If your online wallet is tied to this email, the hacker has one of two

important pieces of information needed to access your wallet. Use a separate email address for your online wallet—one you don't use for any other purpose. This minimizes the chance of your account being discovered by a cybercriminal.

### USE AN OFFLINE WALLET

Every Bitcoin wallet has one or more “addresses” where it stores its cryptocurrency. Bitcoin addresses are long, unique strings of alphanumeric characters, and each address has a pair of private and public encryption keys. When other users want to send bitcoins to your address, they use your public key. When you want to spend your bitcoins, you use the private key to sign your transaction. The private key proves you have ownership of the bitcoins stored in a specific address. Therefore, the key to securing bitcoins is to keep your private key in a safe place.

By using an online wallet, you're effectively letting the service provider secure your private keys for you. That's why it's so easy to use online wallets. But it also makes online exchanges an attractive target for hackers. Although these companies do their best to protect user accounts, they get breached pretty often.

An alternative to online Bitcoin exchanges is offline wallets, which give you full control of your private keys and will protect you against mass data breaches at Bitcoin exchanges. The trade-off is they're more difficult to set up and use, and they require more technical knowledge. Offline wallets come in different flavors:

**Software wallets:** Software wallets are applications you can install on your computer, portable memory drive, or mobile device. A wallet app, such as Electrum, stores private keys on your device and uses them to sign Bitcoin transactions whenever you want to make a payment. If you want complete security with a software wallet, you must install it on a computer that isn't connected to the internet and transfer signed transactions to an internet-connected computer. The process is more difficult but also more secure.

**Hardware wallets:** Hardware wallets are physical devices that generate and store cryptocurrency key pairs. They usually come with an associated app that you have to install on your computer or your mobile device. When you want to send bitcoins to someone, you have to connect the hardware wallet to your computer or pair it with your phone via Bluetooth. Every transaction is signed on the hardware wallet with the approval of the user. Hardware wallets are very secure because the private keys never leave the device; Trezor and Ledger are two popular options.

**Paper wallets:** Paper wallets are Bitcoin key pairs printed as QR codes on paper. You can create paper wallets at one of several websites, including [bitcoinpaperwallet.com](http://bitcoinpaperwallet.com). To receive money in your paper wallet, scan the public key with any Bitcoin wallet app and send it to the payer. To send bitcoins from your paper wallet, scan your private key to sign your transaction.

Paper wallets are “cold storage,” which means they’re good for securely storing bitcoins but not very handy for making day-to-day payments. Paper wallets are secure because they have no digital component and they can’t be stolen or hacked remotely. But you must destroy the digital copy of the wallet after you print it, to make sure no one else can replicate it.

Using an offline wallet doesn’t mean your bitcoins are absolutely secure. If you leave your private keys in an unsecured place, the wrong person might chance upon them. Also, you might accidentally destroy your keys, which will also result in losing your funds without recourse. For instance, if you lose or destroy your hardware or paper wallet or forget your security PIN, your bitcoins will be lost forever.

Online or offline wallet? The choice is up to you. But choose wisely, and make sure you keep your bitcoins safe.





**Fitbit Versa 2** | \$199.95 | **EDITORS' CHOICE** Rating: ●●●●○ **EXCELLENT**

## Fitbit Versa 2: Packed With Features and Looks

**T**he Fitbit Versa remains one of the most functional and friendly Android-compatible smartwatches we've seen. It's packed with features, looks and feels attractive, and costs much less than the iOS-only Apple Watch. Fitbit also offers the even less expensive (though still quite appealing) Versa Lite, and now the original is getting its first major update in the form of the Versa 2. It includes everything we love about the original and adds an AMOLED screen with an always-on option, includes a microphone with Amazon Alexa, and makes Fitbit Pay a standard feature (and not just limited to the Special Edition model), all while keeping its price of \$199.95. The Versa 2 is easily our new favorite Android-compatible smartwatch, as well as our Editors' Choice.

## DESIGN AND STYLE

The Versa 2 is slightly more rounded than the Versa, with an AMOLED face that curves smoothly into the aluminum case instead of the original's flat face and angular edges. The underside is similarly curved, giving the smartwatch a slightly thicker but smoother and friendlier profile. The optical heart rate sensor and charging contacts are almost identical to those of the original Versa's, though the four charging points are now located near the top rather than the bottom of the back of the watch case.

The right edge of the Versa 2 shows the biggest physical change from its predecessor. The two command buttons are replaced by a pinhole microphone for using Amazon Alexa directly on the watch. Your tastes may vary, but I find this a welcome change; I rarely use the two buttons on the right edge of the original Versa, and when I lean on my hand or bend my wrist back, the buttons sometimes trigger an activity mode when I don't want them to. The single menu button on the left edge and the touch screen are enough direct controls.

## Fitbit Versa 2

**PROS** Attractive AMOLED screen with always-on option. Long battery life. Lots of useful apps and fitness features. Fitbit Pay. Amazon Alexa.

**CONS** Screen isn't quite as bright as the original model. Alexa responses are text only.

**BOTTOM LINE** The Fitbit Versa 2 takes everything we like about the original smartwatch and adds an always-on AMOLED display, a microphone for Amazon Alexa, and Fitbit Pay.



You have your choice of colors and wrist straps for the Versa 2. The standard Versa 2 is available in a dark-gray body with a black silicone strap, a light-gray body with a light-gray silicone strap, or a rose-copper body with a pink, burgundy, or dark-green silicone strap. For \$30 more, you can get the Special Edition Versa 2 (\$229.95) in a light-gray body with a dark-gray woven strap or a copper-rose body with a navy-blue woven strap (an extra silicone strap is included as well).

Since Fitbit Pay is now standard on the Versa 2 (for the original Versa, it was included only on the Special Edition), the woven strap is the only significant difference between the standard and Special Edition models. A three-month trial membership of Fitbit Premium is also included with the Special Edition.

The Versa 2 uses the same wristband mount as the Versa, so you have a wide range of accessory straps to choose from if the included ones aren't to your liking. They come in a variety of materials, including silicone, woven fabric, leather, suede, and steel, often with a choice of colors. The least expensive straps are silicone at \$29.95, and the priciest tapered steel band is \$99.95.



**The two command buttons are replaced by a pinhole microphone for using Amazon Alexa directly on the watch.**



## AMOLED SCREEN

While the original Versa and the Versa Lite have LCDs, the Versa 2 uses an AMOLED screen. It has the same 300-by-300 resolution but can display much darker blacks and more vivid colors. Comparing the same watch face on the Versa and Versa 2, the AMOLED screen on the Versa 2 definitely has bluer blues and redder reds, and the black background blends with the edge of the screen much better. It isn't quite as bright as the original Versa's LCD, but it's still bright enough to read both outside and indoors.

The AMOLED screen enables a new feature on the Versa 2: the always-on display. Instead of turning the screen off completely when you aren't looking directly at it, the Versa 2 displays a simple, monochrome watch face that shows basic information. You can make the full watch face appear with a tap or gesture or by pressing the button on the side of the case. The always-on display isn't customizable, as the full watch face is, but it's quite handy.

You can choose from hundreds of different watch faces via the Fitbit app, those made by Fitbit and some created by third-party fans. It's still an awkward library to browse, with few clear categories and no apparent way to sort results by name or popularity. There are some attractive and useful watch faces here, but you'll do a lot of scrolling to find them, and there is no way to identify multiple ones as favorites you might want to switch between; every time you change the watch face, you need to go into the All Clocks section, find the one you want, and download it to your watch.



## AMAZON ALEXA AND APPS

The microphone on the Versa 2 lets you use Amazon Alexa with the watch, a completely new feature and the most significant change over the original model. Once you link your Versa 2 to your Amazon account with the Fitbit app, you can access Alexa by pressing and holding the button on the watch. The Alexa logo will appear on the screen, along with a set of moving bars to indicate it's listening. When you see the bars, you can talk to your watch. Pressing the button is necessary; you can't activate Alexa by using a wake word as you can with a smart speaker or smart display.

Alexa on the Versa 2 offers most of the same features as Alexa on a smart speaker. As long as it's connected to your phone or the same Wi-Fi network as the Versa 2, it can answer questions and follow voice commands. You can get the weather, unit conversions, and general information; set timers and reminders; and control your smart home devices through it. It worked just as well as an Amazon Fire TV Cube in controlling the smart lights in my apartment, and it provided useful weather forecasts when I asked.

While the Versa 2 has a microphone, it doesn't have a speaker, so Alexa on the watch is a voice assistant with no voice of its own. All responses appear as text or graphics on the watch screen.



The Versa 2 also supports a variety of on-watch apps, and you can install multiple apps at once. By default, Deezer, Pandora, Spotify, and Strava are preinstalled, along with the Starbucks Card (which simply loads a barcode of your Starbucks card on the screen). You can install apps including a calculator, a currency converter, and a handful of other useful little tools, various news feeds, many workout assistants, and even some games. These apps can all be accessed by swiping left on the watch face.

### **FITBIT PAY AND BATTERY LIFE**

Besides using certain store cards with the watch, you can also pay for groceries with it. The Versa 2 features Fitbit Pay, an NFC payment system similar to Apple Pay and Google Pay, and it's compatible with most systems that accept them as payment. To set it up, link a credit card to Fitbit Pay on the Fitbit app. Once at least one credit card is registered, you can pay with it by swiping down twice from the top of the screen and tapping the wallet icon. You can also set up the button to bring up your Fitbit Pay cards instead of Alexa with a long press, which is convenient if you use Fitbit Pay more often than Alexa.

I've been using the Versa Special Edition for some time as my personal smartwatch, and I've found it incredibly useful when I go to the gym and don't want to bring my wallet. It works just as well on the Versa 2. Including it as a standard feature on the current model is a welcome improvement.

According to Fitbit, the Versa 2 can last up to five days on a charge. This is generous battery life for a smartwatch, but of course, it depends on what features you use, how bright you keep the screen, whether you use the always-on display, and other factors. Regardless, you can confidently expect two to three days of use before you need to put it back in the charger, which is more than you can say for the Apple Watch.



**By default,  
Deezer,  
Pandora,  
Spotify, and  
Strava are  
preinstalled,  
along with the  
Starbucks  
Card.**



## FITNESS TRACKING

The Versa 2 is just as waterproof and sweatproof as the original, though this will depend on your choice of watchband. According to Fitbit, the Versa 2 is able to handle submersion in up to 50 meters of water with the standard silicone band. Of course, if you go diving with a leather or suede band, it probably won't survive the dip, though the watch body will be just fine.

For fitness, the Versa 2 has the usual set of health and workout features, including a heart rate sensor, a step counter, and various other motion sensors to track your activity and workouts. I tested the step counter against a 3D TriSport pedometer as I walked to the gym for a jog. The watch measured 706 steps, and the pedometer recorded 814 steps. After an hour of jogging on the elliptical, the two devices evened out, with the Versa 2 showing 8,331 steps and the pedometer showing 8,594 steps. The consistency remained; by the time I got back to my apartment, the watch showed 9,461 steps and the pedometer showed 9,726.

At the time I wrote this, I was unable to compare the heart rate sensor on the Versa 2 with a dedicated heart rate monitor. But its measurements of my resting and active heart rates are in line with the measurements taken by my Versa under the same conditions, so you can expect similar performance.



The Versa 2 has many more granular health features than step counting and heart rate monitoring. It can track multiple types of exercise, including swimming and biking, and monitor how you sleep when you wear it to bed. With the Fitbit app on your phone, it can also let you monitor ongoing health and fitness statistics, including food and water consumption and even menstrual cycles.

### **A NEW, BETTER VERSA**

The Fitbit Versa 2 is an appreciable upgrade over the original model. Amazon Alexa on the watch is handy, and the addition of Fitbit Pay as a standard feature that doesn't require the Special Edition is a great move. The always-on display option is also very useful, and the AMOLED screen helps maintain battery life even with it activated. For \$200, the Versa 2 packs more features into a sleek, comfortable design for the same price as its predecessor, and so it takes the Editors' Choice crown for the best non-Apple smartwatch.

The Apple Watch Series 4 is still a more powerful wearable with a much wider variety of faces and apps, but it also costs twice as much as the Versa 2 and requires an iOS device to work. If you have an iPhone, either smartwatch is an excellent choice, but if you have an Android phone, the Versa 2 is easily one of the best models you can get.

**WILL GREENWALD**



**It can track multiple types of exercise, including swimming and biking, and monitor how you sleep when you wear it to bed.**







**Samsung Galaxy Note 10+** | \$1,099.99 | Rating: ●●●●○ EXCELLENT

## Samsung Galaxy Note 10+: Big and Powerful (and Big)

**T**here's a lot going on with the Galaxy Note 10+, Samsung's biggest phone. There always is. The Note line is the epitome of Samsung's technology. It's where the company piles all of its features in, with price and size being no object. I admire it, but I find it hard to love. A lot of this comes down to how many phones Samsung's been slinging out this year with similar features as well as my growing lack of patience with \$1,000-plus handsets. Ultimately, the Galaxy S10+ (\$799.99 and up) and the smaller Galaxy Note 10 (\$949.99) are slightly more affordable ways to get most of what the Note 10+ offers, for less.

## THE HANDBUSTER

The Note 10+ is 6.39 by 3.04 by 0.31 inches (HWD) and 6.91 ounces. It's slightly bigger than the Note 9 (which is 6.37 by 3.01 by 0.35 inches, 7.09 ounces) and noticeably bigger than the S10+ (6.20 by 2.92 by 0.31 inches, 6.17 ounces).

The tablet comes in four “aura” colors: Black, Blue, White, and “Glow,” which has a shimmery rainbow effect. All the colors attract fingerprints—my Glow review unit looks greasy and flat-out gross after less than a week. There's going to be a theme in this review that you should buy a case, and this is one reason.



The Note 10+ has a sharply curved 6.8-inch, 19:9 screen, so the phone almost comes to a point on the sides—the edges are sharper than those of the Note 9. Samsung also did away with the separate power and Bixby buttons for a combined power/Bixby key on the left side. Don't worry; you can set it to be primarily a power key, and then you won't accidentally launch Bixby all the time.

## Samsung Galaxy Note 10+

**PROS** Useful S Pen stylus. Top-notch performance. Long battery life.

**CONS** Expensive. Huge. No headphone jack. Confusing 5G situation.

**BOTTOM LINE:** The Samsung Galaxy Note 10+ is a big, powerful phone that's good for artists and note-takers.

The phone has dual speakers, including a big beefy one on the bottom face and a nearly invisible one at the very top edge. Also on the bottom, the new S Pen stylus pops out with a touch. Still plastic, the Wacom-powered S Pen is now “unibody,” meaning it doesn’t have the gold top third the Note 9’s pen has. It feels pretty much the same in the hand.

And no, the phone doesn’t have a headphone jack. That’s going to anger a lot of people, especially those who were sucked in by Samsung mocking Apple for doing away with the 3.5mm jack. Samsung includes a pair of USB-C, AKG-branded earbuds but no dongle, but the phone works with generic USB-C-to-3.5mm headphone dongles.

I’ve been using a OnePlus 7 Pro for a while, which is about the same size as the Note 10+, yet the Note 10+ feels more unwieldy. After a while, I realized why: When I’m reviewing Note phones, I’m very focused on the S Pen, as it’s the feature that separates a Note from the crowd. And if you’re trying to use the S Pen, you need to hold the phone securely with your other hand. That can be difficult with a 3.04-inch-wide phone.

The phone feels unwieldy when you’re using the camera, too. I feel that way about the OnePlus 7 Pro as well, for what it’s worth, but gripping the phone between my thumb and forefinger horizontally while tapping on the camera UI has always been an issue with Notes, and it’s an issue with this one too. Now, I have pretty small hands, and I was largely testing the phone with women and teenagers. I know one of our analysts at PCMag who has giant paws and swears by phones as wide as possible. But I have to tell you, this thing is at the edge of what a lot of people’s hands will be able to handle.

The device is waterproof, at least, although it’s far from rugged. As with any phone this expensive, I advise getting a case.

## **A BEAUTIFUL VIEW**

The screen is a big reason to come to this big phone. As mentioned, it’s a 6.8-inch, 19:9 bezel-less panel with a front-facing camera at top center. At 3,040 by 1,440 pixels and 498 pixels per inch, it’s actually lower density than older phones such as the Samsung Galaxy S8 and Note 8, but not to any degree that you can notice.

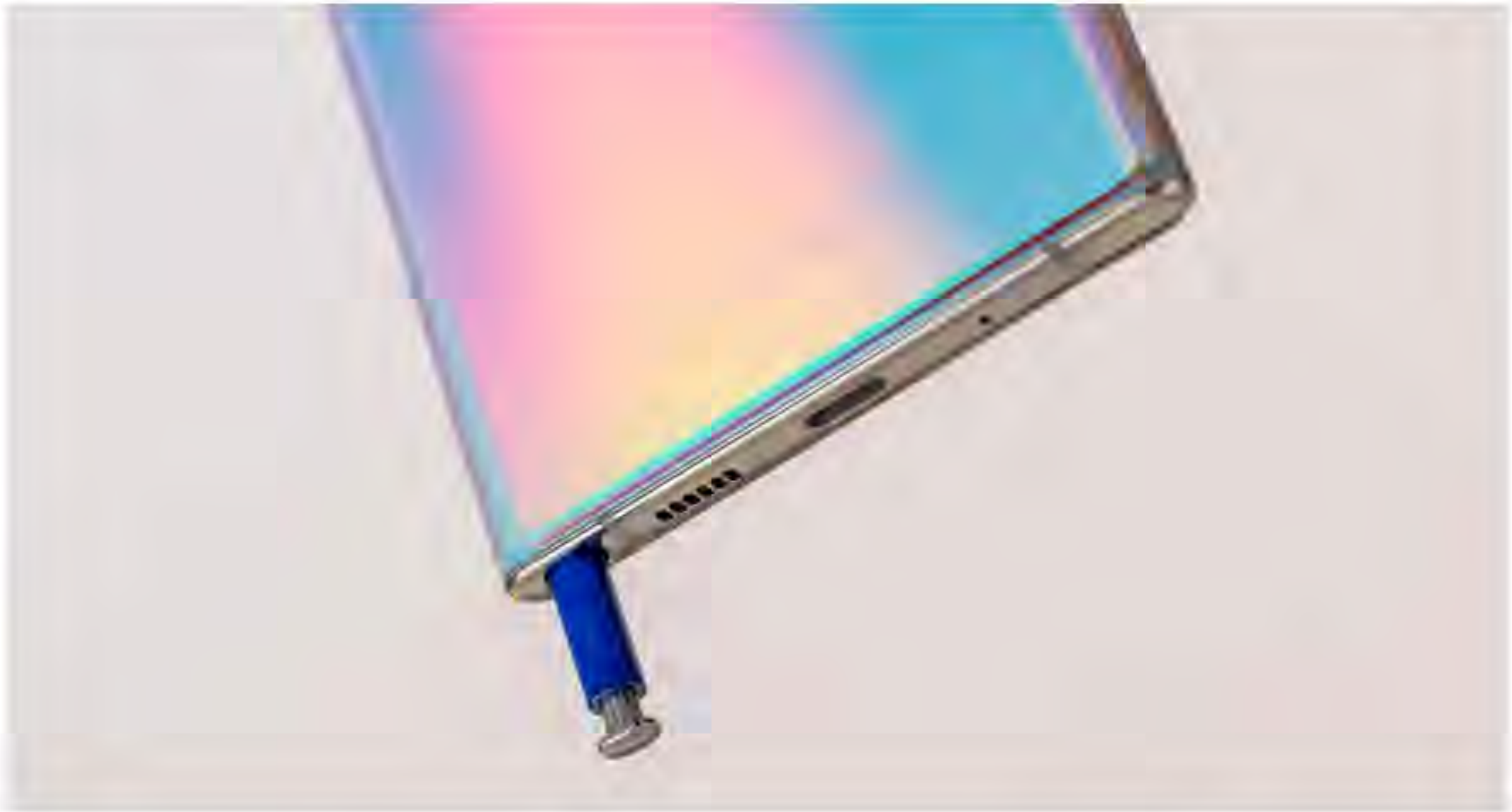


In general, the Note 10+ screen behaves a lot like the S10+ screen in terms of brightness, color accuracy, and overall performance. This is good news, as the S10+ has an excellent screen.

I tested the phone's color accuracy with a Klein K80 colorimeter attached to Portrait Displays' CalMAN software and found that its two color profiles are very close to the Galaxy S10's and to the Note 9's Adaptive and Basic modes. They're all among the best displays out there, and they don't have the oversaturated look we used to see on old Samsung OLEDs.

That said, there's a new wave in screens that I'm a little sorry we're not seeing here. Razer and OnePlus have both gone to 90-hertz screens on their leading devices, a move that makes scrolling feel smoother and would increase the responsiveness of drawing apps using the S Pen. I wish Samsung had made that move here, too.

The phone has an ultrasonic, in-display fingerprint sensor two-thirds of the way down the screen. It's accurate when you place your dry, clean finger oriented correctly on the right spot, but it suffers from the problems that all the in-display fingerprint sensors do right now: There's no physical guide where to put your finger, and it has real trouble with off-angle touches.



## **A BETTER S PEN**

In my mind, the S Pen is why you should really come to the Galaxy Note. There's no other phone with a similar feature.

The S Pen is an intelligent, active stylus with pressure and tilt detection. If you want to write or draw on another kind of phone, you're stuck with a capacitive or Bluetooth stylus. Capacitive styli such as those on the LG Stylo series don't have pressure sensitivity, and Bluetooth styli sometimes lag. The S Pen even tucks into a slot built into the phone, which makes it much harder to lose than an Apple Pencil.

If you're going to use an S Pen, you want to put your phone in a case. Ever since the Note 8 introduced curved screens, I've had some issues with trying to draw on the screen without touching the edge of the curve. A case really helps.

I had a professional artist and an experienced Note 8 user, separately, draw with the S Pen in Samsung Notes, Adobe Sketch, and Autodesk Sketchbook. The Note 10 pen is definitely more responsive than the Note 8 pen, with better pressure sensitivity in Samsung Notes. Adobe Sketch developed lag when we added too many layers, though, which is surprising and infuriating on a device with 12GB of RAM and a 2.8GHz processor.

Samsung's "let's throw things at the wall" approach to software features has popped up here. The company keeps adding new ways to use the S Pen to see whether they stick, but they're generally so haphazardly integrated that they fall flat. Two years ago, it was Live Messages, which let you draw animated messages. It's cool, but was never integrated into any popular messaging program, so few people use it. This year, it's AR Doodle. On paper, the AR Doodle idea is super cool. You can draw persistent augmented-reality objects in space and take photos and videos that include them, like this:



The problem is that the AR Doodle tools are lousy, and there's no eraser. All the drawing options are these wormlike, shiny pipes, and when you make a mistake, you have to start over. That gets old fast.

The top complaint, though, is that the phone is just so big it's hard to hold while drawing. That's part of why I'm excited by the smaller Note 10 model, which has the S Pen but which you can also grip more easily with one hand.

For more writerly types, Samsung Notes also now tries to auto-recognize handwriting and transfers it into Microsoft Word. This is another good idea that doesn't quite work, because you can really write only three or four words on a line, so everything comes out squashed to one side of the document.

Still, the note-taking experience on a Note is like that on no other phone, because you can scribble rather than having to look at a touch keyboard. If handwriting is automatic for you, that means you can write while looking at something else—a big deal.

The S Pen also now works as a remote control for the phone's camera. If the phone's on a mount, you can switch cameras or change zoom by waving the pen around. I found that less useful than just using the pen's button as a remote shutter, which lets you hold the phone at more distant or daring angles for selfies. The remote shutter feature is on the Note 9 and the smaller Note 10, though, so it isn't unique here.

## **PROCESSOR AND PERFORMANCE**

Once again like the Galaxy S10+, the Note 10+ uses a Qualcomm Snapdragon 855 chipset running at a maximum of 2.8GHz. On processor measures, it benchmarked slightly better than the Galaxy S10 and the OnePlus 7 Pro. We got 9,843 on PCMark and 11,180 on Geekbench multi-core. The S10+ got 9,682 on PCMark and 11,105 on Geekbench, while the OnePlus got 9,828 on PCMark and 11,012 on Geekbench.

The OnePlus benchmarked better at web browsing, though, at 481.94 on the Basemark Web test compared with 447.54 for the Note and 304.03 for the S10. OnePlus has always been really good at UI optimization, and that shows on the browser benchmark score. iPhones, alas, beat all Android phones when it comes to web-browsing efficiency: The iPhone XS Max scores 537.4 on Basemark Web.

On GPU benchmarks, the Note 10+ once again performed just like the Galaxy S10+ and OnePlus 7 Pro. One thing to note is that you can improve effective graphics performance by turning down the screen resolution. Kicking it from QHD to 1080p, for instance, improves the framerate on the GFXBench Car Chase onscreen test from 23fps to 40 fps.

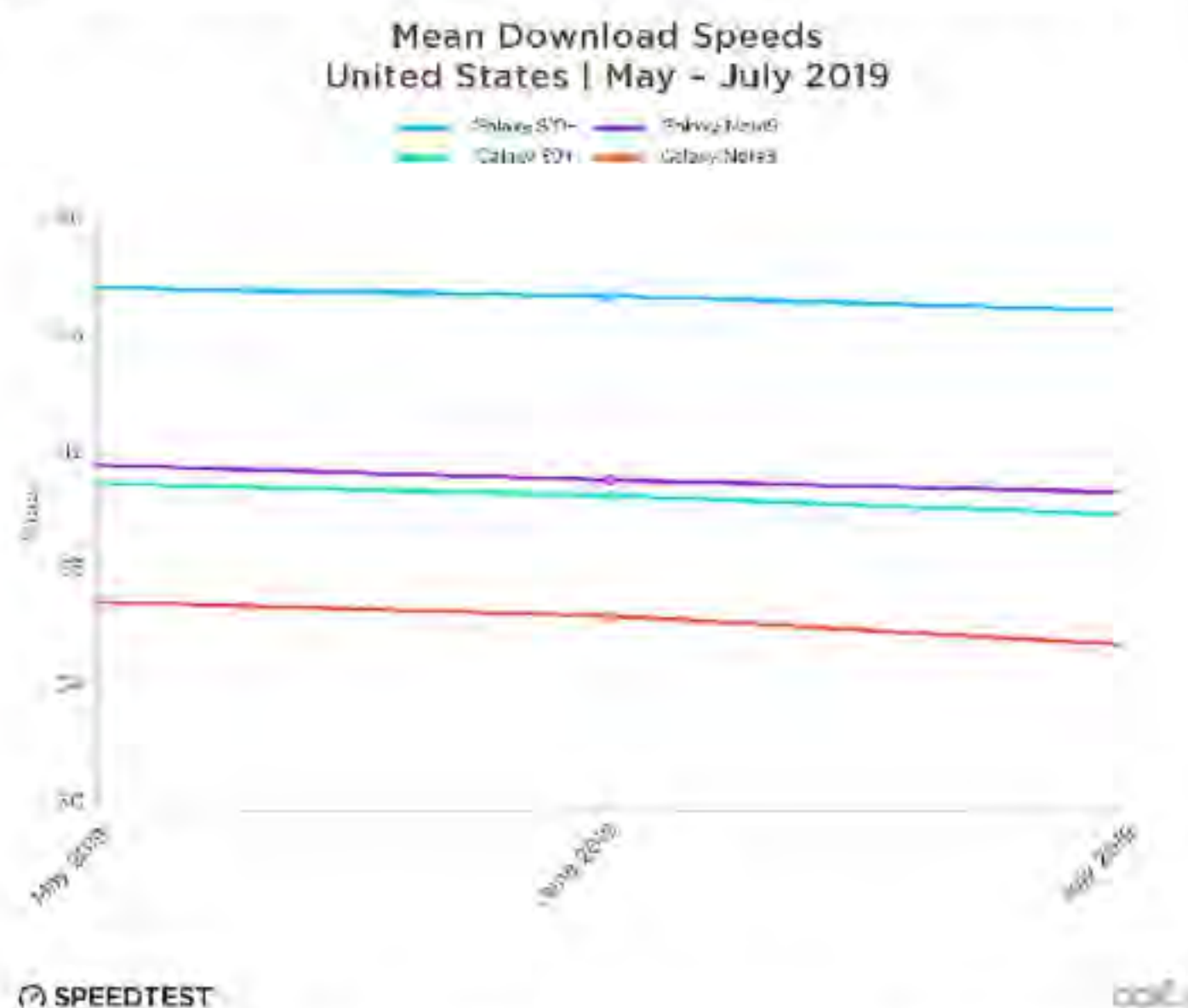
The Note 10+ has a whopping 12GB of RAM, which according to Samsung lets it cache up to 12 apps. Compare that with the S10+'s 8GB, or the OnePlus and Note 9's 6GB. That said, I haven't had much of a problem finding applications being forced to reload on 6GB and 8GB phones, and even with 12GB, the Note 10+ had trouble handling those layers in Adobe Sketch.

The device comes in 256GB and 512GB models, both with a microSD card slot tucked in by the SIM card. It's important to note the smaller Note 10 doesn't have a microSD slot. Outside North America, the Note 10+ uses a Samsung Exynos 9825 processor and Samsung modem; we didn't test that unit.

## 4G, CALLING, AND WI-FI

The Note 10+ and Note 10 have the same 4G modem and abilities as the Galaxy S10. It's based on the Qualcomm X24 modem, with all the 4G frequency bands used in the US and support for Category 20 LTE with 7x carrier aggregation and 4x4 MIMO on five carriers.

That means you'll get better LTE performance than on any previous generation or any iPhone. Performance will be very similar to that of the S10+; we're working with the same modem, the same antennas, the same software, and pretty much the same body size here. We can use Ookla's Speedtest Intelligence to point out how the S10+ compares with the Note 9 and Note 8, and you can see how adding additional levels of carrier aggregation will help speeds (note: Ookla is owned by Ziff Davis, [PCMag.com](http://PCMag.com)'s parent company).



This Samsung generation also brings new Wi-Fi capabilities. The S10 and Note 10 are among the first mainstream phones to support 802.11ax or Wi-Fi 6, a new standard that improves Wi-Fi speed and range in crowded conditions. To take advantage of that you'll need an 802.11ax router, and those are expensive right now. But if you intend to keep your phone for three years, buying an 802.11ax-compatible device is a good idea.



At PC Labs, we still have 802.11ac, or Wi-Fi 5, which is much more common right now. On both 2.4GHz and 5GHz bands, I got slightly longer range—by about 15 feet—from the router with the Note 10+ than with a Note 9. This can mean the difference between some connection and no connection in a public Wi-Fi hotspot, for instance. But once again, this is generational, not unique to the Note 10+.

Making phone calls on the Note 10+ is a great experience with one little asterisk: The Note 10+, like all Samsung flagships since the S8, supports high-quality calling with the EVS codec, which really improves call quality. But to achieve the bezel-less screen, the earpiece has been moved to the very top edge of the phone. If you're used to placing a phone against your ear, relying on the bezel for the location of the earpiece, the feeling of pressing the edge of the Note 10+ against your ear might be a little disconcerting, and it doesn't block quite as much outside noise.

The Note 10+'s speaker is technically the same volume as the Note 9's, at 85dB at 6 inches while playing the same song. But the Note 10+ sounds noticeably louder to me, which is probably an effect of equalization boosting the midrange.

### **WHAT ABOUT 5G?**

If you're buying a gigantic, \$1,100 smartphone, you'd hope that it would be able to take advantage of the latest networks the carriers are laying down. But I'm sorry to say that the Note 10+'s 5G situation is a mess.

The Note 10+ 5G will come to Verizon first, for a \$200 premium over the standard Note 10. That model uses Qualcomm's first-generation X50 modem, the same as we've seen in other first-gen 5G phones, and it works with Verizon's millimeter-wave 5G network in a small number of central cities right now.

Verizon's 5G service plan has a perpetually suspended \$10 surcharge over its 4G plan, and it includes unlimited 5G data and hotspot use. The biggest concern I have is that all the X50-based phones so far have overheated and dropped to 4G in hot weather. According to experts I've talked to, Verizon could fix this by slowing down 5G data access on the phones, but it may not want to do that so it can keep showing off spectacular speeds.

The Note 10+ 5G has a vapor-chamber cooling system that the S10 5G doesn't have—but the LG V50 also has vapor-chamber cooling, and it still has overheating problems. I'll test the Verizon Note 10+ 5G in mid-September to see if it overheats.

On the other carriers, things are messier. The Note 10+ 5G won't be able to use the fast 5G T-Mobile has installed in six cities; instead, it will use a slower, potentially nationwide form of the network that will feel more like good 4G. Ditto for the AT&T model, where the Note 10 won't use any of the speedy millimeter-wave the carrier has been touting in 19 cities here, just its upcoming slower nationwide network. On Sprint, the situation is totally unclear.

This isn't at all what I'd been hoping for. I'd come to understand that the Note 10+ 5G was going to be the first phone to bring together fast, short-range millimeter-wave 5G and slower, but better-covering low-band 5G. That's not the case. That makes the Note 10+ 5G a miss.

## **YOUR PHONE, IN YOUR PC**

Who is DeX for? Samsung's "desktop experience" was previously a way to turn your phone into a PC by attaching a keyboard, mouse, and monitor. It was sold as a way to work anywhere without a laptop. The reason it never took off was that keyboards, mice, and monitors aren't that portable, and there isn't much of a business infrastructure of workstations with peripherals but no PCs.



You can still do that with this phone by attaching a Bluetooth keyboard and mouse, and a USB-C-to-HDMI cable, but Samsung rejiggered the entire experience this year. Now DeX is also a way to use your phone as a virtual machine, in a window on your PC or Mac. The obvious use for this is drag-and-drop file transfer, but there are two other potential killer apps.

One is in business: If you have a secure enclave on your phone protected with Samsung's Knox software, you can now use that data on your laptop within the virtual-machine window.

But the other use could be much broader: It lets you use messaging and social media apps that don't have good PC clients, on your PC. I'm constantly getting text messages and Google Hangouts on my phone, and I keep breaking focus from the work I'm doing on my PC to look at the smaller screen. With DeX, that's fixed.

Hangouts works great on DeX. Snapchat and TikTok work surprisingly well. Instagram works fine, except that you can't resize it, so it's stuck in a pretty small subwindow.

There are other ways to manage the dual-screen life, and Samsung offers one here, too: Link to Windows, a lower-impact feature of Windows 10 that doesn't open a full virtual-machine window but just integrates SMS and notifications into your Windows desktop. That's fine, if that's all you need.

I've tried other solutions with other Android phones. Google Messages for the web is cool but has to be freshly logged into every time you close your browser window. Ditto for the Google Hangouts Chrome extension. There's a desktop app for Instagram, but it doesn't work well. Popping your whole phone up in a window seems like a clean way of dealing with these issues.

## **CAMERA: NOTHING'S CHANGED**

The Note 10+ has four cameras on the back and one on the front. They are effectively the same as the ones on the Samsung Galaxy S10 5G. On the back is a 12-megapixel main camera with 1.4-micron pixels and a lens that switches between f/1.5 and f/2.4 depending on the light; a 12-megapixel, f/2.1 "2x zoom" camera; a 16-megapixel, f/2.2 wide-angle camera; and a time-of-flight sensor for AR applications. The front camera is 10 megapixels.



**The S9, Note 9, and S10 all take great-looking pictures in good light, and the Note 10 does, too.**



The S10's telephoto camera is f/2.4, not f/2.1 The Note 9 doesn't have the wide-angle camera or the time-of-flight sensor.

The time-of-flight sensor, so far, is not terribly useful. It enables an AR measuring app, but that's about it. In the future, it's supposed to enable a "3D scanner" feature that scans objects and turns them into 3D avatars you can then put into AR scenes or even make act things out via motion-capture, but that feature isn't live yet.

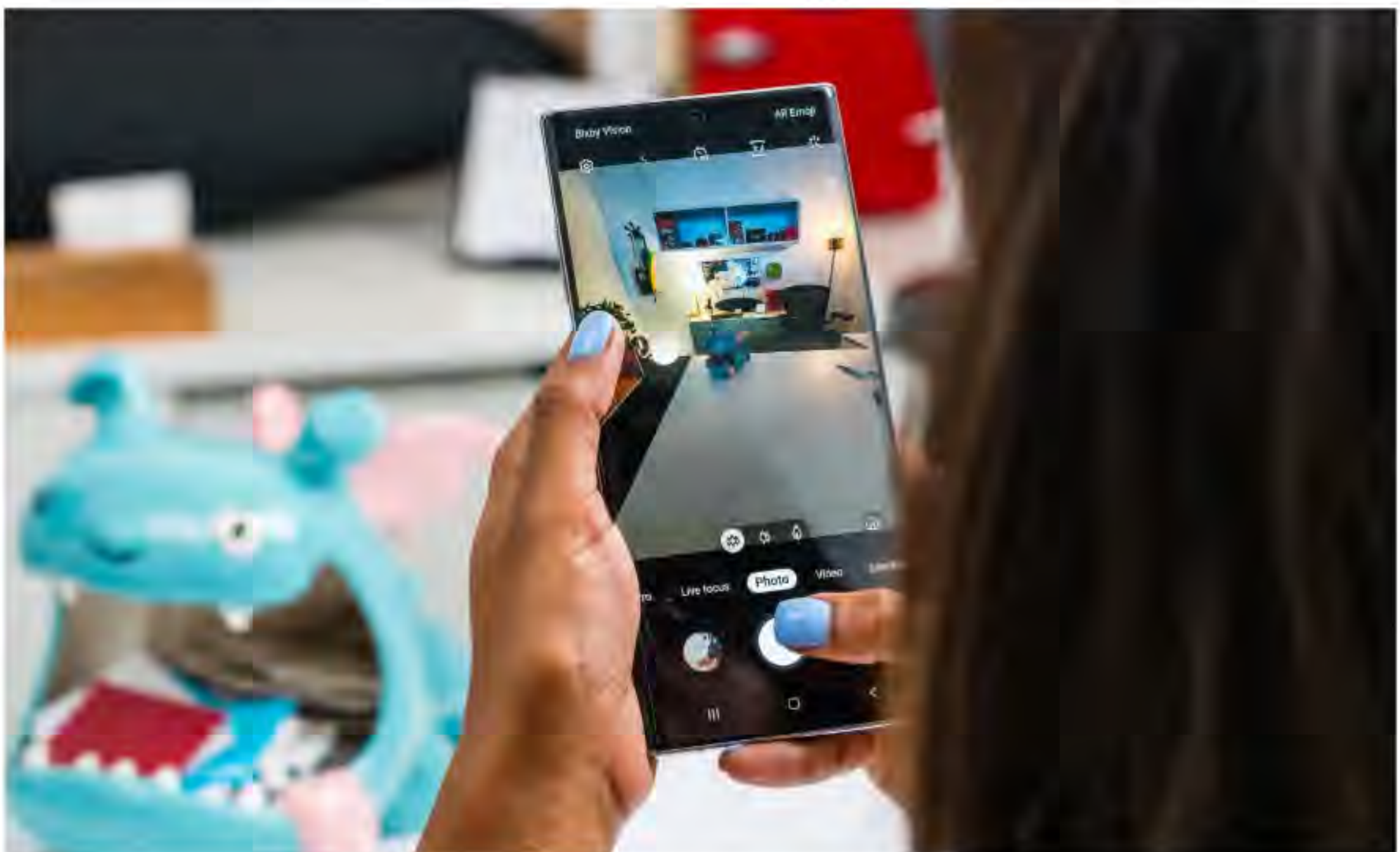
The S9, Note 9, and S10 all take great-looking pictures in good light, and the Note 10 does, too. I'm especially impressed by how sharp the wide-angle lens is at the edges; the OnePlus 7 Pro's wide-angle lens gets really soft in those areas.

Samsung's cameras, at this point, trail Google's and Huawei's in low-light performance, and they've made essentially no gains from the S9 to Note 10 generations. As the lights go down, images become blurry and are laden with artifacts. I found that Samsung's night mode essentially turns the brightness up a bit without pulling out many more details.

Samsung has added a bunch of interesting filters and effects to this phone, although these will also bubble down to the S10 generation. I particularly like the “color-pop” effect, also available on Motorola phones, which makes the main subject of an image color where the background is black-and-white. You can apply color-pop and blur filters to videos, as well. The phone does very well at finding the edges of a subject for the color-pop effect, but it often has trouble with a too-shallow virtual depth of field for the background blur effect, especially on the front camera. Google Pixel phones do this a bit better.

With video recording, there’s one more flagship feature: an “audio zoom” effect that magnifies the sound from a source as you zoom in on it. I tested it zooming in on a conversation in a noisy room, and while it isn’t magic, it definitely makes the conversation more prominent. Is it a spy-cam feature? Borderline—I still couldn’t be more than 20 feet or so from the conversation, but I could certainly have used it if I were a private investigator in a restaurant.

Coming from a previous Samsung phone, the wide-angle camera may be the biggest change. I really like wide-angle lenses; they offer a lot of options for composition that you just can’t get with a standard lens. But remember, pretty much the same array of cameras is available on the Galaxy S10+ and the smaller Note 10 for less money.



