

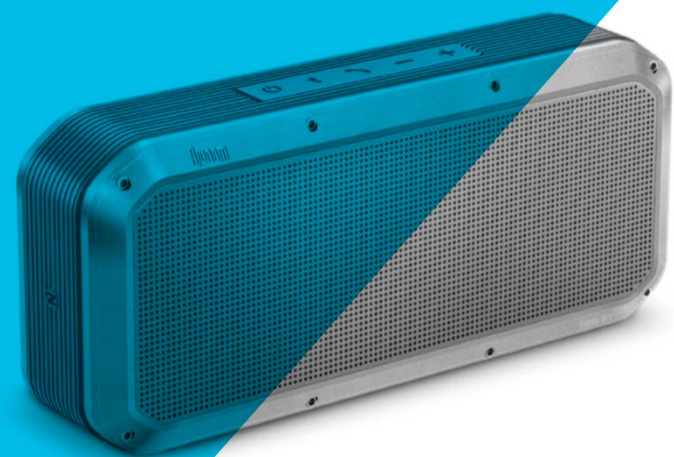
**PC
MAGAZINE**



THE

SMART HOME

GETS SMARTER



FEATURES



COVER STORY

THE SMART HOME GETS SMARTER

Connected products can simplify and improve life in every room in your home. Here are the best of the current crop.



REVIEWS

CONSUMER ELECTRONICS

PREVIEW: Samsung Galaxy Note 5

OnePlus 2

Bowers & Wilkins P5 Wireless

GoPro Hero4 Session

LG 65EG9600

HARDWARE

Acer Revo One

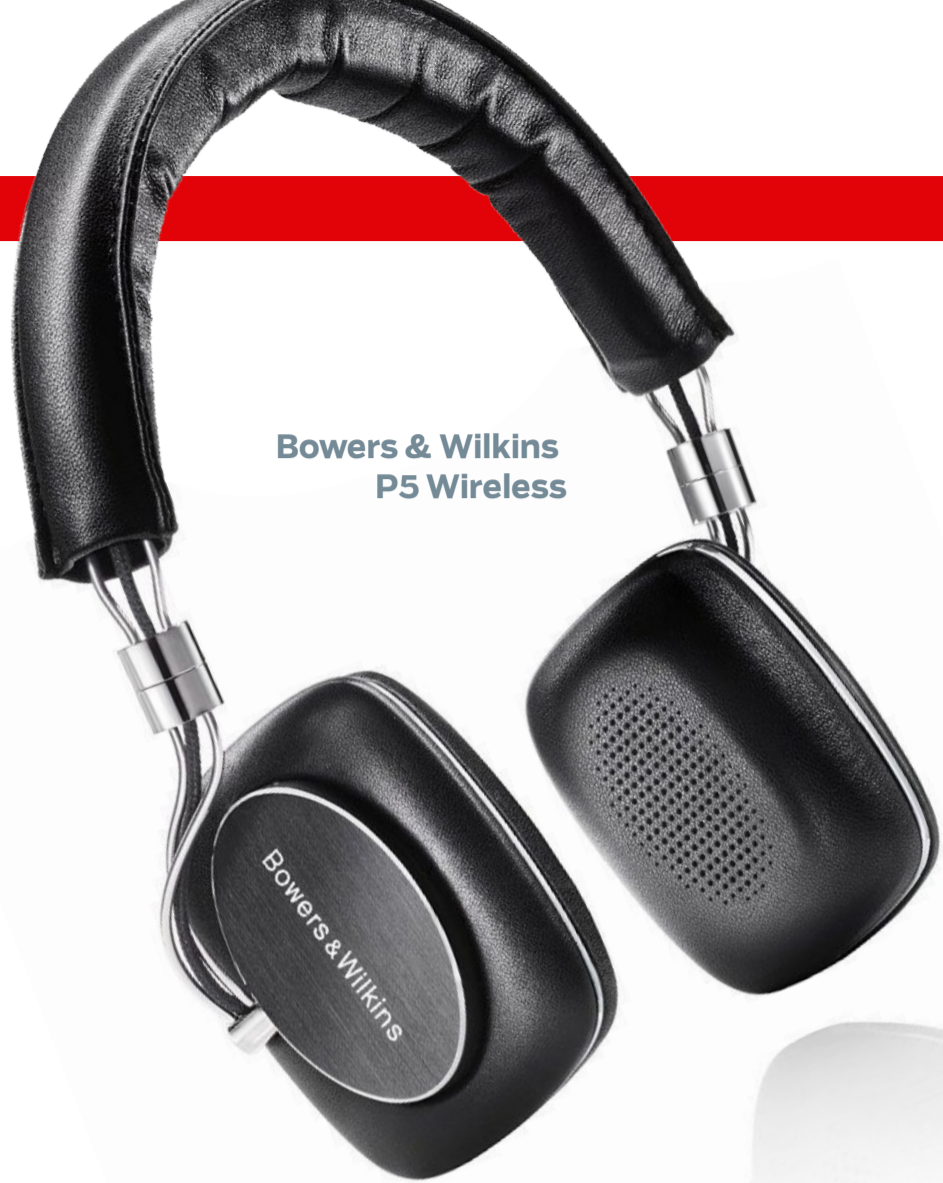
Asus Chromebook Flip

Getac F110

SOFTWARE & APPS

Kaspersky Internet Security

Our Favorite Apps for September



Bowers & Wilkins
P5 Wireless



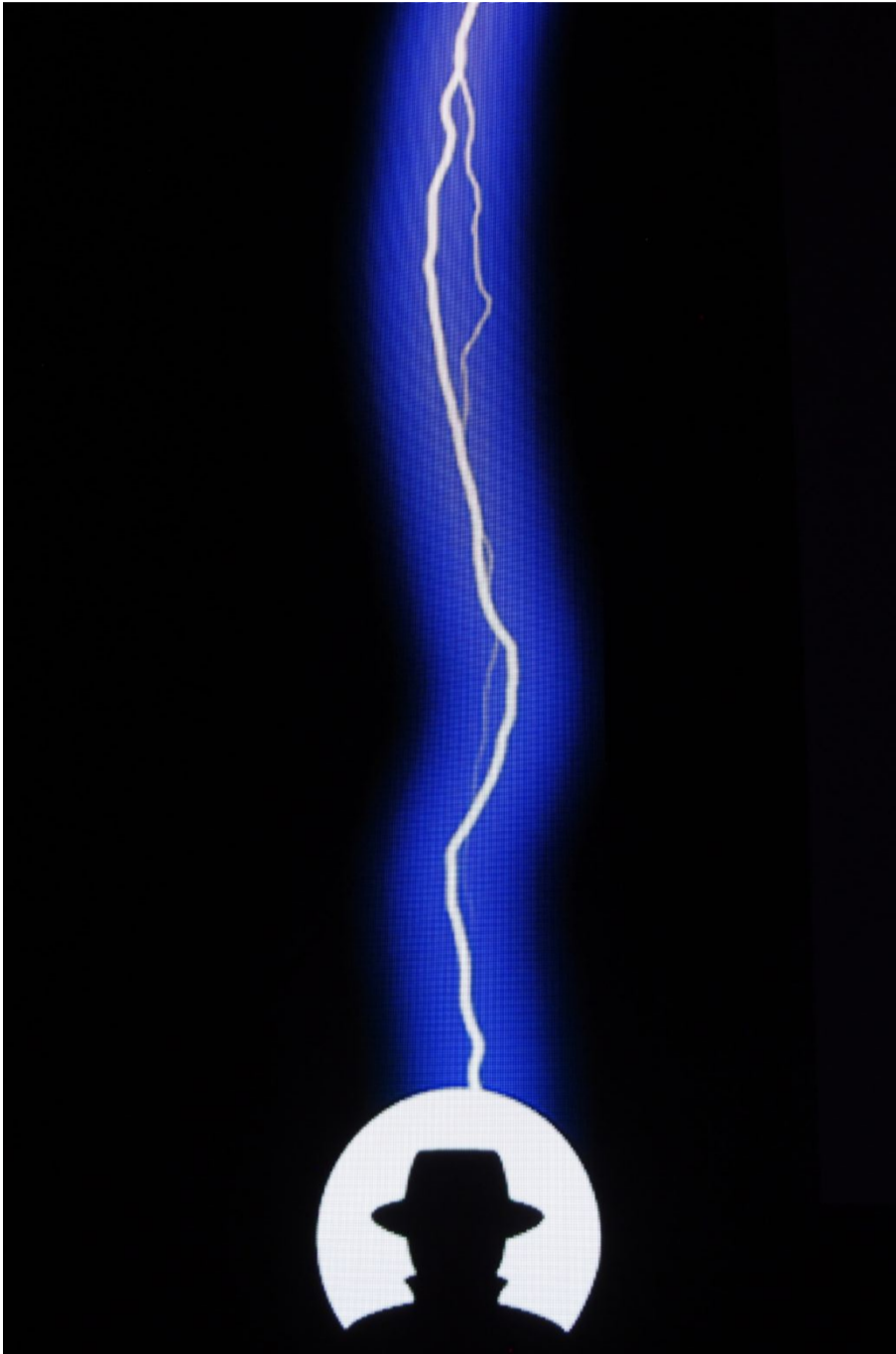
GoPro Hero4
Session



Acer Revo One



WHAT'S NEW NOW



INTEL IS TRYING TO REIN A CHANGING WORLD

Can chip-making giant Intel stay on top of the new computing landscape that is forming around it?

3D XPOINT: THE NEXT, BEST MEMORY STANDARD?

This new design of 3D memory could solve the most vexing problems of DDR and NAND.

SECURITY SOCIAL: BLACK HAT'S BIGGEST THREATS

The annual security conference showcased some terrifying vulnerabilities.

A COMIC PORTRAIT OF A SERIOUS WHISTLE-BLOWER

Political cartoonist Ted Rall explores the life and work of Edward Snowden, with mixed results.

TOP GEAR



OPINIONS

DAN COSTA

First Word

READER INPUT

EVAN DASHEVSKY

**Fox News to Cord Cutters:
Drop Dead**

TIM BAJARIN

**How the Oculus Rift Could
Improve Baseball**

DOUG NEWCOMB

**Do Cars Need Built-in
Tablets?**



**My initial
thought
was that
Alphabet
is some
financial
scam.**



JOHN C. DVORAK
Last Word

DIGITAL LIFE



GET ORGANIZED

How Scanning Apps Keep
You Organized

TIPS

Take a Bigger Bit Out of
Apple Music

CONNECTED TRAVELER

Airline, Make Me a Sandwich



Hitting the Home Button

Last month, we covered the subtle ways that technology has changed how our kids learn. This month, we're looking at how it's changing the way we live.