## **CHARGE!**

The Note 10+ has an excellent 4,300mAh battery. I got 12 hours 10 minutes of video playback at full brightness on a charge, which is excellent. I've had the phone for a few days as I write this, and it's lasted well over a day when I wasn't testing the battery. Samsung has boosted its standard charger to 25 watts, which fills up the battery very quickly: I timed it as increasing from 0 to 100 percent in 69 minutes.

A more standard 10w charger (most chargers you have lying around are 10w chargers) takes about 2.5 hours to charge the battery. You can also buy a \$50 45-watt charger from Samsung that charges the phone even more quickly.

But you pretty much have to use Samsung's branded chargers to achieve these speeds. Dan Bader at Android Central explains that Samsung is using an open (but currently largely unimplemented) standard called USB-C PPS for fast charging. That means most USB-C cables and existing USB-C PD chargers won't go over 15w when charging this phone. Wireless chargers such as Samsung's \$79.99 charging pad also go up to 15w.

To get fast charging without the built-in adapter, you need a PPS power adapter and an "e-marked," USB-C 3.1 v2 cable. So far, we haven't seen many of those, and you can assume the ones you already have don't meet that standard.

## **SHOULD YOU UPGRADE?**

I've never been on board with the idea of buying a Note just because it's big. If you want a big phone, you can find less expensive but still excellent options—the Galaxy S10+ and the OnePlus 7 Pro, for example. You can get an S10+ for \$799.99, which is \$300 less than the Note 10+, and all you really lose is the S Pen, the video filters, and the new DeX mode.

But Samsung tends to have absolutely insane trade-in deals to get people to upgrade. In this case, it's offering a \$350 trade-in value for a Note 8, which is \$200 more than you can get selling one on a marketplace such as Gazelle (you can get closer by using eBay, but it takes more effort). And Samsung takes really banged-up phones, as long as they work and aren't cracked. Samsung's trade-in deals could make up the difference between the Galaxy S10+ and the Note 10+.

To me, the Note series has always been about the S Pen and about people who want to use it: artists, doctors, journalists, and other people who write, draw, and notate. Samsung made an effort this year to make the pen important to photographers, but I feel like that's really pushing it.

This year, I've been leaning toward the smaller and more affordable phones in Samsung's flagship lineup. I like the Galaxy S10e more than the S10+, for instance. And while we haven't tested it yet, we know the smaller Note 10 has a lower-resolution screen, lacks the microSD card slot, and has somewhat less RAM. But it has the S Pen, the same processor, and all the same cameras as the Note 10+, and it isn't a hand-buster.

**SASCHA SEGAN**



**Samsung made an effort this year to make the pen important to photographers, but I feel like that's really pushing it.**





# Roundup: Best Smart Displays

**S**mart speakers are popular, and for good reason: In addition to playing music, you can ask a smart speaker questions, and it answers back. But speakers are limited to telling you what you want rather than showing you. If you want a voice assistant to show you things, you need to take a step further, to smart displays.

Smart displays are effectively smart speakers with touch screens. They offer the same hands-free voice assistant features as smart speakers such as the Amazon Echo and Google Home and let you play music, check the weather, and control your smart home devices just by talking. But the screen adds a whole new level of information and control. When you play music, you can see album art or watch the song's music video. When you check the weather, you can see upcoming temperatures and conditions for the week at a glance. When you control your smart lights, you can tap or slide your fingers to dim them to just the level you want.



Amazon spearheaded the smart speaker concept with the first Echo, and the company did the same with smart displays in the form of the Echo Show, then updated and expanded its line with a number of new models. Now there are numerous smart displays on the market, spanning two voice assistant platforms and half a dozen manufacturers. These are the top models we've tested along with a guide to each platform.

## **AMAZON ALEXA**

**Echo Smart Displays:** Amazon Alexa is available on the company's own Echo and Echo Spot smart displays, but that's only the start. Facebook has gotten in on the action with the Portal and Portal+. All four devices use the Alexa voice assistant, but how they work varies.

For the current Echo Show, you get full access to all of Alexa's capabilities. It can show or tell you anything you want to know (within Alexa's powers to answer). It can also play video from Amazon Video and a handful of third-party services, and it even has a fully functional web browser. It also offers touch-screen control of smart home devices and can show live feeds from compatible home security cameras. You can even make phone calls through it.

The Echo Spot is a scaled-down version of the Echo Show, and that means some compromises. Its much smaller and lower-resolution screen means it can't really pull off the web browser or video playback very well. It also doesn't sound nearly as loud or clear as the larger Echo Show. On the other hand, its smaller design and lower price make it an ideal smart alarm clock.

**Facebook Portal:** Facebook's Portal and Portal+ are capable communication devices, though we have concerns about Facebook's issues with privacy and data.



**Now there are numerous smart displays on the market, spanning two voice assistant platforms and half a dozen manufacturers.**



Communication is the devices' first and foremost function, with other smart display features coming second. Video chat is straight through Facebook, so you're covered if you want to talk over Messenger. But you can't make phone calls or use Amazon's Drop In messaging.

The Portal and Portal+ both feature Alexa voice control, but the implementation isn't as comprehensive as it is on the Echo Show or Echo Spot. As the only third-party Alexa smart displays, they can't play Amazon Video or show lyrics through Amazon Music. It's Facebook first, Alexa second.

**Amazon Fire Tablets and Show Mode:** Amazon's Fire HD tablets now include Show Mode, which makes them act just like the Echo Show. Amazon even offers a charging dock that automatically puts the tablet in Show Mode (or you can simply use your own tablet stand). It's a functional solution and a handy option if you don't want your Fire HD to be sitting flat and unused when it's charging. But a tablet's sound isn't nearly as good as the Echo Show's, and it lacks the sense of permanence a smart display offers.

## **GOOGLE ASSISTANT**

Interestingly, the initial Google Assistant smart displays weren't made by Google. JBL and Lenovo hit the market first; Google didn't release its own Nest Hub until after the third-party smart displays came out.

You won't find a web browser on any of these devices, but you can access YouTube, including live TV through YouTube TV and music through YouTube Music. Curiously, Google Assistant prefers accessing media through those services instead of Google's own Play Music and Play Movies & TV stores. All Google Assistant smart speakers and smart displays are also Google Cast-compatible, so you can easily stream media to them from any compatible mobile app.

The usual information and smart home features are also available, and while Google Assistant's selection of supported home automation devices isn't quite as massive as Alexa's, it's a bit better at dealing with natural language and less picky about syntax. You can also make phone calls with these smart displays, and video chat through Google Duo.

## THIRD-PARTY SMART DISPLAYS

Google Assistant has more universal implementation than Alexa when it comes to third-party devices. It works about the same on the JBL and Lenovo smart displays as it does on the Google Home Hub. JBL, Lenovo, and LG's smart displays are all a bit more expensive, but the models we've tested sound much better than the Nest Hub, so if you plan on listening to any music through a Google Assistant smart display, you'll probably want to go with a third-party model.

## WHAT ABOUT APPLE?

It took Apple a few years to dip its toe into the smart speaker arena with the HomePod. It'll probably take a little more time to release its own smart display. For now, you can use your iPad or iPhone on a stand and talk to Siri or get an Apple TV and speak into the remote, but that's as far as it goes.

### Amazon Echo Show (2nd Generation)

\$229.00



EDITORS' CHOICE



**Pros:** Feature-rich touch-screen interface. Friendly design with a big, bright screen. Powerful audio. Web browser.

**Cons:** Heavily sculpted sound emphasizes extremes and downplays midrange. The screen supports only 720p video.

**Bottom Line:** The latest model of the Amazon Alexa-powered Echo Show smart display is a major upgrade over the original, with a larger, more functional touch screen and a much more powerful speaker system.



### Amazon Echo Show 5

\$89.00



EDITORS' CHOICE

**Pros:** Affordable. Powerful voice assistant features. Useful touch-screen controls with a web browser.

**Cons:** Mediocre sound quality. Music streamed over Bluetooth is filled with artifacts.

**Bottom Line:** The Amazon Echo Show 5 is an affordable little smart display that brings Alexa voice commands to your desk, shelf, or nightstand.

## Amazon Echo Spot

\$129.99



**EDITORS' CHOICE**

**Pros:** Super cute design. Useful display. Supports all Alexa features. 3.5mm output.

**Cons:** Not a powerful speaker. No non-camera option.

**Bottom Line:** The tiny, Alexa-powered, touch-screen Amazon Echo Spot makes a perfect smart bedside or desk clock.



## JBL Link View

\$249.95



**EDITORS' CHOICE**

**Pros:** Surprisingly powerful sound. Bright, crisp screen.

**Cons:** Bass falters at high volume levels. Can't cast video freely to the screen.

**Bottom Line:** The Google Assistant-equipped JBL Link View is the best-sounding smart display we've tested, combining stereo speaker drivers with an 8-inch touch screen.

## Google Nest Hub Max

\$229.00



**Pros:** Integrates with Nest and functions as a security camera. Supports Google Cast. Fairly loud.

**Cons:** Sound quality isn't particularly impressive.

**Bottom Line:** The Google Nest Hub Max is a big, bright smart display with Google Assistant, and you can even use it as a home security camera.





## Lenovo Smart Display (10-Inch)

\$249.00



**Pros:** Bright, crisp screen. Attractive design. Google Assistant is powerful and useful. Google Cast adds media flexibility. Supports YouTube.

**Cons:** Relatively weak bass and low overall audio power. Voice and video chat only through Google Duo.

**Bottom Line:** The 10-inch Lenovo Smart Display is a good-looking, decent-sounding tabletop smart speaker that lets you use Google Assistant hands-free, with visual information and streaming media support.

## Google Nest Hub

\$149.00



**Pros:** Relatively inexpensive. Small footprint. Useful touch screen.

**Cons:** Weak audio. No camera for video calls.

**Bottom Line:** The small, affordable Google Assistant-powered Nest Hub smart display is functional and convenient, but won't impress anyone with its sound quality.



## Facebook Portal

\$199.00



**Pros:** Effortless video calling with unique body tracking. Attractive design. Compatible with Alexa.

**Cons:** Facebook is a political and privacy disaster area. Alexa support falls a bit short of the Echo Show.

**Bottom Line:** The Facebook Portal offers promising video call technology but is outweighed by the company's disastrous handling of your personal metadata.



WILL GREENWALD



**Panasonic Toughbook 55** | \$2,099.00 | **EDITORS' CHOICE** Rating: ●●●●○ EXCELLENT

## Panasonic Toughbook 55: Rugged Excellence

**P**anasonic's Toughbook 55 rugged laptop has an ingenious modular design, making it possible to remove and replace most of its key components in seconds. It's got a startlingly bright display, a built-in stylus, and a cutting-edge CPU. It's also quite durable, tested to survive 3-foot drops, water spray, and some dust ingress. It lacks ultimate rugged bragging rights, though. Panasonic refers to it as "semi-rugged," and its tougher Toughbook 31 cousin can withstand higher drops (from 6 feet) and a direct hit from a water cannon. Still, unless you need this extreme level of protection and are willing to make sacrifices to get it, the versatile, advanced Toughbook 55 (starts at \$2,099; \$2,499 as tested) is a better laptop and earns our Editors' Choice award.

## MODULAR AND RUGGED

With so many thin, light, and sturdy laptops on the market, it might seem hard to justify buying a “true” rugged one like the Toughbook 55. With a 4.6-pound weight and a thickness of 1.3 inches, it dwarfs most other laptops that share its 14-inch screen size, many of which can also withstand everyday accidents like a splash of water or a fall from a coffee table. Its IP53 rating isn’t particularly impressive—even mainstream smartphones like the Google Pixel 3 have higher waterproof ratings. (IP68 is common among flagship phones, signifying the ability to survive complete submersion in more than 3 feet of water.) But the Toughbook 55 can do one thing that most of these other devices cannot: transform into entirely new configurations with minimal effort.

A large portion of the Toughbook’s 13.6-by-10.7-inch base is made up of bays that can accept a dizzying array of modules—everything from RFID readers to Blu-ray drives. Panasonic loaned us a total of nine individual modules to test out, in addition to the modules that are installed in the Toughbook 55’s entry-level configuration. Even the keyboard can be swapped out, though doing so does require a screwdriver. This is truly a flexible machine.

## Panasonic Toughbook 55

**PROS** Super-bright display, suited for outdoor use. Relatively thin and light for a rugged laptop. Components are easy to swap out. Built-in stylus holder. Long battery life.

**CONS** A step down in ruggedization from other Toughbooks. Swap-in modules may be pricey.

### **BOTTOM LINE:**

Panasonic’s Toughbook 55 isn’t full-on armored, but among “true” rugged laptops, it’s the easiest to customize and one of the best-equipped.



Most of the module bays have quick-release sliding locks that, when released, let you pop out the module and swap in a new one. This includes the storage drive and the primary battery bay. Others, like the rear expansion area and the GPU bay (yes, there's even a swappable graphics card module!) have screws in addition to quick-release levers that keep their components more securely in place. Even these bays are easy to access, however. I replaced the placeholder module in the GPU slot with the GPU module (based on the AMD Radeon Pro WX 4150) that Panasonic supplied, booted the Toughbook 55, and saw the GPU was already enabled in Windows Device Manager.

I especially like how the SSD module is located in its own dedicated, easily accessible bay on the bottom of the Toughbook 55. The ability to remove the boot drive can improve data security, allowing you to store the drive in a separate location from the laptop.

All of these modules come at an additional cost, of course, which varies depending on where you buy them. And since they're specific to this laptop, upgrades using third-party components will be unlikely—expect to install Panasonic's modules or nothing. At current list prices, which in most cases are quite high, a second 512GB SSD is \$400, the GPU module is \$700, a second battery is \$150, the fingerprint reader is \$125, and the Blu-ray optical drive is \$400.





Some other rugged laptops have basic degrees of on-the-fly configurability. The Toughbook 31, for one, can accept up to two hot-swappable batteries secured with quick-release sliders, or an optical drive instead of the second battery. The Dell Latitude 5424 and Latitude 7424 also feature dual removable batteries, and all three of these laptops can be configured with alternative connectivity options installed at the factory, such as legacy VGA ports or GPS receivers. But none of them can match the range of post-purchase swappable component options that the Toughbook 55 offers.

This nifty configurability comes in addition to hallmark Toughbook features, such as its bottom docking-slot that's compatible with police-cruiser mounts, the extendable carrying handle built into the front edge of the laptop, and the signature silver magnesium-alloy case. Also on board: MIL-STD 810G certification for resisting vibration and to ensure safe operation at extreme altitudes and temperatures.

### **A CUTTING-EDGE TOUGHBOOK**

Besides its swappable bays, the Toughbook 55 also brings significant performance and compatibility improvements to the Toughbook line, which often remains several generations behind the cutting edge. Unlike the Toughbook 31, which uses older 7th Generation Intel processors, the Toughbook 55 offers far more capable and efficient 8th Generation “Whiskey Lake” Core i5 or Core i7 processors. It's also the first Toughbook to offer a USB Type-C port, an HDMI video output, and Bluetooth 5.0. These are all common on most mainstream consumer laptops, so it's nice to see them join the Toughbook line.



Other cutting-edge features include a webcam with a privacy door and infrared sensors to support Windows Hello face recognition. I especially appreciate the webcam's 1080p resolution, since the 720p cameras found on most consumer laptops tend to offer grainy video quality in indoor lighting conditions.

There are four microphones on the Toughbook 55 to help improve audio clarity in loud environments, a gigabit Ethernet port, and even a backlit keyboard with—surprisingly enough—programmable colors. I found both the keyboard and touchpad to be far more comfortable than their equivalents on the Toughbook 31 when using them with bare fingertips. Many rugged laptops have pressure-sensitive touchpads designed to be used with a stylus or with gloved hands, and these often don't function well with bare fingers.

A fingerprint reader can be installed using an optional module that takes the space of the second battery. This seems like a lot of wasted space, and I would prefer if Panasonic had included a fingerprint reader built into the keyboard deck. Besides the fingerprint-reader module, you can instead choose to install Smart Card or RFID reader modules in place of the second battery.

One of the best parts of the Toughbook 55 is its 14-inch display. The unit I tested comes with the upgraded full HD (1,920-by-1,080-pixel) panel, which is rated for a whopping 1,000 nits of brightness. (For context, most of the brightest consumer laptop displays top out at around 500 nits.) This display is clearly viewable outdoors, although direct sunlight does create significant glare. Panasonic offers anti-reflective and anti-glare screen treatments as configurable options.





The screen also has capacitive touch support, which means you can interact with it using either your fingers or the built-in passive digital stylus, which slides into a nifty slot on the right edge when you're not using it. The base display option is a lower-resolution 1,366-by-768-pixel panel without touch support. I'd spring for the upgrade in a heartbeat, since it offers far better quality than the washed-out 1,366-by-768 resistive touch display I tested on the Toughbook 31.

The base port configuration includes a headphone jack, a microSD card slot, USB 3.1 Gen 1 Type-A and Type-C ports (one of each), an Ethernet jack, and a power connector on the right edge. The rear offers another USB Type-A port and an HDMI output. All of these are hidden behind protective doors.

The left edge contains no ports, with its entire area taken up by the primary battery and optical drive/GPU bay. Configurable port options include a module with VGA and serial ports as well as a second Ethernet port, which can be installed on the rear edge using screws.

In addition to Bluetooth 5.0 and 802.11ac Wi-Fi, which come standard, you can also configure a Toughbook 55 with GPS and LTE connectivity, present on our review unit. The latter supports FirstNet, an LTE band on AT&T's network reserved for emergency communications between first responders when cell networks are overloaded.

## COMPETENT PROCESSING POWER

Our Toughbook 55 review unit is equipped with the base-level Intel Core i5-8365U processor with vPro support, 8GB of memory, and a 256GB SSD.

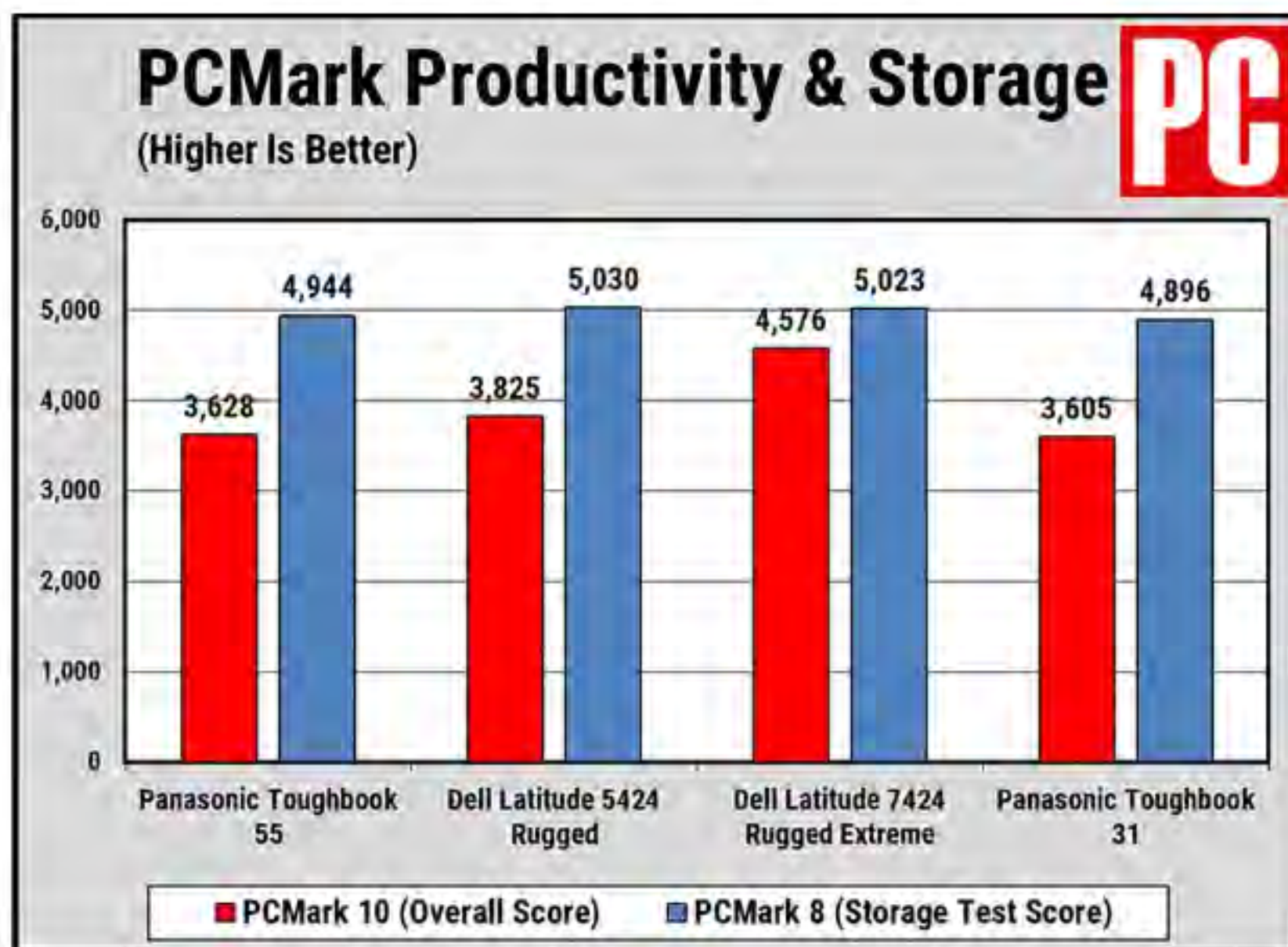
Panasonic currently plans to sell a configuration identical to this one except for a 512GB SSD, for a list price of \$2,499. It will offer plenty of power for basic tasks, like writing reports or accessing databases in the field. As with the rest of the laptop, both the memory and storage are user-upgradable. Two RAM slots accept up to 64GB of RAM, and there are two drive bays, heated for extreme cold weather operation, that can each accept up to 1TB SSDs.

The only option you'll need to configure when you order is the CPU. Panasonic offers a single upgrade, which is to a Core i7-8665U. This chip also features vPro support, and it comes with a slightly higher maximum clock speed (4.8GHz versus 4.1GHz) and a larger cache (8MB versus 6MB), though both chips have four cores and support up to eight processing threads. It's an incremental upgrade, and unless you know your specific tasks will benefit from a higher clock speed, you'll likely be just fine with the Core i5.

I compared the Toughbook 55's computing performance with a few other rugged laptops we've tested recently, whose specs are listed below. Overall, the Toughbook 55 rivals its Dell competitors on basic computing tasks, even though the Latitude 5424 and Latitude 7424 both have more memory in the configurations we reviewed. On specialized multimedia workflows, the Toughbook 55 far outperformed its Toughbook 31 sibling, a difference significantly influenced by the latter's older CPU generation.

Test System Configurations			PC
	PROCESSOR	GRAPHICS	MEMORY & STORAGE
Panasonic Toughbook 55	Intel Core i5-8365U (1.9GHz)	Intel UHD Graphics 620	8GB RAM; 256GB SSD
Dell Latitude 5424 Rugged	Intel Core i5-8350U (1.7GHz)	Intel UHD Graphics 620	16GB RAM; 512GB SSD
Dell Latitude 7424 Rugged Extreme	Intel Core i7-8650U (1.9GHz)	AMD Radeon RX 540 (4GB)	16GB RAM; 512GB SSD
Panasonic Toughbook 31	Intel Core i5-7300U (2.6GHz)	Intel HD Graphics 620	16GB RAM; 256GB SSD

The performance situation is perhaps best summed up by the results of the PCMark benchmark. The PCMark 10 test we run simulates different real-world productivity and content-creation workflows. We use it to assess overall system performance for office-centric tasks such as word processing, spreadsheet work, web browsing, and videoconferencing. The test generates a proprietary numeric score; higher numbers are better. With its Core i7 and 16GB of RAM, the Latitude 7424 has a very small advantage on this test, and the Toughbook 31 predictably performed the worst.



PCMark 8, meanwhile, has a Storage subtest that we use to assess the speed of the system's storage subsystem. Today's PCI Express SSDs all perform roughly the same on this test, so there's little variation among these four laptops.

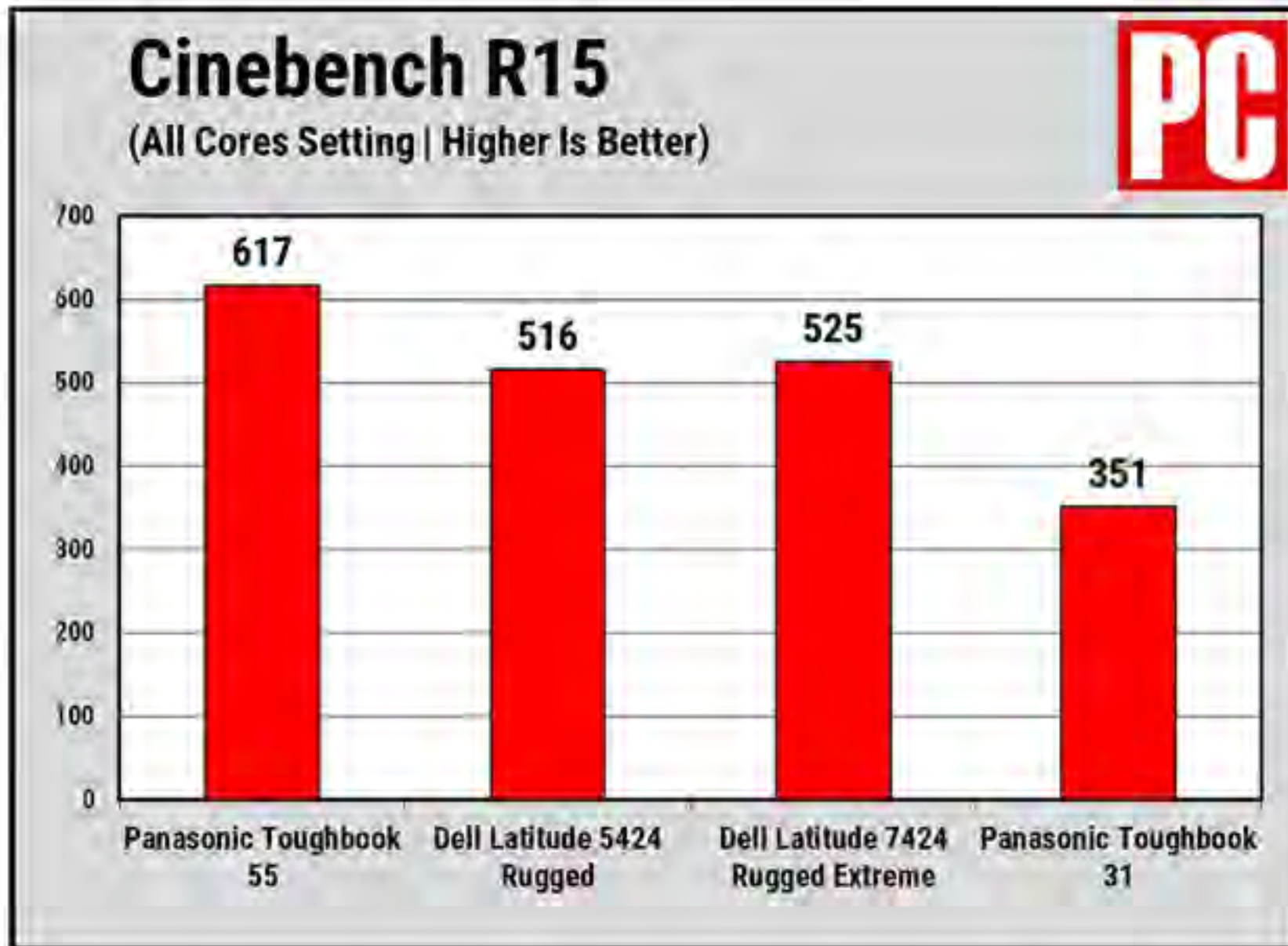
### **BETTER 3D GRAPHICS, IF YOU NEED THEM**

On specialized multimedia tasks like rendering a 3D image using Cinebench and applying a series of filters to an image in Adobe Photoshop, the Toughbook 55 performed very well. Its class-leading Cinebench score is a welcome surprise, and its Photoshop time is very close to that of the Latitude 7424.

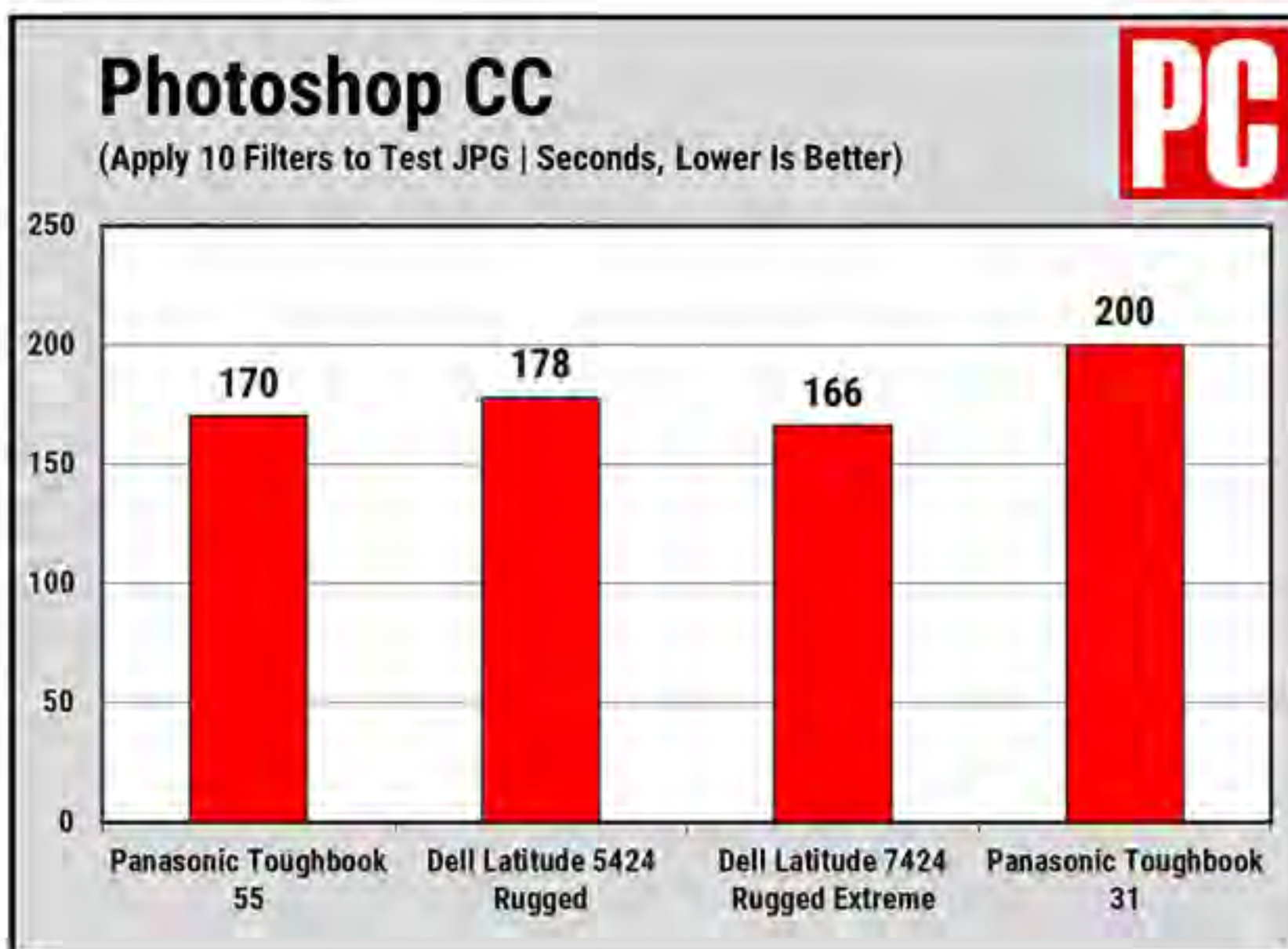


**The unit I tested comes with the upgraded full HD panel, which is rated for a whopping 1,000 nits of brightness.**





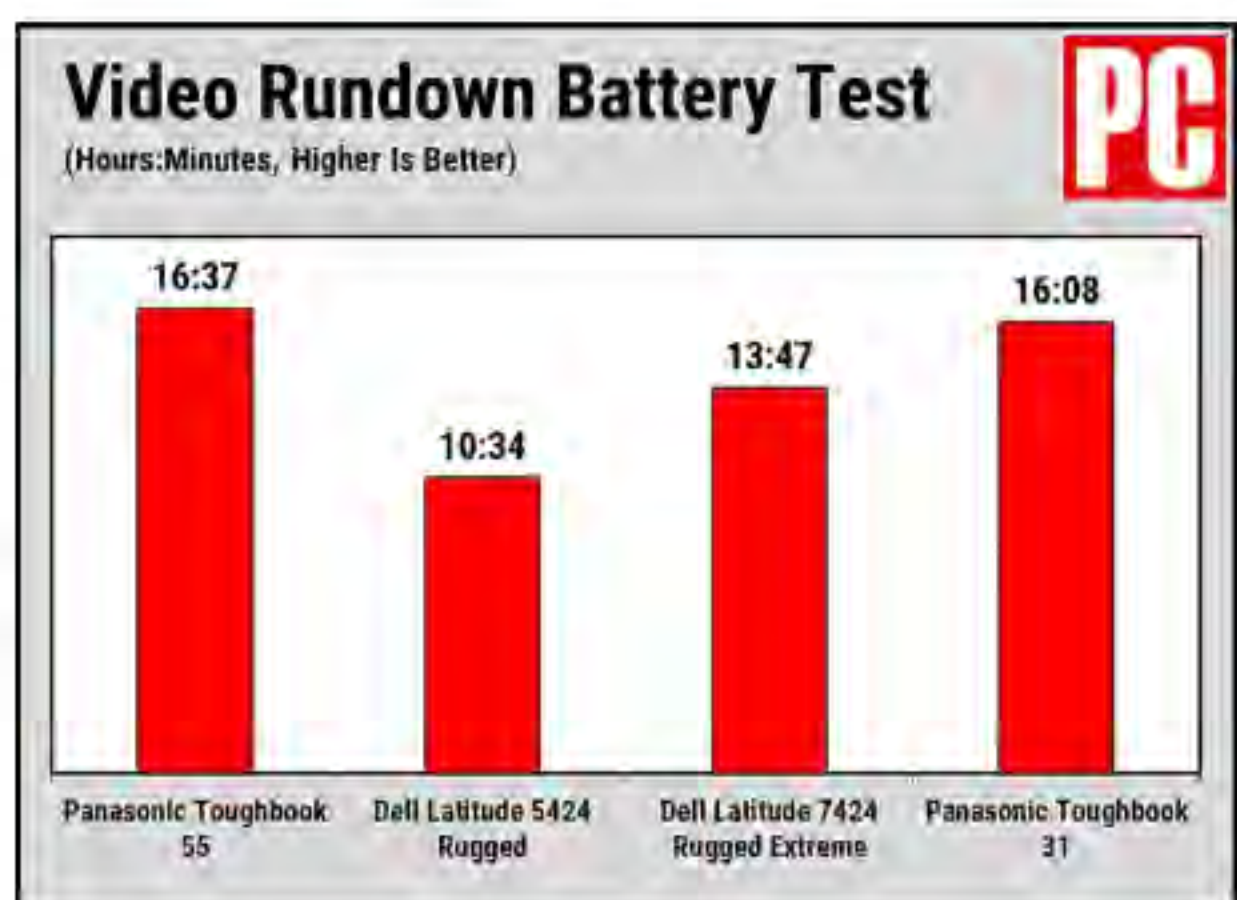
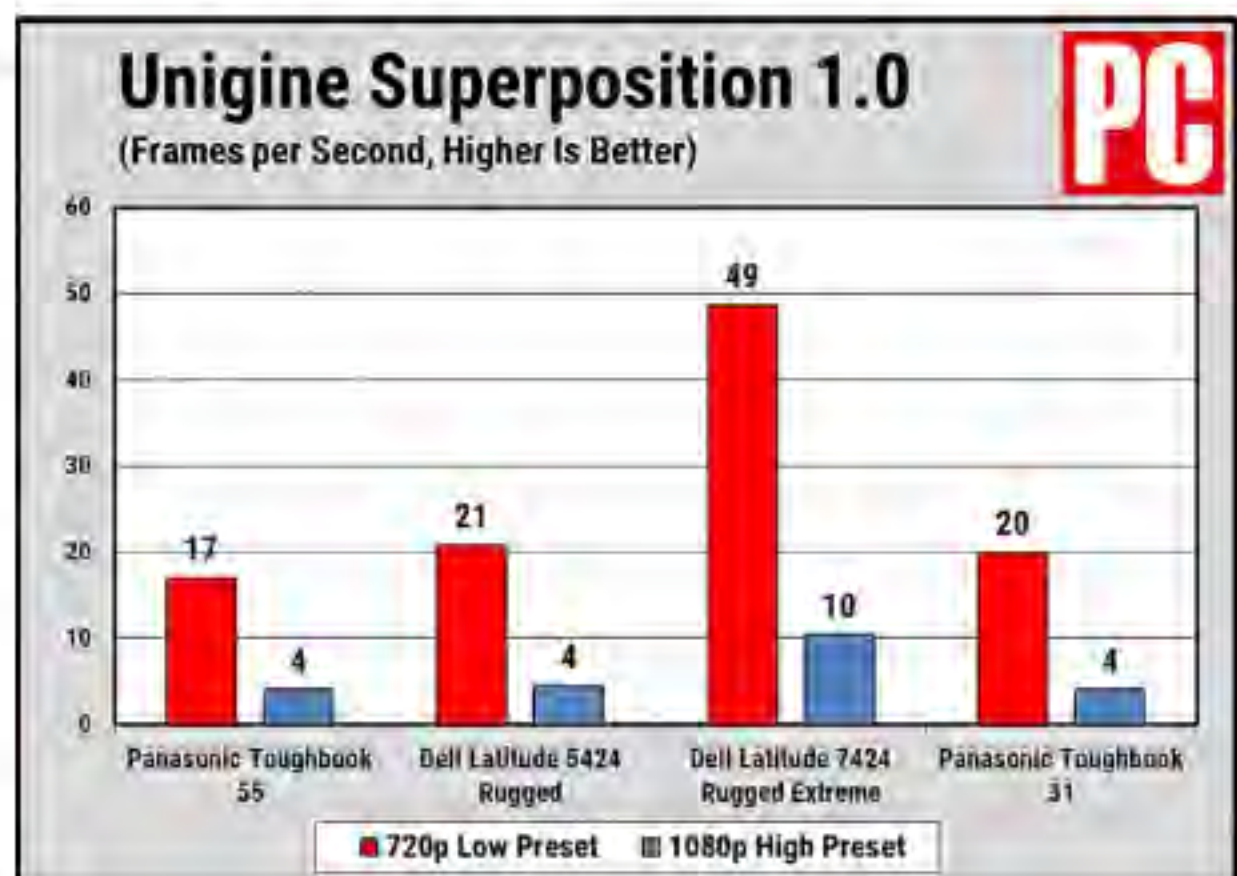
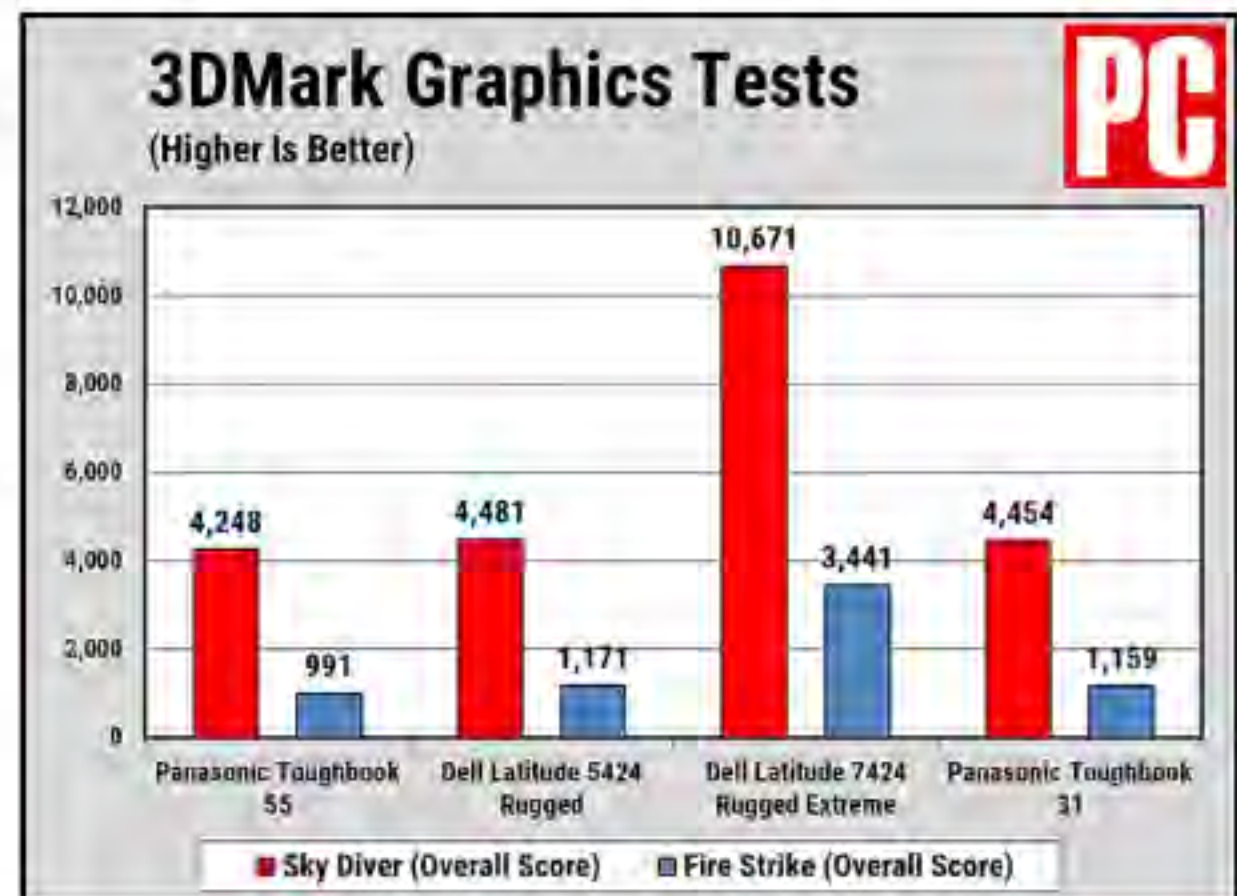
The Photoshop test stresses the CPU, storage subsystem, and RAM, but it can also take advantage of most GPUs to speed up the process of applying filters, so systems with powerful graphics chips or cards may see a boost. Interestingly, I ran these tests without the Toughbook 55's optional AMD GPU installed, so it's possible that if you opt for it, your results on multimedia workflows could improve.