The foundation for the smart home is in place. According to research done by Business Insider's Intelligence group, almost 80 percent of American homes have wireless Internet, although, troublingly, Wi-Fi adoption has plateaued in recent years. At this moment, there are more than 100 items in your home that could—and eventually will—connect to the Internet.

And the technology world is on board as well. Products that use Apple HomeKit are available now, and Google is quickly transforming Nest from a smart thermostat into the foundation of its own smart home platform.

But the road to the smart home will not be a smooth one. First of all, these products still command a hefty premium over their non-connected competitors. You can buy a Master Lock for \$16, but a connected LockState lock will run you \$250. You can get a basic Honeywell Thermostat for \$18, but a Nest will run you \$250. An LED light bulb is \$8 on Amazon, but a Philips Hue smart bulb will run you \$60.

To be fair, the Hue isn't any harder to install than an ordinary light bulb. I can't say the same for a lot of connected home technologies. There is a learning curve, to be sure. Worse, sometimes the products simply don't work. Standards are still pretty spotty, and just because the devices work with each other, that doesn't mean they will work with your home. My 1890-vintage house in upstate

New York has stubbornly rejected both the Nest and the Honeywell Lyris—but the \$18 basic thermostat works just fine. Compatibility will improve as HomeKit, Works with Nest, and other standards take hold, but homes are on a slow upgrade cycle.

Although *PC Magazine* readers will no doubt opt to buy and customize their digital home themselves, a lot of consumers are going to choose more off-the-shelf options. Comcast's Xfinity Home, for example, will sell you a smart thermostat, cameras, motion sensors, outlet controllers, and a monthly service plan starting at about \$40 per month. AT&T's Digital Life will do pretty much the same thing. And the nice thing about these services is that techs will come to your house, install everything for you, and make sure it works. Just, you know, make sure you're home between 1 p.m. and 6 p.m.

Will big cable providers rent you your smart home as an add-on to your monthly broadband bill, or will you build it yourself from the Apple store? It's too soon to tell.

That said, you can buy a robot that will mow your lawn right now! We tested it. And you now have a wide range of choices in automated floor-cleaning options. Don't feel like washing windows? There's a robot for that, too.

Also, I want to use this space to rave about my new favorite smart home accessory: the Amazon Echo. The Echo is one of those tech products that you have to use to appreciate. On paper, a \$180 Bluetooth speaker seems like an overpriced luxury, but once you get it home and spend a few days with it, it's pretty impressive. The Echo is always on, waiting for you to wake up your personal assistant. She's called Alexa, and she works a lot

“

Alexa is just handy to have around, which is the final test for any piece of technology.

”

like Siri, Cortana, and Google Now, albeit with a slightly more limited range of options. Ask her what's on your calendar for tomorrow and she'll run down your meetings. Want to play your favorite musical artists? She'll access your Prime account and start a random playlist—and if you want to turn up the volume or skip a song, just ask. She can even tell you jokes and check the weather. Oh, and of course she can order products for you through Amazon, although I confess I haven't tried that feature yet. Alexa is just handy to have around, which is the final test for any piece of technology.

To be honest, the Amazon Echo is still probably a little overpriced—for now. But there's so much more coming. It already works with the Philips Hue, so you can control your lights with your voice. It won't be long before the Echo can control all of those 100 Internet-connected devices in your home. And the audio is pretty killer.

Finally, I want to say our semi-secret hashtag campaign continues to be a quiet success. We're finding new readers without completely breaking the bank. As such, I'm going to keep it going. If you send us a tweet with the #ilovepcmag hashtag, I'll send you a link to get six issues of *PC Magazine* for \$6. That's good for subscription extensions as well. Thanks for your support.



dan_costa@pcmag.com



Does It Do Windows?

I am trying to find out if my Lotus 1-2-3 (version 9.7) will continue to run under Windows 10. I have been using it for 25-30 years and it runs on Windows 7 Professional. My life depends on it, and I hate Excel. How can I find out if it will run before upgrading?

—Joe Sage

OUR ANSWER:

Windows compatibility can be difficult to judge. During the time I've been using Windows 10, I've only found one program that doesn't work on it that worked in Windows 7 (a specialized piece of networking software), and I use a fair number of older software applications myself.

If Lotus (or any program) runs in Windows 7, the chances are good it will also run in Windows 10. If it doesn't right away, however, you may have other options. The free DOSBox (dosbox.com) is an x86 emulator that runs programs in Windows just as they ran in MS-DOS once upon a time. You'll have to play around with the command line, and maybe tweak some configuration files, but I've been able to use it to operate programs more than 30 years old that won't run any other way.

That said, do a complete backup of your system (preferably an easily restorable disk image) before upgrading to Windows 10. If your software doesn't run, you have 30 days to roll back your operating system installation. Though that hopefully won't be necessary, you should be covered either way.

—Matthew Murray, Managing Editor of *Digital Editions*

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 and we'll respond to your question here. Questions may be edited slightly for content and clarity.



What's New Now

**INTEL TRIES TO REIN IN A
CHANGING WORLD**

**3D XPOINT: THE NEXT, BEST
MEMORY STANDARD?**

**SECURITY SOCIAL:
BLACK HAT'S BIGGEST THREATS**

**A COMIC PORTRAIT OF A
SERIOUS WHISTLE-BLOWER**

TOP GEAR

Intel Is Trying to Rein a Changing World

BY MATTHEW MURRAY



Photo courtesy of Intel

Chip giant Intel has traditionally used its annual Intel Developer Forum (IDF) in San Francisco to showcase its latest and greatest under-the-hood processor technologies. But this year's anchoring revision, the 6th-Generation Core (aka "Skylake") CPU, had a muted presence at best. Unlike in previous years, there were few probing deep-dive sessions covering its wonders, with the individual features (revamped graphics system, new power management) broken out but not exactly highlighted. And few if any new systems were called out by name, let alone displayed publicly, that use Skylake. Indeed, one could progress through the halls and meeting rooms of the Moscone Center and barely be aware Intel was taking this new microarchitecture seriously at all.

CEO Brian Krzanich set the tone in his day-one keynote address by stressing three assumptions that he believes will (and should) guide Intel and tech: the sensification of computing, the opportunity for everything to become smart and connected, and computing becoming an extension of you. Such observations seem more like appendages to Intel's core pursuits than fodder for its mission statement.

The keynote, and much of the show that followed, echoed with uneasy tones: Is Intel struggling to find firm footing on ever-shifting ground it once ruled? Perhaps IDF's most-mentioned advance was not even a new one: Intel's own RealSense camera technology, which can be used (and was demonstrated) in everything from scanners to games to security systems



Is Intel struggling to find firm footing on ever-shifting ground it once ruled?



to provide new depth of interaction and immersion. Voice recognition made regular appearances as well, whether through turning on powered-off computers or (as filtered through Microsoft's Cortana digital assistant) telling jokes and describing the weather. And the Internet of Things (IoT) was everywhere, in both products and proclamations about how important it is to the future of technological interactions and why it needs to be secured. Krzanich even gave the maker

INTEL INSIDE?

Intel CEO Brian Krzanich holds up a new phone that fuses Intel's RealSense and Google's Project Tango during his IDF keynote address.

THE CURIE FOR WHAT AILS YOU

Intel's go-anywhere Curie module might end up being even more important than the bigger processors that were shown at IDF this year.

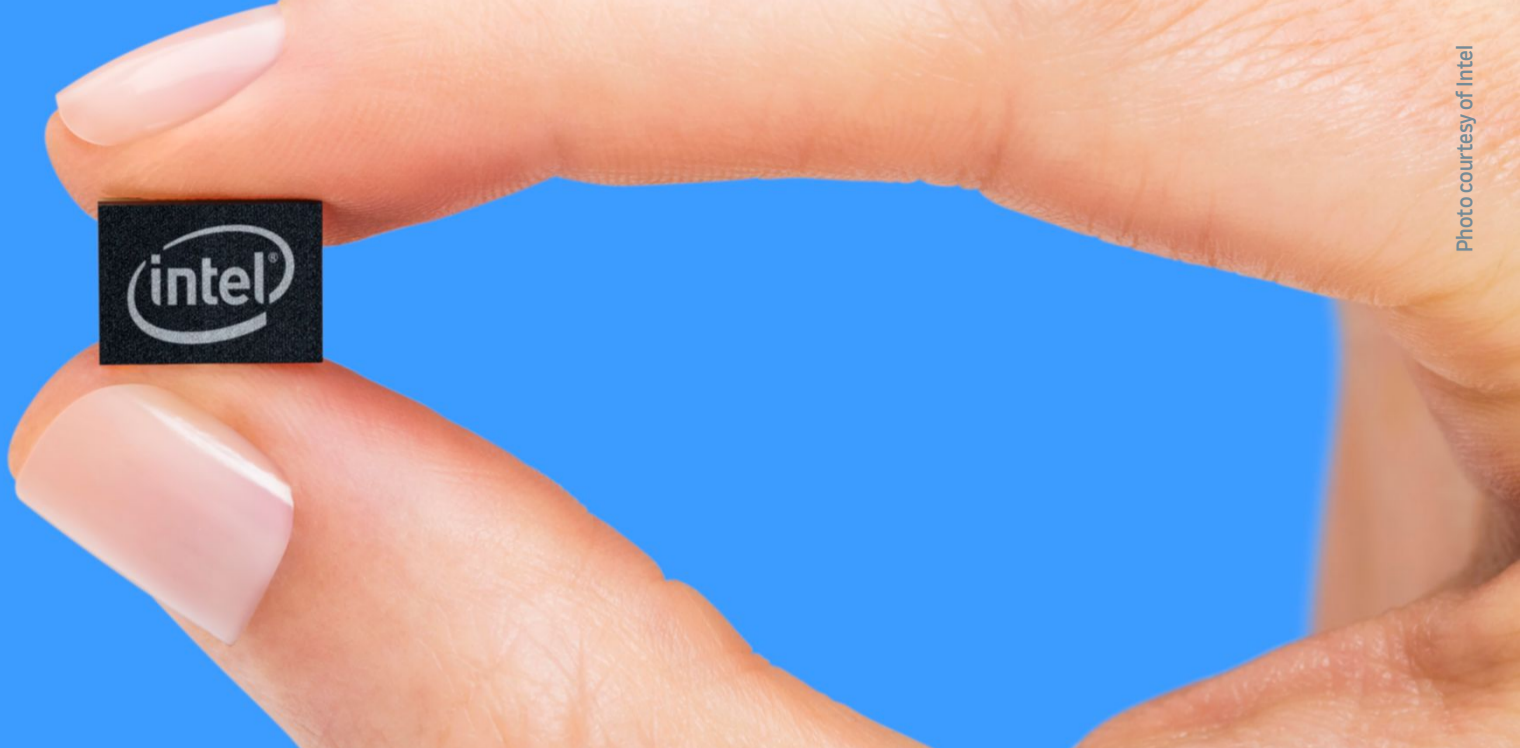


Photo courtesy of Intel

community a shout-out with the help of superstar producer Mark Burnett (*Survivor*, *Shark Tank*, *The Voice*), who's launching a new effort called "America's Greatest Makers" and offering a \$1 million prize to the winner.

Powering the creations at the heart of Burnett's endeavor will be the incredibly small Curie module, which is especially power-efficient and described by Intel as ideal for always-on applications. Ideal as it is for the IoT, and considering that its abilities were what Krzanich chose to highlight during his appearance on *The Tonight Show* earlier this year, Curie is probably what Intel has reason to be most excited about. It's a major development that's both new and firmly in the company's wheelhouse, even if it's also one that faces punishing competition from the likes of ARM, which knows this particular landscape better than Intel does.

But is Intel prepared for a world powered by chips that are well and truly invisible? IDF provided no answers, though the relative lack of news that came out of the show could itself be seen as an answer. To borrow an old theatrical joke, you walked away from the speeches, classes, and demonstrations humming the scenery: the screen-based virtual piano that provides feedback by blowing air on your hands, the hotel-oriented robot that brings you drinks, the bicycle sensors that can analyze complicated riding tricks, the army of dancing spiders. Notions about computers and their inner workings, whether Skylake or new storage innovations, only came to mind much later (assuming you even thought about them at all).

Maybe that's for the best, but it marks a stark change for Intel and the industry as a whole: an admission that we've moved so far beyond the old paradigm, it can't even be seen outside the rear windshield anymore. IDF's theme statement set the tone: "Developed By You." Sure, it was a call to creative action for the myriad tech types in attendance. But it was also a reminder that we're not far off from a world that won't care much what's developed by Intel.

3D Xpoint: The Next, Best Memory Standard?

BY JOEL HRUSKA

3D XPOINT

The new 3D Xpoint memory architecture, designed by Intel and Micron, promises nonvolatile storage that can read and write without requiring a transistor.

For years, researchers have hunted for memory architectures that could address the primary weaknesses of DDR and NAND flash without introducing more problems or simply costing too much money. Intel and Micron have recently announced that they may have created it.

The new memory architecture, named 3D Xpoint (pronounced “crosspoint”), is designed in a 3D structure, like some of the more cutting-edge 3D NAND. Unlike NAND, however, 3D Xpoint doesn’t use an electrical charge to store data in cells. According to Intel, the properties of a 3D Xpoint cell change when the cell is written and remain changed for long enough for the device to be classified as nonvolatile memory. In addition, 3D Xpoint memory can write data into much smaller areas; NAND flash must be written in relatively large blocks.

3D XPoint™ Technology: An Innovative, High-Density Design

Cross Point Structure

Perpendicular wires connect submicroscopic columns. An individual memory cell can be addressed by selecting its top and bottom wire.

Non-Volatile

3D XPoint™ Technology is non-volatile—which means your data doesn't go away when your power goes away—making it a great choice for storage.

High Endurance

Unlike other storage memory technologies, 3D XPoint™ Technology is not significantly impacted by the number of write cycles it can endure, making it more durable.

Stackable

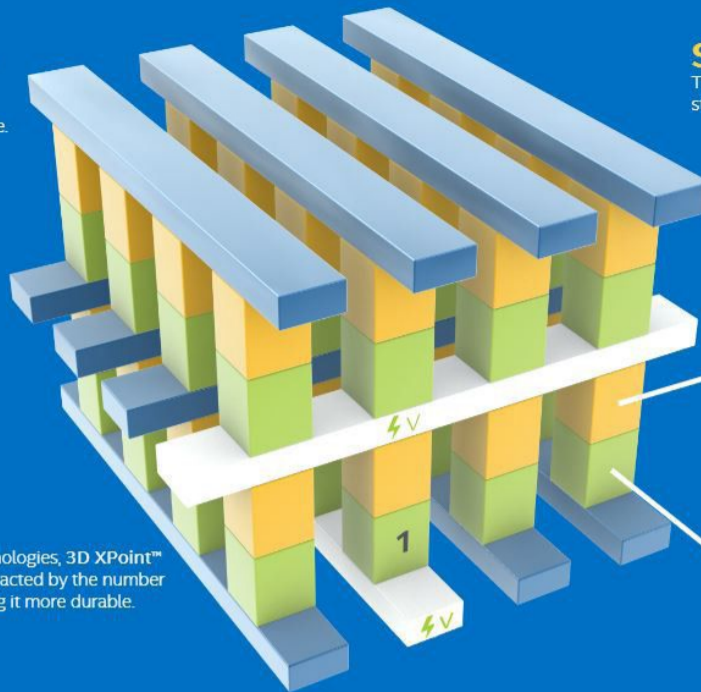
These thin layers of memory can be stacked to further boost density.

Selector

Whereas DRAM requires a transistor at each memory cell—making it big and expensive—the amount of voltage sent to each 3D XPoint™ Technology selector enables its memory cell to be written to or read without requiring a transistor.

Memory Cell

Each memory cell can store a single bit of data.



Transforming the Memory Hierarchy

For the first time, there is a fast, inexpensive and non-volatile memory technology that can serve as system memory and storage.

~8x to 10x Greater Density than DRAM¹

3D XPoint™ Technology's simple, stackable, transistor-less design packs more memory into less space, which is critical to reducing cost.



The above image covers the basic features of 3D Xpoint. The new memory is designed to be nonvolatile and stackable (to improve density), and can perform read and write operations without requiring a transistor (DRAM requires one transistor per cell, which is one reason why it draws much more power per gigabyte than a NAND flash drive). Each memory cell can hold one bit of data, which might seem to be a disadvantage given that NAND flash can hold two to three bits per cell, but Intel is claiming that it can hit densities eight to ten times greater than DRAM. Samsung has produced 8Gb DDR4 DRAM (that's 1GB per IC), whereas Micron claims it can provide NAND chips at up to 2Tb. That's 125 times more dense than DRAM, and it implies that 3D Xpoint may not be all that dense compared with NAND flash.

Still, that's a relatively minor shortcoming if the other aspects of the technology pan out and Intel and Micron can stack the dies higher. Intel claims that Xpoint dies are smaller than competing DRAM designs and that the technology can be scaled to match NAND's density in a similar footprint.

The real killer feature of 3D Xpoint memory is that it is supposedly 1,000 times more durable than NAND, while simultaneously offering 1,000 times the performance. As radical as that sounds, however, it's important to keep something in mind. Currently, fast PCIe-based solid-state drives (SSDs) have 1ms latency, which means Intel is talking about a nonvolatile memory solution

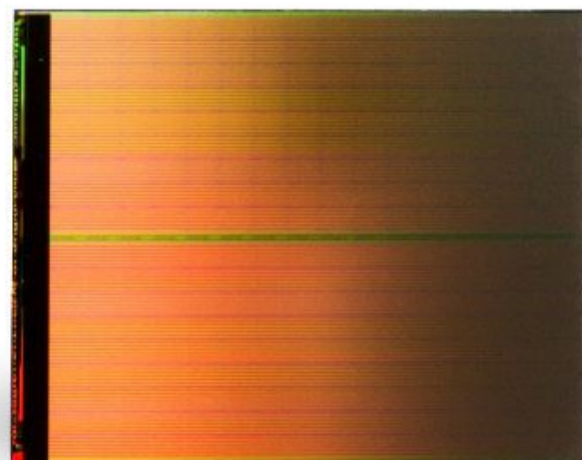
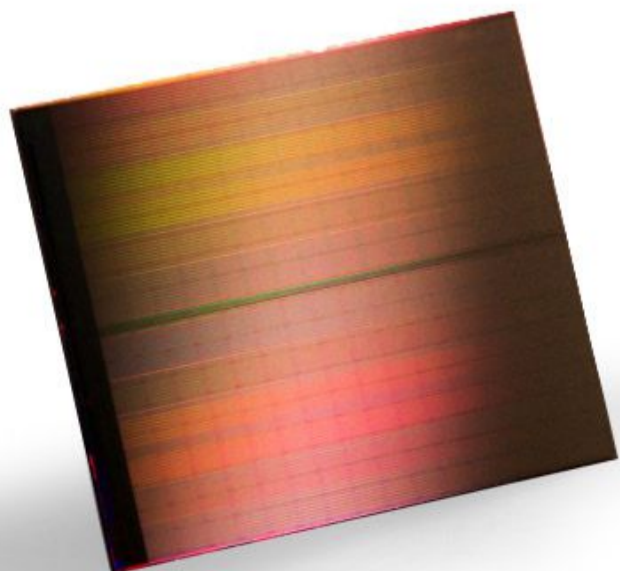
that's both more dense than traditional DRAM and yet has superficially similar characteristics. We say "superficially" because a generic "1,000 times faster than NAND" isn't much to go on. Intel could be referring to something standard, like seek times, or cherry-picking some areas where NAND performs poorly. Right now, we don't know.

The companies have jointly stated that they'll begin sampling select customers later this year, but have declined to give any information on product timelines. Intel is positioning the new technology as a solution for big data companies and for crunching vast data sets. If the technology offers DRAM-equivalent performance, it could find a home in exascale computing, where the need for huge amounts of power-efficient memory is particularly acute.

It's also promising that we could see consumer systems utilize 3D Xpoint—we'd expect the technology to either deploy as an additional cache level between main memory and primary storage, or possibly as a RAM replacement in ultraportable systems in order to improve battery life. Because the new memory is nonvolatile, a system doesn't have to spend power constantly refreshing it.

The Holy Grail of memory technology is memory that is nonvolatile; has excellent endurance, high density, and top-notch performance; and is affordable. We've seen phase-change and magnetic memory make a play in the future memory technology space before, but nothing quite as concrete as this. Intel and Micron aren't revealing much about the underlying architecture, save to say that it doesn't use transistors and isn't phase-change memory.

If this memory tech does everything Intel and Micron claim, it could revolutionize computing just as much as the introduction of SSDs. No, devices might not feel much quicker—the gap between SSDs and 3D Xpoint is microseconds versus nanoseconds, whereas the gap between HDDs and SSDs was microseconds versus milliseconds—but power consumption and performance in some tasks could be significantly improved while RAM density shoots up. We'll see what happens once hardware ships.



Security Social: Black Hat's Biggest Threats

BY MAX EDDY



During the first week of August, like-minded individuals converged on Las Vegas to celebrate their shared love of a future deeply imbued with technology and a society improved by science and rational thought. Those people were at the *Star Trek* convention. A few casinos away, a similar group gathered to talk about all the new and exciting ways they'd discovered to steal information and hack into systems. Those people were at Black Hat.