One thing the discrete GPU option will definitely improve is the Toughbook 55's 3D graphics performance. With its superior graphics chip, the Latitude 7424 was clearly the best on both our Superposition and 3DMark gaming simulations. 3DMark measures relative graphics muscle by rendering sequences of highly detailed, gaming-style 3D graphics that emphasize particles and lighting. Like 3DMark, the Superposition test renders and pans through a detailed 3D scene and measures how the system copes, but returns a result in frames per second instead of a proprietary score.

After I installed the Toughbook 55's GPU, I reran the 3DMark Fire Strike benchmark and achieved a much better result of 3,786, suggesting that this configuration will offer performance roughly comparable to the Latitude 7424, as well as to other laptops with entry-level GPUs like the Nvidia GeForce MX250.

One of the side benefits of using cutting-edge components is that they're very good at maximizing battery life. The Toughbook 55 achieved more than 16 hours on our battery rundown test with only its main battery installed, and Panasonic touts up to 40 hours of life with both batteries installed. If you buy a third battery and keep it charged and ready to swap in, you could potentially have enough power to last through a multi-day trip to a remote location.



## JUST TOUGH ENOUGH?

The Toughbook 55 is the most advanced—if not the most rugged—Toughbook we’ve tested to date. It’s not impressively equipped compared with the latest consumer laptops, and flagship phones (and other rugged laptops) are far more water-resistant. But the ability to configure the Toughbook 55 with so many different components gives it a different strength, especially for those buyers looking for a blend of features and ruggedization and willing to compromise to achieve them.

In fact, you really won’t find a direct alternative to the Toughbook 55 on the market, at least as of this writing. Some stalwart Toughbook customers, especially police and fire departments, have begun switching to smartphones and tablets for many tasks. But there’s no substitute for a rugged Windows-powered laptop for many other kinds of customers, and the Toughbook 55 will offer them a Goldilocks blend of toughness and cutting-edge features.

*TOM BRANT*



**The ability to  
configure the  
Toughbook 55  
with so many  
different  
components  
gives it a  
different  
strength.**







**Razer Blade 15 Advanced Model** (Mid-2019, OLED) | \$3299.00 as tested | Rating: ●●●●○ EXCELLENT

## Razer Blade 15 Advanced Model: All About the OLED

**T**he first major wave of laptops with OLED displays is here, and the results are stunning. The Razer Blade 15 Advanced Edition OLED marries the cutting-edge panel technology to the excellent design of Razer's flagship 2019 laptop to head-turning effect. The screen is a joy, shining with incredibly vibrant colors and deep blacks. You can consume beautiful 4K content, and the high-powered components enable gaming at maximum settings. It's pricey, but it's hard to find a gaming laptop sleeker, portable, and satisfying to use, with the OLED screen only elevating the experience. The non-OLED version remains our Editors' Choice, but this machine feels no less like luxury. You can find better dollars-for-frame-rates values for performance, so don't break the bank just to get the screen. But if you can afford it, get it: You'll fall in love.

## DON'T MESS WITH A WINNING DESIGN

The physical features of this laptop, apart from the display, are identical to those of the Blade 15 Advanced Model we reviewed earlier this year. A short summary: This is one of the best-designed gaming laptops on the market. The metal body has an ultra-premium look and feel while still thin and relatively light. The 4K OLED version does weigh slightly more than the others, at 4.87 pounds, but it's not significant enough a weight boost to kick it up to a higher weight class. If you considered the Blade 15 Advanced to be portable enough for your needs before, this model should be too. All other physical features, including its port selection and per-key backlighting, remain intact.

Before I get to the new display, let's touch on the internal changes. Unlike the overall design, the component offerings have been altered. This mid-2019 refresh is bringing Intel's 9th Generation processors to the party, with the Core i7-9750H, specifically, used in all five units of the Advanced Model. (At the time of this writing, a whole smorgasbord of 10th Generation Intel Core chips had just been announced, but no H-series ones.) This is up from the 8th Generation silicon, the Core i7-8750H, in the unit we reviewed last.

## Razer Blade 15 Advanced Model (Mid-2019, OLED)

**PROS** Brilliant 4K OLED display with eye-popping picture quality. Premium build quality and design. Top-end components for 60fps gaming at sub-4K resolutions. Good battery life. Per-key RGB keyboard backlighting.

**CONS** OLED config is expensive. Can't maintain 60fps at 4K in AAA titles.

**BOTTOM LINE** Razer's Blade 15 Advanced Model was always envy-inducing, and the OLED-screen version makes it even more so. It's pricey, even for a gaming laptop, but if you can afford it, you'll find it sleek, satisfying, and powerful.





The CPU is the big change, but there are some other alterations. Our 4K OLED configuration also comes with an Nvidia GeForce RTX 2080 Max-Q graphics chip, 16GB of memory, and a 512GB SSD for \$3,299. Those parts were all options previously, but Razer's less expensive Blade 15 Advanced Models are also based around a new screen.

Although it's not a 4K OLED, all four other models use a full HD (1080p) display with a 240Hz maximum refresh rate, which is up from 144Hz. This blistering top refresh rate will only matter for some competitive multiplayer titles (and to really hit the limit, you may have to turn some settings down), but it's an added bonus for serious multiplayer buffs and esports enthusiasts. The 4K OLED display, in contrast, caps out at a pedestrian 60Hz, the typical rate for any mainstream laptop screen.

The models without the OLED screen have a GeForce RTX 2080 or 2070 Max-Q GPU and 256GB or 512GB of storage, and all come with 16GB of memory. There's also a Mercury White color option in one SKU, which looks slick but costs a \$50 premium over the black version with the same components. These other non-OLED-equipped models range from a starting price of \$2,399 (with an RTX 2070 and a 256GB SSD) to \$2,999 (the model just below ours, which is the only other unit with an RTX 2080).

## DISPLAY DEEP DIVE: IT'S ALL ABOUT THAT SCREEN

The new display is the star of this show, and in short, it looks absolutely stellar. What was already a nice display has been transformed into one of the best screens you can get on a laptop, thanks to this Samsung-developed OLED panel.

A bit of screen-tech background: LED-lit LCD screens use a white backlight that's passed through a fast filter, which tints the light to provide the correct color. In somewhat simple terms, OLED screens (the acronym stands for "organic light-emitting diode") use a completely different display paradigm: a self-emissive organic compound that allows each pixel in the panel to produce its own light when current is applied.

That's what enables OLED screens to produce extra-brilliant colors and deep blacks. To display black, that area of the screen stops producing any light, so it is truly displaying nothing, which in turn provides better contrast and "truer" blacks than simply filtering out an ever-present LED backlight. All of this also allows the panels to be more efficient and thus thinner. That doesn't come into play with laptops as dramatically as with TVs; many OLED TVs are nearly razor-thin.

But back to how great it looks. I can describe it, but OLED is the kind of thing that you really have to experience for yourself. Trying to approximate it here through a non-OLED panel in images or videos is fruitless. The colors seem to pop off the screen, looking almost impossibly vibrant and more realistic than if you just cranked up the saturation. The blacks are deep and true, looking like you can fall into their depths. The quality of black areas creates a stunning contrast with the brightness of the colors.



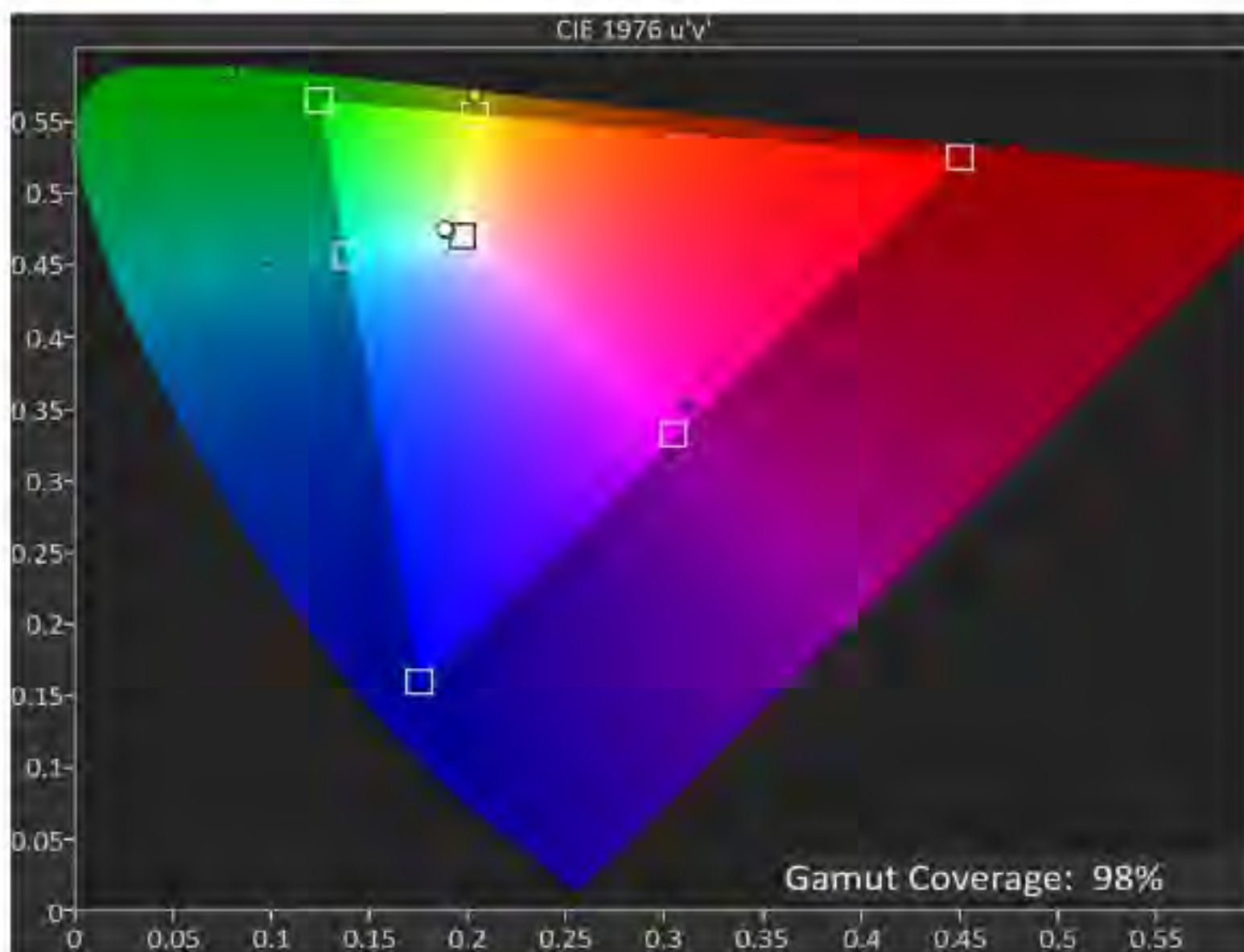
**What was already a nice display has been transformed into one of the best screens you can get on a laptop.**



On this laptop, the 4K resolution definitely helps matters, as everything is super-sharp. (Indeed, you'll want to make sure that text scaling is turned up, or all text will appear way too small.) The screen also features touch technology, which proves useful at times, though I find myself hesitant to smudge up such a pretty display. This panel has the expected glossy glass finish, which isn't everyone's favorite. But boy, with its help, does that picture ever pop.

As for specific claims about this screen, Razer says it boasts 100 percent coverage of the Adobe RGB color space and 100 percent of the DCI-P3 spectrum. Big claims, certainly, and while it looks great to the eye, we need some objective data. So I gathered the following results using the same Klein K10-A meter and CalMAN Ultimate software we use for testing monitors. First up, its coverage of the widely used sRGB color space.

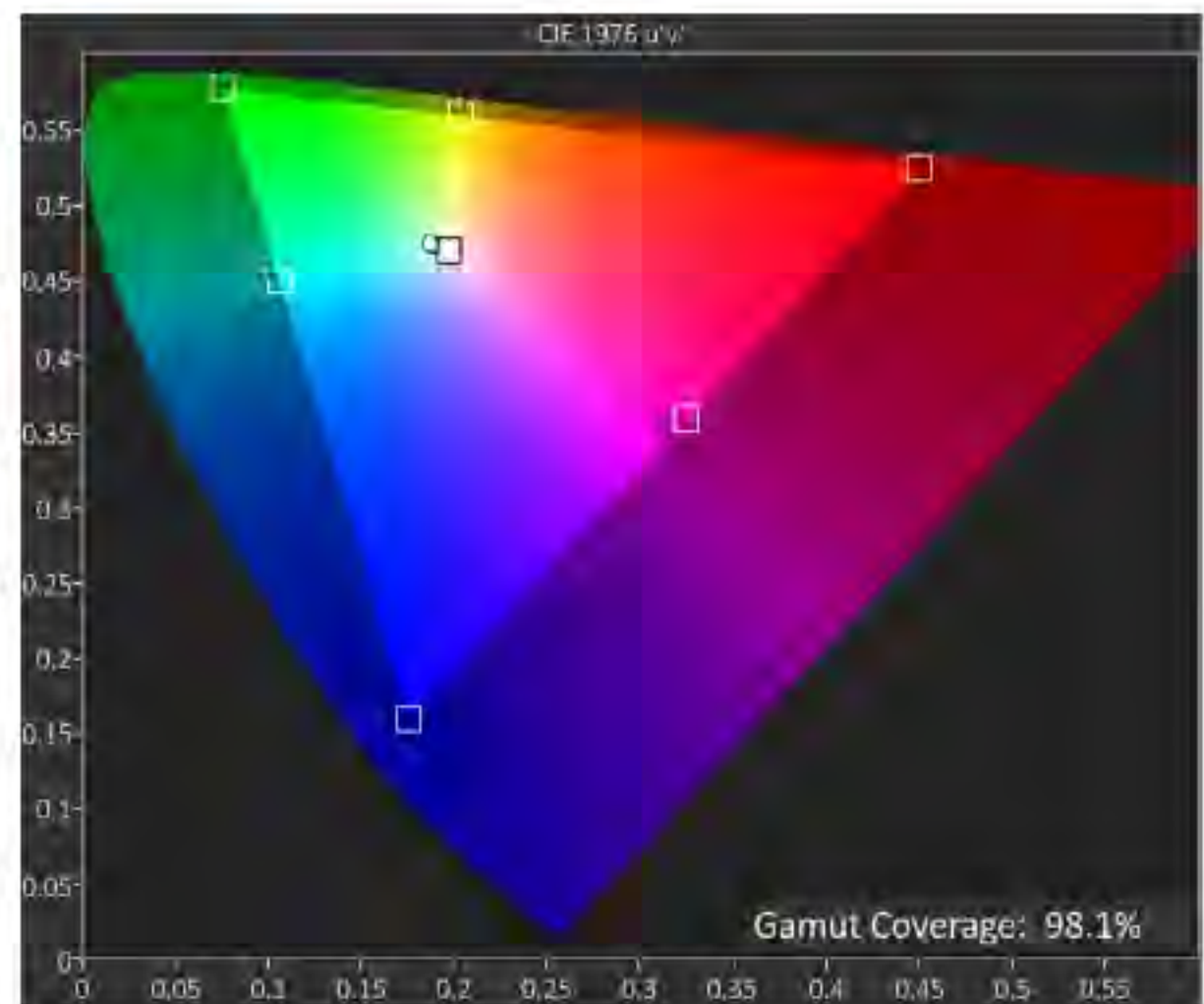
“The screen features useful touch technology, though I'm hesitant to smudge up such a pretty display.”



Since the sRGB spectrum is the common gamut for internet content, it's important to be able to color-match accurately for the many screens out there. A 98 percent coverage is strong, even if it doesn't quite hit the 100 percent claim, but coming that close is still a good result.

On to the next gamut.

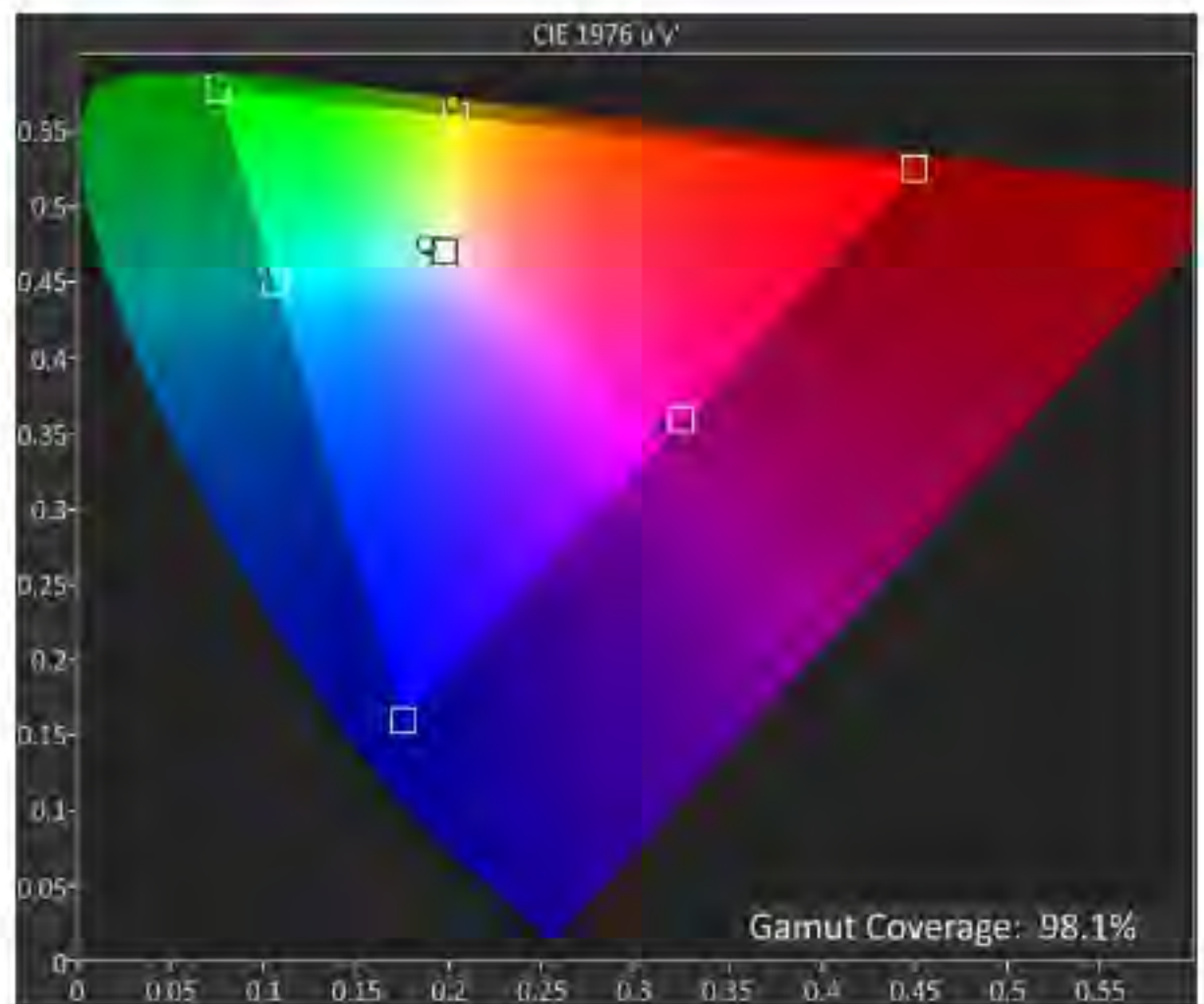
Blade 15 OLED came through with 98.1 percent Adobe RGB coverage, as shown in the chart above. That's not quite the 100 percent claimed, but it's realistically extremely difficult to hit such heights on this wide gamut. High-end gaming monitors such as the Acer Predator XB3 (which came in at 90.1 percent) don't even usually hit that mark, so know that this is one of the most color-accurate screens available, especially on a laptop.



Finally, I tested Razer's claim of 100 percent DCI-P3 coverage.

DCI-P3 is most useful for film and video professionals, so a solid 94.5 percent result should be pleasing to those users. It's not full coverage, however, so depending on how precise your work needs to be, that may not be quite enough.

As for color accuracy, Razer claims the screen's "DeltaE" or "dE" score—the value that represents color accuracy—is a mere 0.39. The closer the score is to zero, the more color accurate the screen is, since it's a measure of variation between what's being displayed on the screen and the "true" color. We're still developing our color-accuracy-testing methodology to be as precise as possible with OLED displays in particular, and will update you with our own dE score for this laptop when we have one. For now, Razer's claimed score is incredibly good, if true, and should be music to the ears of creatives who need super-accurate displays for image and photo work.



Finally, the display demonstrated high luminance, at 447 nits. That matches the eye test of it being quite a bright screen, and on paper, it beats even the Asus ProArt PA34VC Professional Curved Monitor, a creative professional display that pushed 322 nits.

The main takeaway is that this is a plenty viable display for creative professionals. It looks fantastic and generally has high color gamut coverage. Coverage is not quite at 100 percent by our measurements, so it may not be the best fit for every creative professional. For now, we can't make our own claims about color accuracy, but the claimed capability is quite high.

## TESTING THE BLADE: STILL A TOP PERFORMER

For performance comparisons, I've put together a list of gaming laptops that share power and/or price tiers with the Blade 15 OLED. Our unit is maxed out, so these are, generally, also pricey laptops. Still, it's worth noting that the OLED version of the Blade 15 is the most expensive laptop on this list, between the display and the top-tier GPU. Below you can see their names and core components.



**We're still developing our color-accuracy testing to be as precise as possible with OLED displays in particular.**



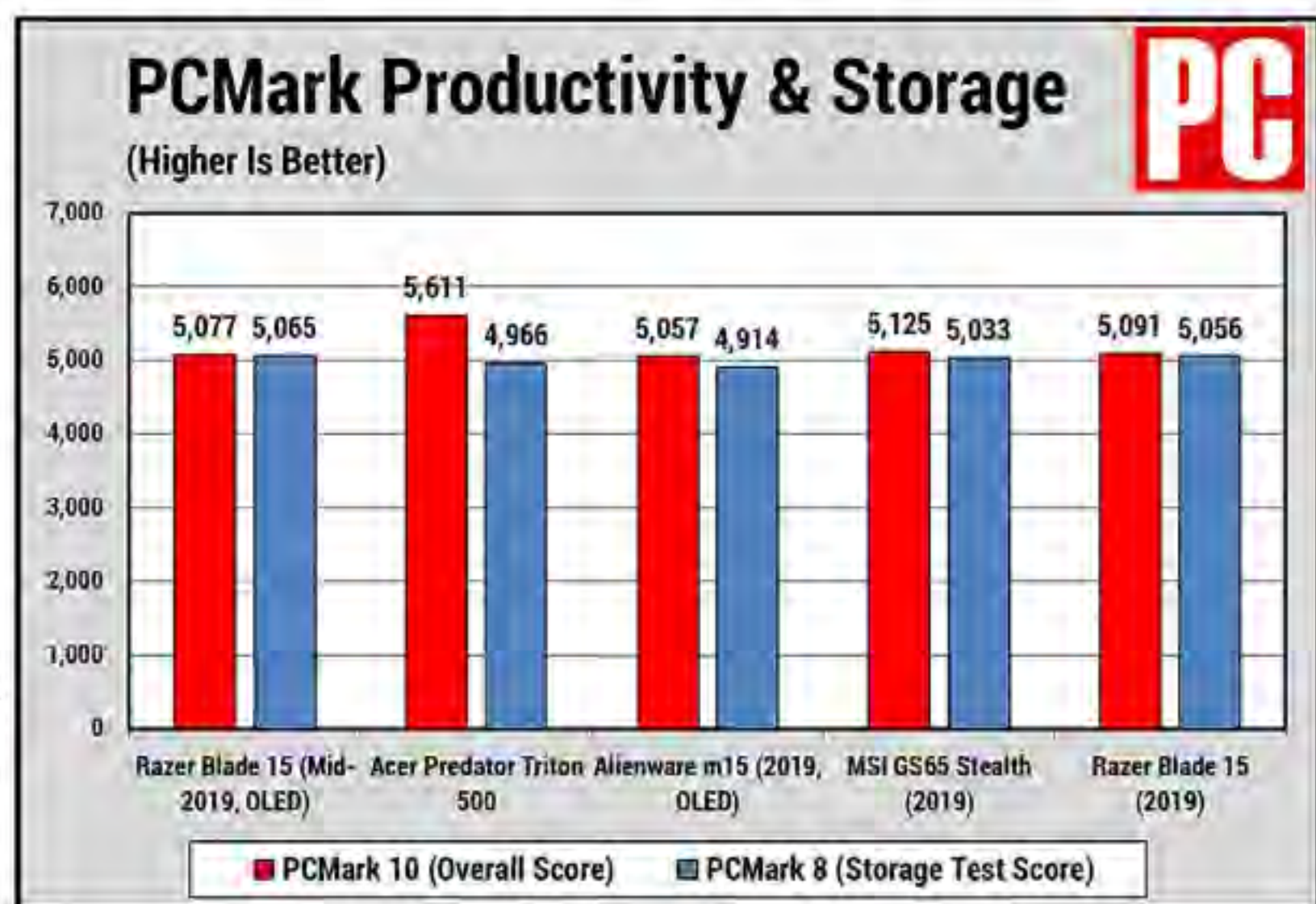
Test System Configurations			PC
	PROCESSOR	GRAPHICS	MEMORY & STORAGE
Razer Blade 15 Advanced Model (Mid-2019, OLED)	Intel Core i7-9750H (2.6GHz)	Nvidia GeForce RTX 2080 (8GB, Max-Q)	16GB RAM; 512GB SSD
Acer Predator Triton 500	Intel Core i7-8750H (2.2GHz)	Nvidia GeForce RTX 2080 (8GB, Max-Q)	16GB RAM; 512GB SSD
Alienware m15 (2019, OLED)	Intel Core i7-8750H (2.2GHz)	Nvidia GeForce RTX 2070 (8GB, Max-Q)	16GB RAM; 512GB SSD
MSI GS65 Stealth (2019)	Intel Core i7-9750H (2.6GHz)	Nvidia GeForce GTX 1660 Ti (6GB)	16GB RAM; 512GB SSD
Razer Blade 15 Advanced Model (2019)	Intel Core i7-8750H (2.2GHz)	Nvidia GeForce RTX 2070 (8GB, Max-Q)	16GB RAM; 512GB SSD

The standout inclusion is the MSI GS65 Stealth, because it's not quite as powerful. This system is our Editors' Choice for midrange gaming laptops, and it's priced at just \$1,699 as tested, but it's useful here to demonstrate the power gap as well as its bang for buck. The rest of the table includes the early 2019 version of the Blade 15 (\$2,599.99 as tested), with its 8th Generation processor and step-down GPU, as well as the competitive Acer Predator Triton 500 (\$2,499.99 as tested), which gave the Blade 15 a run for its money for the Editors' Choice honor. Finally, there's the Alienware m15 OLED (\$2,779.99 as tested), the only other gaming laptop with an OLED screen we've reviewed so far.

**Productivity and Storage Tests:** PCMark 10 and 8 are holistic performance suites developed by the PC benchmark specialists at UL (formerly Futuremark). The PCMark 10 test we run simulates different real-world productivity and content-creation workflows. We use it to assess overall system performance for office-centric tasks such as word processing, spreadsheet use, web browsing, and videoconferencing. PCMark 8, meanwhile, has a specialized Storage subtest that we use to assess the speed of the PC's boot drive.

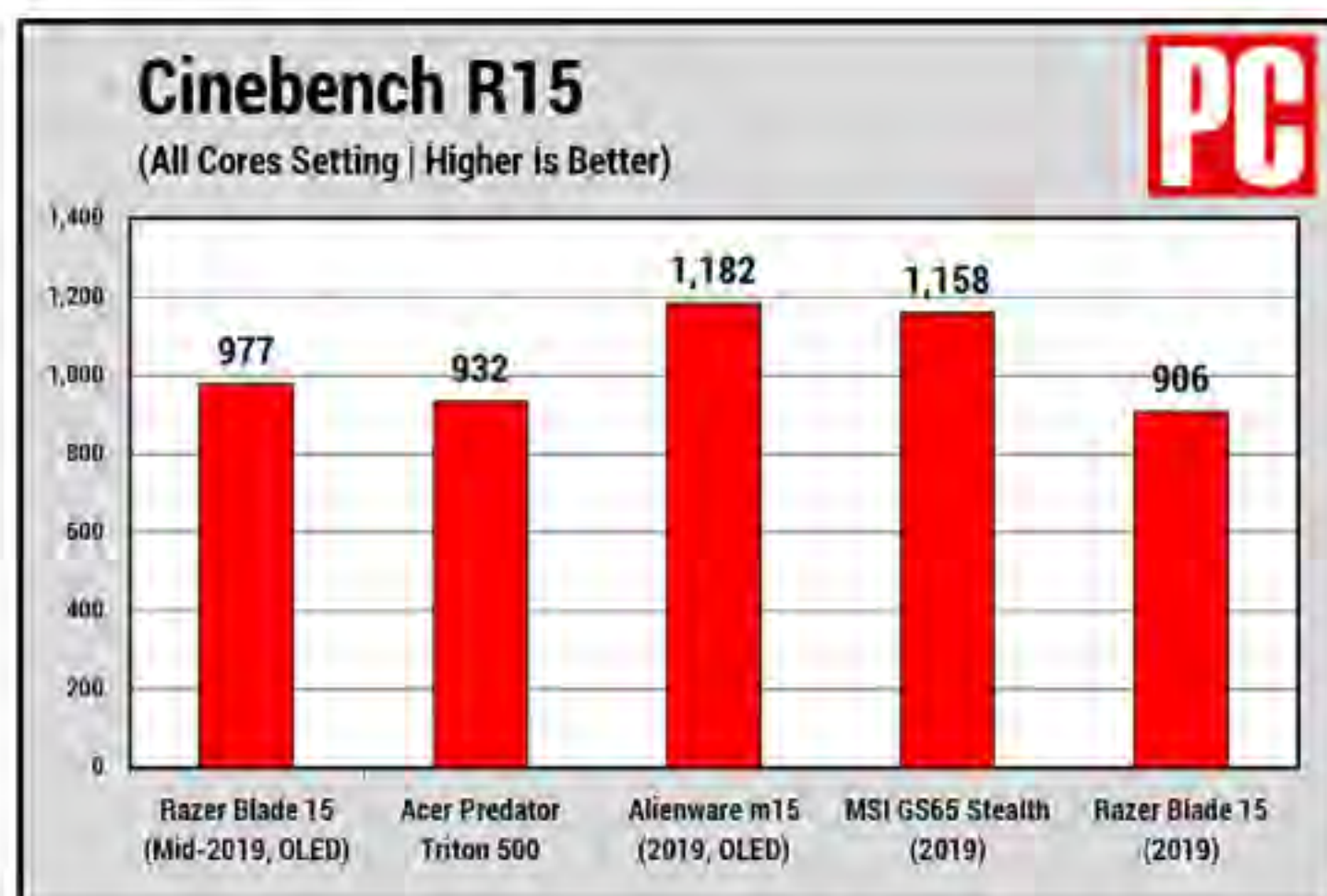
The speedy new processor didn't have a ton of room to stretch its legs (and cores) on PCMark 10, but it posted a good result nonetheless. The previous-generation version on the non-OLED Blade 15 edged it very slightly, as did the GS65's matching CPU, but it's nothing to

worry about. All of these scores represent a quick processor that will be able to handle daily home and office tasks with ease. The same goes for the PCMark 8 Storage results, though the OLED Blade 15 did top the charts on this one (tied, unsurprisingly, with the other Blade system). This group of SSDs will have your games loading quickly, and your PC booting within a few seconds.



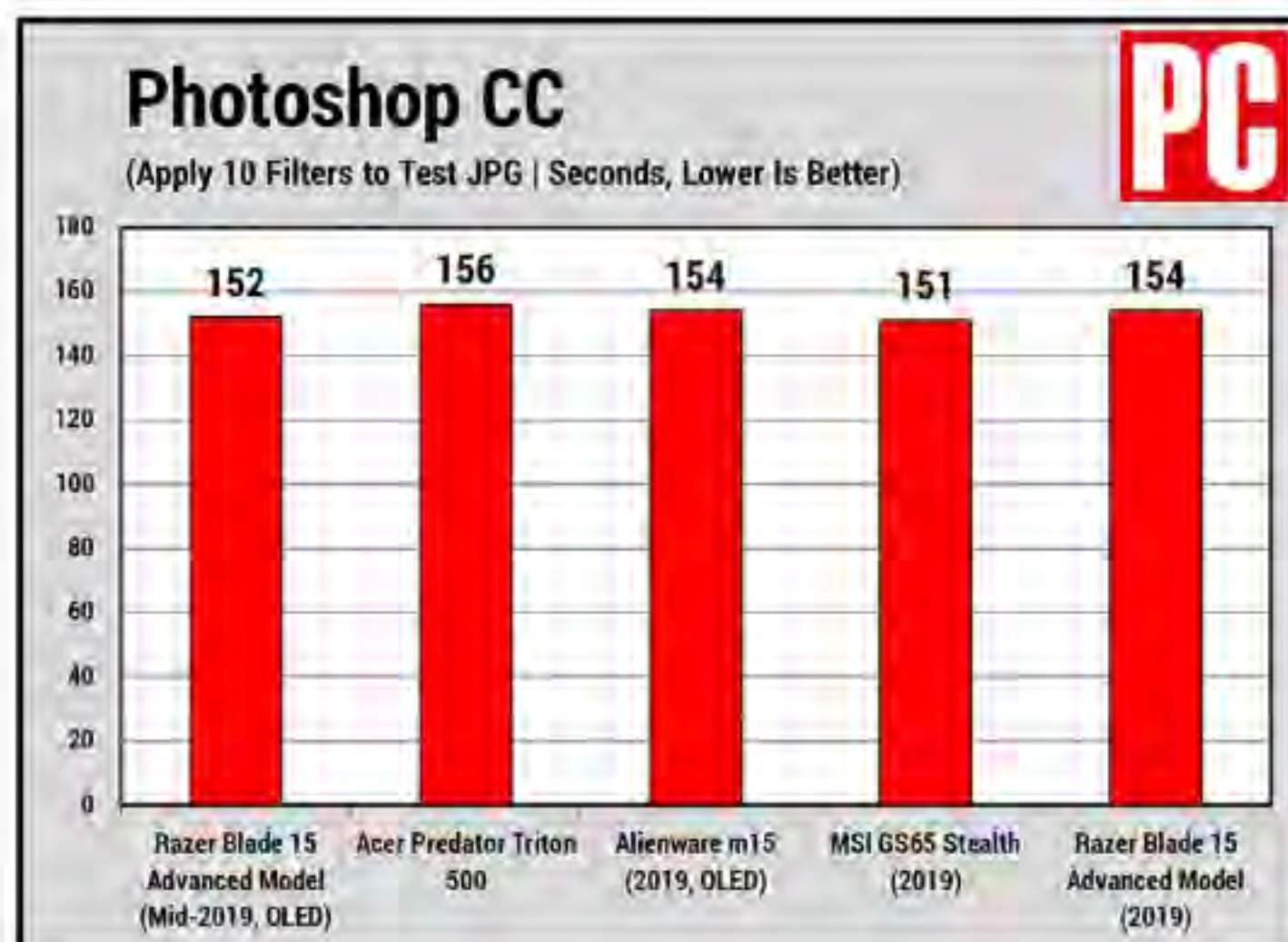


**Media Processing and Creation Tests:** Next is Maxon's CPU-crunching Cinebench R15 test, which is fully threaded to make use of all available processor cores and threads. Cinebench stresses the CPU rather than the GPU to render a complex image. The result is a proprietary score indicating a PC's suitability for processor-intensive workloads.



We also run a custom Adobe Photoshop image-editing benchmark. Using an early 2018 release of the Creative Cloud version of Photoshop, we apply a series of 10 complex filters and effects to a standard JPEG test image. We time each operation and, at the end, add up the total execution time. This stresses

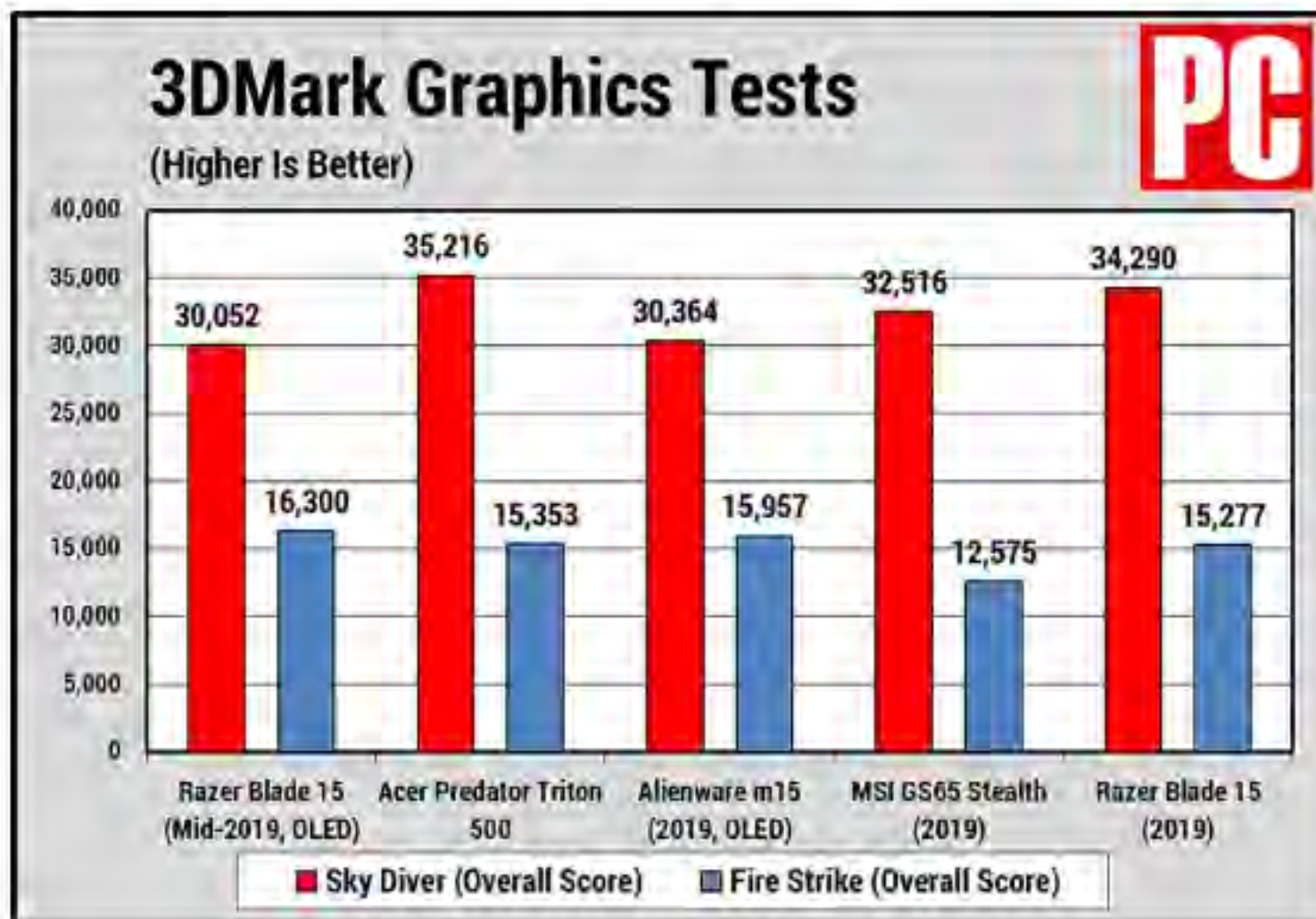
CPU, storage subsystem, and RAM, but it can also take advantage of most GPUs to speed up the process of applying filters. (Systems with powerful graphics chips or cards may see a boost.)