Black Hat bills itself as the premier show for offensive security, and it lived up to its promise. This year, we knew we'd hear about hacking Linux-powered rifles, remotely taking control of cars, and attacking Android phones with

malicious text messages. But also tackled were the Stagefright Android vulnerability, another flaw by which a clever attacker could use dormant plugins on most Android devices to take control of the phone as if the attacker were holding it, and a clever attack that could steal all of your files from a cloud storage service without you ever being the wiser.

Black Hat is also about learning about how to be a better hacker or security researcher, as the case may be. This year saw attendees learning how to use special security software designed for security research and a session that explained how to carry out research without getting arrested.

Two *PC Magazine* colleagues and I attended Black Hat this year, and somehow we made it back alive. We bring with us terrifying tales, but also good advice, and the hope that our digital lives can be made safer and more robust through better security.



Hacking Cars From a Cell Phone

Chris Valasek and Charlie Miller have been working on various attacks on cars for a while now, but their most recent efforts are perhaps the most dramatic to date. They found a way to gain control of the onboard entertainment unit, and use it as a backdoor into more of the car's systems. The end result is seizing control of a car remotely, and being able to drive it off the road.

Miller and Valasek's previous work required having physical access to the car in order to attack it. But this latest research only required being near the car for an initial attack, which makes it much scarier. Not to worry, though! Chrysler has since recalled 1.4 million vehicles to address the problem. But as cars become even more connected and intertwined with complex electronics, this probably won't be the only attack we see.



Gas Pump Attack

Speaking of cars, Trend Micro set out to discover if hackers were going after gas pumps. The short answer: yes. The longer answer: Hackers are attacking gas pumps a lot. Researchers Kyle Wilhoit and Stephen Hilt told the crowd at Black Hat that they observed 23 attacks on a honeypot gas pump system between February and July.

Though the researchers used a bogus gas station system to lure hackers, such attacks could cause some real problems. Depending on what the attacker gained access to, he or she could change how gas is distributed, what kind of gas is being pumped, and trick the system into thinking there's plenty of fuel available when there's actually none.



Turning Your Computer Into a Secret-Spewing Radio Station

When you have a computer or a network that is really important, you isolate it from the Internet behind what's called an air gap. But Ang Cui showed that even then, hackers may not be shut out. According to his research, specially made malware can use the components inside consumer electronics to broadcast messages in the RF range. Once infected, a device can spew its secrets to a hacker on the other side of steel-reinforced concrete.

Of course, infecting a device requires direct access. And the infected electronics need to have sufficiently long wires to serve as a broadcast antenna. But it's one of the more ingenious attacks we saw at Black Hat this year.



How to Not Get Arrested

One of the most talked-about sessions among the Black Hat attendees was one hosted by the Department of Justice. To the average person, it would probably have sounded dull, but this lively session sought to educate the audience and explain how hackers could continue their work without running afoul of the law.

Leonard Bailey, the special counsel for national security in the Department of Justice's computer Crime & Intellectual Property Section, explained to attendees how they could perform vulnerability scans and penetration tests safely. But what's more important is the DOJ's efforts to make sure that law enforcement doesn't have a chilling effect on security research.



How to Become a Hacker

Now that you know how not to be arrested for security research, maybe you're interested in playing around with some hacking tools of your own? Enter Kali Linux, a customizable platform that lets you have all kinds of fun.

Kali Linux is meant to be easy, but more important, it's meant to be flexible. You can add or remove tools for penetration testing, network testing, malware testing—you name it. You can even install the tools on a Raspberry Pi for security testing on the go.



Stealing Files Out of the Cloud

Cloud storage services like Dropbox and Google Drive have quickly become essential tools for getting work done. That's what's so chilling about a new attack from Imperva researchers that can steal all your files from the cloud. What's worse is that Imperva says that the attack is undetectable by perimeter defenses and traditional endpoint security tools.

The clever part of this attack is that it avoids the problems of having to steal a potential victim's credentials or compromise the cloud platform itself. Instead, the attacker tricks the victim into installing malware that redirects the locally stored copies of cloud files to a different server, to which your computer happily delivers all your important files.



Seizing Control of Your Android Phone

Remote Access Trojans, or RATs, let an attacker remotely access your phone or computer as if they were sitting in front of it. It's among the scariest kinds of malware, and researchers say they've found a way to gain that kind of access on millions of Android devices.

The trouble is that some Android manufacturers include special plug-ins that normally sit dormant until a remote support service like LogMeIn or TeamViewer makes contact. Then the plug-in turns on and lets the company access the Android device as if the support agent were using the phone. Check Point researchers Ohad Bobrov and Avi Bashandiscovered how to use these plug-ins for evil, letting them take control of Android phones. The worst part? Because these plug-ins are installed by manufacturers, there's nothing you can do to protect yourself.



Stagefright Steals the Show

Disclosed prior to Black Hat by Zimperium researcher Josh Drake, Stagefright is the new Android vulnerability that's thought to affect 95 percent of all Android devices. Drake showed that he was able to make Android phones execute code just by sending a text message. Coupled with the right kind of attack, this could be devastating.

Also attending Black Hat was Google's head of Android security, Adrian Ludwig. He acknowledged the scope of Stagefright but announced that Google and its partners were staging an equally large effort to protect Android against Stagefright exploitation. Ludwig also highlighted the work Google had already done to keep Android safe. In the face of numerous attacks, he said Android was still strong.



Hacking a Linux-Powered Rifle

Pretty soon, the Internet of Things (IoT) will be all around us. (Actually, it already is.) But there are some places where Internet-connected technology has only just started to make inroads, such as firearms. Runa Sandvik and her core-researcher Michael Auger bought, tore down, and successfully hacked a Tracking Point smart rifle. Under normal circumstances, this rifle helps you hit your mark every time. Under hacker control, it can be locked, made to miss targets, and induced to hit other targets.

One thing that was clear from Sandvik and Auger's work was that hacking a rifle is not easy. They took time to point out all that Tracking Point did right, and suggest to the industry how IoT devices can be further improved. Perhaps hacking this rifle will one day lead to a world with more secure toasters.



Hackers Can Bust Your Connected Home Wide Open

The ZigBee home automation system lets you control your door locks, lights, and thermostat with ease, but it might also be extending that control to hackers. In a dramatic presentation, researchers Tobias Zillner and Sebastian Strobl demonstrated how they could take control of ZigBee-based systems.

The fault, it seems, does not lie with ZigBee but with the vendors that use its communication system. ZigBee offers numerous security tools to ensure that only the right people are talking with devices. But vendors simply aren't using those tools, and are instead relying on a less-secure backup system. Thankfully, it's a tricky attack to pull off, but device manufacturers need to step up their collective game.



How Safe Is Your Fingerprint?

Mobile devices are increasingly including fingerprint sensors, and we can expect more exotic kinds of biometric authentication in the future. But your fingerprint data may not be safely stored on your phone, and the reader itself could be attacked by a hacker. FireEye researchers Tao Wei and Yulong Zhang presented four attacks that could steal your fingerprint data.

One of the more interesting showed how, with the right tools, an attacker could simply spoof an unlock screen in order to trick the victim into swiping a finger on the scanner. Another could access data from the fingerprint scanner without having to break into the secure TrustZone segment of the Android device. The vulnerabilities Zhang and Wei found have been patched, but it's likely there are many more yet to be discovered.



Hacking a Chemical Plant Is Really Hard

In one of Black Hat's most complex presentations, Marina Krotofil described how attackers could bring a chemical plant to its knees. The biggest challenge to an attacker is figuring out how to understand the complex inner workings of a plant, where gasses and liquids are moving in strange ways not easily trackable by electronic devices available to hackers. And then there's having to deal with the pesky physics of a factory. Turn down the water pressure too much and the acid might reach a critical temperature, and draw attention to your attack.

The scariest part of Krotofil's presentation was definitely the fact that hackers had been successful at extorting money from utilities and plants in the past, but that information was not available to researchers.



The Future Secure Society

During her keynote speech, celebrated attorney Jennifer Granick described how the hacker ethos of social advancement through technology had been lost to complacency, government control, and corporate interests. The dream, she said, of a free and open Internet that made knowledge and communication seamless, and eroded racism, classism, and gender discrimination, was never fully realized and is fading fast.

She described her fear that information technology would create a world in which data analysis is used for everything. This would reinforce existing power structures, she said, and hurt fringe cases most. She also warned of governments using security as a way to project power, creating security-haves and security-have-nots. Scary stuff.



Attackers on the Network

Don't trust the Black Hat network. There are plenty of folks around the network, and many of the attendees use the opportunity to try out new tricks and techniques they learned during the week. Fortinet managed the security operations center for Black Hat this year and monitored all the activity on both the wired and wireless networks on site. There were a lot of screens showing what applications were running, but the bulk of the analysis was performed by an all-volunteer team of security professionals. One class, learning advanced Web penetration attack techniques, got a little carried away, prompting the ISP to call the operations team to tell them to stop.

A Comic Portrait of a Serious Whistle-blower

BY JORDAN MINOR



READ BETWEEN THE LINES

Ted Rall's new biography *Snowden* lets you see Edward Snowden, king of the whistleblowers, in ways you never have before.

It's been more than two years since Edward Snowden revealed the startling scope of the NSA's programs for spying on the American people. So there's been enough time to form more substantial responses to Snowdens' revelations than hot take after hot take. Laura Poitras' Academy Award-winning documentary *Citizenfour* showed history being made as Snowden walked reporter Glenn Greenwald through the data. Later this year,

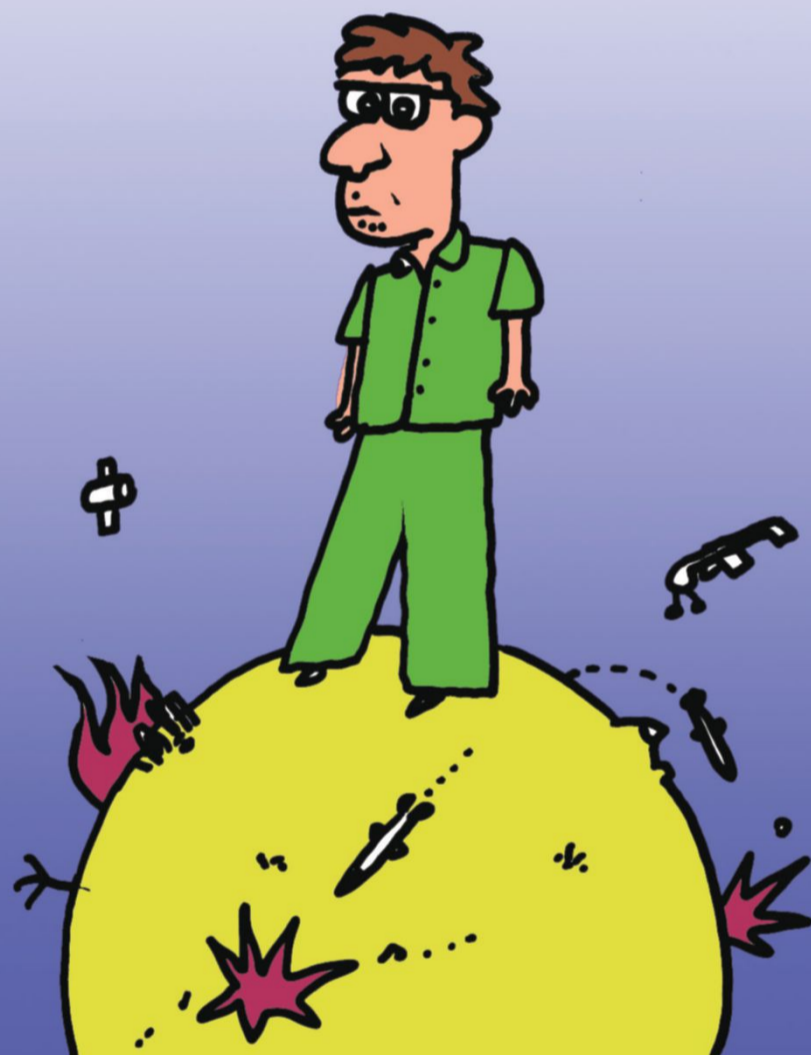
Gordon-Levitt will star in Oliver Stone's *Snowden*, a dramatization of the whistleblower's life. Until then, you'll be able to read *Snowden*, an illustrated biography by author and editorial cartoonist Ted Rall that turns out to be a darkly funny look at our ongoing surveillance nightmare.

SURVEILLANCE STATE OF EMERGENCY

In case the immediate comparisons to 1984 are too subtle, Rall's *Snowden* argues that PRISM, Stellar Wind, and the various other NSA spying programs revealed by Snowden are really harmful to a free society. The opening chapter explains these programs with detailed but understandable language. Even readers already aware of Snowden's actions might be shocked by just how sinister these systems are.

The government is tapping into our phones, televisions, and laptops. Cops are tracking and predicting our movements. The post office is stealing our mail. And, all the while, bullies are using these monitoring programs to squash their political rivals with no repercussions. And for every sobering, dystopic example of privacy invasion, there's an absurd comic punch line like NSA workers gawking at naked couples through hacked webcams. It's in moments like that where Rall's unflattering, political cartoon art style shines.

"MUCH OF WHAT I SAW IN GENEVA REALLY DISILLUSIONED ME ABOUT HOW MY GOVERNMENT FUNCTIONS AND WHAT ITS IMPACT IS IN THE WORLD. I REALIZED THAT I WAS PART OF SOMETHING THAT WAS DOING FAR MORE HARM THAN GOOD."



BITTERLY COMIC

The juxtaposition of a cartoony drawing style with deadly serious subject matter helps give *Snowden* its heft.

POLITICAL CRIMINAL MINDS

From there, the book turns into a more traditional biography of Edward Snowden himself, and the results are more mixed. Rall's central question is: Why was Snowden the one to leak this data? Approximately 1.4 million Americans had similar levels of access to NSA data, so why didn't they speak up? Rall's attempt to answer this question combines intriguing personal details from Snowden past, armchair psychology, and entertaining but ultimately pointless gossip.

Let's start with what works. Rall compellingly traces Snowden's political awakening, starting from his upbringing in a Maryland town teeming with NSA offices. He wanted to protect his country, but his unpleasant experience in the army with soldiers who "just wanted to kill Arabs" nudged his views in a more Libertarian direction. A smart and tech-savvy guy, Snowden used his talents to land several high-paying government jobs, ranging from CIA employee to NSA contractor. And when the already cynical programmer was confronted with the NSA's secrets, evidence that would shatter anyone's faith in government, he took the steps that he believed were necessary for the good of the United States.

1.4 MILLION AMERICANS HAD "TOP SECURITY" CLEARANCE IN 2011. THIS GAVE THEM ACCESS TO MANY OF THE SAME DOCUMENTS AS EDWARD SNOWDEN.



*DEPARTMENT OF HOMELAND SECURITY;
DEFENSE INTELLIGENCE AGENCY

GOOD QUESTIONS, SHAKY ANSWERS

Though Rall is good at presenting problems, his answers to them make *Snowden* less satisfying than it might otherwise be.

Rall compares Snowden to Thomas Drake, another whistleblower whose attempts to draw attention to wasted 9/11 federal funds ended up reducing him from an NSA executive to an Apple Store clerk. Rall interviews Drake to try and figure out Snowden's mindset. But the responses Rall gets from Drake, like "I hate seeing injustice" and "The government hires loyal people," aren't exactly revelatory.

Other attempts to pick Snowden's brain have issues of their own. Linking Snowden's future actions with bits of his personal history—his lack of education, his time with the Boy Scouts, his parents' divorce—feels like a stretch. And Rall occasionally falls prey to the kinds of tabloid distractions Snowden himself warned the media would use to discredit him. It may be funny that Snowden talked about liking Asian women and the fighting game Tekken on an Internet forum under a pseudonym, but does it really matter?

ONCE UPON A TIME IN AMERICA

Fortunately, *Snowden* bounces back in the later sections recapping Snowden's current status. It's a comprehensive overview of how dire his situation is. American politicians have exerted so much pressure on other countries that only Russia will house Snowden. Meanwhile, the NSA is going unpunished, even though recent court rulings have determined that the agency committed crimes far more illegal than Snowden's. And slowly but surely, people are once again ignoring how thoroughly their privacy is being compromised. Encouraging stuff.

With its succinct prose and pictures on every page, *Snowden* reads like a children's book for adults. But it's also an entertaining, exhaustive, and approachable look at an incredibly important and relevant topic, because information security affects everyone—whether you like it or not.



THREE DIMENSIONS MADE TWO

Snowden (top) is a fascinating subject for a biography, though Rall (bottom) falls short of capturing the nuances of his actions and personality.



What We Love Most This Month

BY STEPHANIE MLOT



AIRBOARD 1.0

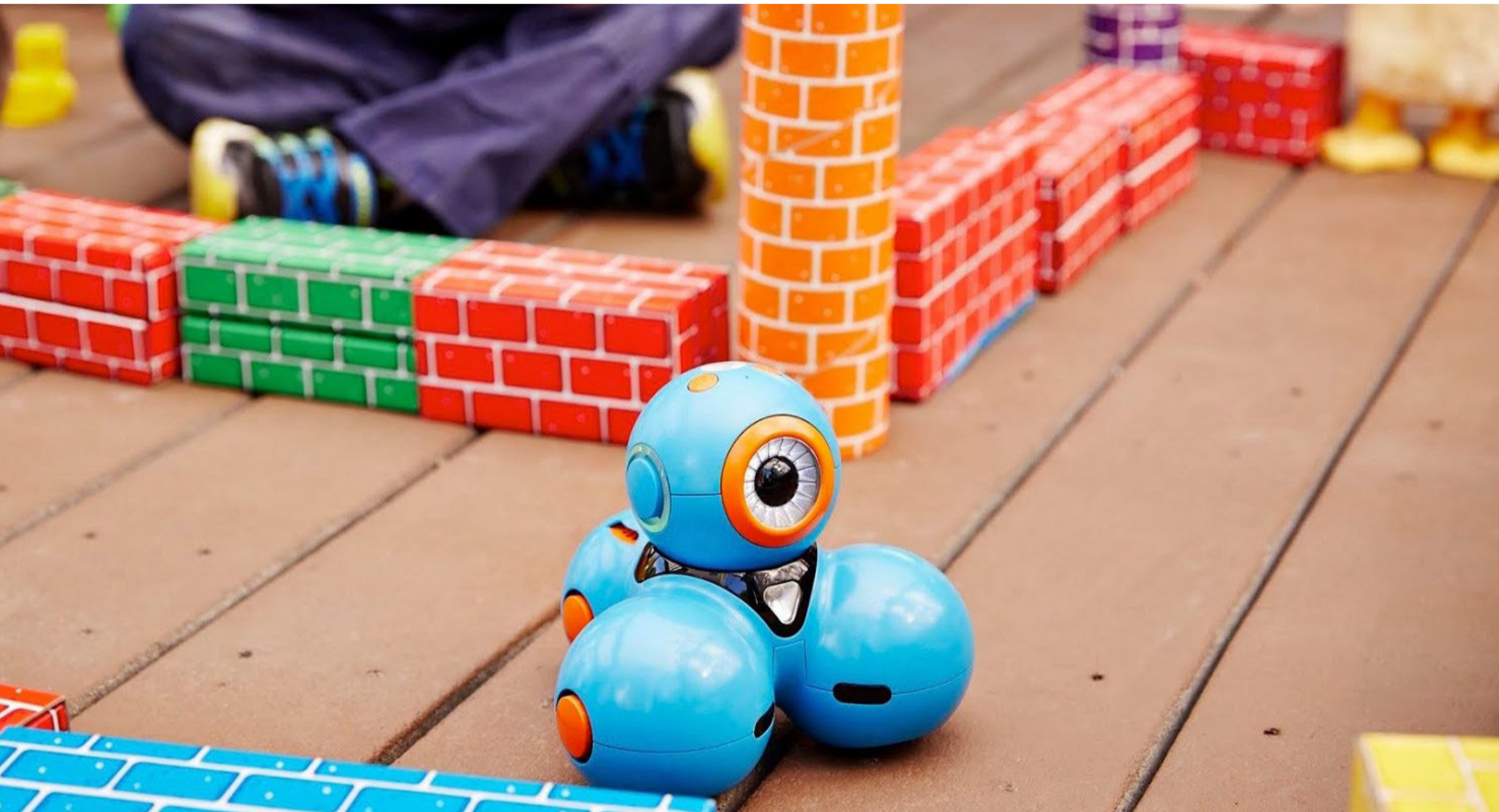
Forget the hoverboard: The AirBoard can take you anywhere you need to go. Just lean in the direction you want to move and push your toes down. Using pressure pad recognition, the board will spin and float on your command. The self-balancing board operates at 10mph for 12 to 14 miles between charges. Roads? Where the AirBoard is going, you don't need roads. (Actually, you do...)