The Blade 15 OLED also did well on these tests, even if it didn't stand out from the pack. (There's a lot of CPU parity among these systems.) Its Cinebench score did show some improvement over some 8th Generation CPUs, but the Alienware m15 still won out. The Photoshop results were even more clustered. There isn't much variation among

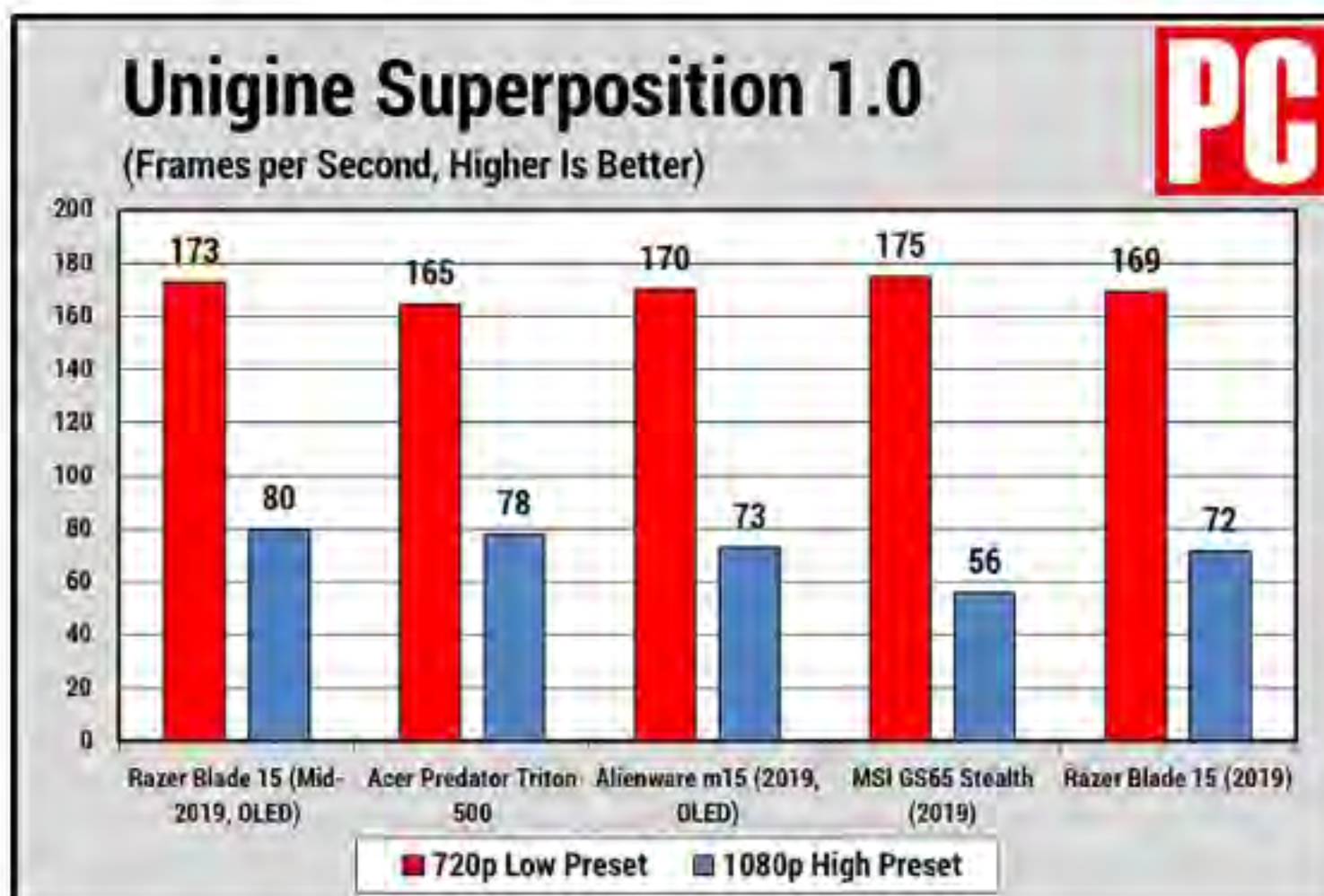
these laptops in general on the media tests: All are faster than your average laptop, capable of crunching through these tasks moderately well, but short of a true workstation. The 9th Generation processor, overall, doesn't make a marked difference for these tests.

**Synthetic Graphics Tests:** Next up: UL's 3DMark suite. 3DMark measures relative graphics muscle by rendering sequences of highly detailed, gaming-style 3D graphics that emphasize particles and lighting. We run two different 3DMark subtests, Sky Diver and Fire Strike, which are suited to different types of systems. Both are DirectX 11 benchmarks, but Sky Diver is suited to laptops and midrange PCs, while Fire Strike is more demanding and made for high-end PCs to strut their stuff. The results are proprietary scores.



The following chart shows results from another synthetic graphics test, this one from Unigine Corp. Like 3DMark, the Superposition test renders and pans through a detailed 3D scene and measures how the system copes. In this case, it's done in the company's eponymous Unigine

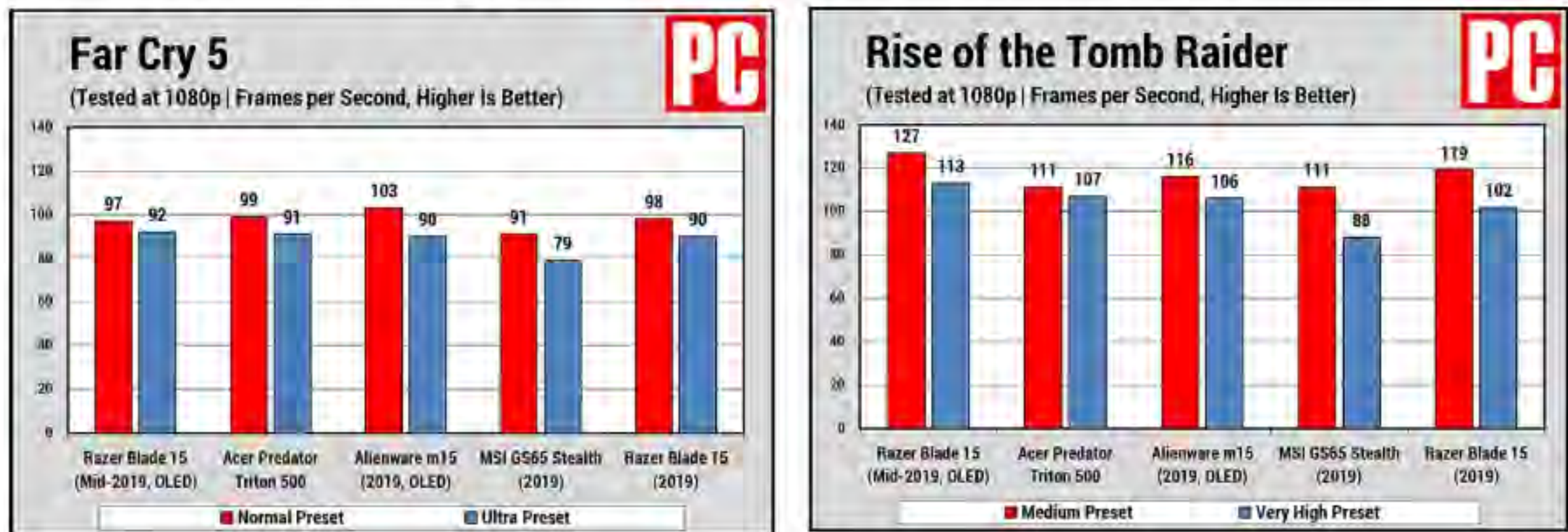
engine, whose different 3D workload scenario presents a second opinion on the machine's graphical prowess.



Unlike the generational CPU uptick, the GPU upgrade made a big difference. The Blade 15 OLED and its RTX 2080 Max-Q powered past the competition on these synthetic tests. The Triton 500 and its matching GPU were much closer than the rest but still couldn't quite

match the Blade 15 OLED. There's a clear bump up over the RTX 2070 Max-Q, but it's not a wholly different performance tier if you have a limited budget. Does the same hold true for the real game benchmarks? On to the next results.

Real-World Gaming Tests: The synthetic tests above are helpful for measuring general 3D aptitude, but it's hard to beat full retail video games for judging gaming performance. Far Cry 5 and Rise of the Tomb Raider are both modern AAA titles with built-in benchmark schemes. These tests are run at 1080p on both the moderate and maximum graphics-quality presets (Normal and Ultra for Far Cry 5; Medium and Very High for Rise of the Tomb Raider) to judge performance for a given laptop. Far Cry 5 is DirectX 11-based, while Rise of the Tomb Raider can be flipped to DX12, which we do for that benchmark.

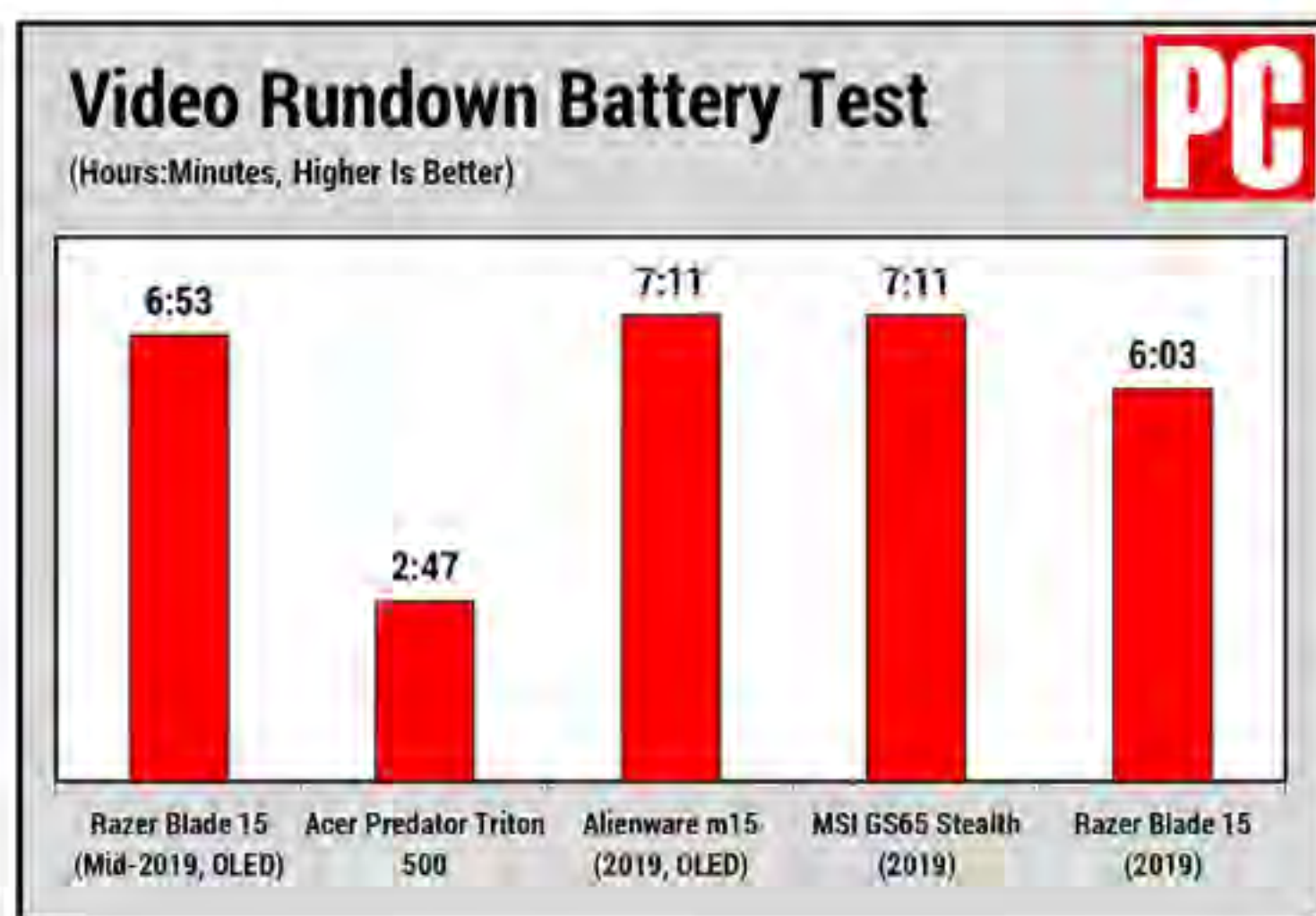


This laptop's native resolution is 4K, but the above were all tested in full HD for level comparisons with the other laptops here. The Blade 15 OLED and its RTX 2080 Max-Q top the charts on these tests, by a slim margin over the Triton 500 with the same GPU. With the non-Max-Q versions of these GPUs, I'd expect more of a gap between the RTX 2080 and 2070, but the limited thermal space means the potential is capped. You can see, as a result, that the Alienware's RTX 2070 Max-Q is hot on the Blade 15 OLED's tail. In most cases, we've found the extra cost of the RTX 2080 over the RTX 2070 in laptops doesn't quite scale with the benefit it brings, but it does eke you out a few extra frames.

Either way, you're getting strong frame rates—way over 60fps—in big-budget games with this laptop. Yes, the screen caps out at 60Hz, so you don't get the benefit of sustained frame rates greater than 60fps, but the added headroom lets you lock in at 60fps without many dips.

Obviously, changing the resolution to native 4K was much more demanding. Far Cry 5 and Rise of the Tomb Raider drop to 39fps and 41fps, respectively, when running at maximum settings in 4K. Sub-60fps isn't too appealing, so you'll likely want to crank the resolution down to at least 1440p for smoother frame rates.

**Battery Rundown Test, Part One:** Finally, the battery-life testing. After fully recharging the laptop, we set up the machine in power-save mode (as opposed to balanced or high-performance mode) and make a few other battery-conserving tweaks in preparation for our unplugged video-rundown test. (We also turn Wi-Fi off, putting the laptop in Airplane mode.) In this test, we loop a video—a locally stored 720p file of the Blender Foundation short film Tears of Steel—with screen brightness set at 50 percent and volume at 100 percent until the system conks out.



Despite the 4K resolution, OLED technology, and powerful GPU, the Blade 15 OLED lasted a respectable amount of time—nearly seven hours is a solid result for desktop-replacement laptops, and even more so for a gaming system. It lasted even longer than the non-OLED Blade 15, despite the more demanding resolution.

This may have to do with a particular aspect of OLED, which is generally positive: When an OLED screen is displaying black on some or all of the screen, the pixels on those portions of the display are turned completely off. Because of that, the screen should use less power when showing black-dominant images or videos with more black segments. This also holds true even when the scene or image is not completely black, just dark, because the pixels are still using less power than they would with lighter scenes.

To leverage this OLED trait, Razer ships the system with Windows 10's Dark mode turned on, so no more juice than necessary is spent displaying your windows, folders, and taskbar. Note that our particular video file has numerous dark scenes (in addition to cinematic black bars along the top and bottom), but to my eye, no more than most. This should add up to greater power savings through the course of an average movie or video.

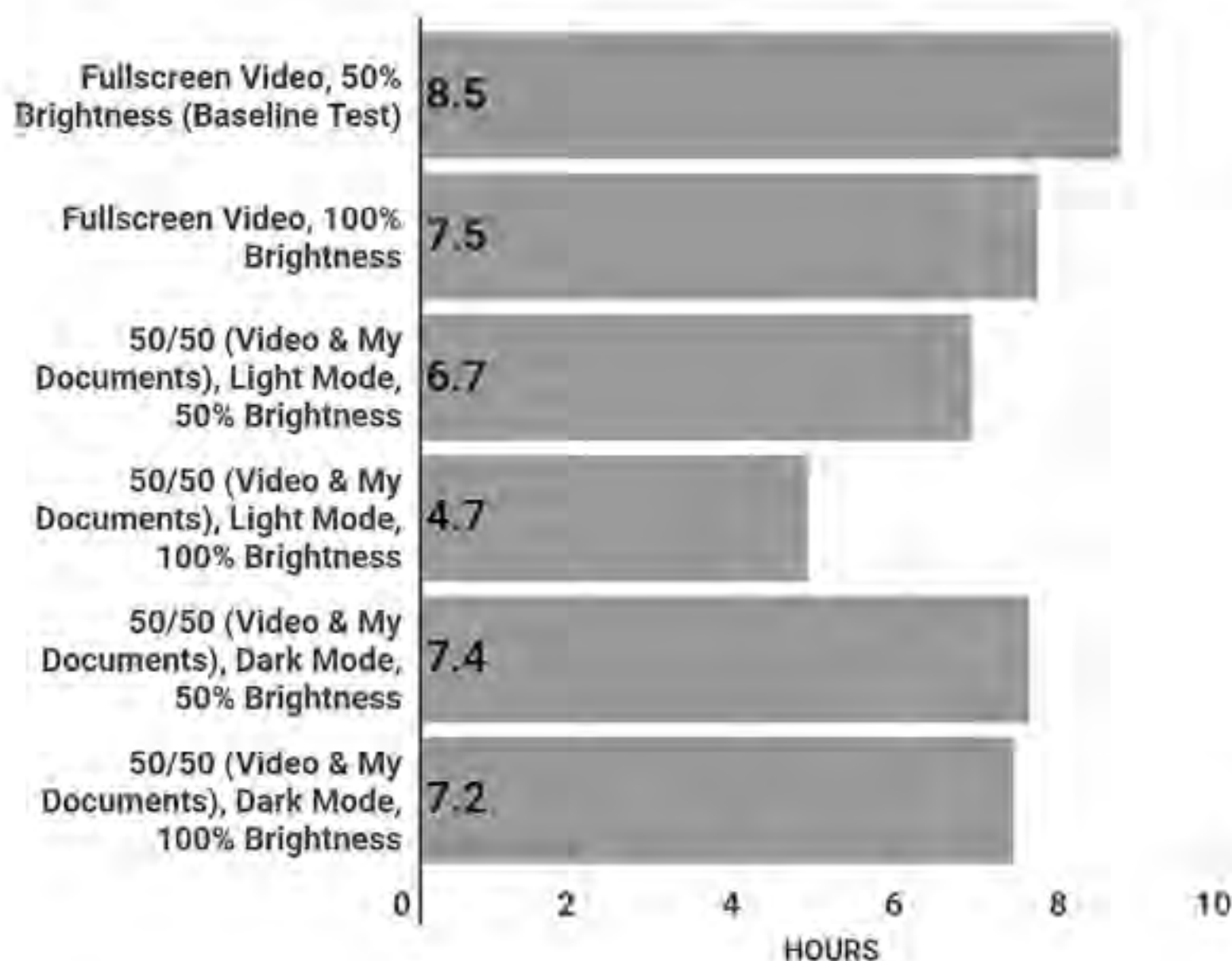
**Battery Rundown Test, Part Two:** To further examine the effect of this phenomenon on battery life, I added a few different layers to our battery test, running multiple permutations of the standard settings.

OLED screens look best at full brightness, so to start, I ran our same battery test at 100 percent brightness, as opposed to the usual 50 percent brightness. This dropped the battery life from 8:32 to 7:30, chopping about an hour off its lifespan. That's surprisingly good, frankly, and it means you still get a fairly long runtime off the charger even when you choose to enjoy the beautiful screen at maximum brightness.

My other battery runs got a bit more granular. In one run, I kept our base test settings, but split the screen 50/50 with the video playing on one side and the Windows 10 File Explorer opened to My Documents on the other. I did this with Dark mode on and Dark mode off, so we could see the effects of powering (or not powering) lots of bright white pixels, and ran each of those tests at 50 percent and 100 percent brightness.

The impact on the battery life was easily observable—and played out how I theorized it might. Here are all of the results for comparison.

### Razer Blade 15 Advanced Edition OLED: Variant Battery Tests





There are a bunch of takeaways here, but they tell an easily understandable story. It takes more power to run at full brightness, of course, but the drop on the standard test wasn't too drastic, at just one hour. From there, things get interesting. Splitting the screen down the middle—with half showing the video and half showing My Documents in light mode—made a fairly big impact on battery life, dropping almost two hours from the baseline. That was only exacerbated when pumped up to 100 percent brightness, taking lots more juice to power the white portion of the screen at full luminance. It ran for just 4:42, significantly cutting into your off-charger time.

As you can see, the battery fared much better on the same 50/50 split but with Dark mode, proving that the white areas and colored lighting really eat up more battery life than black areas do. My Documents in Dark mode is not fully black, but with the grey-black background color and black window bars, the pixels are using much less power. Interestingly, ramping up the brightness with this setup didn't degrade the battery much. The battery life dropped by only 12 minutes when going from 50 percent to 100 percent brightness at a 50/50 split. In light mode, though, that drop was big: from 6:41 to 4:42. This makes sense, because the black pixels are essentially off, and the others showing dark colors aren't using much energy. Making them "brighter" when they are already showing a dark color has very little effect.

## A SCREEN GEM

We already knew the Razer Blade 15 Advanced Model was an excellent laptop. Adding new internals and one of the best screens you can buy only improves it. The screen makes you want to find something graphically engaging to do on it, just to keep looking at it—it really is that nice.

Now, of course, a 4K native resolution isn't the best fit for gaming on a laptop, given the muscle it demands. But you have other, lesser resolution options to switch to while playing, and you can enjoy and create content in 4K when you're not. For those creators, the screen offers largely strong color coverage, and only the most discerning users should mind the just-shy-of-100-percent coverage. If you're not a user who needs the utmost precision, the screen will greatly enhance your enjoyment of this laptop.

I wouldn't tell everyone to get the OLED Blade 15 over the non-OLED one, simply because it's so expensive and most users don't need 4K. But if it's within your means, you have our—and our eyes'—strongest recommendation.

**MATTHEW BUZZI**



**Now, of course,  
a 4K native  
resolution  
isn't the best  
fit for gaming  
on a laptop,  
given the  
muscle it  
demands.**





**Intel Core i9-9900K** | \$499.00 | Rating: ●●●●○ EXCELLENT

## Intel Core i9-9900K: Peak Silicon for a New Build

**W**hether or not Intel acknowledges it, since the launch of AMD's first-generation "Summit Ridge" Ryzen processors (spearheaded by the excellent Ryzen 7 1800X), the two companies have been in a Core War. With the launch of the Intel Core i9-9900K, Intel now has a shot at claiming the mainstream-CPU productivity crown from AMD. Although raw performance isn't the only factor to use to determine which components to buy, it is an important one. And without a doubt, on that front, Intel scores a definitive win with the eight-core Core i9-9900K.

That said, though this epic mainstream processor delivers killer scores on benchmark testing and is a top-flight pick for performance-minded PC gamers and content creators, you'll need to factor in a decent thermal topper for this chip—and some extra budget for both that and the chip itself. It's the priciest desktop CPU of recent memory on a mainstream, rather than specialized enthusiast, platform. But oh, is it ever a good one.



## THE WHOLE I9 YARDS

If you've purchased an Intel Core processor (or a prebuilt laptop or desktop) at any point in the last decade, you know how Intel segments its products into Core i3, Core i5, and Core i7 families. With the "Nehalem" microarchitecture, which launched in 2008, Intel began offering Hyper-Threading on its Core i7 chips but not on the Core i5 ones. With Hyper-Threading, by letting each core handle up to two threads on these higher-tier processors, users realized approximately 30 percent better performance per core, depending on the application. For this reason, the Core i7 processors were a good deal more powerful than the Core i5s, especially when running highly threaded software. But with the 9th Generation Intel Core Processors, Hyper-Threading is no longer a standard feature on the Core i7s.

Intel already has a tier of processors above the Core i7s, which it introduced in May 2017, with the Skylake-X HEDT (High-End Desktop) processor family, the leading chip of which is the formidable, multi-kilobuck Core i9-7980XE Extreme Edition. This first wave of Core i9s was designed specifically for well-heeled extreme enthusiasts and pro content creators. The core counts with the Core X-Series Core i9 processors start at 10 and go up to 18, with Hyper-Threading a standard feature, but all these chips require a pricey Intel X299-based motherboard, and the Core i9-line chip prices themselves start at a cool \$1,000 with the Core i9-7900X. Apart from access to these supercar-speed processors, support for four-channel main system memory and lots of extra PCI Express lanes (to accommodate multiple video cards or PCI Express-based SSDs) are the reasons that buyers might opt for the X299 platform.

## Intel Core i9-9900K

**PROS** Two more cores than previous top Coffee Lake CPU. A flamethrower for multi-threaded applications. 5GHz peak one-core clock for single-threaded apps. Unlocked multiplier.

**CONS** Creates new, costlier price tier above former Core i7 flagship CPUs. Runs hot. No stock cooler.

**BOTTOM LINE:** Intel's Core i9-9900K mainstream flagship CPU is a spirited performer, no matter what you task it with. If you don't need the RAM bandwidth or PCI Express lanes of Intel's Core X or AMD's Threadripper platforms, this chip is peak silicon for a new build.

In contrast to the Core i9 chips of Intel's Core X family, the Intel Core i9-9900K is the first i9 processor to become available on Intel's mainstream desktop platform, and it'll work in significantly more affordable Z370 motherboards, though a BIOS update will be required. This chip also offers two more cores than the former mainstream flagship chip, the six-core Core i7-8700K. When you look at the rest of the Core i9 processors in Intel's stack, it's easy to see the Core i9-9900K as a bit of a middle ground—extreme silicon, to be sure, but designed to appease enthusiasts with no need for Core X's spare PCI Express lanes and quad-channel memory.

On the other hand, the \$499 list price on the Intel Core i9-9900K (retail prices at the time I wrote this started at \$530 and went up even higher) is a harder pill to swallow for anyone who was expecting this chip to be a straight-up replacement for the Core i7-8700K. Instead, Intel is launching the \$385 Core i7-9700K as the top-end Core i7 processor for the 9th Generation, and although it has eight cores, Hyper-Threading is not a supported feature. The core and thread jump from the Core i7-7700K to the Core i7-8700K is measurable in almost everything you do with your PC, but Intel doesn't seem keen to tread the same path this time. Are there instances where the Core i7-8700K, with its six cores and 12 threads, will outperform an eight-core/eight-thread Core i7-9700K? Perhaps, though we suspect these will be the exception rather than the rule. I'll save that discussion for that processor's review, assuming I can get my mitts on one.



And what about AMD? At eight cores and 16 threads in their flagships, AMD and Intel may have achieved core parity on their respective front lines now, but AMD is once again wielding price as its greatest weapon. Before we talk about how Intel competes, however, let's take a close look at what you get with the Core i9-9900K.

### **THE GUTS OF 9TH GEN CORE**

Although the Core i9-9900K looks just like all the rest of the LGA 1151 processors Intel has manufactured, there's something new (well, new since the days of "Ivy Bridge") under the hood. Instead of using silicon-based paste between the processor's die surface and the glued-on heat spreader, Intel is bringing back bonded metal, or solder. This Soldered Thermal Interface Material (STIM) is considerably more capable when it comes to pulling heat away from the die when the CPU is under load. With a decent CPU cooler attached, STIM can help keep your processor running cooler.

Like the present of an unlocked multiplier, this new feature is a wink from Intel directly to overclockers, who've created a whole cottage industry around delidding Intel processors to replace the paste TIM with something more thermally conductive. It's also worth noting that all of AMD's AM4-based processors, with the exception of its "Raven Ridge" chips, rely on bonded metal between the die surface and the heat spreader.

The Core i9-9900K is built on Intel's umpteenth revision of the 14nm process (dubbed here "14nm++"). But the chip giant has managed to fit two more cores with similar clock speeds into the same package.



The Intel Core i9-9900K is a 95-watt TDP processor that features eight cores and 16 threads, and it's built on an LGA 1151 package. This processor belongs to the Intel "Coffee Lake-S" family, and it has a 3.6GHz base clock and a maximum Turbo Boost frequency of 5GHz. Like the Intel Core i7-8086K Limited Edition, this 5GHz Boost clock applies only when a single core is active. In my tests, this processor boosted up to 4.7GHz when all cores were active.

Other features include 16MB of Intel Smart Cache that's available to all eight cores, a dual-channel memory controller, and Intel UHD Graphics 630 integrated graphics with a 350MHz minimum and 1.2GHz maximum GPU frequency. With the exception of the Smart Cache, the rest of these features are the same on the Core i7-8700K. The memory controller is rated to support up to DDR4-2666 memory, and Intel Extreme Memory Profile support means that Z370 and Z390 motherboards can support memory speeds beyond 4,000MHz.

The processor has 16 PCI Express lanes available for discrete graphics cards, and the integrated UHD Graphics 630 processor (the same graphics engine as on the Core i7-8700K) supports overclocking with an unlocked multiplier. When you slot this chip into a Z370 or Z390 motherboard, you'll also get unlocked base clock and memory ratios, support for per-core overclocking, and adjustable voltages.

You may not be inclined to use the UHD Graphics 630 for gaming (I was unable to test it because my system's MSI MEG Z390 ACE motherboard doesn't feature a graphics output) but it's not just some useless vestigial lump of silicon. With Intel Quick Sync Video Technology, this portion of the chip can rapidly convert HEVC 10-bit (H.265) video files and encode/decode premium 4K Ultra HD content, for instance from Netflix. This chip also supports the AVX2 instruction set, Intel Optane Memory, and Intel Turbo Boost Technology 2.0.

Intel is also launching a slightly tweaked Z390 chipset to go with the 9th Generation Core processors, though if you already have a Z370 motherboard, there's not a lot to get excited about. The upticks from Z370? Z390 features an integrated USB 3.1 Gen 2 controller for up to 10Gbps ports and integrated Intel Wireless-AC with support for Gigabit Wi-Fi speed.

That said, not all Z390 motherboards will necessarily ship with said ports and Wi-Fi capabilities, but at the high end, Z390 motherboards equipped with an Intel Wireless-AC 9560 adapter will support theoretical data rates up to 1,733Mbps. Also, as mentioned earlier, not all Z390 boards will necessarily have video outputs that will let you use Intel's integrated graphics. Shop with care if that matters to you.

## **TESTING STOCK PERFORMANCE**

On paper, the Intel Core i9-9900K looks to be a powerful processor, but to see just how it compares to the other muscle-car chips currently on the market, I ran a passel of tests to determine how it handles a host of workloads at its default settings.

For my test setup, I installed the Intel Core i9-9900K into the MSI MEG Z390 ACE ATX motherboard mentioned earlier and populated two of the DIMM slots with 16GB of dual-channel G.Skill Sniper X DDR4-3400 memory. For the Windows 10 boot drive, I relied on the 240GB Crucial BX300 6Gbps SATA SSD. I installed the components into an Alpine White EVGA DG-77 case and used the Fractal Design Celsius S36 closed-loop liquid cooler to flush heat away from the processor's STIM-fused integrated heat spreader.

Keep in mind that like many of Intel's enthusiast-centric processors, the Intel Core i9-9900K does not include a stock CPU cooler in the box, so you'll need to have one on hand. For our game testing, I supplemented the Core i9-9900K with an Nvidia GeForce GTX 1080 operating at the Founders Edition clocks.

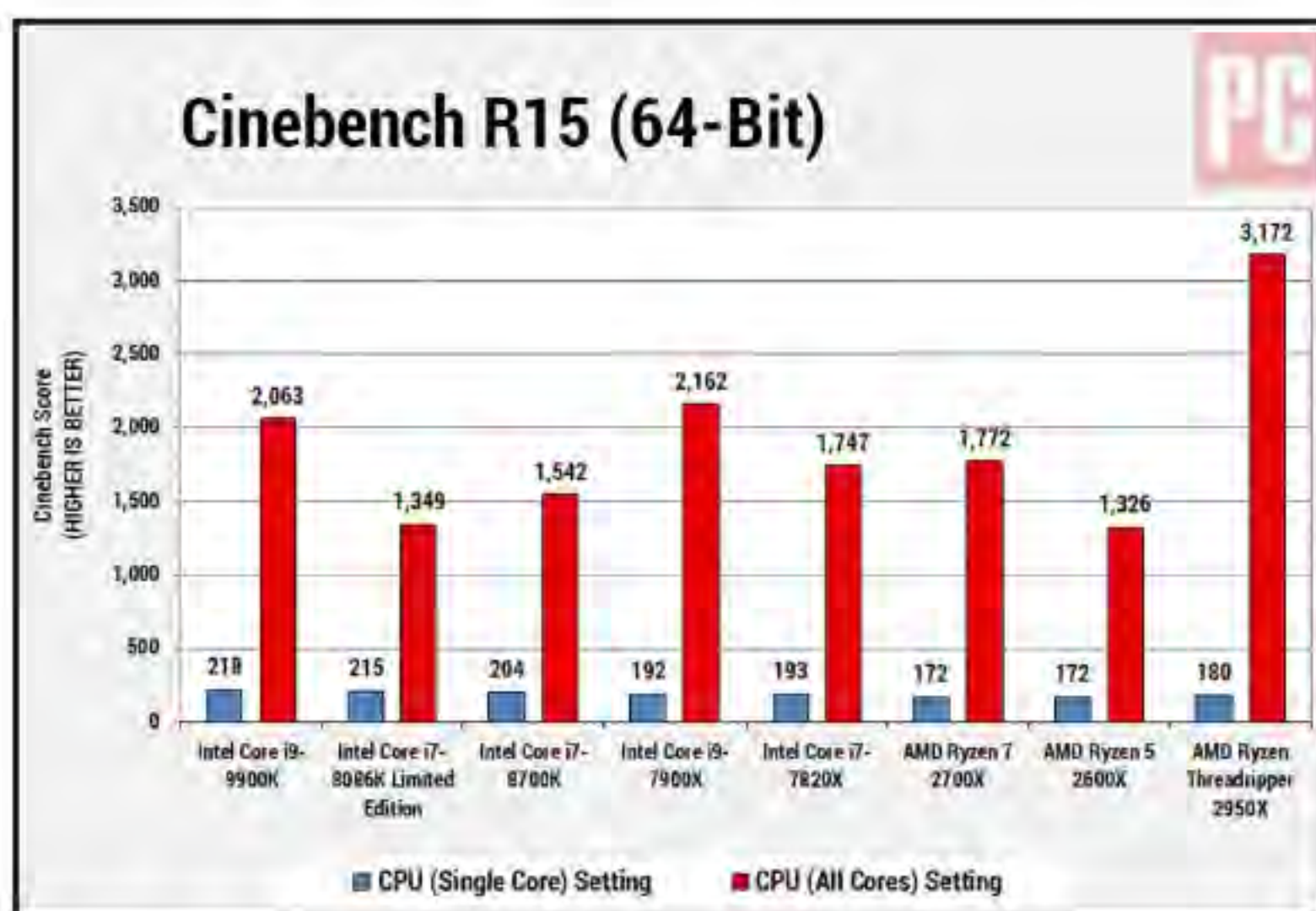


To compare this processor's scores with that of other chips currently on the market, I included in the charts below scores for several chips mentioned earlier: the six-core/12-thread Intel Core i7-8700K and Core i7-8086K Limited Edition, the 10-core/20-thread Intel Core i9-7900X, and the eight-core/16-thread Intel Core i7-7820X. The first two are on the same platform as the Core i9-9900K and will work with Z370 motherboards, and the two Core X-Series chips (the ones ending in "X") rely on X299.

For the AMD side of the aisle, the competitors are the mainstream-flagship eight-core/16-thread AMD Ryzen 7 2700X, the step-down six-core/12-thread Ryzen 5 2600X, and for kicks and context, the much costlier 16-core/32-thread Ryzen Threadripper 2950X.

## CINEBENCH R15

Maxon's 64-bit Cinebench R15 is a CPU-centric test that lets us gauge both the single-core and multicore performance of the various processors I tested. The resulting scores are test-specific numbers that represent the processor's performance while rendering a complex CPU-intensive image. This is considered a synthetic benchmark.

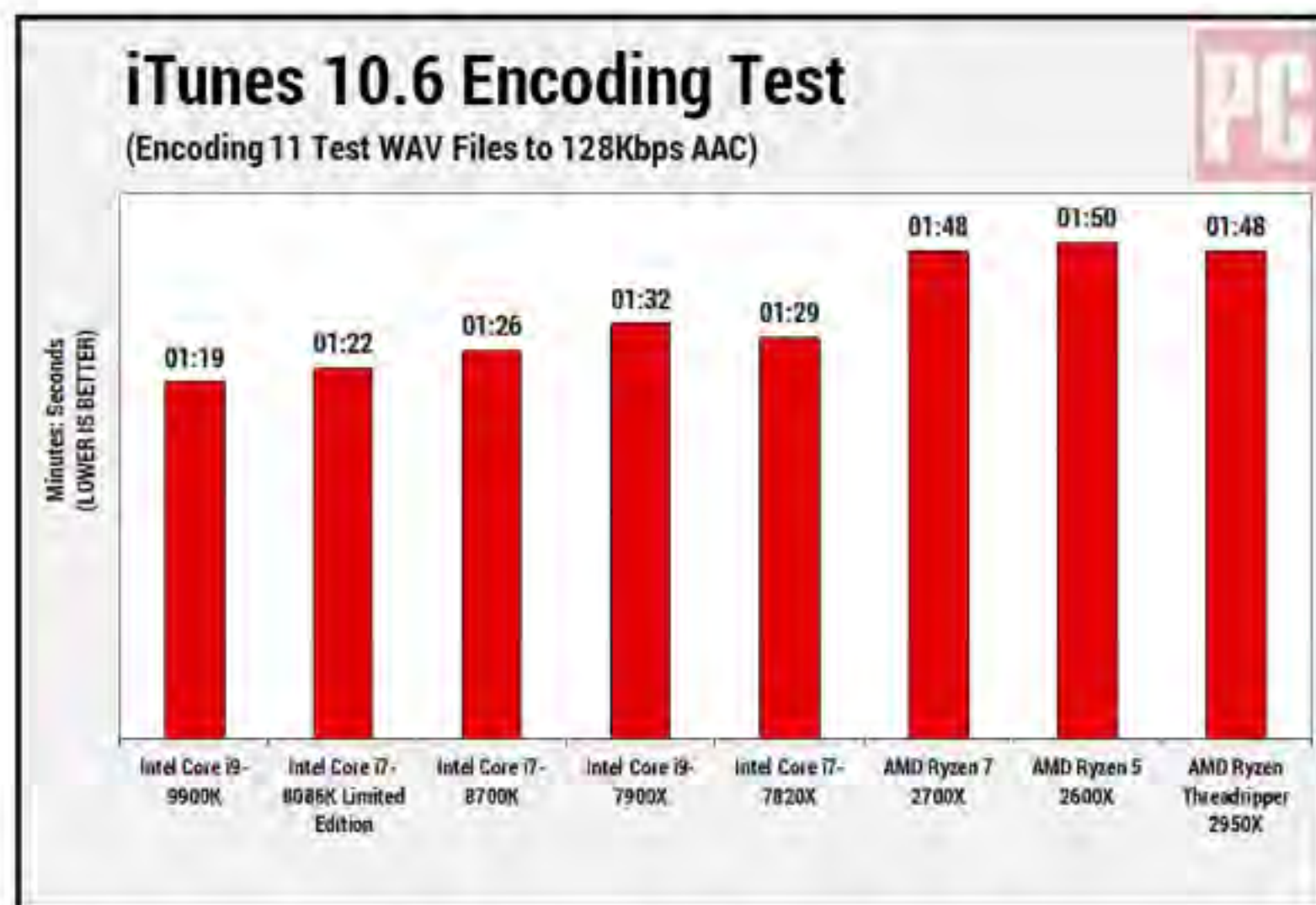


In the Cinebench R15 multi-threaded subtest, more cores tend to return higher scores. Despite this, the Core i9-9900K scores more in line with the much pricier 10-core Core i9-7900X. The eight-core Ryzen 7 2700X and Core i7-7820X are neck-and-neck, and the trio of six-core processors brings up the rear.

The Cinebench R15 single-threaded test is oblivious to more than one core, so megahertz matters most here. As you'd expect, the two 5GHz Intel processors take the top spots, but the Core i9-9900K has a slight edge.