\$999 theairwheelusa.com



What We Love Most This Month

BY STEPHANIE MLOT



DASH & DOT

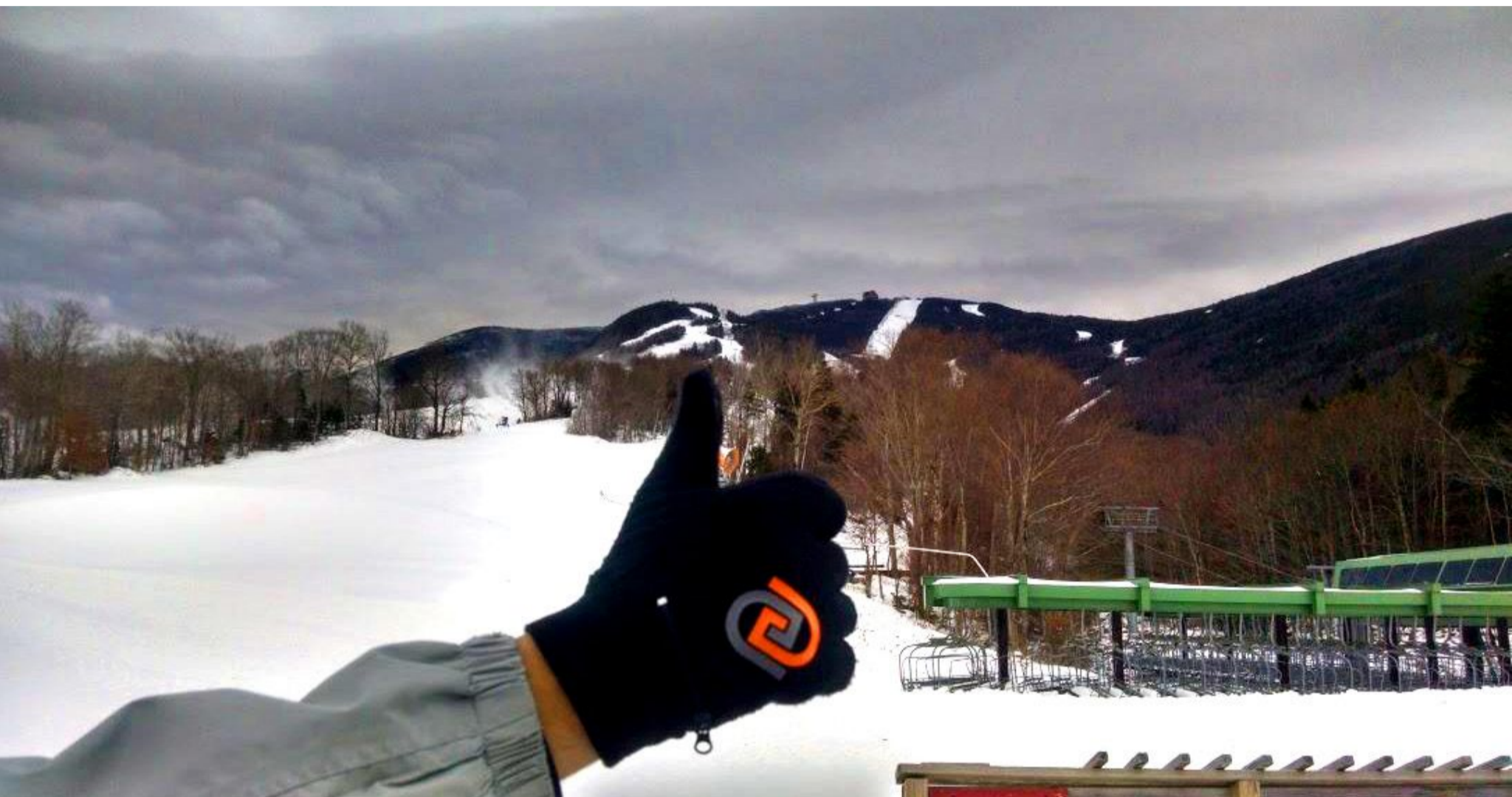
Dash and Dot are aimed at young kids, who can use tablet- and smartphone-based apps to control the lovable little robots. The play-based programming system combines music, stories, and animation so children learn the basics of computer programming while the bots move, make sounds, light up, and even interact with each other. The robots are compatible with a handful of Apple and Android phones and tablets.

\$229.99 makewonder.com



What We Love Most This Month

BY STEPHANIE MLOT



GOGLOVE

Remember the 1990s, when you could just clap your hands twice and turn on or off the light? GoGlove is the 21st-century equivalent, albeit less noisy. The Bluetooth glove comes with AirTap technology to let the wearer control a smartphone's music, apps, and camera, or a GoPro action cam. Tap your fingers to change tracks, play or pause tunes, change the volume, snap photos, and capture video. Once the snow melts and flowers bloom, strap the control module onto your bike, shirt, or keychain for continued control.

\$99 goglove.io



What We Love Most This Month

BY STEPHANIE MLOT



INCIPIO OFFGRID BATTERY CASES

Owning a smartphone is as much about fashion as function. The offGrid Battery Case promises hours of extra battery life and full device protection for a range of Apple and Samsung phones. Have a Galaxy S6? Simply toggle the switch to Storage mode for instantly expanded space, thanks to a microSD slot built into the case (the card isn't included), and take advantage of overcharge protection, NFC pass-through, and fast-charge circuitry.

\$89.99 incipio.com



What We Love Most This Month

BY STEPHANIE MLOT



UO SMART BEAM LASER PROJECTOR

Need to liven up your backyard bash? Just grab the UO Smart Beam Laser Projector, and turn the side of the house into a movie screen. The miniature machine promises a 720p high-definition picture from the “world’s smallest HD LCOS laser projector.” Standing only 2.2 inches, the Smart Beam Laser comes with a built-in speaker and rechargeable 4200mAh battery for up to 2 hours of fun.

\$420 uobeam.com



Opinions

EVAN DASHEVSKY

TIM BAJARIN

DOUG NEWCOMB

**This is a last
gasp of an
outmoded
media
paradigm.**

EVAN DASHEVSKY
FOX NEWS TO CORD CUTTERS:
DROP DEAD

Fox News to Cord Cutters: Drop Dead

The August 6 Republican presidential debate on Fox News Channel was, to be sure, An Event. So why was it almost impossible to watch it live if you didn't have a cable subscription?

Yes, it's 2015, and you still have to pay a cable provider for the privilege of watching a live digital feed on the Internet. The debate was streamed on Fox News' website and many associated app platforms, but they all required a cable subscription log-in. To put it another way: You had to pay a middleman who may not have even been in the middle.

Clips from the debate were uploaded to FoxNews.com throughout the evening, and the debate was archived on the site the next day for those without a subscription. (How very 2010 of them.) But cord cutters who wanted to join the live conversation surrounding the debate were simply out of luck.

It's not just Fox News sticking it to the growing number of consumers who refuse to take part in the cable-industrial complex. CNN will only offer viewers a free 10-minute preview of its September 16 GOP debate via its website and iPad app before requiring a subscription log-in. (We should note, however, that CNN's broadcast is viewable online as part of Dish Networks' Sling TV service, which delivers cable subscription-free live broadcasts over the Internet.)



Evan Dashevsky, a features editor for *PC Magazine*, has been writing about tech since 2010 for such publications as *PC World*, *TechHive*, *ExtremeTech*, and *Digital Times*.

Requiring a cable subscription to watch a live presidential debate—or any big event—has no place in today’s mediascape. This is a last gasp of an outmoded media paradigm. You can sell content directly to consumers on a per-view basis (see as iTunes or iBooks) or include it in a subscription platform (Hulu or Sling), but don’t punish consumers who don’t want to sign up for a cable package full of channels they will probably never watch. ISPs need to get out of the content fascism business and concentrate on providing Internet access.

A LEGACY OF ANNOYING

These paywalls are likely the result of legacy contracts with providers that pay networks like Fox News for their content. In fact, the cable channels are just as much victims in all this—they are getting locked out of potential viewers and revenue. The Fox News debate featured “limited commercials”; surely more advertisers would have loved to get their message in front of all the eyeballs that watched the highest-rated primary debate ever and the highest-rated non-sports cable broadcast ever (and they would pay more for such an opportunity). And let’s not forget that the national parties and the candidates are also missing out by not getting their messages heard by as many potential voters as possible. There are mostly losers here.

The takeaway is this: These paywalls need to go. All Americans—except for those who are executives at large cable providers—can agree on this. In fact, there are two very strong (if completely conflicting) arguments against these paywalls, which could be described as the “blue state argument” and the “red state argument.” Like most issues, these arguments have their

roots in very different views of the world. But, in the end, proponents of each only want what is best for the nation.

First, the egalitarian-minded blue state argument. Presidential debates are important. The debate may be facilitated by a for-profit entity like Fox News, but the content should be made available to everyone on any screen without a paywall of any kind. Technology makes this dissemination possible, and broadcasters should take advantage of it. Public affairs programming of this nature helps a democracy thrive; it should not be held hostage.

Let's say you are completely repulsed by the notion of giving goods away to those who haven't paid for them. Then perhaps you can agree with the free-market-leaning red state argument: The cable networks are for-profit entities, and a live stream would allow them to greatly expand their audience and potential revenue stream.

Americans will never agree on most issues. But regardless of whether we root for the red team or the blue team, surely we can all come together and embrace new technologies. Let the people of the United States join together to say to our cable companies the words made famous by Mr. Donald J. Trump: "You're fired!"



Regardless of whether we root for the red team or the blue team, surely we can all come together and embrace new technologies.



How the Oculus Rift Could Improve Baseball

It seems clear to me that the first generation of apps for the Oculus Rift will be targeted at vertical markets, specifically gaming. The Rift's initial price and design makes it a bit expensive for ordinary consumers, and until it can work as a standalone device, with all the intelligence inside the headset itself, its reach will be limited.

But once it reaches that state, I have what I believe will be a killer app that could have a serious impact on America's pastime.

A few weeks back, I was watching my beloved San Francisco Giants on TV, and their pitcher, Ryan Vogelsong, threw what looked like a perfect strike. But the umpire called it a ball. Replays showed that it was clearly a strike, but the blind-as-a-bat ump called it differently. Even though they're not allowed to protest balls and strikes, Vogelsong and Giants manager Bruce Bochy both gave the umpire their humble views on the matter—and were unceremoniously tossed from the game. Thankfully, the Giants won, but that call seriously angered Giants Nation. I brooded about it for days and am still mad.

I have often thought that technology could help provide more accurate calls when it comes to balls and strikes. Replays slow



Tim Bjarin is the president of Creative Strategies and a consultant, analyst, and futurist covering personal computers and consumer technology.

down the game, but lasers or sensors built into home plate would let the umpire get the call right. It appears, at least on paper, that the strike zone is well defined.

Yes, each batter's stance helps define these rules, but let's face it: The pitch crosses the plate so fast that unless umpires' reactions are stellar, they're bound to make mistakes. But technology can make sure the umpire gets the call right every time. MLB already uses instant-replay tech, which has brought a great level of accuracy to live field calls, so why not take the next step and use technology at home plate, too?

This is where Oculus could make a difference. MLB rejected the laser/sensor idea for various reasons, including being able to transmit that info in real time so the umpire can make an instant call. But if an umpire were using the Oculus Rift with an algorithm that takes into account all of the real-time parameters of home plate and the player's body position, there's no reason that every call couldn't be the correct one.

The Oculus Rift might actually be overkill; whatever solution the MLB selects would need a transparent lens in order for the umpire to see the game. Perhaps Microsoft's HoloLens?

This idea was tested in an independent league's game between the San Rafael Pacifics and the visiting Vallejo Admirals back in July. Balls and strikes were called by the PITCHf/x system, which also created the yellow lines for the NFL. In this test, an umpire was in a booth watching

pitches, which were tied to the PITCHf/x system and called over the loudspeaker. This is an interesting approach, but I still think the MLB should give the plate umpire VR or AR glasses as a tool to make more accurate ball and strike calls.

Will this ever happen? Well, I never thought MLB would do replays of live field play, and that's now part of the game. I know that traditionalists will push back against this idea, but there is a technology answer to this issue. Using some type of glasses or goggles tied to sensors or lasers that give instant feedback to an umpire could really add a new level of fairness to a sport that is part of America's fabric of life. I suspect millions of people would like to see the game played fairly at all times.



There is a technology answer to this issue.



Do Cars Need Built-in Tablets?

As smartphones skyrocketed in popularity, automakers tried to replicate the devices' user interfaces in their dashboards. The result was infotainment systems such as MyFord Touch and Cadillac CUE, which were met with discontent from car buyers and the media.

Now, two German automakers are going down a similar path, but taking the concept a step further. When the redesigned Audi Q7 crossover and BMW 7 Series sedan hit showrooms later this year, each will come with a standalone tablet.

Videos on the Audi and BMW consumer websites show that the tablets are primarily designed to let those in the back do things like operate the stereo, change climate settings, enter a destination into the navigation system, and, in the case of the BMW 7 Series, adjust cabin lighting and seat position, and draw the rear sunshades.

Another feature shown in the videos is connecting to a vehicle's onboard Wi-Fi hotspot to let passengers surf the Web and stream video content. Audi and BMW obviously consider the tablets a way to replace clunky and outdated DVD-based rear-seat entertainment. The 10.2-inch Audi



Car tech expert Doug Newcomb has written for *Popular Mechanics*, *Road & Track*, and other publications, and is the author of *Car Audio for Dummies*.

tablet even snaps into a seatback mount; the 7-inch BMW tablet fits into a charging dock between the back seats.

The price of the Audi tablet hasn't yet been announced, but BMW will offer the 7 Series tablet as part of a \$2,700 entertainment package option or a \$3,900 comfort package, according to Automotive News. Although features in high-end vehicles like the Q7 and 7 Series usually trickle down to other models and non-luxury cars, these prices put vehicle-specific tablets out of reach of the mainstream.

“People in the minivan set are willing to buy Velcro straps and hook something onto the back of the headrest,” Danny Shapiro, senior director of automotive at Nvidia, which produces the Audi tablet's processor, told Automotive News. “For this to become part of the minivan culture, the price point is going to have to go down.” And passengers in, say, a Chevy Cruze with 4G LTE connectivity and in-cabin Wi-Fi can just use a much-less-expensive iPad.

Audi points out that the screen of its tablet is made of automotive-grade safety glass so that it will shatter instead of crack into hazardous shards in a crash. And the tablet is designed to withstand extreme heat and cold—from -44 degrees to 185° F—that could render ordinary tablets inoperable.

Tapping into a car's electronics is also a major advantage for the Audi and BMW tablets over handing the backseat passengers an iPad or generic Android tablet. And this could be a tactic to thwart the advance of Apple and Google into car electronics.

Five years after MyFord Touch and Cadillac CUE were introduced, automakers still struggle with how to merge the smartphone with the dashboard. But now Apple CarPlay and Google Android Auto have stepped in to provide a solution by projecting familiar apps and the UI of the companies' respective operating systems onto a vehicle's in-dash display.

Automakers insist that their own infotainment systems can coexist with CarPlay and Android Auto, and that the two platforms can't integrate with core vehicle systems. But Apple may have plans to tap into vehicle electronics with CarPlay, according to a recent *New York Times* article, and both the Audi and BMW tablet use Google's Android operating system.

Given the difficulties automakers have experienced successfully integrating the smartphone experience into the car, as well as other factors such as cost, vehicle-specific tablets have a good chance of becoming the modern equivalent of the short-lived car phones from 30 years ago.



Apple may have plans to tap into vehicle electronics with CarPlay.



Reviews

CONSUMER ELECTRONICS

PREVIEW: Samsung Galaxy Note 5

OnePlus 2

Bowers & Wilkins P5 Wireless

GoPro Hero4 Session

LG 65EG9600

HARDWARE

Acer Revo One

Asus Chromebook Flip

Getac F110

SOFTWARE & APPS

Kaspersky Internet Security

Our Favorite Apps for September

Is the New Note Noteworthy? Not Quite

One and a half steps forward, one step back. The Samsung Galaxy Note 5 gives you the best smartphone screen on the market, and it continues to be endlessly productive, thanks to its slick S Pen stylus. But intoxicated by the Galaxy S6's flashy design, Samsung chooses form over function in ways that aren't really necessary on a phablet, and some of the new Note's flagship features are incremental enough that I don't see a convincing reason for Galaxy Note 4 owners to upgrade.

DESIGN AND PHYSICAL FEATURES

Samsung goes for the full S6 treatment with the Galaxy Note 5, encasing it in a sealed glass-and-metal body with gently curved sides. At 6 by 3 by 0.3 inches (HWD) and 6 ounces, it's 0.1 inch narrower than the Note 4, but you lose the memory card slot, the removable battery, and the grippy texture of the Note 4's back. This phone is a lot more slippery; it's not an issue with the smaller Galaxy S6, which can be gripped easily in one hand, but here it's a problem.

The 5.7-inch, 2,560-by-1,440-pixel display is bright, rich, and beautiful.

PREVIEW:
Samsung Galaxy Note 5

Price: TBD

Not Yet Rated



Ray Soneira at DisplayMate Labs analyzed it and found that it's noticeably brighter and more power-efficient than the screen on the Note 4, which is in turn far better than the display on the iPhone 6 Plus. It's also brighter and less reflective than the LG G4 screen. Samsung has always been a leader in displays, and the Note 5 takes things to the next level.

I am not one of those “removable battery or death” people. For instance, I really like the Galaxy S6 and the Motorola Droid Turbo, two phones with sealed batteries. Shrinking a single-handed phone to the smallest possible size by way of a sealed-in battery makes sense. And the 3,000mAh cell here has plenty of power: We achieved 8 hours, 30 minutes, of nonstop video streaming over LTE at maximum volume. That's longer than the Note 4, and pushes twice the battery life of the iPhone 6 Plus. Like the Note 4, the Note 5 uses Qualcomm Quick Charge, which charges the phone in less than 2 hours with a compatible adapter.

But although the Note 4 has a microSD card slot to add up to 200GB of storage, the Note 5 is stuck at 32GB or 64GB with no card slot. And there's not even a 128GB option as there is with the iPhone 6 Plus. This design choice is just unnecessary. With phablets, bigger actually can be better; you're not trying to save millimeters to slim the phone down.

Samsung also moves the single speaker to the bottom of the phone from the back, next to a USB 2.0 port; that's a missed opportunity as well in the new era of fast and reversible USB-C. The signature S Pen stylus now pops out so you don't have to pull it out, and it's flatter and thus easier to hold, with a more attractive two-tone design.

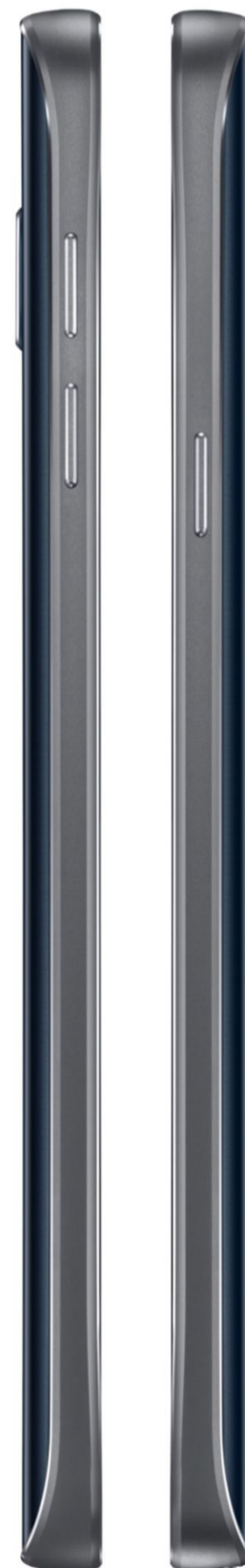
NETWORKING AND BATTERY LIFE

Our European test unit showed poor reception on T-Mobile's network; we were advised by Samsung that the band layout is all wrong for the U.S., so we're not

Samsung Galaxy Note 5

PROS Best phone screen available. Excellent battery life, performance. S Pen is still unique among phablets.

CONS Battery not removable. No card slot for storage expansion. Some gimmicky features.



going to draw conclusions about call quality and LTE speeds from this device.

We were able to test Wi-Fi speeds, though, and they were terrific. Compared with the Note 4, both devices sustained 30Mbps at 25 feet away from a Verizon FiOS router. The Note 5 maintained 18Mbps another 15 feet away, through a wall and a door, while the Note 4 showed 8 to 12Mbps. Credit that to support for dual-band 802.11ac. The phone also supports GPS, NFC, and Bluetooth 4.1.

Like the Galaxy S6, the Note 5 supports Samsung Pay, a payment service that's promised to work with every form of credit card accepted in the U.S. The service isn't launching until late September, so it's impossible to say right now whether it works well. The phone also supports a new form of high-res wireless audio (UHQ-BT, an ultra-high-definition wireless lossless audio codec) that works with exactly one pair of high-end Samsung headphones—the Samsung Level On Wireless Pro—which is not yet available. It also supports Qi and PMA wireless charging, two technologies we've been hearing about for years, but have so far failed to take off. As with the Note 5's design, I feel like Samsung is adding these extra features just to tout innovation, rather than including them to improve usability.

PROCESSOR AND PERFORMANCE

Built around one of the fastest smartphone processors available, the Note 5 has the same 2.1GHz eight-core Samsung Exynos 7420 CPU as the Galaxy S6, and it handily bests Qualcomm's Snapdragon 810 on multiple benchmarks.

AnTuTu benchmark scores were between 67,000 and 69,000, Geekbench scores were in the 1,450 range, and the Note 5 scored 37 frames per second (fps) in the GFXBench T-Rex test. Among phones currently available today, only the iPhone 6 and 6 Plus, with Apple's A8 processor, scored higher. No other



Android device can keep up on processor scores, although the high screen resolution gives the phone a bit of a disadvantage against devices with lower-res screens when it comes to graphics tests.

The Note 5 runs Android 5.1.1, with an update to Android Marshmallow promised in the future. At this level, you expect apps to run smoothly, and they consistently did throughout the test period.