## **ITUNES 10.6 CONVERSION TEST**

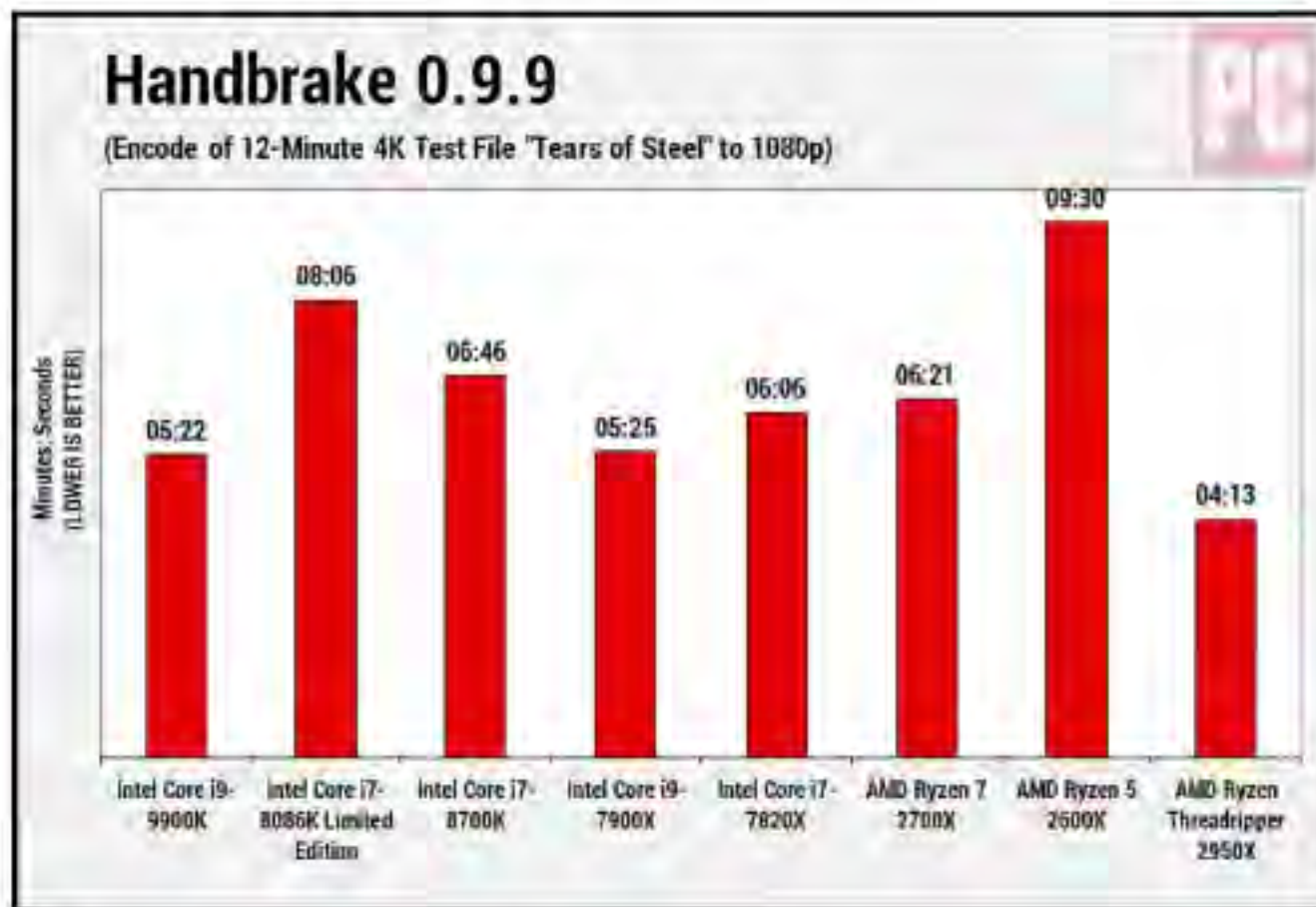
The iTunes 10.6 Encoding Test is tragically single-threaded, which means that more cores simply don't make a dent in these workloads. This test is designed to illustrate the performance you might expect when running legacy software that doesn't scale well across more than one core.



The iTunes encoding test is a bit like Cinebench R15's single-threaded test, where sheer one-core clock speed plays a big role. The Core i9-9900K once again comes out on top, but the rest of the Intel chips aren't far behind. All three of AMD's processors finish the encoding task 16 seconds or more behind the slowest Intel processor, the Core i9-7900X.

## **HANDBRAKE 0.9.9**

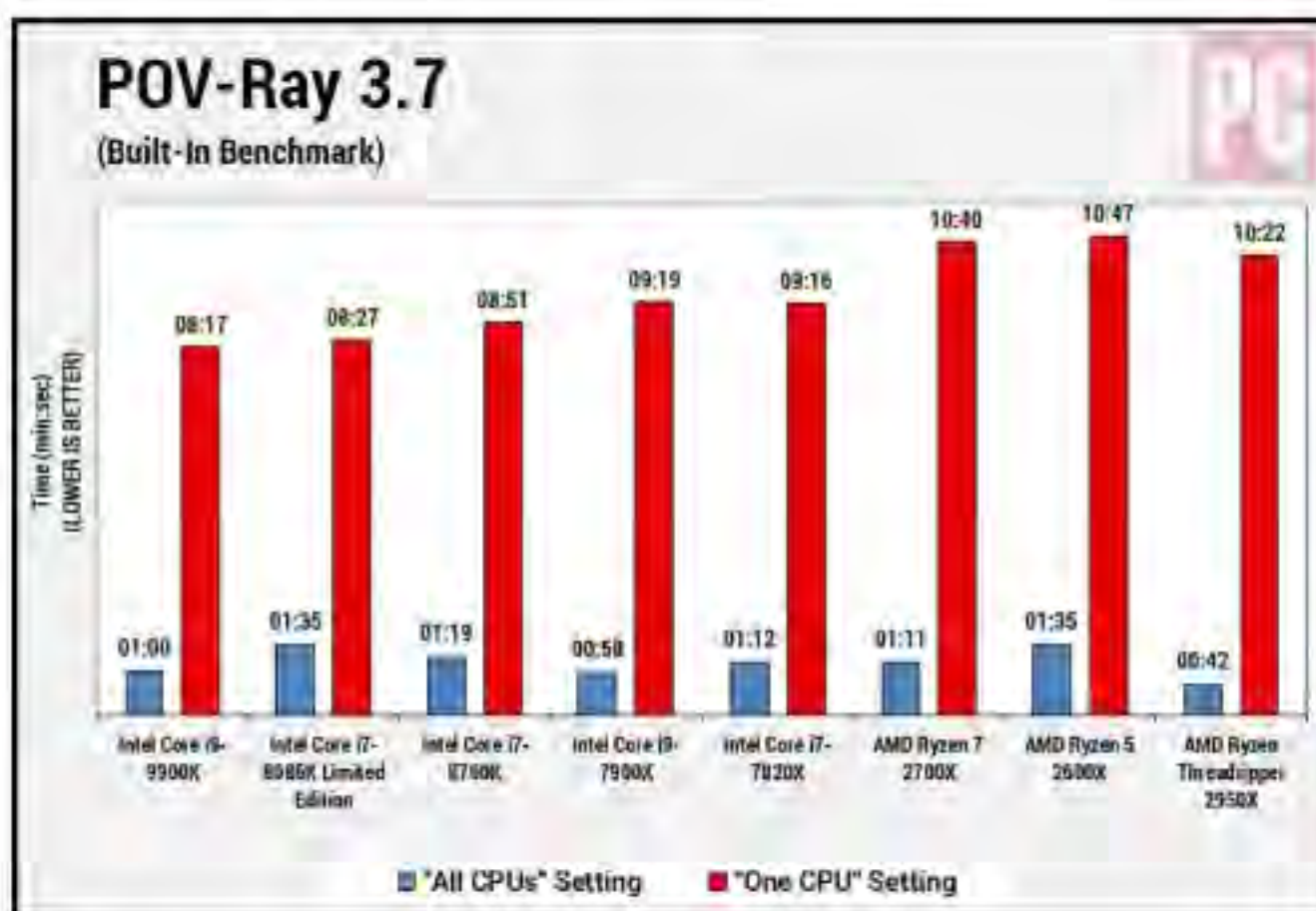
Handbrake is a classic (and popular) workstation application that is used to convert videos between formats. Typically, the more threads and cores a processor has, the better it will perform in this utility. I loaded up a 12-minute-long open-source 4K movie titled Tears Of Steel and used the software to convert it into a 1080p MPEG-4 video.



The AMD Ryzen Threadripper 2950X is a force to be reckoned with when it comes to Handbrake renders, but the Core i9-9900K comes in second place, beating even the about-a-grand Core i9-7900X. The AMD Ryzen 7 2700X clocks in almost a full minute behind the Core i9-9900K.

### POV-RAY 3.7

This benchmark is another one that's generally considered synthetic; however, the highly threaded nature of the utility is getting to be more and more representative of the applications available today. (The benchmark tasks the processor with rendering a complex photo-realistic image using ray tracing.) I ran POV-Ray using both the multi-threaded "All CPUs" setting and the hamstrung "One CPU" setting.



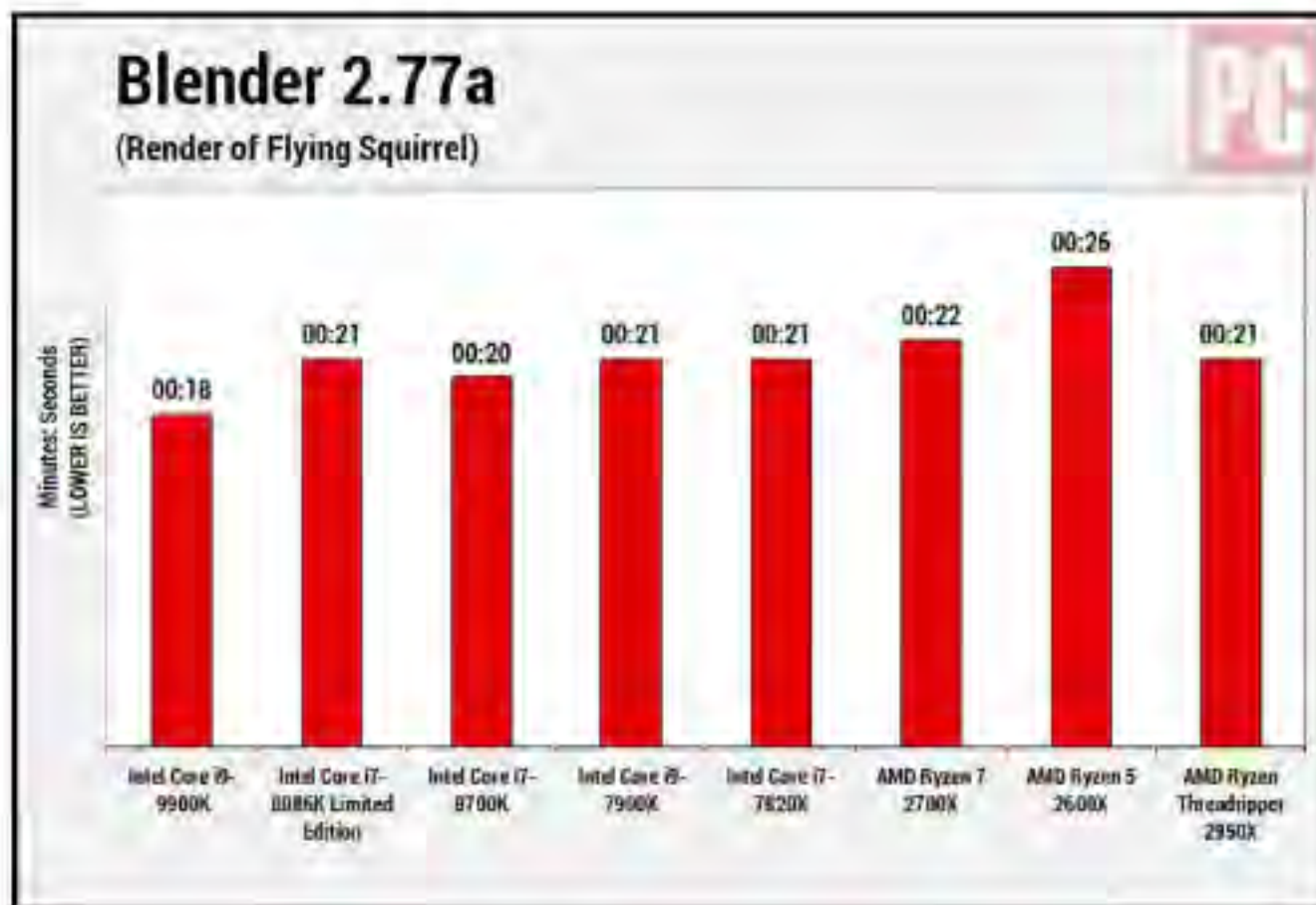
POV-Ray's single-threaded workload seems to favor Intel's processors, and the Core i9-9900K has an impressive run once again to claim the top of the chart. The multi-threaded POV-Ray doesn't deliver such one-sided results, however, with the Threadripper chip predictably taking the top spot

by a huge margin. Just 11 seconds separates the AMD Ryzen 7 2700X's fourth-place finish from the Core i9-9900K in third place.

### BLENDER 2.77A

Another of the real-world benchmarks I used is Blender, a popular open-source 3D rendering application that people far more creative and talented than I use to craft 3D visual effects, animations, and models. Our test file consists of a cartoonish flying-squirrel render that takes less than a minute to complete with most modern processors.

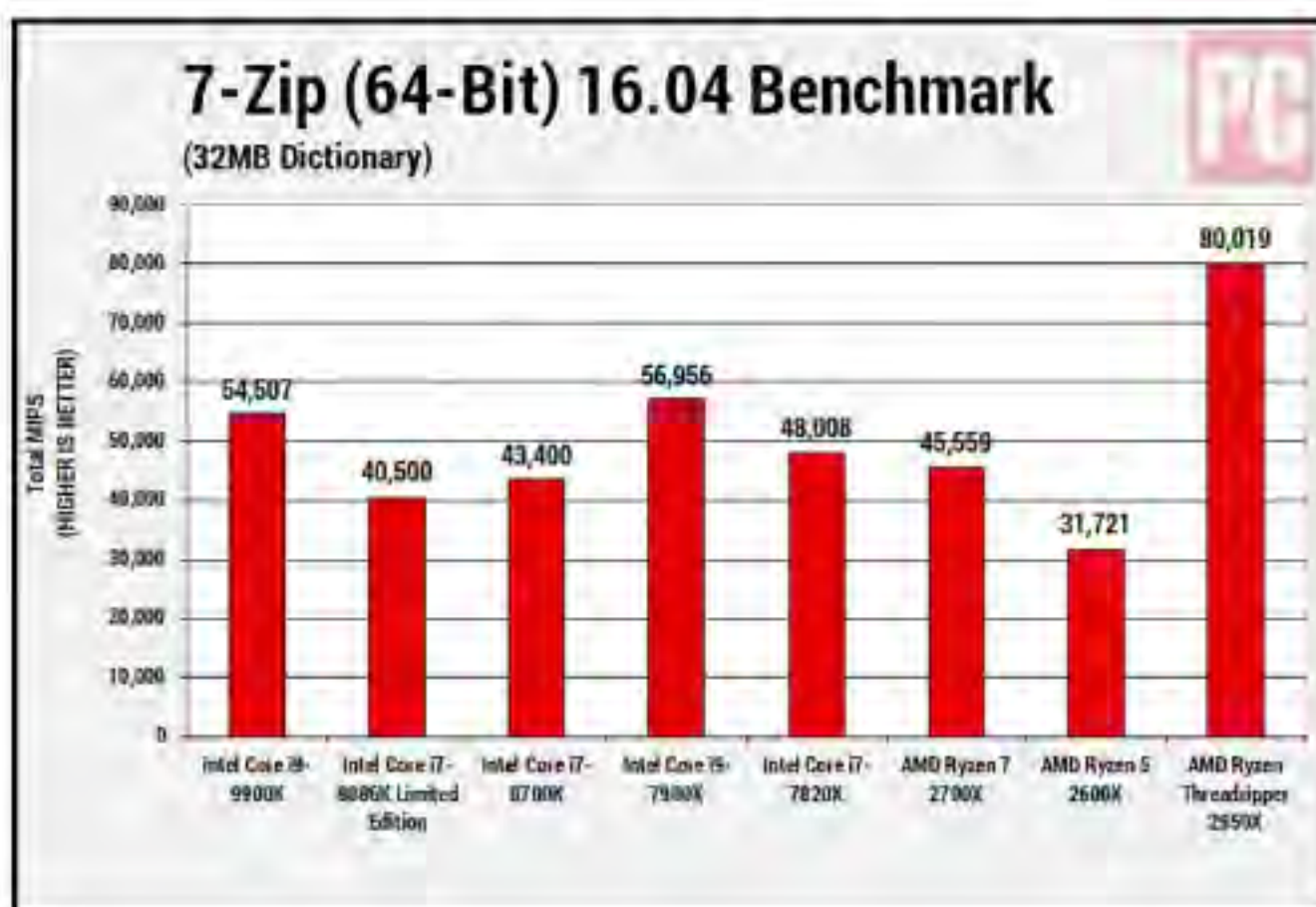




In Blender, the only processor that took more than 25 seconds to render our test image was the Ryzen 5 2600X. The rest of the processors managed it in between 22 and 18 seconds. The Core i9-9900K scored the fastest time, and the Ryzen 7 2700X was a mere 4 seconds behind it.

## 7-ZIP FILE COMPRESSION

7-Zip is a widely used file-compression utility that features a built-in compression/decompression benchmark. It's a real-world test that generally makes use of as many cores and threads as your processor has to offer.

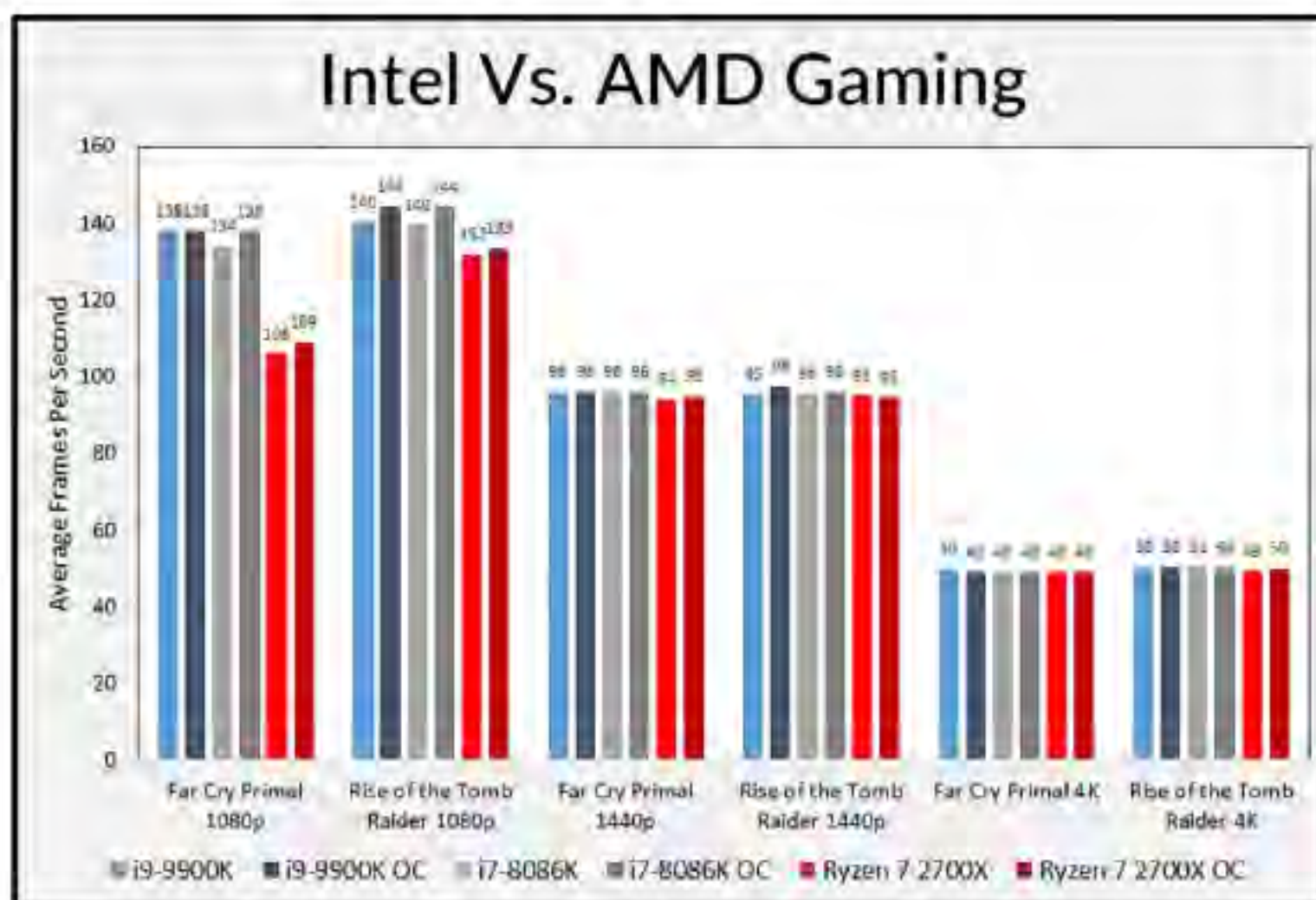


With a cursory glance at our results, it's clear that 7-Zip likes multi-core processors. Although the 16- and 10-core processors capture first and second place, the Core i9-9900K is the fastest of the eight-core processors we tested. The six-core Intel chips (the Core i7-8700K and Core i7-8086K Limited Edition) left the AMD Ryzen 5 2600X in the dust.

## THE ULTIMATE GAMING CPU (WITH AN ASTERISK)

Due to time and hardware-availability constraints, I narrowed the game-benchmarking focus to just three processors: the Intel Core i7-8086K Limited Edition, the Intel Core i9-9900K, and the AMD Ryzen 7 2700X. The first has six cores, but it shares the Core i9-9900K's 5GHz Boost clock, and the AMD processor has the same core count as the subject of this review. The component doing the real heavy lifting for the game benchmarks is the Nvidia GeForce GTX 1080 card.

To keep the platform comparisons as apples-to-apples as possible, I used the same graphics card, as well as the same memory kit, running at the same frequency (3,400MHz) and with the same timings. I ran in-game benchmarks from Far Cry Primal (at the High graphical preset) and Rise of the Tomb Raider (DX11, on the Very High preset) at three resolutions: 1080p, 1440p, and 4K. I also ran the benchmarks at both stock and overclocked settings, and occasionally saw a slight performance improvement for our efforts (but not always).



After I reviewed the Core i7-8086K Limited Edition, I was skeptical that Intel's Core i9-9900K would be able to top its gaming performance, even with a Boost clock to match. But the numbers don't lie. At the stock and overclocked settings, the i9-9900K scored 138fps and 140fps in Far Cry Primal and Rise of the

Tomb Raider's 1080p tests, respectively. The Core i7-8086K was right there, but the AMD platform only managed stock and overclocked frames-per-second (fps) scores of 106fps/109fps in Far Cry Primal and 132fps/133fps in Rise of the Tomb Raider. That's a 26 percent deficit for the AMD platform in Far Cry Primal. In Rise of the Tomb Raider, the difference between the two platforms is less apparent; the AMD chip is just 6.6 percent behind Intel at 1080p. Although both platforms yielded frame rates above 100fps, this gulf is not inconsequential.

But what happens when we move the resolution to 1440p? As the CPU becomes less a bottleneck and the graphics card gets some room to run, the difference all but vanishes. Compared to the Ryzen 7 2700X, Far Cry Primal was 2 percent faster on the Core i9-9900K platform. In Rise of the Tomb Raider at 1440p, the difference at the stock settings was less than a single frame per second. At the 4K resolution, in both games, Intel's and AMD's platforms performed the same.

So to sum up: Yes, Intel's Core i9-9900K is dominant in games, as long as your resolution and graphics card choices are such that the CPU becomes a bottleneck. (Generally, that will be an issue mainly at 1080p.) The testing I did was by no means exhaustive and depending on the game, there will be wins for Intel and there will be wins for AMD. If you're only gaming on your PC, then you can save hundreds of dollars by getting a six-core Ryzen 5 2600, a Core i5-8600K, or a Core i5-9600K and pouring that extra money into a beefier graphics card, or a monitor with a higher resolution or a high refresh rate. The extra frames Intel's platform will get you don't offer near the experience that increasing your resolution and/or refresh rate do. The games-only demographic will not find much value in the i9-9900K versus other high-end CPUs. Luckily for content creators, extreme multitaskers, and the rest of us power users, this processor speeds through virtually any task you toss its way.

## OVERCLOCKING

To start, I loaded the BIOS menu of the MSI MEG Z390 ACE motherboard and raised the multiplier to 50. After a series of reboots and tests, I settled on a core voltage setting of 1.33V, which is still modest enough to maintain for the long term should I choose to make this clock speed a permanent setting.

The screenshot displays the MSI Click BIOS 5 interface. At the top, it shows the time (20:47) and date (Wed 17 Oct, 2018). The main status area indicates the CPU Speed is 3.60 GHz and DDR Speed is 3400 MHz. System information includes MB: MEG Z390 ACE (MS-7B12), CPU: Intel(R) Core(TM) i9-9900K CPU @ 3.60GHz, Memory Size: 16384MB, VCore: 0.998V, DDR Voltage: 1.356V, BIOS Ver: E7B12IMS.100, and BIOS Build Date: 09/07/2018.

The Overclocking section is expanded, showing the following settings:

- Adjusted CPU Frequency: 5000MHz
- CPU Ratio Offset When Running AVX: [Auto]
- Game Boost Function Control: [By Onboard Bu...]
- Ring Ratio: Auto
- Adjusted Ring Frequency: 4700MHz
- Misc Setting:
  - CPU BCLK Setting: 100.00
  - CPU Base Clock (MHz): 100.00
- Clockgen Features:
  - DRAM Setting:
    - Extreme Memory Profile(X.M.P): [Enabled]
    - DDR4 3400MHz 16-16-16-36 1.350V
  - DRAM Frequency: [DDR4-3400 (34...)]
  - Adjusted DRAM Frequency: 3400MHz
  - Memory Try It!: [Disabled]
- Advanced DRAM Configuration:
  - Voltage Setting:
    - DigitALL Power:
      - CPU Core Voltage: 0.998V / 1.33
      - CPU SA Voltage: 1.151V / Auto

A help window on the right side provides instructions for navigating the BIOS: ↑↓: Move, ←→: Group jump, Enter: Select, +/-: Value, F1: General Help.

Back in Windows 10, with 5GHz on all cores running stable and within reasonable temperature thresholds, I ran Cinebench to see the performance benefits. The Intel Core i9-9900K went from scores of 2,063 (multi-threaded) and 218 (single-threaded) to 2,188 and 222, respectively. My overclock shaved a second each off the Blender and iTunes encoding tests, 20 seconds off the Handbrake result, 4 seconds off the POV-Ray multi-threaded test result, and 3 seconds off the single-threaded POV-Ray test score. My results in the games didn't show much improvement overall, but I achieved 4fps more in Rise of the Tomb Raider at 1080p, and 2fps more in the game's 1440p result.

## **POWER AND THERMAL TESTING**

When Intel says that the Core i9-9900K has a 95-watt TDP, that has virtually no bearing on the amount of power that this chip draws, even at stock settings. Back when I tested the six-core Core i7-8086K Limited Edition, another chip with a 5GHz Boost clock, the 95-watt TDP wasn't far from the 103-watt total package power draw I saw in AIDA 64's System Stability Test. When I overclocked the Core i7-8086K to run at 5GHz on all cores, power draw increased to 141 watts. At its stock settings, the Core i9-9900K running the AIDA 64 System Stability Test drew a whopping 165 watts. Keep in mind: This is out-of-the-box performance. You are likely to encounter loads similar to this in real-world computing scenarios.



Despite this amount of power, the Fractal Design Celsius S36 (the closed-loop liquid cooler I mentioned earlier, equipped with a 360mm radiator) was able to keep the processor running at between 65 and 75 degrees C. When I overclocked the Core i9-9900K to 5GHz on all cores, the power draw increased another 10 watts, but temperatures climbed into the mid-80s, with highs in the 90s. I have no problem running a system that occasionally spikes into the 90s for short bursts. If I'm doing something with this computer that takes hours to complete, however, I would back down to stock settings. If you keep your PC running heavy loads routinely, you may need a custom liquid-cooling system with more thermal capacity than a mere compact liquid cooler. If you plan to run an air cooler, I do not recommend overclocking the Intel Core i9-9900K, unless perhaps you equip it with a specialized high-end air monster such as one of the Socket 1151 models from Noctua.

When I first learned that Intel was using STIM between the die and the heat spreader of the Core i9-9900K, I thought that this was an example of Intel really listening to the enthusiast community. After working with the chip for a couple of weeks, however, I've concluded that anything less would have been a nonstarter.

### **9TH GEN CORE: STILL GOT THE GOODS**

Even though it's the product of an iterative refinement, the Intel Core i9-9900K is no less a wonder of modern silicon engineering. The fact that it does what it does while having been built on the same manufacturing node as the previous Coffee Lake processors boggles the mind. With Intel's ongoing woes around the move to the 10nm process, few would say that the Santa Clara chipmaker is at the usual top of its leading-edge game, but this processor would not exist if some of the world's best and brightest weren't tweaking and iterating on an already solid platform.



**This processor wouldn't exist if some of the world's best and brightest weren't tweaking and iterating on a solid platform.**



If anybody was thinking that AMD's second-gen Zen was going to be the blow that would put Intel in the underdog's place at the mainstream, then that person just doesn't know Intel very well. This processor isn't for everyone, but for those who can afford both it and the serious cooling needed to overclock it, the Intel Core i9-9900K will not disappoint gamers, content creators, and extreme multitaskers who expect their CPU in a single-GPU system to do it all and do it all well. That said, Intel's existing Hyper-Threading-capable 8th Generation Core chips and AMD's top-end second-gen Ryzens continue to deliver superior value for those who can live with gear a notch or two below the leading edge and just one video card.

ANDREW LIEBMAN



**The Intel Core  
i9-9900K  
won't  
disappoint  
gamers,  
content  
creators, and  
extreme  
multitaskers.**





**Apple Music** | \$9.99 | Rating: ●●●○○ GOOD

## Apple Music: Now Browser-Based, Too

Since its release, Apple Music—Cupertino’s streaming audio service—let people stream music and music videos to their iOS devices, dive into numerous curated playlists, and find artists using Siri voice commands. An Android version debuted shortly after its iOS counterpart, which is a major departure for Apple that shows how seriously it takes music. Now, Apple Music continues its platform expansion by bringing its 50 million-song library to web browsers. Apple Music’s many attractive features, including its human-curated Beats 1 channel, make this service a strong contender in its category, one that challenges our Editors’ Choices, LiveXLive Powered by Slacker Radio and Spotify. Note, however, that Apple Music lacks rival services’ standout extras like podcasts and ticket sales.

## SIGNING UP

Apple Music brings more than 50 million songs and a strong music-video crop to macOS, iOS, tvOS, watchOS, CarPlay, HomePod, Windows, Android, Chrome OS, Amazon Echo, Sonos, and web browsers. So if you own a consumer tech device, there's a good chance that you can use it to stream Apple Music.

Signing up is easy. Apple Music offers a three-month trial, which is a significant amount of time to try before you subscribe (you have to supply credit or debit card information to get the trial, though). After that, you'll need to sign up for a subscription plan.

The \$9.99-per-month Single Membership and the \$14.99 Family Membership (for up to six people using iCloud Family Sharing) grant ad-free music listening, ad-free video watching, offline listening, and access to Beats 1 Radio (Apple's human-curated, 24/7 channel). I like seeing Apple Music and other streaming music services adopt family plans, which is something that LiveXLive still lacks.

College students enrolled in an eligible college or university can subscribe to Apple Music for a wallet-friendly \$4.99 per month. Students can take advantage of the discount for up to four years. Spotify and Tidal offer a similar student deal. Unfortunately, Apple Music lacks a free, ad-supported version.

## PUTTING THE NEEDLE TO THE GROOVE

Apple Music's layout features large, eye-catching icons that invite you to explore the service, be it via a browser or an app. Honestly, that's something that you're likely to do anyway, as the interface features a menu structure that helps you quickly find content. Library, Playlists, Artists, Albums, and Songs are all prominent and easy to navigate.

## Apple Music

**PROS** Streams more than 50 million tracks. Siri and Apple Watch integration. Family Plan. Cool video playlists. 24/7, human-curated Beats 1 radio station. New browser-based version.

**CONS** No free version. Doesn't offer truly standout extra features.

**BOTTOM LINE:** Apple Music boasts a deep music well Siri and Apple Watch compatibility, but this well-rounded streaming music service falls just short of joining LiveXLive and Spotify as the best in class.



Apple Music is also for discovering new music, not just for listening to old favorites. So I hopped over to the For You section and swiped through numerous themed playlists, such as Eric Clapton: The Early Years and Lady Gaga vs. Madonna.

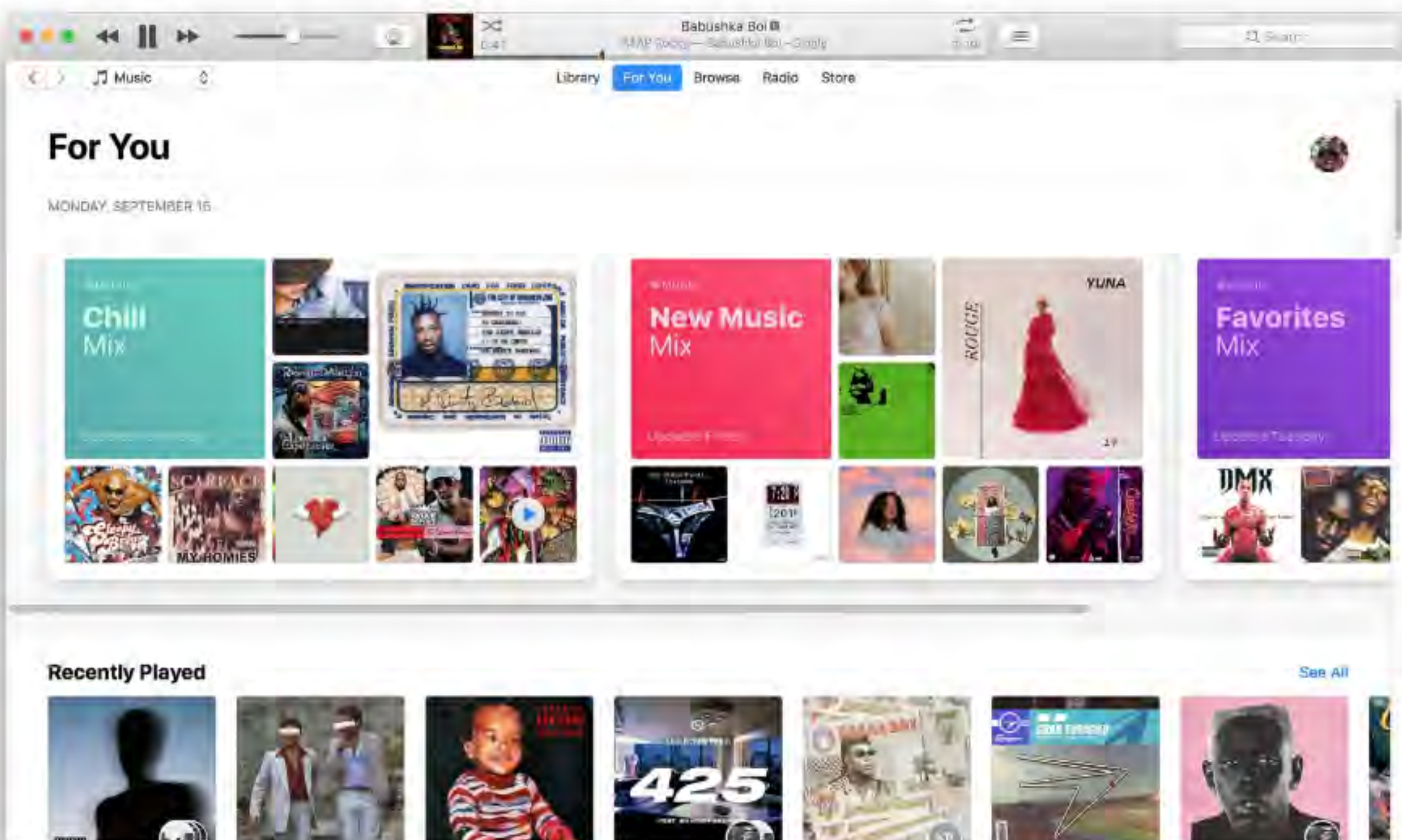
Apple must have discovered that people really dig these prefabricated playlists, because the original For You iteration was an entirely different beast. The older For You tasked you with manually selecting genres using brightly colored bubbles and creating stations around those picks. So, basically, the current For You removes the extra step. Of course, you still have the option to use the search box to find new tunes.

## DIGGING INTO THE LIBRARY

Apple Music features a vast selection of albums and songs, including Dr. Dre's "The Chronic" as well as tracks from Taylor Swift and other pop acts. I found many Prince albums, too, including "1999," "Purple Rain," and "Sign 'O' the Times." You can also listen to music channels dedicated to certain themes, such as Hip-Hop Workout Anthems and Disney Princess Radio.



**I hopped over to the For You section and swiped through numerous themed playlists, such as Eric Clapton: The Early Years.**



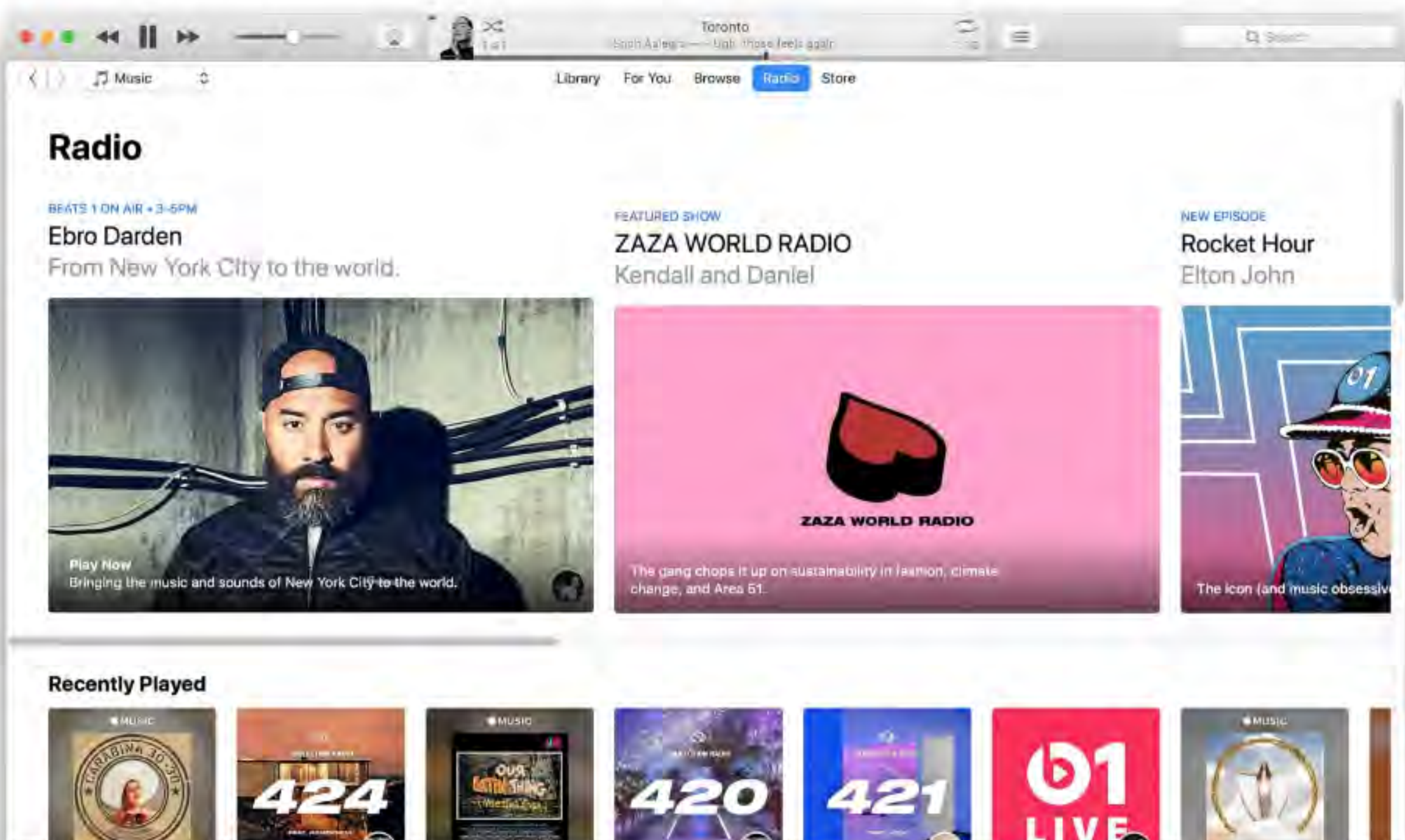
There are plenty of comedy tracks, too, for those times when you're in the mood to yuck it up. Maria Bamford, Kevin Hart, Eddie Murphy, Joe Rogan, Amy Schumer, Katt Williams, and Daniel Tosh are just a few of the notable comedians who have standup work streaming on Apple Music.

Meanwhile, Apple's flagship radio station, Beats 1, features tracks curated by DJ Zane Lowe, along with artist interviews. But that's the extent of the music-related extras; Apple Music lacks LiveXLive's Stories and music history channels (Artist DNA and Sample City), Tidal's editorial, and Spotify's podcasts. If you want to listen to podcasts, Apple Podcasts is your destination.

Music video fans will be happy to know that Apple Music has a dedicated section for that medium, too. The videos are tailored to your preferences, too, so it was not at all surprising that I was fed plenty of hip-hop tracks.



**Apple's flagship radio station, Beats 1, features tracks curated by DJ Zane Lowe, along with artist interviews.**



## AUDIO QUALITY AND SIRI

Apple Music's audio quality is fine, but it's not as high as Tidal's Hi-Fi and Masters offering. Only hardcore audiophiles will notice the difference, though, since the audio streams at 256 Kbps. That's a lower bitrate than Spotify's 320 Kbps streams, but Apple's use of the AAC format enables its streams to retain more audio data. In addition, Apple Music supports lyrics (when available), so you can sing along to a song even if you don't know the words.

What would an Apple service be if it didn't encourage you to use other Apple services and products along with it? You can use Siri to tell Apple Music to play specific songs or ask for recommendations, like The Top Songs of the 80s. Apple Watch owners can sync music to their devices and keep listening even when they're not paired to iPhones.

## A SOUND GARDEN

The 90-day free trial should be plenty of time to determine whether Apple Music is a service you want to invest in. Chances are that if you're a music fan, you'll like it—just make sure to turn off auto-payments in case you don't. Apple Music has numerous tracks and music videos as well as very solid radio service in Beats 1. Just don't expect non-music content, such as LiveXLive's Stories or Spotify's podcasts and Archie comic book adaptations.

JEFFREY L. WILSON



**Apple Music supports lyrics (when available), so you can sing along to a song even if you don't know the words.**





# KEEPER

Cybersecurity Starts Here™

**Keeper Password Manager & Digital Vault** | \$29.99 per year | **EDITORS' CHOICE** Rating: ●●●●○ EXCELLENT

## Keeper Password Manager & Digital Vault: An Elegant Solution

**T**he main reason to use a password manager is to create varied, strong passwords for every website and app you use—ones that you don't have to remember for yourself. But it's also important to be able to access your passwords from every one of your devices without difficulty. Keeper Password Manager & Digital Vault delivers an excellent experience across a ton of platforms and browsers. It also offers top-notch features such as robust two-factor authentication support, good sharing capabilities, and full password histories. Keeper is an Editors' Choice password manager, alongside Dashlane.

### PRICES AND PLATFORMS

As with Dashlane and other competitors, you can use Keeper at no cost if you're willing to restrict your usage to a single device. That one-device cap is a major limitation, but you can store all the passwords you want on that device. The easiest way to get started with Keeper is to sign up for a free account, then upgrade to the paid version after you're sure you want to. LastPass and Bitwarden offer much more flexible free versions, with no limits on how many devices or passwords you can use.

You pay \$29.99 per year for a personal Keeper subscription, which is a good value. A Sticky Password subscription costs the same, but LastPass Premium is slightly more expensive at \$36 per year. Dashlane Premium is a much costlier \$59.99 per year.

Keeper offers many subscription options and other services. For instance, the secure KeeperChat messaging service costs \$19.99 per year. Keeper's max bundle plan costs \$59.99 per year and includes Keeper's password manager, KeeperChat, the BreachWatch security feature for checking your passwords against leaks (we discuss this later), and 10GB of secure file storage. Keeper's family plan is a real bargain; for \$59.99 per year, you get five licenses and 10GB of secure file storage. The price for the family version of KeeperChat is \$59.99 per year, while the family bundle costs \$119.98 per year. Students can get Keeper at a 30 percent discount.

The Keeper apps look and feel consistent across platforms with a modern design. By default, the apps use a restrained gray, white, and yellow color palette, but you can choose from a number of lively color themes in the settings. Keeper offers apps for Windows, macOS, Android, iOS, Kindle, Windows Phone, and Linux, as well as browser extensions for Chrome, Edge, Firefox, Internet Explorer, Opera, and Safari. Keeper also maintains a Microsoft Store version that may already be installed on your PC, depending on your device manufacturer.

## **ZERO KNOWLEDGE**

Just about every password manager offers a warning at installation—if you forget your master password, there's no way to access the passwords you stored in the password manager. The company can't recover them for you. That's a good thing. The fact that only you have

## **Keeper Password Manager & Digital Vault**

**PROS** Supports all popular platforms and browsers. Two-factor authentication. Secure password sharing and inheritance. Optional secure file storage and messaging. Retains full history of passwords and files.

**CONS** Web form filling somewhat limited. No fully automated password updates.

**BOTTOM LINE** Keeper Password Manager & Digital Vault is an elegant and security-first password management solution available for all popular platforms and browsers.

your master password means that a subpoena can't force the company to turn over your passwords and that a shady employee can't weasel into your stored data.

Zero knowledge is central to the philosophy of Keeper Security. As such, Keeper didn't include a password inheritance feature until the developers came up with a zero-knowledge technique. Keeper still doesn't attempt updating passwords automatically, though it helps with the process of updating to better passwords. A contact at the company pointed out that competing products aren't fully zero-knowledge during automated password updates. Your passwords exist in memory on the company's servers, at least briefly.

### **GETTING STARTED WITH KEEPER**

Keeper includes a thorough onboarding module that walks you through the entire setup process. To start, it offers to import any passwords stored in your browsers; your browser's built-in password managers are not as secure (remember the Opera breach?) or flexible as a dedicated password manager. It's up to you to delete those passwords and turn off the browser's password capture. Keeper can also import from almost 20 competitors, among them LastPass, Dashlane, RoboForm, and True Key.



**The fact that only you have your master password means that a subpoena can't force the company to turn over your passwords.**



Keeper helps you create your first record and install the browser extension, with an optional tour of the extension's features. It shows how to add a payment card and personal information for filling web forms and encourages you to turn on two-factor authentication. We are impressed with this thorough introduction.

As part of the setup process, you'll define a security question and answer. We always advise creating your own question rather than accepting the canned ones and making the answer something nobody else could know or find out. Keeper doesn't even include the option to use a preset question. You'll need this answer to reset a forgotten master password.

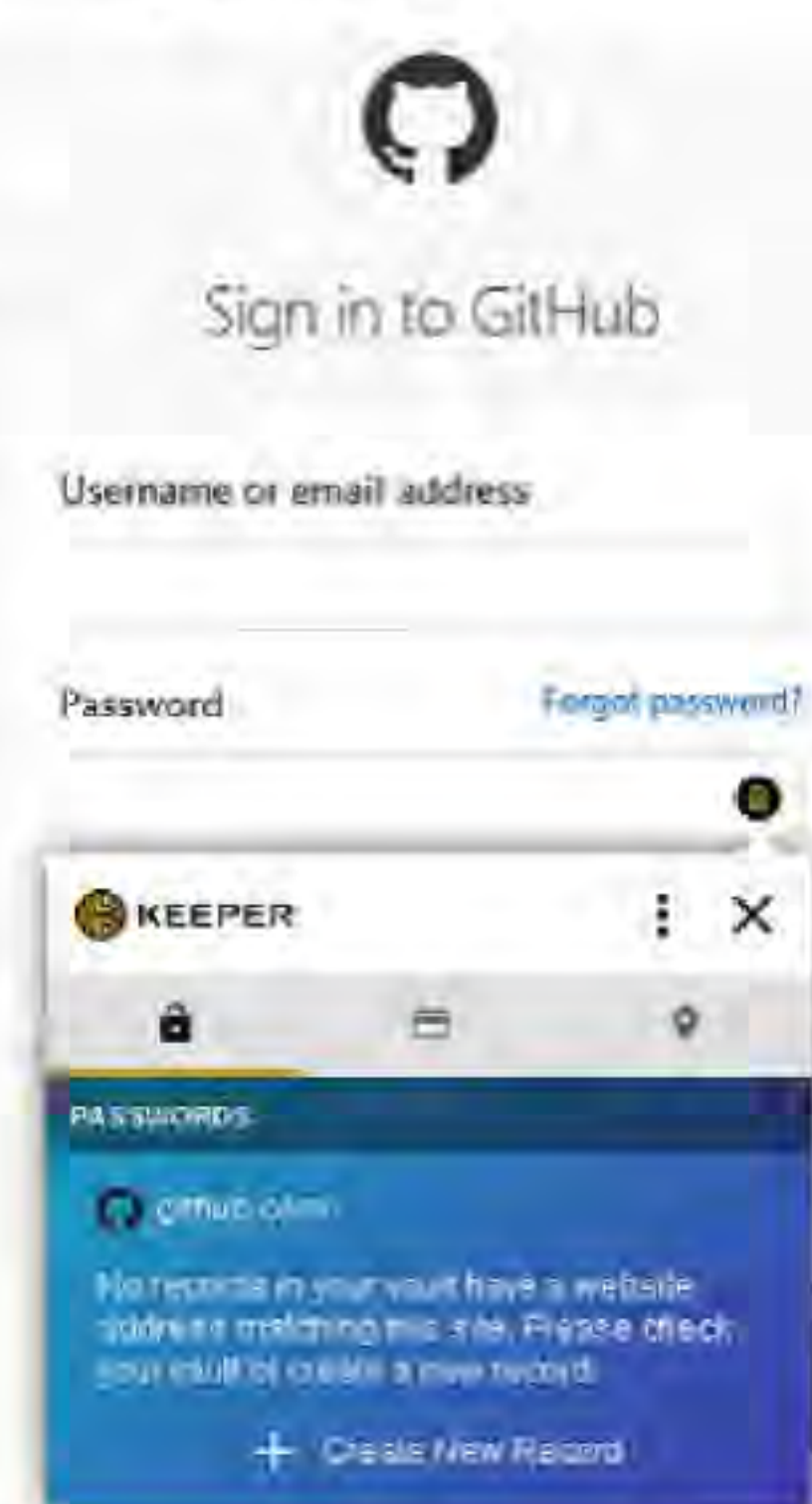
Reset a forgotten password? How can Keeper do that and still be a zero-knowledge solution? Our Keeper contact explained that Keeper encrypts your local data both with your master password and with your security answer, and can decrypt it using either. However, logging in with the security answer requires an emailed code as well as whatever two-factor option you've selected. You can read a full explanation on Keeper Security's website. The main takeaway is that you should be extra careful in selecting your security question and answer.

## **PASSWORD CAPTURE AND REPLAY**

Like most password managers, Keeper captures passwords as you log in to secure sites. To start, you could just log in as you would normally and then accept Keeper's prompt to save those credentials.

Alternatively, you can click the Keeper lock icons that appear in every username and password field to create a new login entry in Keeper directly. At this time, you can give the entry a friendly name and add a note. If you choose this method, Keeper will fill them in on the page after you save the entry.

When you return to a page for which you've saved login data, Keeper offers to auto-fill your credentials via a pop-up prompt. You can also click the Keeper lock icon to view all your relevant logins and fill them into the fields. If you want to edit your existing passwords or create a new one altogether, you can do so from the lock's menu.



Keeper doesn't include fully automated password updates such as you get with LastPass, Dashlane, or LogMeOnce Password Management Suite Ultimate. But when it detects a password-change page, the kind with one field for the old password and two for the new, it offers a one-click option to update and save a new, strong password. As previously noted, Keeper's developers contend that when competing products perform a fully automatic password update, your passwords exist for a time on company servers, which doesn't pass the zero-knowledge test.

Clicking the browser extension's toolbar button brings up a simple menu with five items: Display Locks (in the entry fields), Vault, Settings, User Guide, and Logout of Keeper. Clicking Settings lets you toggle a half-dozen important features such as whether Keeper should prompt you to create a new login and whether it should automatically submit filled-in credentials. You can also control whether Keeper displays a lock icon in fields that it recognizes. We like the options to show the lock only when the mouse cursor is over a field and the settings for changing the location of the pop-up prompt.

Selecting Vault brings up the Keeper interface in your browser, which includes access to the full range of settings. This interface is almost indistinguishable from the standard Keeper Windows app, which is a good thing. Note that the Microsoft Store edition necessarily looks different, as to comply with Microsoft's layout and appearance rules for store entries.

## **DIGITAL VAULT**

You can attach a file or photo to any password entry in Keeper, or you can create an entry just to hold the attachment. A basic Personal subscription lets you store five such attachments. If you want more, you'll pay another \$9.99 per year for 10GB of secure online storage and up to \$749.99 per year for 1TB. As noted, both the max bundle plan for individuals and the family plan include 10GB of storage.

Keeper notably retains every version of every entry. You can scroll back through every password you've ever used for a given site and even restore an old version. You can also peruse all versions of files you've saved as well as any entries you've deleted.



## PASSWORD GENERATOR

Keeper's password generator automatically comes up with a new password any time you create a new record. If you're logging in with an existing password, you simply overwrite the generated one. By default, it creates 12-character passwords using all character types (letters, numbers, and symbols). Interestingly, the one-click password updater creates 16-character passwords. A contact at Keeper mentioned that the default would soon change to 20 characters across the board.

Dashlane also defaults to 12 characters, and RoboForm to just eight. Password Boss Premium creates 20-character passwords by default. Given that you don't have to remember these passwords, they might as well be plenty long. We recommend 16 characters or more. MyKi, a free password manager, defaults to 32 characters.

## IMPROVE YOUR PASSWORDS

Using a password manager doesn't improve your security if all your passwords are "password," "123456," or some minor variation of those. Even if you use the same super-strong password on multiple websites, a breach at one of those sites could expose them all. Keeper's Security Audit section helps you identify both weak and reused passwords by assigning a password strength to each one and an overall percentage-based score for All, Reused, and Weak categories.

Dashlane similarly points out potential password changes that would raise your score. Keeper doesn't match up entries that have the identical password the way LastPass does, but that's not really a problem, since changing one of a pair of duplicates makes both vanish from the list.

Keeper, LastPass, Dashlane can also show which passwords haven't been updated in a long time. Do note that the National Institute of Standards and Technology (NIST) no longer recommends periodic password changes. Rather, NIST now recommends changing passwords only after a breach. Keeper's BreachWatch feature flags passwords that may have been compromised in a data breach. This is not a simple check against databases such as Have I Been Pwned? though. A Keeper representative confirmed that matching is performed in a way that maintains the company's Zero-Knowledge commitment.



## TWO-FACTOR AUTHENTICATION

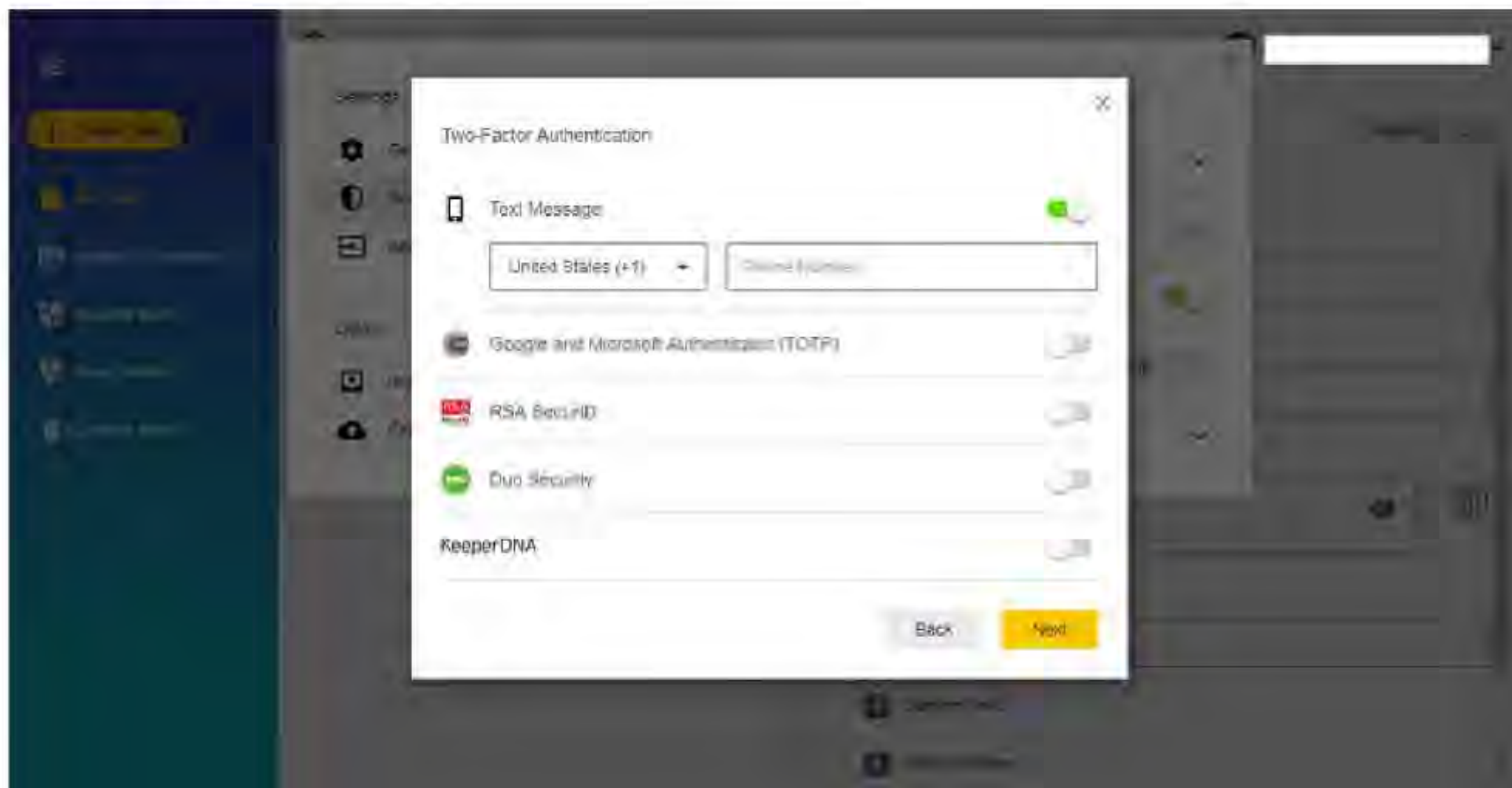
Your master password protects all your other passwords, so it needs to be strong. No matter how strong it is, though, you're still in trouble if a malefactor gets hold of it. That's where two-factor authentication comes in. When logging in requires both your master password and a fingerprint or physical token, cyber-crooks can no longer gain access.

As mentioned, Keeper walks you through setting up two-factor authentication during the onboarding process. Specifically, it asks for a mobile phone number to send six-digit authentication codes. It also generates a collection of one-use codes, in case you lose your phone or have no cell service. In the settings, you can set an Auto-Logout timer as well as Enable Self-Destruct, which erases all locally stored Keeper files after five failed login attempts.

Like Dashlane, Keeper can register a FIDO U2F (Universal Two-Factor) key such as a Yubikey for authentication. LastPass also supports Yubikey authentication, but you need a premium account to use it. You can register multiple U2F keys with Dashlane, in case you lose one.



**When logging in requires both your master password and a fingerprint or physical token, cyber-crooks can no longer gain access.**



Authentication using a time-based one-time password (TOTP) app, such as Google Authenticator and Microsoft Authenticator, is also an option. This method is more secure than SMS. You can also use an RSA SecureID token or Keeper's own KeeperDNA app (on your smartphone or watch). With KeeperDNA, you simply respond to the notification on your device. The fact that you have the device is the second authentication factor, so no need for a six-digit code. On a device (mobile or desktop) that has a fingerprint reader, you can add biometric authentication to the mix.

LogMeOnce encourages using smartphone-based verification instead of a master password. True Key can also log you in without the master password, though doing so requires multiple other authentication factors.

One new feature of Keeper is an integrated two-factor authentication code option for each password entry. To set up this integration, navigate to password entry, and click on the Add Two Factor Code button underneath the Custom Fields and File or Photos options. You can then upload a QR code or manually set up the connection to an account that allows authentication via TOTP apps. This capability replaces the need for a separate TOTP app for authentication, such as Google Authenticator, and worked without issue in testing.

## FORM FILLING AND PAYMENTS

Keeper can store and use personal and payment data to fill web forms. Where Sticky Password, AgileBits 1Password, and many others let you create multiple identities, Keeper allows just one. But you can add multiple phone numbers and addresses, which is effectively the same as having multiple identities. You can also add as many payment cards as you like. If you're using a smartphone, you can add a card by scanning it.



Filling forms with Keeper isn't quite as automatic as it is with most other password managers. First, you click the lock icon in any field to display the familiar popup. Then you click the tab for addresses. You can select an address and click to fill all matching fields, or expand the view and fill fields one by one. Another tab lets you fill payment information.

RoboForm 8 Everywhere started life as a form-filler utility, and it remains the most flexible. You can store a ton of data types, with multiple entries for each field if needed. But Keeper's form-fill feature handles all the fields you need when making an online purchase, and that's the most important thing.

### **KEEPERFILL FOR APP PASSWORDS**

KeeperFill now works for app passwords on all platforms. On iOS (version 12 and later), you need to give Keeper permission to AutoFill passwords and then hit the Password button on the keyboard, whenever it pops up to find matching entries. For Android (version 8 and newer), you need to enable Keeper as Autofill Service, select KeeperFill in the Manage Keyboard section, and give it permission to display over other apps. We installed the Keeper app on a Google Pixel 3 running Android 9 to test out its autofill capabilities. In testing, the app successfully offered to fill in the correct username and password.

On macOS and Windows, you use a hotkey (you can configure this to whatever you want) to bring up KeeperFill and locate the desired entry. Another hotkey fills in the username, and a third fills in the password. Or, you can just click on each entry to fill them in. Again, in testing on Windows, this worked fine.



**Keeper's form-fill feature handles all the fields when you're making an online purchase, and that's the most important thing.**

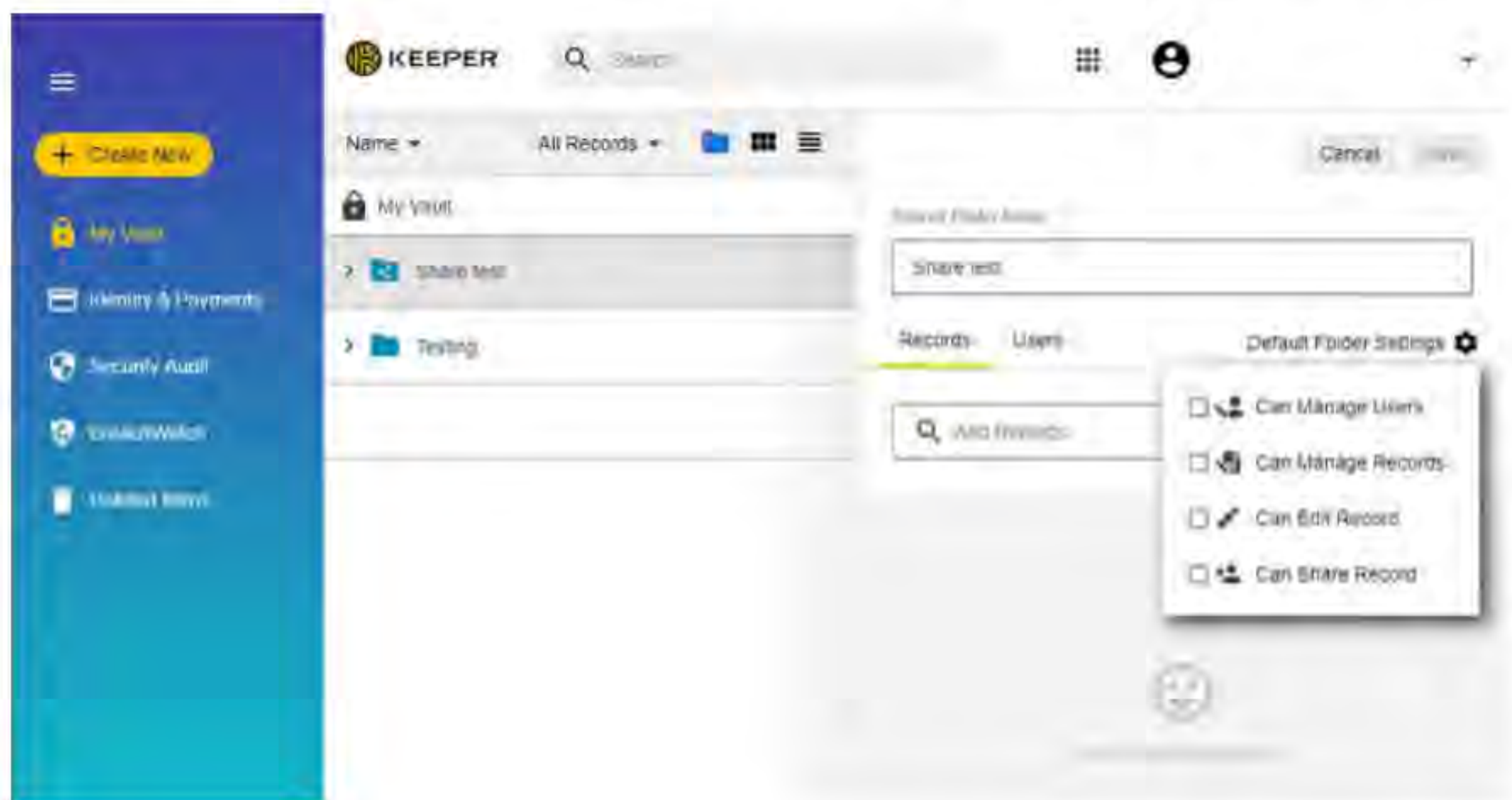


LastPass and Sticky Password Premium use a somewhat awkward multi-step process to capture app passwords. RoboForm attaches a toolbar to app windows that seem to be asking for a password. Keeper doesn't attempt capture. You either create the entry manually or use one of your existing website logins.

## SECURE SHARING

You know you shouldn't share your passwords with just anybody, but there are cases when you must share them with a trusted partner. With Keeper, you can share any password record with another Keeper user and maintain as much control as you like.

To share a record, you start by entering the recipient's email. If that email address doesn't correspond to a Keeper account, the product lets you know that the recipient will have to sign up for a free account and that it will email you once that happens. The recipient gets notification within Keeper itself.



By default, the recipient can view and use the login, but can't change it. You can set it to allow editing, allow sharing with others, and even make the recipient the owner of the record. The simpler sharing system in LastPass just lets you choose whether the recipient can view the password. Dashlane lets you choose between limited access (like Keeper's default) and full co-ownership.

If you want to share multiple passwords with other users, you're better off creating a shared folder. Here, too, you can limit how much control you grant to the other users. To start, you're able to say whether each user can add or remove users and add or remove records. You also control whether other users can edit or share each record. A small sharing icon distinguishes shared folders from others.

## **EMERGENCY ACCESS**

What happens to your online accounts after you shuffle off this mortal coil? Like Dashlane, LogMeOnce, and several others, Keeper now includes a system to give a trusted friend or relative emergency read-only access to your accounts. To access these settings, go to Account > Emergency Access.

You can enter the email address for up to five trusted individuals who have a Keeper account. For each of them, you set a timeout, from no delay to three months. If one of them requests access while you're still alive, you get a notification, and an opportunity to revoke their access. The similar feature in RoboForm and LastPass allows a timeout of up to 30 days. With the business-focused Zoho Vault, access is immediate, and an administrator can take control of any work-specific passwords.

## **COMPLETE AND COMPREHENSIVE**

A password manager needs to do its job with as little friction as possible. Otherwise, users will drop it and go back to using the same password everywhere, or writing passwords on sticky notes. Keeper Password Manager & Digital Vault offers consistent, excellent apps for all the platforms and browsers you could want and includes the advanced features found in the very best password managers, among them password inheritance, secure sharing, two-factor authentication, and an actionable password strength report. For security reasons, it doesn't perform fully automated password updates, but you can update and save a password with a few clicks. Keeper is an Editors' Choice password manager, as is Dashlane, which excels for its usability and features.

*NEIL J. RUBENKING, BEN MOORE*

# FEATURES



**A**re you the IT staff of choice for your family, friends, and chance acquaintances? Well, imagine how much more in demand you'd be if you worked at PCMag! We get asked for all kinds of advice, and we dispense it generously. For this story, we asked our editors, analysts, and producers to share their most cherished tech tips. We wound up with a rich assortment of wise gems, including the best way to use Google Maps on trips, keeping phone notifications at bay, and unearthing Netflix's secrets. So read and enjoy: There's sure to be plenty of advice you can use—and answers to questions you haven't even been asked yet.

**CHLOE ALBANESIUS, EXECUTIVE EDITOR, NEWS & FEATURES**

**Schedule emails in Gmail:** I'm a night owl, and I tend to get work done at odd hours. But no one likes getting work emails at 10 p.m. And firing off a request during off-hours means the message can easily get buried overnight. The schedule function in Google's Gmail solves this problem. In the compose window, click the little arrow next to the Send button and select "Schedule send." You can opt to send it at 8 a.m. the next day or choose a specific time and date. Scheduled emails live in the left-hand menu on the desktop, so you can edit or delete them before they go out.





**Use Slack reminders:** At PCMag, we live in Slack, sending messages back and forth even with people sitting 2 feet away. The constant pings can be distracting (thank you, “Mute channel” function), but the “remind” function is a lifesaver. In your own channel, type “/remind” followed by a command, like “/remind edit tips story in an hour” or “/remind ask the team about holiday coverage on 10/1 at 10 a.m.” The reminders pop up in the Slackbot channel at the scheduled time, which you can either mark as complete or snooze for periods of time. You can also hover over Slacks from other people and ask to be reminded about them at a later date.

**Unfollow ‘Friends’ on Facebook:** The way Mark Zuckerberg talks, your Facebook friends are all actually your friends, not a bunch of randos from childhood you haven’t spoken to in 20-plus years. And yet, “de-friending” them would feel mean or awkward, so their article shares, sunset snaps, and pics of their kids filter into your News Feed. What to do? Be passive-aggressive, of course. Facebook lets you “unfollow” people without actually de-friending them. That way, you still appear as “friends” if they look at your profile for some reason, but their updates never appear in your News Feed. And you can peep their pages when you’re feeling nosy. The easiest way to do this is to click the ellipsis icon on the top-right of a post and select “Unfollow [their name].” To get them back later, go to News Feed on the top-left on desktop and select Edit Preferences > Reconnect with people and groups you unfollowed.

#### **TOM BRANT, SENIOR ANALYST, HARDWARE**

**Don’t prop your laptop up on a pillow:** You might be amazed at how much cooler and quieter it runs when its vents aren’t blocked. And if the fan doesn’t have to run constantly, battery life should improve.

**Use Apple Pay or Android Pay while traveling abroad to speed up your transactions:** Using a US-issued credit card abroad almost always results in the merchant asking for a signature, but contactless payments typically get approved immediately, avoiding this annoyance.

**Free TV:** Don’t want to pay for cable, but also don’t need an unsightly antenna? Use a free service like Locast, which legally captures over-the-air broadcasts and delivers them to your laptop, TV, smartphone, Roku, and so on.

## JASON COHEN, ASSOCIATE EDITOR, HELP AND HOW-TO

**Save your eyes and use dark mode:** You don't have to stare at white screens anymore. Both Android and iOS now offer system-wide dark modes for many built-in apps. And a number of third-party apps support it, too, so look in settings to see which of your favorites have it. This may seem unimportant, but it has helped me reduce eyestrain, and it just looks better.

**Search websites with Google:** Ever try to find an article from a specific website, but you can't seem to locate it anymore? Use a shortcut. Add `site:[website.com]` to the end of your search and Google will spit back only results from that particular website. I use it every day for work and personal queries, and it has saved a lot of time and aggravation.

**Quick Google mobile search:** Chrome on mobile offers a helpful search feature: when you highlight a word or phrase, a card appears at the bottom of the screen. Open this card, and you get an instant Google search without having to leave the page. This is great for quickly looking up the definition of a word or getting some context for a name or place with which you might not be familiar.

## JIM FISHER, LEAD ANALYST, CAMERAS

**Keep distractions down:** I'm bad with screens and a bit of a workaholic, a combination that leads me to Slack and email at 10 p.m. on a Friday. I've found that the iPhone's Do Not Disturb feature can keep me from working overtime, at least unintentionally. It stops notifications from making my phone's screen glow, so it's easier to forget about work on the weekends.



**Put Alexa in the kitchen:** When I bought an Amazon Echo, I didn't realize its primary purpose would be to serve as a timer for kitchen tasks. As I'm prepping a meal at home, I find myself talking to Alexa most of the time. Three minutes for the fish, 15 minutes for the vegetables—you can even name your timers to help keep everything straight.

**WILL GREENWALD, SENIOR ANALYST,  
CONSUMER ELECTRONICS**

**Make sure your TV's in the right mode:** For almost everything you want to watch, your TV should have the most accurate picture, and the default mode probably won't cut it. Look for a picture mode called Cinema, Movie, or Calibrated. Stick with that mode when you're watching most things. The only exception is video games; for games, use the Game picture mode or any separate Game mode you can enable to reduce input lag. Either way, make sure Color Temperature or White Balance are set to the warmest preset as well; most TVs are set to look bluer than they should because it makes them appear brighter to the eye, but color is less accurate.

**If your TV is 4K and HDR, make sure it's getting that signal:** If you want to watch 4K HDR content on your new TV, you need to make sure your devices are sending that signal. Always use an HDMI connection that's rated at least Premium High Speed, and check your TV's input settings if there's an Enhanced or Deep Color mode for individual HDMI inputs. Turn that mode on for any HDMI port connected to a device that can show 4K HDR video. Go into that device's display settings and make sure it's set to display 4K and HDR video when applicable.



**Most TVs are set to look bluer than they should because it makes them appear brighter, but color is less accurate.**



## ERIC GRIFFITH, FEATURES EDITOR

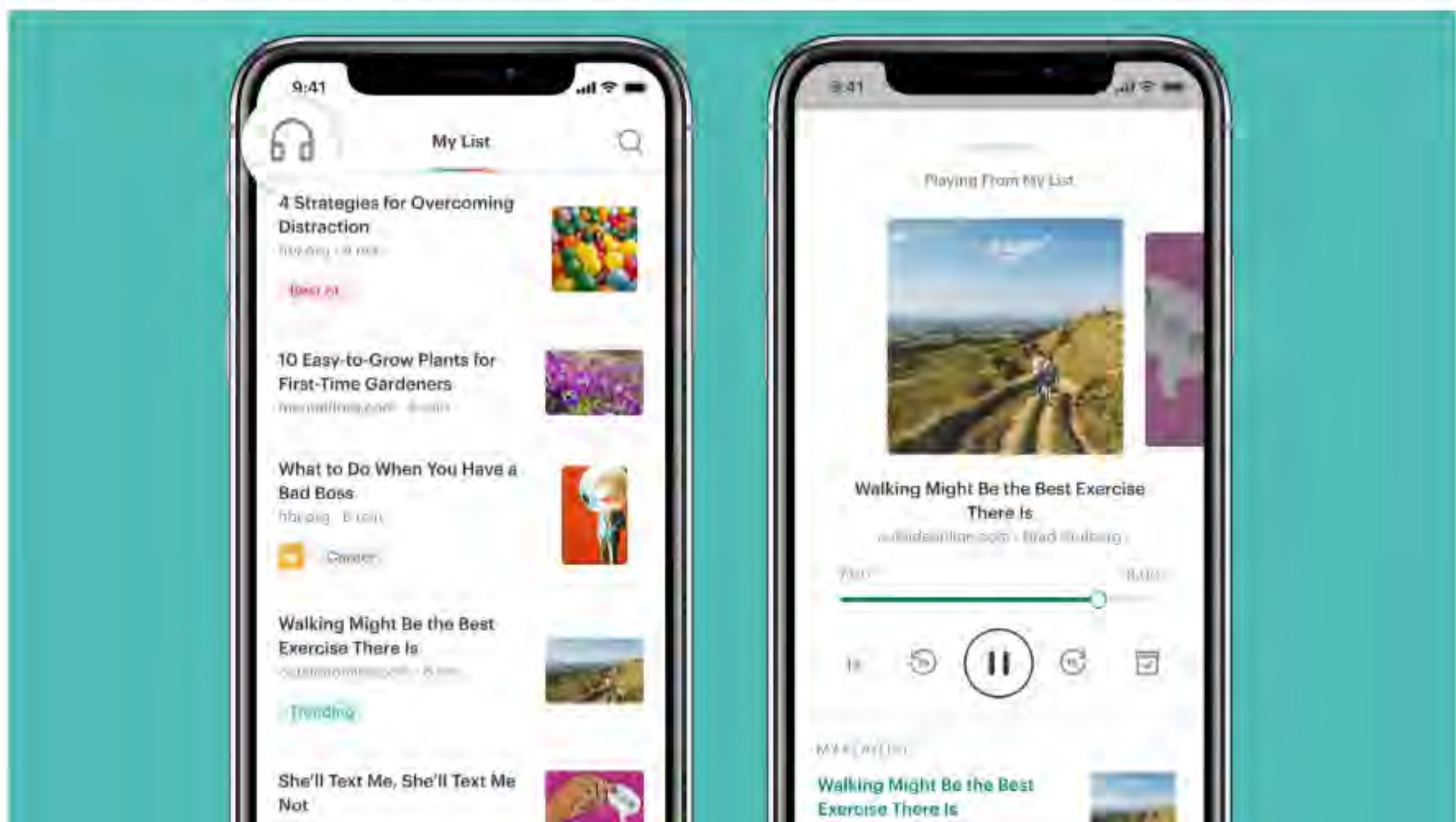
**Keep on top of your Google accounts:** If you've got multiple Google accounts, embrace the Checker Plus extensions for Google Chrome by Jason Savard ([jasonsavard.com](http://jasonsavard.com)). They make life much easier to manage when you're juggling Google Drives, Gmails, and Google Calendars across multiple walks of life.

## PETE HAAS, SOCIAL MEDIA MANAGER

**Focus by turning your phone to grayscale:** My phone is full of candy-colored icons begging to be played with. I fix that by going deep into my iPhone's settings (General > Accessibility > Display Accommodations > Color Filters) and changing the phone's color to grayscale. It seems silly, but something about removing the color from my phone's screen makes it 100 percent less appealing to my brain. My focus then shifts to my work computer.

**Remember everything with Sticky Notes:** All notes apps are useful and largely do the same things. But Windows 10's Sticky Notes looks enough like a Post-It (a big yellow square you can put wherever you want) to feel satisfying to use and have all the convenience features you'd want, such as syncing across devices and searching.

**Let Pocket read stories to you:** The best part of this read-it-later app is the text-to-speech feature, which will "read" to you while you're jogging, commuting, or working. The voices sound a bit robotic, but it's helped me make significant headway on my endless reading list.



## JAMIE LENDINO, EDITOR-IN-CHIEF, EXTREMETECH

**SSD for everything:** If you haven't already taken the plunge, upgrade all of your computers' boot drives (both desktop and laptop) to SSDs. Prices have cratered, with 256GB models going for less than \$30 and roomy 1TB SSDs hovering around the \$100 mark, so even covering the rest of your storage is possible in most cases.

**Keep it all in the cloud:** OneNote, Apple Notes, Google Keep—all these programs are free and offer cloud sync for your lists, notes, projects, instructions, and anything else you need to keep track of, whether you're at your desk or out and about with your phone.

**Banish noisy websites forever:** Are any websites you frequent still auto-playing video with sound? Mute the entire site in Chrome. Simply right-click the tab and select Mute Site. You'll need to re-enable it for videos you actually want to watch, but that takes just an extra click.

## MICHAEL KAN, NEWS REPORTER

**Try before you buy:** When you're considering buying a laptop, go to a store and test it out. A laptop can look and feel very different than you might have expected when you're holding one in your hands. Inspecting the device in person will let you determine whether it was built cheaply and whether you like the keyboard.



Photo credit: Bommar Taras/Shutterstock

**Build your own gaming machine:** Mobile gaming is cool. But for serious play, I recommend building your own gaming desktop instead of shelling out for a pricey gaming laptop. You'll get a lot more bang for your buck: A DIY desktop will be more powerful on the graphics front and can be upgraded over its lifetime. For instance, I built my gaming desktop back in 2012, and I still use it as my powerhouse PC. A gaming laptop I purchased in 2010 is now collecting dust under my bed.

**Think before you post about your kids:** I don't have kids myself, but I'm concerned about all the parents who post photos of their children on social media. Granted, parents can make their posts private, but they're still trusting these companies to hold on to their personal data and content responsibly. Ideally, we would all have at least some control over our digital privacy before we become adults. But for now, parents get to decide this for their kids, often without realizing the full ramifications.

#### **ROB MARVIN, ASSOCIATE EDITOR, FEATURES**

**Keep your home as dumb as possible:** Although a smart home comes with benefits—voice-activated convenience, remote home control, energy savings—I don't think it's worth the privacy and security trade-offs. Every digital assistant platform (Alexa, Siri, Google Assistant, Cortana) has gone through its share of always-on listening scandals and privacy gaffes, with third-party contractors listening to intimate details of your lives for “quality assurance” or Alexa inadvertently sending recorded private conversations to random people. But it goes beyond offering tech companies eyes and ears inside your home. Amazon-owned Ring is using its smart home security cameras to set up a warrantless surveillance network sold to and exploited by local police nationwide. Every connected appliance in your home is another entry point for malicious actors: Why would you buy a fridge someone can hack? Finally, this technology is new. It has bugs. This summer, a smart oven manufacturer came under fire after some of its ovens began spontaneously preheating to 400 degrees in the middle of the night. Do you know what won't inadvertently burn your house down all on its own? A dumb analog oven.

**Google Maps is your best travel buddy:** The most-used app on my smartphone is Google Maps. It's changed the way I navigate the world, especially when I'm traveling internationally. Even if you don't have an overseas

data plan and your phone is on Wi-Fi mode the whole trip, offline Google Maps is still the best navigator that fits in your pocket. Before I go on a trip, I research my destination and load up a custom map with starred and labeled locations: attractions, bars, restaurants, my Airbnb, train stations, and airports. Once I'm there, I can wander backroads and cobblestone streets, exploring freely. Then when I get hungry or realize I'm near a spot I want to check out, I pull out my phone, use the GPS to avoid tourist traps, and head exactly where I want to go.

**Always carry a Chromecast:** Like a lot of millennials, I don't have cable anymore. I have plenty of logins to different providers and services, but they all plug into my smartphone for each streaming app and TV network, depending on what show or broadcast I want to watch. A \$35 Chromecast is the easiest way to stream anything you want to any TV with an HDMI port. Pop one in your pocket, bag, or suitcase and no matter where you are, you can plug it in, open your app of choice (or a Chrome tab on your laptop), and tap the Cast button.

#### **BEN MOORE, ANALYST, SOFTWARE & WEB**

**Use fake emails for throwaway accounts:** Your inbox can easily become a cluttered mess filled with newsletters and product announcements from services you signed up for only to get a free trial or a coupon code. To avoid these emails, use a temporary or random email generator (preferably one with an inbox) to sign up for services you will never need to use again. Use fake email addresses with caution, though; make sure you have access to your login credentials for any services you plan to use again in the future.



**Keep your old technology in usable shape:** Older devices may be slower than or not as pretty as new-to-market ones, but that doesn't mean you need to toss them out. You can still use old gadgets for less-intensive tasks (as an alarm clock, for example) or as a backup device in case your primary one breaks. Occasionally, old hardware can even regain relevance; for instance, I now use my Zune HD with my wired headphones that no longer work with my smartphone.

**Use spreadsheets for every aspect of your life:** You can usually find half a dozen apps and services that promise to quantify some aspect of your life—say, your finances, health, or reading list—but few methods are as versatile, cheap, and private as using a spreadsheet. The prospect of customizing a spreadsheet from scratch may seem daunting, but you can find plenty of resources online for implementing conditional formulas and organizing data in a way that makes sense to you. And when you want to see how lifestyle changes will affect future trends, you can quickly add and delete data with no consequences.

**MICHAEL MUCHMORE, LEAD ANALYST,  
SOFTWARE**

**Shake that window:** To focus on your current app in Windows 7 or 10, grab the top bar of the program window with the mouse cursor and shake. All other windows will minimize to leave you alone with the app of utmost import. Want to get back to all the glorious clutter? Just shake again.

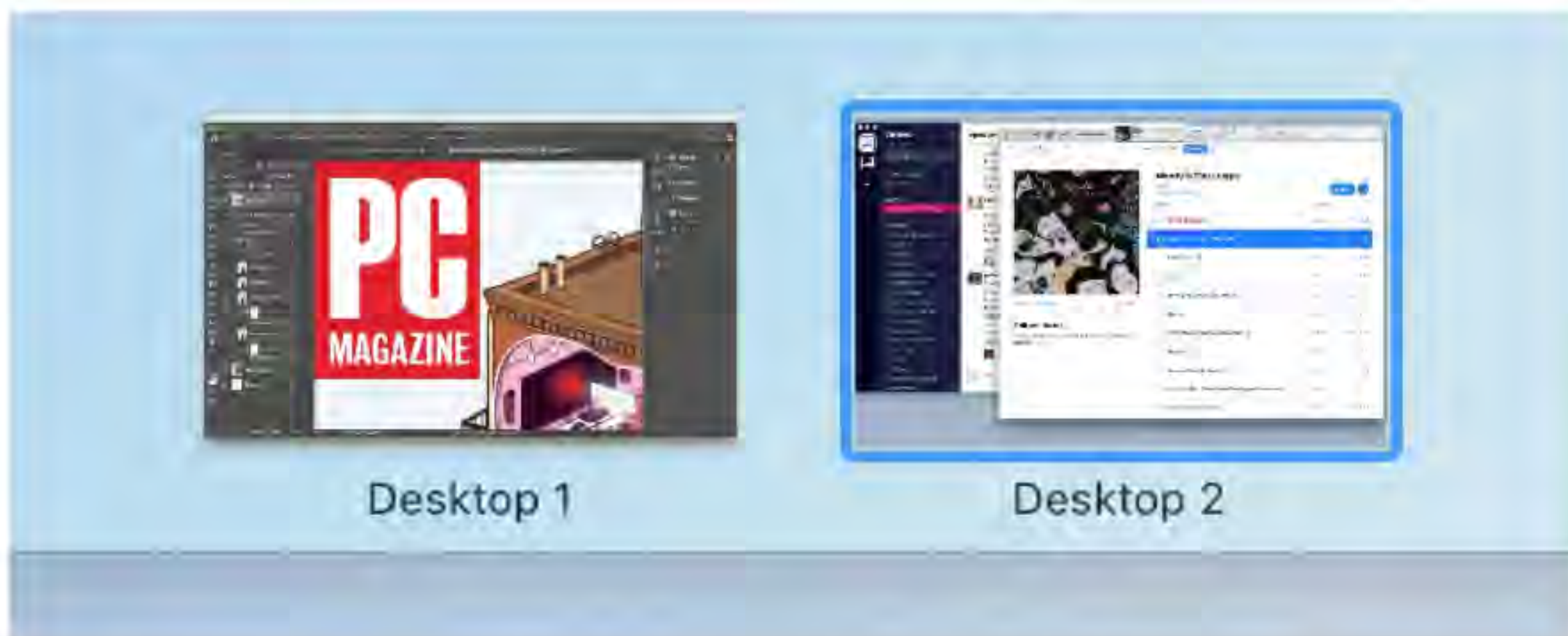
**Use separate virtual desktops for work and personal:** When I'm at work, I set the main desktop for serious job stuff and create a second background virtual desktop for things such as music and WhatsApp. In Windows, tap the Task View button to the right of



**You can still use old gadgets for less-intensive tasks (as an alarm clock, for example) or as a backup device.**







the search bar, and then switch back and forth with the key combo, Windows Key+Ctrl+Right (or Left) Arrow. In macOS, open Mission Control and tap the plus sign at the upper right to create a new “Space.” MacOS creates a new desktop for every full-screen window whether you want one or not, however, so that can confuse a neat windowing system. (There’s an even more confusing option that automatically rearranges Spaces based on most recent use, which I recommend turning off.) Switch among Spaces with Control+Right and Control+Left.

**Use Windows 10’s new screenshot history feature:** If your Windows 10 is up to date with the 1903 version, hit Windows Key-V after cutting text or an image with Ctrl-C. This lets you save multiple items to the clipboard and paste them later. You even can sync the clipboard among your multiple PCs with Cloud Clipboard.

#### **OLIVER RIST, EXECUTIVE EDITOR, BUSINESS REVIEWS**

**Stop relying on low-rent password managers:** Or worse, individual passwords your employees manage on their own. Identity management systems have become easier and cheaper, and they’re far more efficient and powerful than older methods. Best of all, they make single sign-on (SSO) a secure reality, and that’s often worth gold all by itself. We’ve tested identity management systems in the PCMag Labs, and while our Editors’ Choice, Okta Identity Management, probably requires an IT staffer to implement, new players on the market have simplified this type of technology. JumpCloud is worth a close look if you’re seeking to up your ID security but not your IT budget.

**Deploy multifactor authentication:** Businesses should have adopted this technology for anything critical by now, and it's available for many services aimed at individuals, too, including games, Google G Suite, Microsoft Office 365, and so on. This simple step makes hacking the associated account extremely difficult and can keep you safe even when those around you are getting speared like tuna.

**Test your security for free:** The bad guys use smart software to automate attacks such as phishing. Although that lets them attack a much wider swath of targets simultaneously, it also means you don't need to spend lots of cash to test whether your defenses are working. You can use automated software, too—and even better, it's free. Both Microsoft (<https://techcommunity.microsoft.com/t5/Security-Privacy-and-Compliance/Announcing-the-Public-Preview-of-Attack-Simulator-for-Office-365/ba-p/162412>) and KnowBe4 (<https://www.knowbe4.com/resources>) have automated anti-phishing tools you can use to test how well your employees (or your family) and their devices are protected. If you want to spend a little money to be even more sure, check out tools like Infosec IQ (<https://www.infosecinstitute.com/iq/phishing>), which is more sophisticated but still accessible to the average power user and includes several kinds of attack simulators.

**Test your people, too:** Business owners need to know how well employees understand these threats. So spend a little time on training. Have a pro come in to give a lunchtime talk and a scary demonstration, or just require some online training from sources such as Udemy. For \$11 per employee, you can get your whole staff up to speed on the threats and then test out what they learned with simulators from KnowBe4, Microsoft, or Infosec IQ.

**Catch up on your security.** If you haven't yet adopted 2018's breakout security trends—data encryption and virtual private networks (VPNs)—it's way past time to do so. Encryption is simple: Encrypt it all. It's included in most operating systems (like BitLocker in Windows), so turn it on, keep it on, and make sure everything you've got in the cloud is encrypted, whether it's in transit or at rest. VPNs are one way to encrypt things in transit as well as protect your identity, your location, and your activity online. You can get a great service for less than \$10 per month.

## NEIL J. RUBENKING, LEAD ANALYST, SECURITY

**Learn some keyboard shortcuts:** Staring at the screen while you position the mouse cursor precisely right is slow. Flying fingers are fast. Edit your documents and spreadsheets at blazing speed by learning the keyboard shortcuts for your most common actions.

**Be smart about passwords:** You should use a strong password for every website, and every single one should be different. Nobody can handle that alone, so get a password manager to help you.

## SASCHA SEGAN, LEAD ANALYST, MOBILE

**Make your phone more peaceful:** Social media and messaging can be addictive, but you can reduce their grip on your brain. Just forbidding notifications helps: If you don't see that badge or pop-up, you might hit an app fewer times per day. On Android phones, you can usually "disable" built-in apps from app settings, making them effectively disappear. Want to really calm down? Disable your phone's web browser and app store, and you'll pick it up a lot less often.

**Improve call quality:** You don't have to settle for crappy-sounding calls. Recent and higher-end phones, using 4G networks, make clearer calls than older and cheaper models. Look for a phone with the EVS voice codec, such as recent Samsung, Apple, and LG flagships.

**Text on the web:** Texting on a little phone screen can be really annoying, especially when you're at a desk. Google Messages (for Android) and iMessage (for iPhones and Macs) both let you text from your laptop or desktop. It's a lot easier when you can type with both entire hands.



## GADJO SAVILLA, ANALYST, BUSINESS

### **Download your music playlists and podcasts**

**when you're on Wi-Fi:** Not only is it faster, but you'll save data and money on your phone plan since streaming audio uses up substantial data. Note that many streaming services do offer settings that restrict downloads to when you're on Wi-Fi.

**Record audio for free:** When you need to record voice audio or interview someone, use the free [Otter.ai](https://otter.ai) smartphone app. It automatically records audio and transcribes it to text in real-time. It's not 100 percent accurate, but it saves a lot of time and is also accessible on the web.

## CHANDRA STEELE, SENIOR FEATURES WRITER

**Organize your phone screens:** Navigating your phone screen is like touch-typing: You know where to tap when you need to, but there's no true order to things. Clean up some of the clutter by organizing your screens according to use. For instance, my phone's Home screen has all the apps I use in the morning, pretty much in order of use: weather, social media, train schedules, coffee cards, and the like. The next screen is dedicated to work-related apps, including Slack, Asana, Workplace, and Google Drive. After that are screens devoted to off-hours entertainment, shopping, and health. And in the bottom tray are the things I turn to constantly: messaging, mail, and camera.

**Use Pocket:** Content-capturing Pocket is one of my most-used apps. I save stories to read on the train, recipes to make on the weekend, listings for events I want to attend, and so much more. The basic app is free and has lots of features, including a share extension that lets you Pocket via lots of other apps. Be sure to add the extension to your browser or use the Pocket bookmarklet to easily save things from your computer.



**Add the extension to your browser or use the Pocket bookmarklet to easily save things from your computer.**

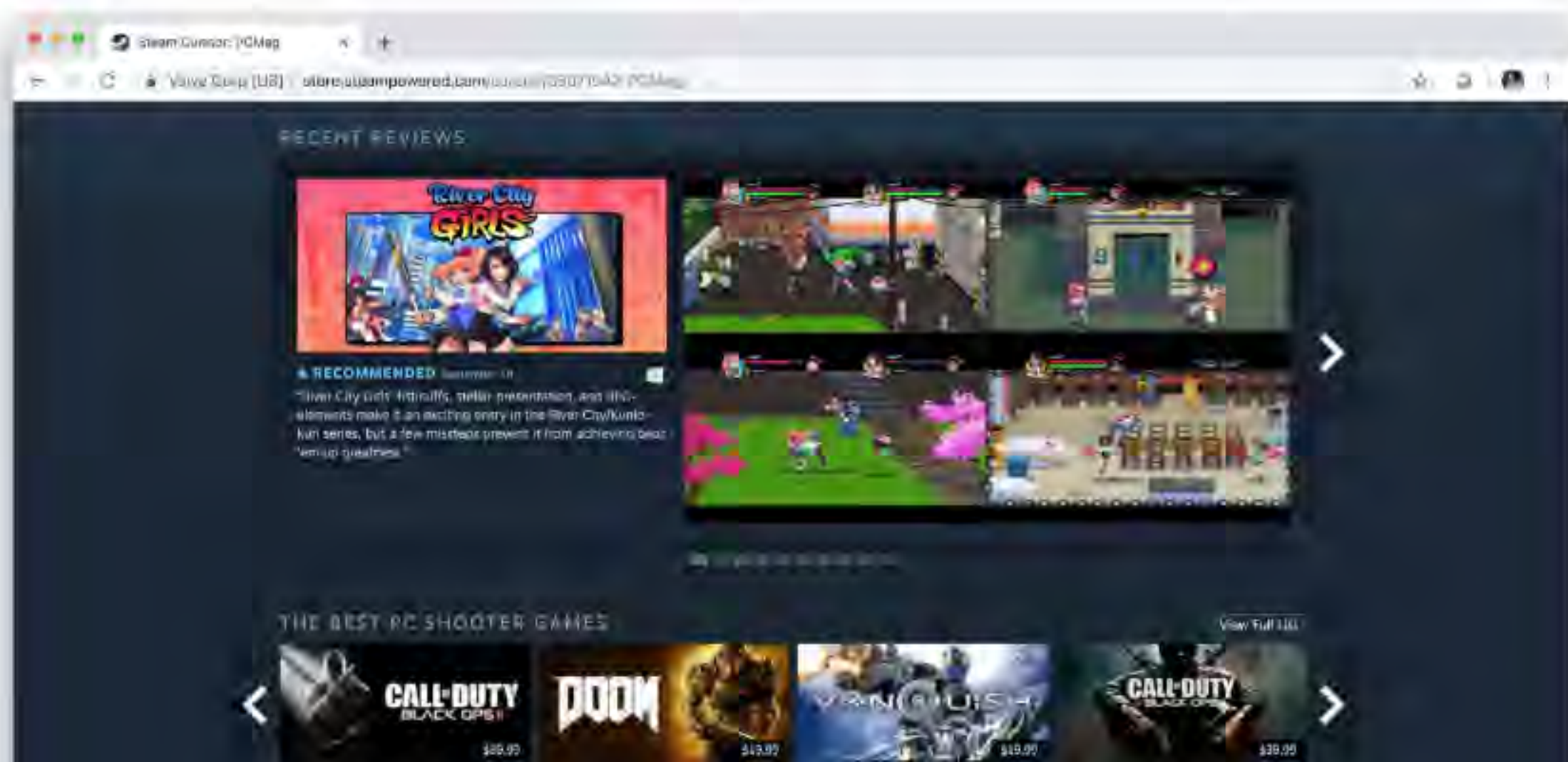


**See what Netflix is hiding:** You know how Facebook decides you don't want to see anything from certain friends and keeps them out of your timeline until they confront you about never liking photos of their cat (even though you really would have loved to have seen photos of their cat)? Netflix is like that, too. It displays categories it thinks you're interested in—but maybe you're watching action movies over and over simply because that's all you're being offered. Unlock the indie film lover inside you by seeing all of what Netflix has. Type [http://www.netflix.com/browse/genre/\[INSERTNUMBER\]](http://www.netflix.com/browse/genre/[INSERTNUMBER]) into your browser, and then consult this list (<https://www.whats-on-netflix.com/library/categories/>) for the numbers that correspond with a genre you'd like to peruse. Replace [INSERTNUMBER] in the URL with those numbers.

### JEFFREY L. WILSON, LEAD ANALYST, SOFTWARE

**Join the Steam client beta to receive early features:** Valve's video game marketplace is an essential component of PC gaming, but did you know that you can partake in beta features before they're released to the general user base? To do so, log into Steam and click Steam > Settings. In the Account section, you'll see the Beta Participation setting that lets you opt into new features. Many beta updates are bug fixes, but occasionally you'll receive a big feature, such as a revamped user interface.

**Join a Steam Curator Group for game recommendations:** Steam has a ridiculously massive game library, so finding titles of interest can be tough. Steam Curator Groups are designed to alleviate that problem. By clicking Store > Curator, you'll arrive at the Steam Curator page. There you'll find accounts from individuals and brands that highlight the games you should buy (or avoid). In fact, PCMag has a Steam Curator Group that contains all of our Steam game reviews, as well as recommended, genre-focused game lists.



## STEVEN WINKELMAN, ANALYST, MOBILE

**Hold the phone (still):** Most smartphones capture solid photos in daylight but struggle in low light. While Night mode features on many flagships can greatly improve lowlight photos, a steady hand also does wonders. PopSockets are a great and inexpensive way to quickly stabilize your phone when taking pictures at night or in a dimly lit room.

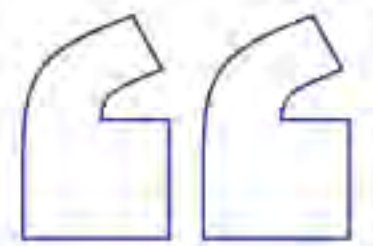
**Use universal cables:** Hate traveling with multiple charging cables? Nomad's lineup of universal cables can remove most of the cable clutter. The handsome Kevlar USB-A to USB-C cables include tethered attachments for devices with Lightning and micro USB ports.

**Untether:** When used mindfully, smartphones and tablets can be a godsend, but too often they become mindless distractions that decrease productivity and zap creativity. When you find yourself chained to your mobile device, it may be time for a detox. Try placing your phone on silent and charging it in another room at night. If you're worried about emergency calls or texts from children or loved ones, set up the Do Not Disturb feature on your phone and create an exception list for your favorite contacts.

## ZACH YUZON, VIDEO PRODUCER

**Use two-factor authentication.** Most everyone these days owns a smartphone and has numerous online digital accounts. But lots of us don't take advantage of 2FA—one of the best ways to stay safe and private. It's easy to enable, and most apps and services offer it.

**Turn it off and on again:** I've lost count of how many tech issues have been raised to me this year. Some, I wasn't sure how to solve. Regardless, I always ask people whether they've restarted their problematic device. And more often than not, that fixes the problem.



**PopSockets are a great and inexpensive way to quickly stabilize your phone when taking pictures at night or in a dimly lit room.**



**Buy a battery case for your smartphone.** No matter how good your phone's battery is, you probably still worry about running out of juice. Not me: I constantly use Spotify and Google Maps as well as social media and browsing apps on my phone, and I have my brightness turned up during the day—all thanks to my battery case. You can find third-party battery cases for most phones on Amazon. The only drawback is that a battery case makes your phone a bit heavier. I'm happy to make that compromise!

**Invest in a cloud service for storage.** You'll have way more flexibility in accessing your files, as well as peace of mind about your files and media backup. Just make sure to do your homework on cloud companies and the services each provides across multiple devices, so you get the best fit for your needs.

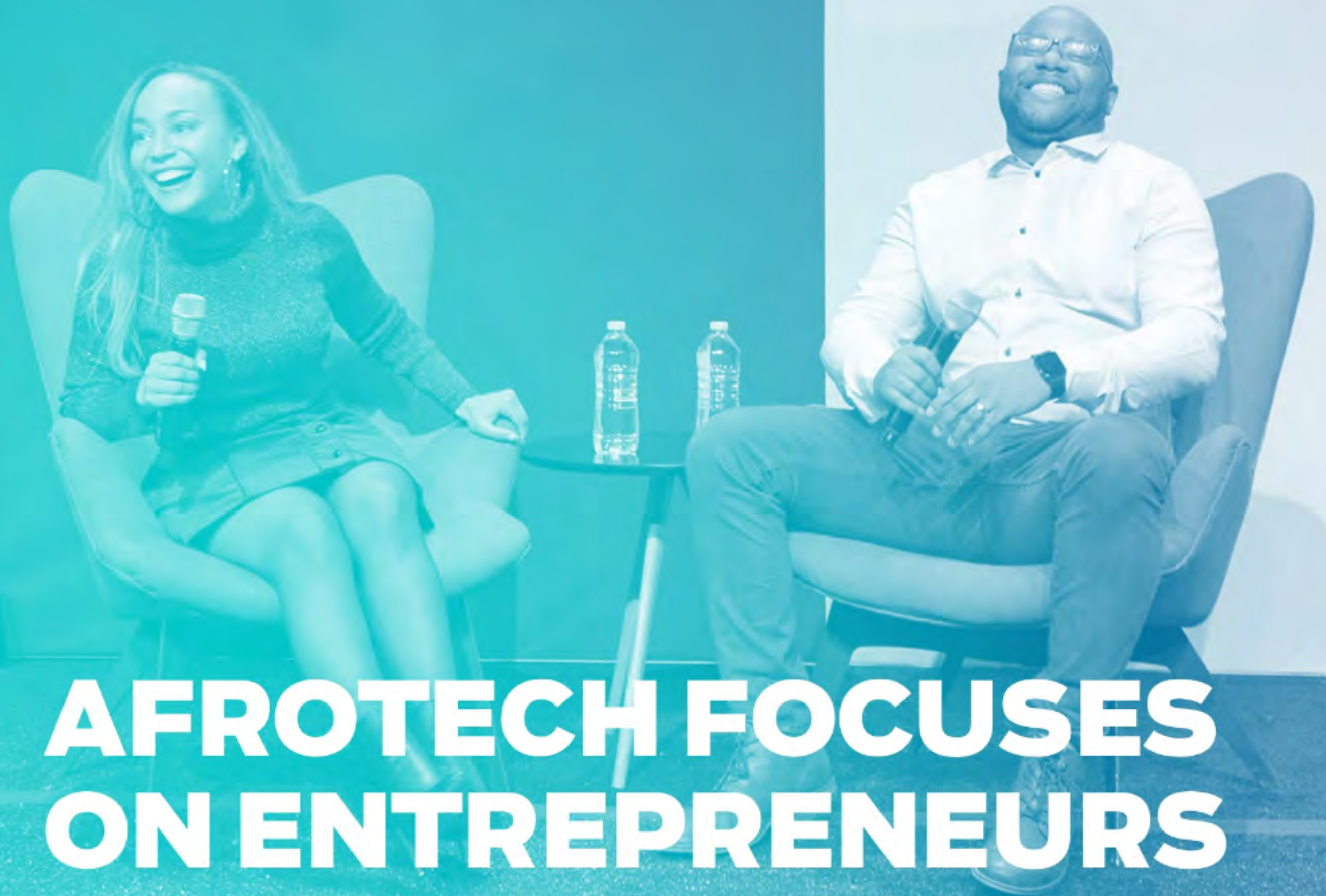
#### EMILY ZODA, DIGITAL PRODUCER

**Mix reminders with calendars:** I'm a big fan of using shared calendars and reminding myself of everything, so I use Sorted3, which integrates calendars and reminders from your iPhone, even from Siri, and lets you check things off easily as you go about your day.

**Connect Slack to your calendar:** To make Slack work better for me, I connected it to my Google Calendar. Now, when I'm invited to a meeting, I can accept or decline right from Slack. When the meeting starts, my Slack status automatically sets to "In a meeting" until it's over.

**Calm down notifications:** I hate when my phone lights up with what I think is a text, but it's just a notification from an app that I don't want to check at the moment. So I set most of my iPhone notifications to Deliver Quietly. In iOS 12 and above, you can have your notifications appear in your notification center without your phone lighting up with every single one. It definitely helps deter my usage throughout the day and weeds out useless notifications.

# FEATURES



**AFROTECH FOCUSES  
ON ENTREPRENEURS  
WITH A DIFFERENT  
STORY TO TELL**



# Morgan DeBaun ‘couldn’t find a media brand that spoke to the things’ she cared about, so she created one herself.

BY SC STUART

**O**n November 7, thousands of tech innovators will converge on Oakland, California, for the fourth annual AfroTech conference, which brings together black entrepreneurs, techies, startups, and community organizations for discussions, workshops, and networking events on business, culture, and technology.

Blavity, the company behind AfroTech, has called it the biggest black tech conference in the nation. And it all started with a group of friends—Morgan DeBaun, Jonathan Jackson, Jeff Nelson, and Aaron Samuels—sitting at a lunch table at Washington University in St. Louis.

The word “Blavity” comes from the concept of “black gravity”—when people of color migrate toward each other in predominately white spaces, as DeBaun did with her future co-founders. After graduation, the friends headed for opposite coasts to work at Palantir Technologies, Bain Capital, Google, and Intuit but later joined forces to form Blavity.

Since its founding in 2014, the media organization and community for multi-cultural creatives has raised \$9.4 million from investors including 500 Startups and Google Ventures. Blavity has also acquired several content companies, including Travel Noire, and has 80 full-time employees, with offices in Los Angeles and Atlanta.

AfroTech is the company’s main event; it also runs smaller activities in San Francisco, Detroit, Chicago, St. Louis, and New York. PCMag spoke to Blavity founder and CEO Morgan DeBaun about leadership and entrepreneurship, how Blavity has evolved, and what to expect from this year’s AfroTech.

**PCMag: Morgan, tickets to AfroTech sold out last year. There were 4,000 attendees, 69 speakers, and 35 major tech companies that came to recruit experienced hires. What were the highlights for you?**

**Morgan DeBaun (MDB):** AfroTech 2018 was amazing. We had already moved to a new venue [in San Francisco] to accommodate the growth but swiftly sold out again, so this year, we're moving to Oakland. The highlight for me included seeing so many young people interested in getting into the tech industry; observing engineers collaborating on projects in real-time during the event and seeing founders who'd raised millions onstage sharing their success with their community.

**I know you can't pick favorites, but it must have been powerful for the attendees to see luminaries such as Dave Salvant (Squire Technologies), Phaedra Ellis-Lamkins (Promise), and Valerie Jarrett (former advisor to President Obama) giving the inside track on their careers. Who are your headliners for AfroTech 2019?**

I can't say yet, but I'm really excited about taking AfroTech to Oakland. I want to grow with the city that is closer to our community and make AfroTech a real destination. This year we're also offering an entire set of programming for free and will open up a community stage as well to give back.



**You're also the founder and CEO of Blavity, Inc., the company behind AfroTech. Give us the elevator pitch: What is Blavity and why is it important today?**

Blavity Inc. is a media company and community platform for black consumers, primarily in the US, focused on creating content, ideas, and experiences that bring people together. Blavity also reflects our community by distributing other voices and lives that haven't been told. We want to be as diverse as the community we're trying to represent.



“  
**There was no black-run company looking to solve the problems of today's young black consumers.**  
”

**I heard you say in an interview that entrepreneurship is about risk, but it's also about finding and building an ecosystem to thrive in. Did you start Blavity because the ecosystem you needed just didn't exist?**

That's exactly right. I was working in Silicon Valley, inside the heart of innovation, but I couldn't find a media brand that spoke to the things I cared about. There was no black-run company looking to solve the problems of today's young black consumers. It seemed so obvious, but it didn't exist. So I built it.

**As a CEO, what are your go-to tech tools? And how complex are your daily dashboards to track success?**

We are deeply integrated into Asana for project management, and use Slack for all comms. We developed our own CMS and a bunch of other proprietary technologies. Our co-founder and CTO, Jeff Nelson, worked at Palantir, so we have quite the tech stack.

**Blavity and AfroTech are focused not just on the US but also on the global black diaspora, right?**

That's a great question. Yes, the tech industry is booming globally. People come from all over the world to AfroTech, and, at Blavity, we've collaborated with clients in Haiti and South Africa. I've

been inspired by how local governments in those areas are supporting young entrepreneurs to scale their businesses. The South African Tourism Board is a sponsor of AfroTech, and Haiti has a huge tech summit in partnership with Google, another Blavity client. This is just the beginning.

**Success in tech entrepreneurship often depends on learning from failure. You founded a couple of startups before Blavity, including a personal finance calculator and an app that scraped local event calendar data to let students know where to score free food to save cash. What did you learn most from both?**

I learned a lot about building a strong founding team and only working on something you're incredibly passionate about. There are an infinite amount of problems to solve with technology, but you have to be passionate about the community you're building it for. One of the reasons that Blavity has been so successful and sustainable is that we focus on our audience and less on how we're solving problems for them—it's all about the audience in the end.





Photo credit: iStockphoto/Shutterstock.com

**You've raised \$9.4 million to date. What really resonated with investors about your pitch?**

When we showed how big the opportunity was in serving a community that is not just underserved right now but hyper-engaged online. They also responded to our authenticity.

**Ava DuVernay has a \$100 million deal with Warner Bros; Shonda Rhimes has a similar-size deal with Netflix; Tyler Perry is launching a massive streaming service with BET; and Amazon Studios has a first-look deal with Jordan Peele. Are you building Blavity to be the millennial answer for next-gen Hollywood?**

Not necessarily [laughs]. But I will say we are certainly a place for the next generation of Hollywood to be discovered. Through our Blavity-owned brand Shadow and Act, we partner with Hollywood studios to ensure that stories can be found there from people who haven't yet found their way into Hollywood. People who deserve to be seen and heard.

*All photos courtesy of AfroTech*



**We showed how big the opportunity was in serving a community that is not just underserved ... but hyper-engaged online.**



# How to Stay Anonymous Online

BY ERIC GRIFFITH



Photo credit: Elnur/Shutterstock

**S**ome might argue that the internet was built on anonymity, paving the way for a place where free speech reigns supreme. But after years of learning about who's snooping into everything we do online, privacy on the web is hardly a given.

It's not just about government spying; it's also about how much data big companies such as Amazon, Google, Facebook, and Microsoft have collected in order to serve you targeted ads. (Not to mention how much of your personal data gets scooped up in all the breaches and hacks.)

There will always be good reasons for people to go online without being tracked. It may be the only way for a real whistleblower to reveal corruption, considering how some have been treated. There's nothing wrong with wanting to stay anonymous, no matter what you're doing.

Is it even possible to take control of your own personal privacy online?

Ultimately, the only way to stay truly anonymous online is not to go online at all. That's not really an option for most of us these days, though. Here's a rundown of what you can do to minimize the spying, targeted ads, and ID theft as you explore the world online.

### **PHONE CALL CONFIDENTIALITY**

If you want to be anonymous, forget the smartphone. The big-name OS makers are control freaks (Apple) and ad servers (Google). To remain anonymous when you're mobile, your best choice is a prepaid phone—a.k.a. a burner.

Even a burner had call records, though, and you can be triangulated via GPS. The upside of a burner is not having your real name associated with the device. As you see in the movies, you can always throw the phone into a passing truck and lead whoever might be tracking you on a wild goose chase.

But when you've got an expensive smartphone, you won't want to throw it away. Thankfully, there are apps aplenty to get you temporary, anonymous numbers you can use with Android or iOS. One of those apps is named, aptly, Burner.



## LIGHT THAT FIREWALL

Is your desktop or laptop computer connected directly to a broadband modem? That's a very bad idea. Hackers are constantly bombarding IP addresses to see if they can get onto a system.

You should always have a router on your home network that can protect with its built-in firewall. A router uses Network Address Translation (NAT) to assign an IP address to every device on your home network; those are then visible only on that network. Direct attacks can sometimes be stopped dead right there. You need the router for sharing the internet connection and Wi-Fi anyway.

Some ISPs' modems come with a built-in router, so that should keep you covered. You could also use firewall software installed on your PC. Windows 10 comes with a pretty decent solution called, you guessed it, Windows Firewall. You can also find firewalls as part of security suites. But as PCMag's security expert Neil J. Rubenking explains, you don't really need a firewall if you use the one that ships with Windows.

If you want real anonymity based on your OS, stop using Windows or macOS on the desktop, and move to a Linux distro that specializes in all forms of keeping you secret. Your best bet is Tails: The Amnesic Incognito Live System.

## SLEUTH YOUR OWN STEALTH

What does your computer (or tablet or smartphone) give away about you when you visit websites? At the very least, the site knows your IP address—and that's necessary, or you'd get no results.

In most cases, it also knows your approximate physical location (by checking where your ISP supplies those IP addresses; see it in action at [IPLocation](#)), and probably your time zone and what language you speak—all good info for advertisers. Your browser can also report on your operating system, browser type, and what versions of software you run for browser plug-ins. It even reports on the fonts you have installed. All of this can add up to giving your system a unique fingerprint. And anyone who's watched *Law & Order* knows, a unique fingerprint is sometimes all it takes to track you down.



If you don't believe it, visit [MyBrowserInfo](#) or [BrowserLeaks.com](#) for a full report. Then check out the EFF's Panoptick tool to see how well your browser and VPN are protecting you. They'll push their worthwhile browser extension called Privacy Badger at you; it monitors sites that monitor you. The Ghostery browser extension, which blocks all sorts of trackers and advertising on almost all browsers, is a lot like Privacy Badger but gives you a little more control.

What's more, even if you've got a VPN (virtual private network) running, as you should, it could be leaking. Here's how to get yourself back into stealth mode.

### **SAFE SURFING**

Make sure your browser isn't storing too much personal info. In the settings menu, turn off the ability for the browser to store the passwords you use to access websites and services. That can be a pain, though, because you should have a different password for every service you use. The best alternative is to use a password manager, such as PCMag's 4.5-star Editors' Choices LastPass and Dashlane.

Browsers store images, your surfing history, and what you've downloaded, as well as cookie files, which can remember helpful things like settings and passwords. Obliterate that info occasionally.

Major browsers also have anonymous surfing modes. In Chrome, it's called Incognito (Ctrl+Shift+N to access); in Firefox, it's Private Browsing (Ctrl+Shift+P); and in Microsoft Edge and Internet Explorer, it's In Private browsing (also Ctrl+Shift+P). Using it will prevent the browser from saving info on pages visited, whatever you search for—passwords, cookies, downloads, and cached content such as images.



**If you want real anonymity based on your OS, stop using Windows or macOS on the desktop, and move to a Linux distro.**



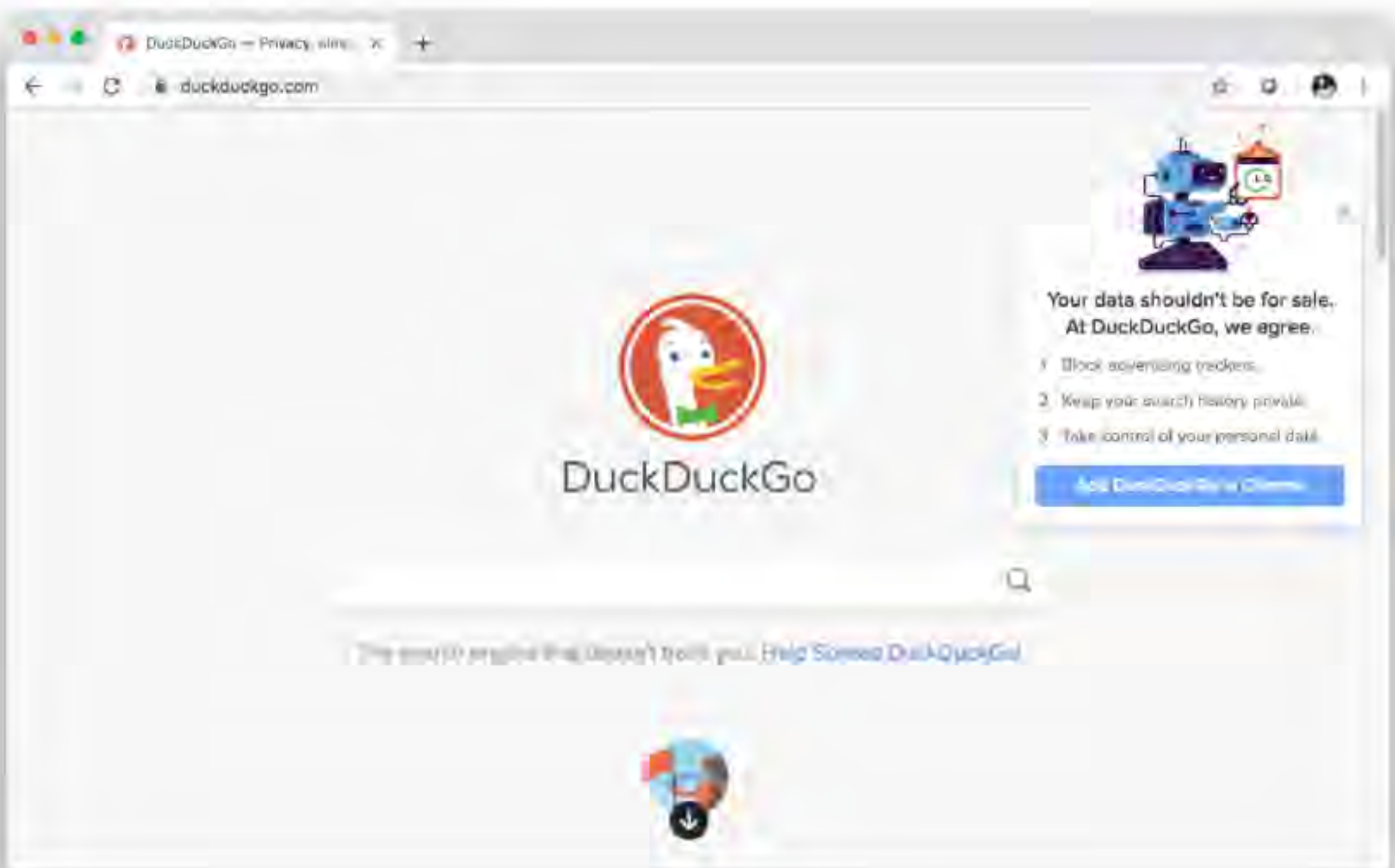
Any browser you use for privacy should have Javascript deactivated. It can help a web server ID all sorts of things beyond your browser, such as your monitor's size—all of which goes toward fingerprinting your system, and you. You can at least turn it off or on for select sites (some websites require it to be any good to you) using extensions like NoScript and ScriptSafe.

A number of browsers bill themselves as privacy-focused. Of course, they all use the same rendering engines as the big names, especially Google's Chromium engine; the difference is the browsers don't share any info with Google. Examples include Epic, Comodo Dragon, Comodo IceDragon (based on Firefox), and of course, the Tor Browser.

If you're looking for a more mainstream browser with some extra security, consider getting Opera—it at least has a free VPN built right in. (Note that it only protects your browser traffic, not the other apps that utilize the internet.)

Use a different search engine than Google or Bing, which want to sell, sell, sell you. Go to DuckDuckGo, which doesn't track you or sell your info, it says.

Keep in mind, using stealth modes and special browsers won't make you completely anonymous, but they do prevent sites from writing info to your computer, including cookies, which can later be read by other sites to figure out your browsing habits.



## PROXIES AND VPNS AND TOR, OH MY

The way to ensure outsiders don't gather information about you while you're browsing the web is to appear to be someone else in a different location. This requires a proxy server or a virtual private network (VPN) connection. With the right combo, you can not only be anonymous but also surf sites in other countries as though you're a native.

Proxies aren't for newbies, but FoxyProxy can get you started. It works with major browsers and offers proxy services and VPN tools.

VPN services are everywhere. They have the advantage of not only securing the traffic between your computer and servers but also masking your IP address and location. For example, by connecting through my work VPN, sites believe I'm at corporate HQ, even though I work from home.

VPNs also double as a way to get access to location-blocked content. When you're in a country that can't get the BBC iPlayer or Netflix, for example, a VPN could be your ticket.

No discussion of anonymity online is complete without mentioning Tor. The name is an acronym for "the onion router"—the implication being there are many layers of security offered.

Tor is a free network of tunnels for routing web requests and page downloads—it's not the same as a VPN but might be even more secure when it comes to your identity. It's supposed to make it impossible for the site you access to figure out who you are. But does it?

The NSA's spying controversy leaked by Edward Snowden in 2013 included what some thought was a workaround to identify users of Tor. But it wasn't that simple. As explained by security expert Bruce Schneier in *The Guardian*, the NSA actually monitors what's called the Tor "exit nodes." The agency could tell users were using Tor but not who the users were. By setting up a "man in the middle" attack, the NSA pretended to be the site the user wanted (Google, for example) and could send data back to the user that would take advantage of exploitable holes in the browser—not a hole in Tor.

The lesson there: Keep your browsers up to date or use one of the previously noted anonymizing browsers.

Guess who else has an anonymizing browser? Tor, that's who. It's a browser bundle for Windows (run it off a flash drive you can take with you), macOS, or Linux; it's available in 16 languages. There's also a Tor Browser for Android devices; iOS users can try the third-party VPN+TOR Browser Private Web app.

Tor is not entirely foolproof. The theory is you could still be tracked by someone skilled enough, even if they can't read what you send. The list of potential Tor weaknesses is long. If you're sensing a trend in that nothing can keep you 100 percent anonymous, you're paying attention. But it's like a lock on a door—sure, someone could kick it in, but if why leave the door open?

## ANONYMOUS EMAIL

As nice as it is to remain anonymous as you surf, it may be even more essential for your email to go unnoticed if you want to avoid spam or surveillance. The problem is, email simply wasn't built with security in mind.

There are secure email services, of course, which use encryption to scramble what you send and require the recipient to have a password that decrypts your message. Edward Snowden used a webmail service known as Lavabit, which was so secure the government insisted that it hand over the private keys of users. Lavabit, to its credit, immediately shut down to protect its customers. Later, it returned with even more user-forward security features. But be aware that just because you use such a service doesn't mean it can't be compromised or will die to protect you.



For those who want a Webmail service that's going to handle encrypted messages, ProtonMail is considered the top of the heap. With a data center in privacy-minded Switzerland, the service has a free tier and charges from 5 to 30 euros a month for more storage and aliases. ProtonMail keeps all your email info secure from search, allows for self-destructing messages, and offers apps for iOS and Android.

You might think your Gmail account is safe because you see that lock icon on the browser and access it with a secure sockets layer (SSL) connection (indicated by the *https://* in the URL). But SSL encrypts data only as it is transferred from your device to the server. Google still reads your email to tweak the advertising it places on Gmail. That is always going to be a problem with web-based services.

That said, there are tools to encrypt web-based email. Mailvelope is an extension (for Chrome and Firefox) that will secure Gmail, [Outlook.com](https://www.outlook.com), and Yahoo Mail. FlowCrypt is another. Perhaps the smart move is to eschew web-based mail and stick with desktop client software. Outlook 2007 and up have some built-in encryption tools, while Mozilla's Thunderbird has add-ons such as Engimail to handle message encryption and decryption.

## **AVOIDING SPAM, SPAM, AND SPAM**

Beyond the obvious things—like never, EVER clicking on a link in a spam message or even opening a spam email—the best way to avoid spam is to never let them get your address. It's almost impossible, but there are methods to reduce the volume.

Number one is to use an alias or dummy email with any service that requires an email address. You might be able to set one up if you own your own domain name. In G Suite, for example, you have your primary address, like [bill@yoursite.com](mailto:bill@yoursite.com), but there's the option to use [William@yoursite.com](mailto:William@yoursite.com) as an alias for online signups, messages to which can be forwarded to the main address. When spam begins to collect, change or kill that second address; there can be up to 30 aliases per individual.

Gmail is a little more straightforward: To make an alias, you append something to the user name. Turn [bill@gmail.com](mailto:bill@gmail.com) into [bill+alias-name@gmail.com](mailto:bill+alias-name@gmail.com). Once the alias in question accumulates spam, filter it right into the trash.

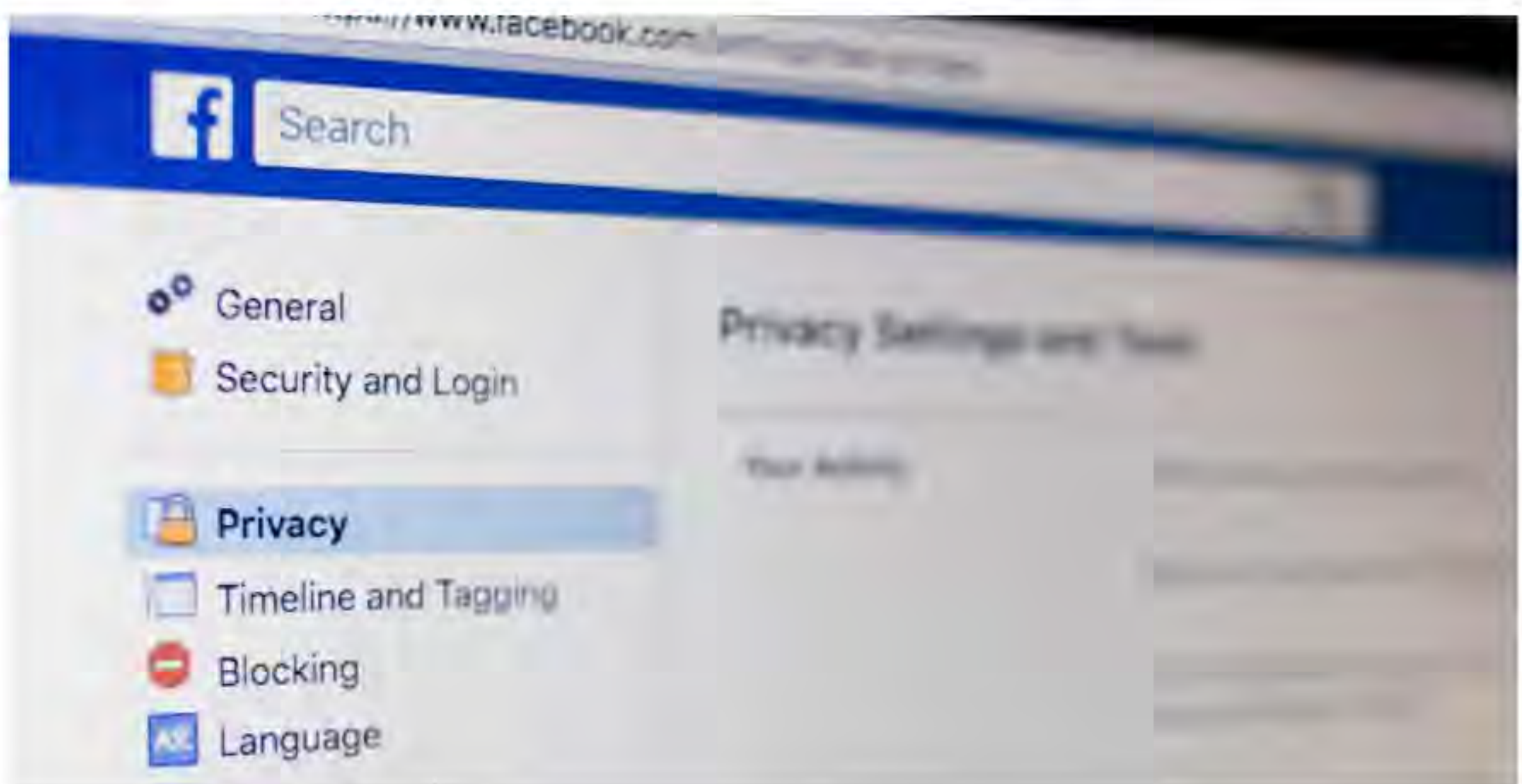
In Yahoo Mail, there are Disposable Addresses (under Settings > Security), which are similar—there’s a base name, then a secondary keyword appended, like bill-trash@yahoo.com. [Outlook.com](http://Outlook.com) also supports aliases, up to 10 per account. Look for “Account Aliases” under the Account settings. If you have your own domain name, check the control panel at your web host. It’s likely to have tools for creating aliases galore.

If you need an alias for just a short time, a disposable address is very handy. Free services including [GuerrillaMail.com](http://GuerrillaMail.com) and Mailinator create an address you can check for just a short time.

## **SOCIAL (NETWORK) SECURITY**

Should you care about security when it comes to social networks such as Facebook? One word: Duh. Facebook isn’t an altruistic nonprofit. It makes money by having lots of users looking at lots of ads. That occasionally means making your data available to questionable entities. Plus, you might not want all your “friends” or their extended networks to know all of your business, right?

You can take several steps to regain some Facebook anonymity. First, on a desktop, go to the Account menu in the upper right and select Settings > Privacy. You’re going to want to click the “Edit” link on every choice on this page to personalize who can see what, who can friend you, even who can look you up. Make sure your posts are not spidered by search engines.



Get as granular as you want, making sure, for example, that old boyfriends or girlfriends don't see your posts—even the old posts. To perform a full Facebook Privacy Checkup, click > Privacy Checkup. Under Timeline and Tagging, ensure that you don't get tagged in images or posts without your express permission. Finally, inspect your contact info. Go to your General Account Settings and again click “Edit” next to every entry. Double-check the email address and phone numbers entered. Minimize the list of who has access as much as possible to maximize anonymity.

If you need out of Facebook entirely, make sure to delete the account; deactivating it leaves your data on the site for your potential return. It'll deactivate your account for two weeks, just in case you really, really, really didn't mean it. After that, it's gone. But even then, some digital photos may linger.

On LinkedIn, go to the Settings icon of your face in the upper right and select Settings & Privacy. In the center, select the Privacy tab.

What about Twitter? Don't list your website or real email in your profile. Make sure your password is different from that of any other site. That's good advice across the board, but we know people don't follow it, so we repeat it a lot. You really should with Twitter, which has had some security breaches. You also have the option, under Settings > Privacy and Safety, to protect your tweets, meaning only those followers you approve get access to them. Protected tweets aren't searchable or retweetable, and you can't share permanent links to them with non-approved followers.

That said, you're fooling yourself if you think using social networks (or making any post online) is 100 percent safe—all it takes is an “approved follower” to take a screengrab and share it with the world.

If you're worried about getting tracked as you surf, it also behooves you to sign out of the above services, as well as Microsoft, Google, Amazon, and Apple, when you're done using them. Otherwise, the ad servers and cookies and so forth that are run by them or their affiliates will pretty much know where and when you go online. Signing out is a pain, so many of us skip it—and that's exactly what the big companies are counting on.

# How to Kill Email With the Right Project Management Software

BY JILL DUFFY



Photo credit: NicoElNino/Shutterstock.com

**E**mail increases stress, creates unnecessary work, and makes people feel overwhelmed. No one can be the best version of themselves at work under those conditions. In the past few years, organizations have started to move away from email in favor of team messaging apps such as Slack and other workplace communication tools. Finding the right tool affects whether your team will be able to give up their traditional inboxes. For many teams, project management software should be part of the solution.



## WHAT'S PROJECT MANAGEMENT SOFTWARE?

Project management apps are online tools that teams use to track work. In the broadest sense, a project management app could be anything from a complex piece of software for managing work, like Microsoft Project, to a basic to-do app. The beefiest apps include other business tools for managing resources, tracking time spent on a task, or even billing.

We often distinguish different types of collaboration tools from project management apps to make it easier to recommend the right app for the right purpose. That said, those two categories and a few others (such as kanban board apps and work-management apps) overlap substantially. So while I sometimes make the case that apps such as Asana, Trello, Airtable, and Basecamp aren't strictly project management apps, we can include them here.

## WHAT DO YOU DO IN PROJECT MANAGEMENT SOFTWARE?

Every project management app works a little differently, but most of them let you see various aspects of your team's work without requiring you to ask your colleagues about them.

When you log in, you see all the tasks your team must complete and the deadlines you have to hit. You see who was assigned to which task, if and when they completed it, and whether they had any comments about it. If one of your colleagues is out unexpectedly, you can log into the project management app and check whether they had anything urgent assigned today that another team member could handle. If you currently use email to tell someone that a task is done, ask questions about a task, or send something off for approval, you would probably benefit from a project management app.



**Finding the right tool affects whether your team will be able to give up their traditional inboxes.**



As you and your colleagues use a project management app, it keeps count of the work that gets done. How many tasks were completed on time? Is the project at large still on track to be completed by its deadline? Robust project management apps come with all kinds of charts and graphs to help you keep an eye on this sort of thing. That way, if the project starts to slip, you can detect it early and work to prevent it. But let's not get sidetracked: Here's how project management apps help people communicate.

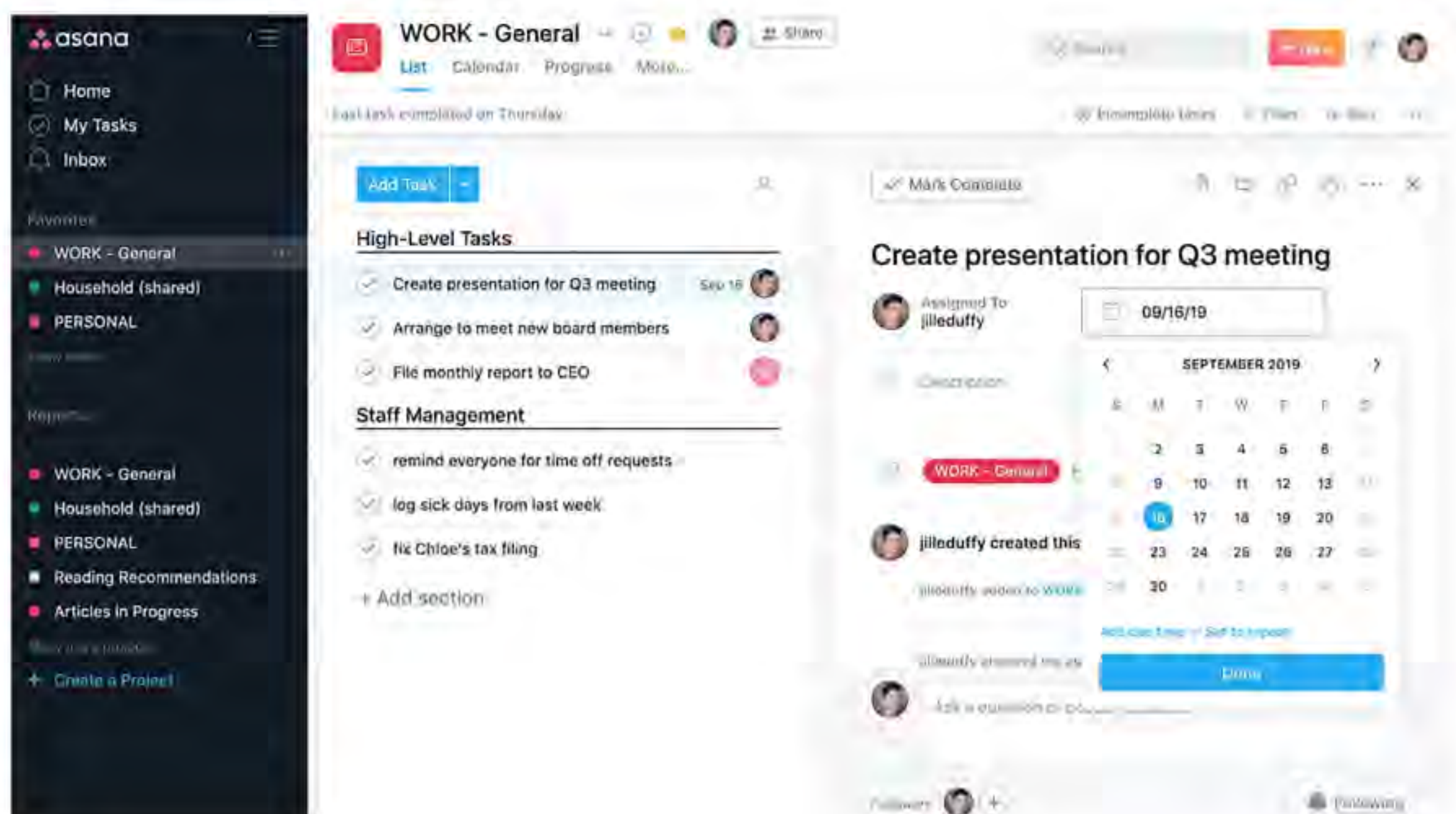
## WHAT DOES A PROJECT MANAGER DO?

A project is a series of tasks. A project manager knows what all those tasks are—or at the very least, oversees them. Sometimes the project manager doles out the tasks or puts them into a pool for people to claim. The project manager then keeps an eye on the tasks and the people doing them until they're all done.

Not every team has a project manager, but most have someone who's in charge. It could be a business owner, manager, or team lead. Your point person or daily decision-maker is your project manager.

## WHY EMAIL IS BAD FOR PROJECTS

Email is electronic mail, which everyone knows—but stay with me. Mail is a horrible avenue for assigning work. Imagine if your assignments came to you by snail mail. Ridiculous! And email isn't all that different from regular mail, except that it's faster.



The screenshot displays the Asana project management interface. On the left is a dark sidebar with navigation options: Home, My Tasks, Inbox, Favorites (WORK - General, Household (shared), PERSONAL), Recent items, and Rejected items. The main content area shows a project titled "WORK - General" with tabs for List, Calendar, Progress, and More. A notification states "Last task completed on Thursday". Below this is an "Add Task" button and a "Mark Complete" button. The task list is divided into sections: "High-Level Tasks" (Create presentation for Q3 meeting, Arrange to meet new board members, File monthly report to CEO) and "Staff Management" (remind everyone for time off requests, log sick days from last week, fix Chloe's tax filing). A task detail view for "Create presentation for Q3 meeting" is shown on the right, assigned to "jilleduffy" with a due date of "09/16/19". A calendar for "SEPTEMBER 2019" is visible, with the 16th highlighted. The task description includes "jilleduffy created this" and "jilleduffy added to WORK". A "Done" button is at the bottom of the task detail view.

Think about what email is good at providing: asynchronous communication with a paper trail and document delivery. Now think about what a project manager needs to know when they manage a series of tasks:

- Who's available
- How much work each worker currently has assigned to them and when it's due
- The progress of work that's already assigned (for example, "John has two tasks assigned to him and both are 90 percent done")
- A calendar of deadlines
- The ability to prioritize and reprioritize tasks based on the needs of the project

Doing that kind of work by mail is laughable.

More important, the way most office workers use email creates interruptions. When new email messages arrive with dings or pop-up notifications, workers typically check to make sure that the incoming message is not urgent. Then they get back to what we were doing until the next interruption. People do this all day long, checking and scanning their email. Several studies show that using email takes up around 30 percent of a knowledge worker's day, and that time is spread evenly throughout the day rather than in discrete chunks. In other words, email interrupts us constantly.

Interruptions usually have a net negative effect, although it might not be in the way you assume. Interruptions make people feel more stressed and like they have a bigger workload than they actually do. People also feel greater frustration and time pressure.

The way people interact with email also leads to wasted time. We lose time when we have to reread the same email that we scanned earlier in the day because we've forgotten what it said. If you forget what the date is for a key deliverable, digging it out of email takes time. And what if the email you dig up is an old one and the date has since moved forward a week?

This is all to say that email wasn't designed for managing tasks. It's the wrong tool for that job.

## COMMUNICATING WITH A PROJECT MANAGEMENT SERVICE

Project management involves juggling people and resources, keeping a watchful eye on time, and redistributing or reprioritizing tasks as the situation changes. Project management software was designed to handle those kinds of issues and others that commonly crop up during the course of a project.

What's it like to communicate in a project management app versus in email? It's like the difference between seeing something with your own eyes and reading a description of it. In the first scenario, you have control over what you want to see and when. In the second, you rely on other people to type out messages telling you what they think is most important—or, worse, what they think you want to hear.

Different project management apps have different tools for communicating. Nearly all of them support @ mentions, for example. Seeing as Slack and other team messaging apps have become so popular, you can often connect them to your project management app, thereby streamlining your conversations to one place. If you don't already have a team chat app, you might skip it and instead look for a project management app that includes an in-app chatbox. Zoho Projects and ProofHub both offer one.

The image displays a screenshot of a project management application interface. On the left, a chat window is open, showing a message from Jane Duffy: "Sure. Drafts uploaded. We'll chat as a team later today and put our notes here 😊". Below the chat is a text input field with a rich text editor toolbar (bold, italic, underline, bulleted list, numbered list) and a "Submit" button. On the right, a task update feed is visible, listing actions such as "Jane Duffy posted comment for Task in Website Redesign" and "Jane Duffy has updated the Priority of Task to High in Website Redesign".

Let's say the project in question has a lot of visual elements, and the team working on it needs to discuss them. Your life will be much easier if you have image markup tools in your project management app. That way, you can electronically scribble on an image and attach comments, making it easier for everyone on your team to both give and understand feedback. Volverro is one example of a project management app with markup tools.

As mentioned, project management apps handle all the basic stuff you need to juggle and track, such as tasks, deadlines, progress, and assignees. All that information is visible to those who need it. In that sense, there's less need to communicate about these sorts of matters. You never need to email someone and CC half a dozen people to know whether they're almost done with a task when you can log into the system and see it's marked as 75 percent done. A lot of the stuff that requires you to read between the lines when using email for task-management suddenly becomes crystal clear when you use project management software.

### **LESS TIME EMAILING = MORE TIME WORKING**

The benefits of getting a team off email and into a project management app to communicate can be enormous. The reduction in email alone is sure to make everyone happy, but that pales in comparison with the added value of having greater visibility into who's doing what, what else they are doing, and the status of every task. That visibility makes it much easier to have accurate information on hand as you work, so that decision-makers can make good decisions.



**We lose time  
when we have  
to reread the  
same email  
because  
we've  
forgotten  
what it said.**



# A Beginner's Guide to BitTorrent

BY WHITSON GORDON



**I**f you've spent any time on the internet since the early 2000s, you've probably heard of BitTorrent, the popular file-sharing tool used to swap movies, programs, and other large chunks of data. But BitTorrent is a bit more complex than the file-sharing tools that came before it, so it helps to acquaint yourself with its ins and outs before using it. Our guide can help.

## WHAT IS BITTORRENT?

When you download a file from the internet, you're typically downloading it directly from a server somewhere. How fast you download that file can vary depending on the server's location, its speed, and how many people are trying to download the file at the same time. Although you might have a 200Mbps connection from your internet provider, you might have to download a file much slower than that when the server providing the file is slow or getting hammered with requests.

BitTorrent is an alternative way of downloading big files that doesn't share the same weaknesses. BitTorrent isn't just a program—it's a peer-to-peer (p2p) protocol that any program can use (though there is a program called BitTorrent, owned by the company of the same name that develops and maintains the protocol itself).

Instead of downloading a file from a single server, with BitTorrent you download pieces of that file from other users across the globe who have the same file on their PC (hence peer-to-peer). The file or group of files you download is called a torrent, sharing those files is called seeding, and the group of people you download from is called a swarm. The more people connected to a given swarm, seeding a file, the faster you'll be able to download that file.

BitTorrent is commonly known as a piracy tool, thanks to its efficiency in sharing large movie files, music albums, software, and porn. Using BitTorrent isn't inherently illegal, though: The protocol has many legitimate uses, including the sharing of open-source software such as Linux, delivering updates for programs such as World of Warcraft, syncing files between computers Dropbox-style, and sharing media released over BitTorrent by artists themselves. Microsoft uses similar tech to optimize Windows updates.

All that said, BitTorrent is often used for piracy, since its efficiency, decentralized nature, and popularity have produced a bustling community around sharing those files. If you want to download something, there's a good chance someone's sharing it with BitTorrent, legally or not. To be clear, we at PCMag do not condone piracy. If you use our instructions for that purpose, you do so at your own risk.



**With BitTorrent, you download pieces of that file from other users across the globe who have the same file on their PC.**



# HOW TO DOWNLOAD A TORRENT

## 1. Get a BitTorrent Client

Downloading files with BitTorrent is a bit more complicated than just clicking a link in your web browser. Most browsers don't have built-in support for BitTorrent, so you need a specific program, called a BitTorrent client, that knows how to download and assemble the pieces of a file in a torrent.

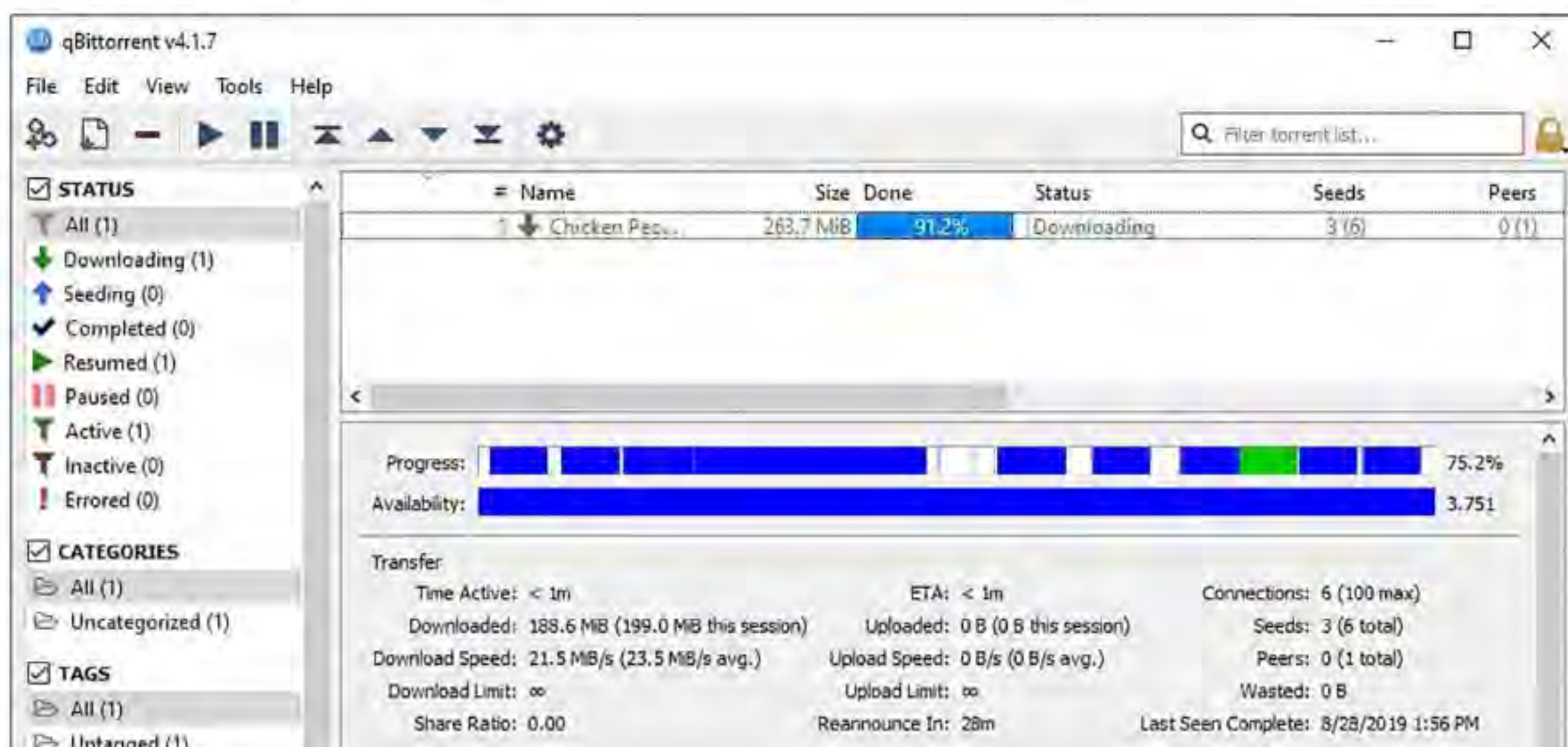
I'm personally a fan of qBittorrent, a free open-source client that's easy to use, available on multiple platforms, and provides a good amount of advanced features for those who like to dig in. Other popular programs include uTorrent, Transmission, and Deluge. We'll discuss the differences between all these in a future article.

## 2. Find a Torrent to Download

You can find torrents to download in a few different ways. When you're downloading something that the creator has made available on BitTorrent, you'll probably find a link to download the torrent somewhere on their site—for example, the Linux distribution Ubuntu offers torrents on its Alternative Downloads page. You can also visit a torrent search engine like the aptly named Pirate Bay to find things.

## 3. Download the Torrent File

Once you find what you're looking for, you need to download the .torrent file—a tiny piece of data that points your BitTorrent client toward the swarm, so it can download the actual files you're looking for. When you're downloading a video, for example, you'll download the small .torrent file first, then double-click it to open it up in qBittorrent, where it'll start downloading the actual video.







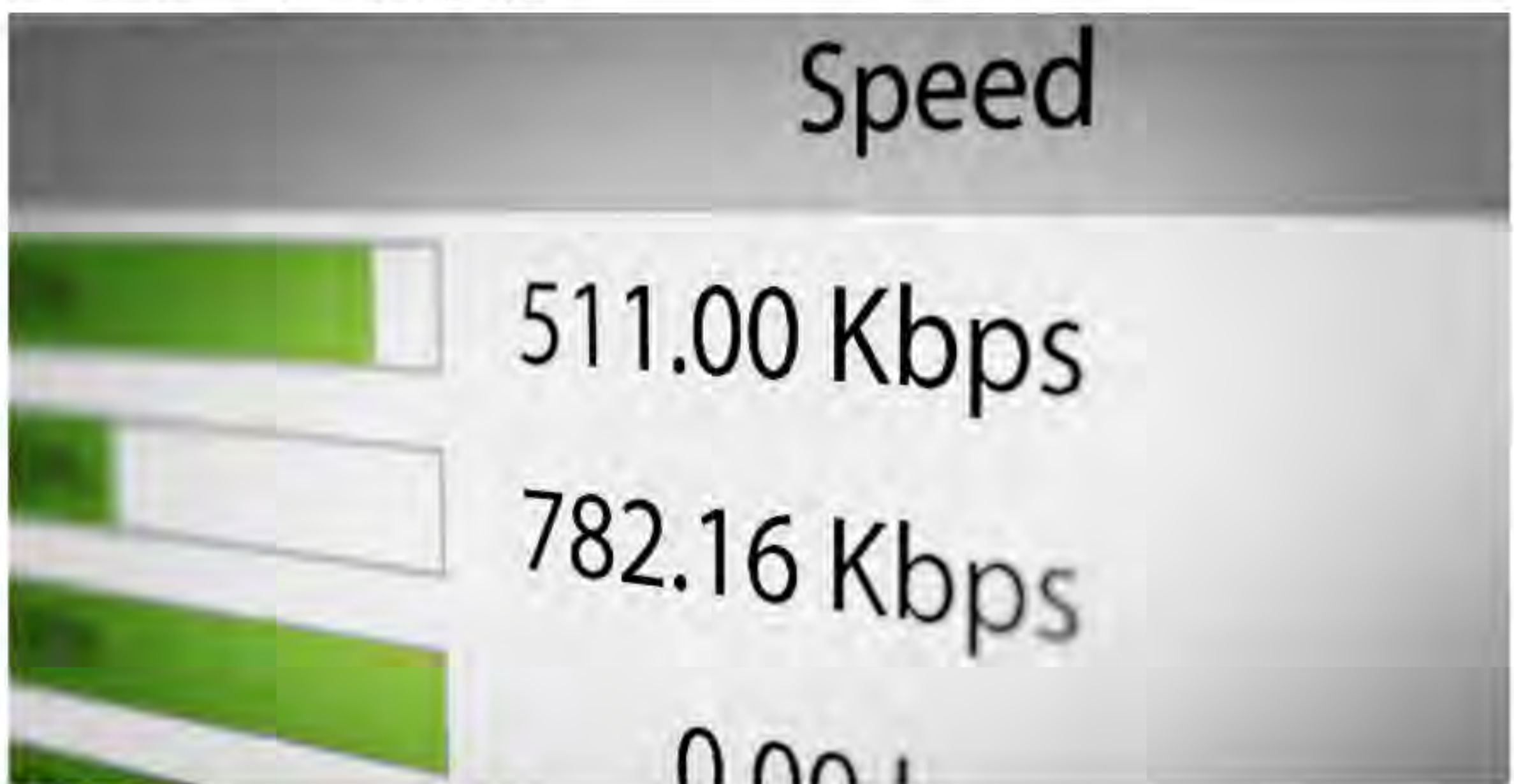
Many torrent sites have comments on each page, which can help you determine a given torrent's authenticity based on what other users have written. Some directories put badges next to the uploader's username, denoting users with good track records of uploading safe files. And, of course, you should be running good antivirus software, which scans everything you download automatically.

### **Use a VPN**

Since you're connecting directly to other users to download your torrent, you can see the IP address of every user in the swarm—and they can see yours. That IP is traceable to you, allowing anyone who joins the swarm to see what you're downloading. Some ISPs, particularly those outside the US, may also throttle your speeds if they see you're using BitTorrent. To prevent both of these issues, you should use a trustworthy VPN whenever torrenting—it'll obscure your IP address from the swarm and encrypt your traffic so that your ISP doesn't know what you're doing.

### **Avoid Dead Torrents**

BitTorrent lets you download files faster and more efficiently than a direct connection to a server—as long as there's a big enough swarm sharing the file. If a torrent has only a few seeders, you'll probably download the file very slowly. And if there aren't any seeders, you won't be able to get the file at all. When you download the torrent, make sure you download a recent one that has a lot of seeders to ensure the best speed (many sites will list the number of seeders on the torrent's download page).



## Make Sure You're Open to Connections

These days, most torrent clients are set up optimally out of the box—they create a Windows firewall rule for themselves and use UPnP or NAT-PMP to automatically open a port so that seeders can send you their pieces of the file. If a program has a lot of seeders and the file isn't downloading, though, you may need to manually forward a port on your router or go through other troubleshooting steps to ensure you're connectable to peers in the swarm.

## Follow BitTorrent Etiquette

While this isn't crucial to success, it's generally considered good practice to pay it forward and seed files after you download them, allowing others the opportunity to download the data themselves. After all, if there were no seeders, BitTorrent wouldn't work very well, and we'd all be stuck downloading files at a snail's pace. If you can't seed the file forever, at least seed it until you've shared as much as you've downloaded (also known as having a 1:1 "ratio") before deleting the torrent from your client.

BitTorrent can be a remarkably powerful tool for those willing to dig into their client's settings. But for most beginners, this should get you started, keep you safe, and allow you to avoid the dreaded "slow download server" as much as possible.



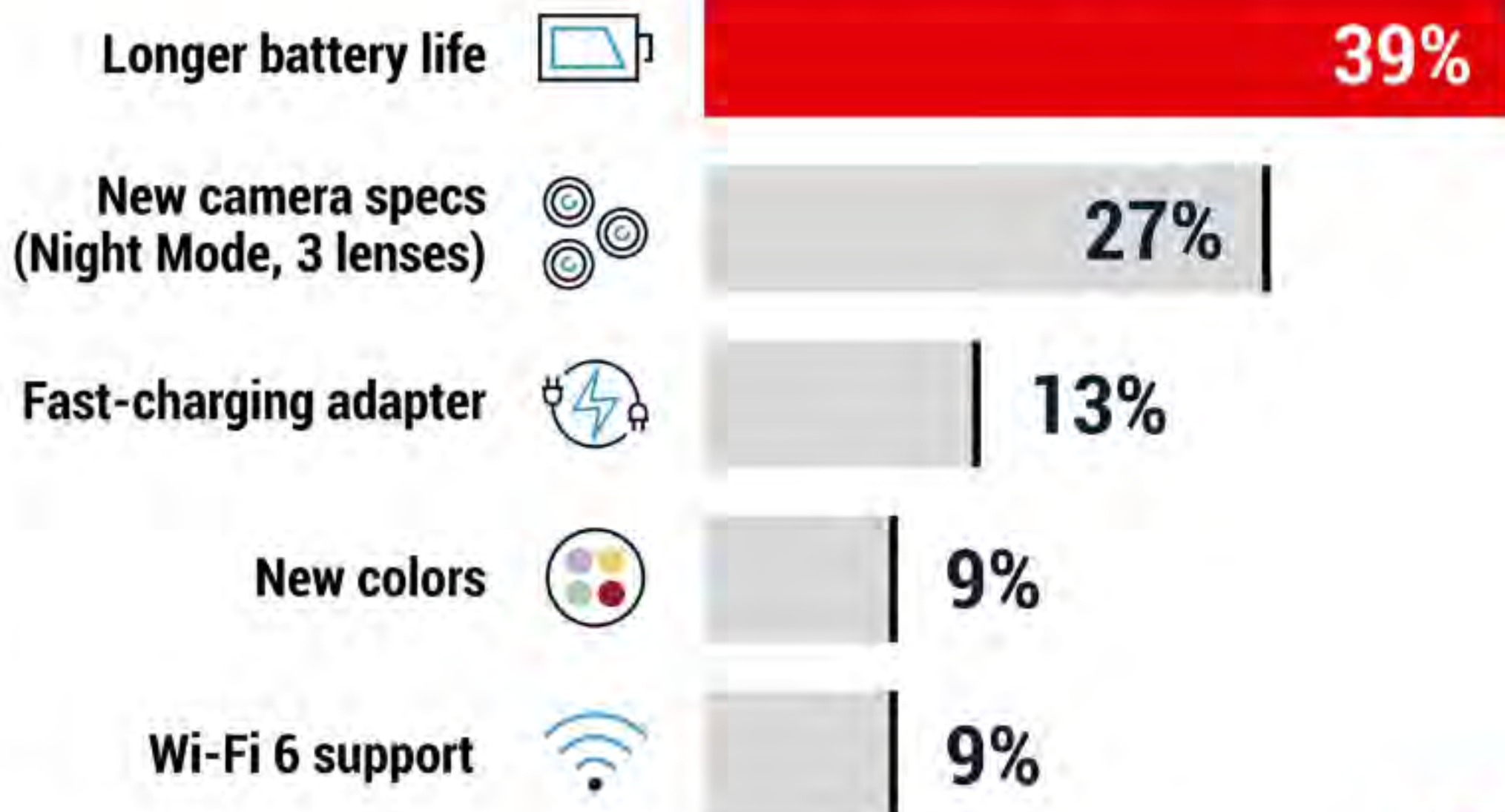
**When you download a torrent, make sure you download a recent one that has a lot of seeders to ensure the best speed.**



## Which New iPhone Features Are the Most Tempting to Buyers?

BY CHANDRA STEELE

### What's the most exciting new feature of the iPhone models from the recent Apple event?



PCMag.com | Survey conducted from September 16 to September 13, 2019. All rights reserved.



**T**here are plenty of considerations when choosing between the new Apple iPhone 11, iPhone 11 Pro, and iPhone 11 Pro Max smartphones. But some features are clear standouts.

PCMag surveyed readers to find out what most excited them about the new phones. Given how much use our smartphones get during the day, it's not a surprise that longer battery life was the favorite feature, at 39 percent. The iPhone 11 gains an hour of battery life over its predecessor, the iPhone XR; the iPhone 11 Pro has four hours more than the iPhone XS; and the iPhone 11 Pro Max gets five hours more than the iPhone XS Max.

One of the biggest upgrades this year is with the iPhone cameras. That is, indeed, cameras plural. The iPhone 11 has two cameras on the back, dual 12MP ultra-wide and wide cameras, with a 12MP front-facing camera. The iPhone 11 Pro and Pro Max each have three 12MP cameras on the back: a primary wide-angle lens, ultra-wide-angle lens with a 120-degree field of view, and a sort-of-but-not-really-telephoto lens with 2x optical zoom in and out as well as 10x digital zoom. The front-facing cam is also 12MP. The phones also have Night Mode, which lets users shoot in low-light conditions. These specs and features appealed to 27 percent of survey respondents.

Another appealing inclusion with the iPhone 11 Pro and iPhone 11 Pro Max: Apple is shipping an 18W power adapter in the box, which appealed to 13 percent of our respondents.

Apple events used to prominently feature the newest iPod, along with a commercial for it that was as bright as the device itself. This year, the color came from the iPhone 11, which is available in six different ones: purple, yellow, green, black, white, and red. Even the Pro versions got a little extra color with a midnight-green option added to the usual gold, silver, and space-gray. The new colors swayed 9 percent of those answering the survey.

**If Apple doesn't integrate 5G support soon, would you consider switching from iPhones to Samsung or other Android phones that support 5G?**



One feature was missing from the lineup, though: support for 5G. Apple has its reasons for not releasing 5G-compatible phones this go-round, and most respondents were OK with that: 73 percent said they wouldn't consider switching to an Android phone even if Apple "doesn't integrate 5G support soon."



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