Too many words have been spilled about the TouchWiz UI layer, but by now you should know that Samsung's Android, although perfectly functional and compatible with other phones, doesn't look exactly like Google's Android. All the widgets and icons are different, and Samsung has its own replacements for the camera, contacts, gallery, calendar, and so on. In some cases these replacements are necessary, so you can use the S Pen. For instance, S Planner is a calendar you can scribble into. In other cases, well, it's just Samsung.

But let me praise the S Pen once again. There is no other stylus for Android that offers better sensitivity and input speed. And the Note 5 introduces a new mode that launches note-taking as soon as you remove the pen, without unlocking the phone, so you can just start writing even when the screen is off. That, combined with dual-window multitasking, makes the Note series the best Android devices for productivity.

Samsung is also playing up its SideSync app, which mirrors your phone's screen on your PC, letting you easily drag and drop files, send messages, and tether your phone for Internet access. With the My Knox app, new this year,



you can create separate, protected workspaces for personal and work modes, with different accounts and sets of settings that don't mix. That's another boon for productivity, and it prevents you from sending the wrong messages from the wrong account. Unfortunately, the Note isn't a dual-SIM phone, so you can't have separate home and work lines. That would be revolutionary on a major U.S. carrier device.

MUSIC AND PHOTOGRAPHY

The Note 4 already supports high-res, 24-bit/192kHz audio. The Note 5 purportedly “upscales” lower-quality audio into a high-res mode; the truth is, this is impossible, as you can't replace what was lost in a lower-quality file. The upscaling effect seems to push vocals back a little in the mix as compared with the same track heard on a Galaxy Note Edge. This isn't what you want with most vocal music. Also, oddly, the headphone jack delivered less volume than the one on the new Galaxy Note Edge. Using Bowers & Wilkins P5 headphones in wired mode, I could get the Edge to peak at 102dB; on the same track, the Note 5 could only hit 96dB.

The camera here is considerably better than the Note 4's. It's much more like the Galaxy S6's, which is one of the best smartphone cameras on the market. The rear camera has the same 16 megapixels, and the front camera has been upgraded from 3.7 to 5MP. Autofocus is much faster than on the Note 4, reaching Galaxy S6 or iPhone levels of speed. Low-light performance is dramatically improved as well. On standard outdoor shots, it was much more



difficult to see the difference from older Note models, but the experience of taking pictures is still better thanks to the faster focus and faster HDR. The main camera records 4K video at 30fps. The front camera records 1080p video at 30fps. Video quality is good at either setting.

COMPARISONS AND CONCLUSIONS

We're expecting many new phablets to come out soon, but regardless, the Galaxy Note 5 is not a groundbreaking blockbuster. Prioritizing thin and smooth over capacious and configurable makes sense for a small, one-handed phone, but seems less valuable on a phablet. Otherwise, the faster processor, brighter screen, and improved camera are all real pluses, but not enough to tell Galaxy Note 4 owners to make the jump. It's hard to get excited about Samsung Pay when we still haven't seen it actually work in the wild, and things like high-resolution audio and wireless charging just seem like a random grab bag of features added to build up a checklist.

The Note 5's S Pen is still the single best differentiator I've seen. Writing on your phablet makes perfect sense, and being able to start writing when the screen is turned off makes it even better. But you also get an S Pen with the great-looking Note 4, which is now less expensive and does most of the same things. Although I'd recommend the Note 5 if the Note 4 went off the market, it's an incremental improvement rather than a significant one.

SASCHA SEGAN



A High-End Unlocked Phone That's Also a Great Value



The OnePlus 2 is every bit the “flagship killer” the rogue smartphone manufacturer promises, packed with the latest in mobile tech at an unbelievably low price of \$389 for the 64GB model. And that’s unlocked. The company’s much-maligned invite-only retail model remains, but that unconventional approach helps profit margins, so few competitors can deliver a higher price-to-performance ratio than OnePlus. The OnePlus 2 is a better value than high-end unlocked phones like the ZTE Axon Pro and easily outclasses budget-friendly options like the Alcatel OneTouch Idol 3. It’s our new Editors’ Choice for unlocked smartphones, offering unparalleled value and performance in a spectacular complete package. You just have to be lucky enough to get an invitation to buy one.

DESIGN, FEATURES, AND NETWORK PERFORMANCE

OnePlus doesn’t stray too far from its inaugural effort, the OnePlus One, focusing instead on subtle refinements and tight execution. The wonderfully textured sandstone finish helps assuage any plastic prejudices, and the new rigid metal frame exudes quality. At 5.98 by 2.95 by 0.39 inches (HWD) and 6.17 ounces,

OnePlus 2
(64GB, Unlocked)

\$389



the OnePlus 2 is on the large side by conventional standards—much bigger than Samsung’s Galaxy S6 (5.65 by 2.78 by 0.27 inches, 4.87 ounces) and only a hair smaller than the ZTE Axon Pro (6.06 by 2.9 by 0.37 inches, 6.3 ounces). Pleasantly stiff Power and Volume buttons line the right edge, and a dedicated alert slider on the left edge mutes notifications. Along the bottom edge is a new USB-C port. The backplate peels off to reveal the dual-SIM-card slot and sealed battery, and OnePlus sells swappable backs in exotic materials like rosewood and Kevlar.

The 5.5-inch, full HD LCD might not wow the spec-obsessed, but the display nearly matches the S6’s blinding maximum brightness, and colors and whites look cleaner and true to life. Contrast is excellent, as are viewing angles. Below the display is a combination Home button and fingerprint reader flanked by programmable capacitive navigation buttons. The Home button is also capacitive, and OnePlus also lets you opt for on-screen software navigation buttons, if you’d prefer.

Sold completely unlocked, the OnePlus supports a wide range of wireless spectrum. In the U.S., it will work on AT&T and T-Mobile with full support for 4G LTE on both carriers. I tested with an AT&T SIM, which worked without any additional configuration. Call quality was excellent in my tests, putting the OnePlus One’s struggles in the rearview mirror. The earpiece is punchy and offers solid dynamic range with no distortion at maximum volume. Callers’ voices sound full and intelligible, and transmissions through the mic were equally clean with natural tone. Noise cancellation works well for moderate indoor distractions, but the OnePlus 2 still let through a good amount of noise from a busy city street in testing. The speakerphone pumps out loud volume, but it sounds very harsh at top levels.

The handset supports 802.11b/g/n/ac Wi-Fi on the 2.4GHz and 5GHz bands, as well as Bluetooth 4.1 and

OnePlus 2 **(Unlocked)**

PROS Incredible price-to-performance ratio. High-end design. Clean Android software with useful tweaks.

CONS Invite-only retail model. Runs warm. Some bugs.



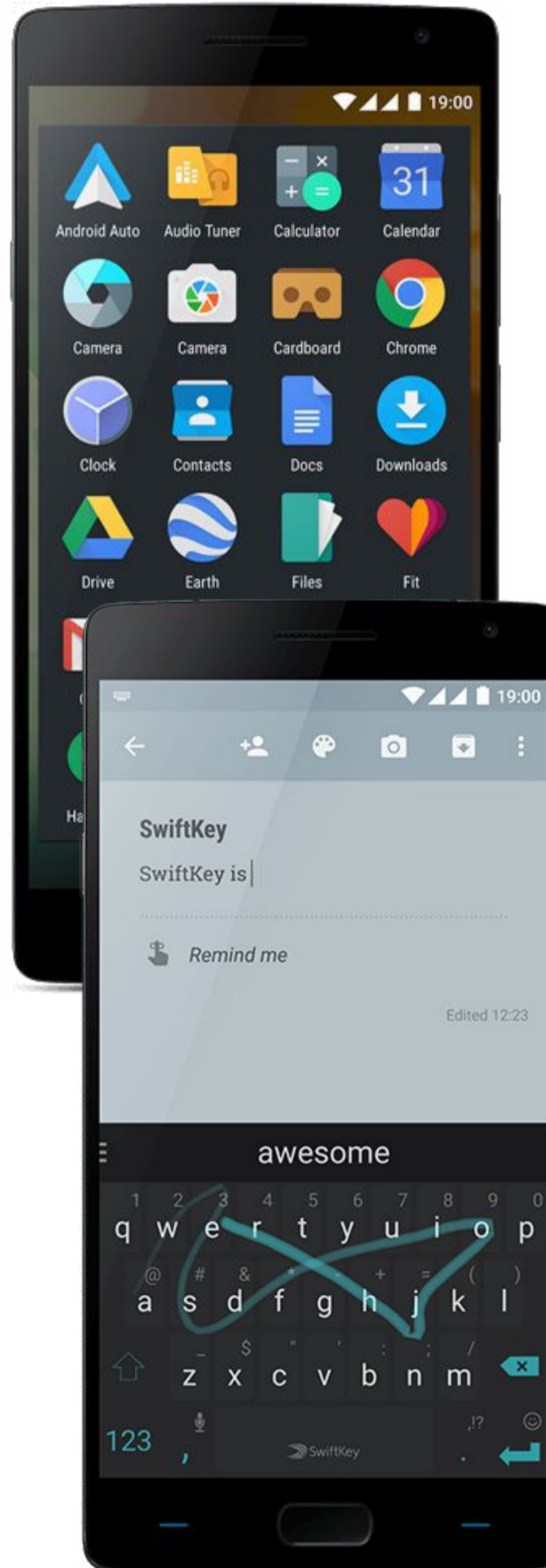


GPS. In side-by-side tests, the OnePlus 2 was able to keep pace with the Galaxy S6 in Wi-Fi speed, notching an impressive 115Mbps peak download rate compared with the S6's 118Mbps. Upload speeds lagged, hovering around 6Mbps (the S6's average was 10Mbps).

PERFORMANCE AND ANDROID

The original OnePlus One was notable for being among the first affordable unlocked phones to use a high-end Qualcomm chip. That tradition continues in the OnePlus 2, which has a Qualcomm Snapdragon 810 SoC clocked at 1.8GHz (slightly lower than the ZTE Axon's 2GHz Snapdragon 810). The phone gets noticeably warm at times, but not uncomfortably so. Benchmarks were right in line with what we've seen from phones like the Axon and the LG G4, and numbers didn't dip after running intensive games like Grand Theft Auto: San Andreas for an hour. If you opt for the 64GB model, you also get 4GB RAM, versus 3GB for the 16GB model (\$329). That means strong multitasking chops; I could jump between resource-heavy games or apps without losing my place or reloading. I noticed a few bugs during my testing period, including intermittent lag between app launches and some random, but infrequent, Home button unresponsiveness.

OnePlus parted ways with the CyanogenMod team that handled the software for OnePlus One. The OnePlus 2 runs Android 5.1 with OnePlus' OxygenOS tweaks on top. Thankfully, OxygenOS



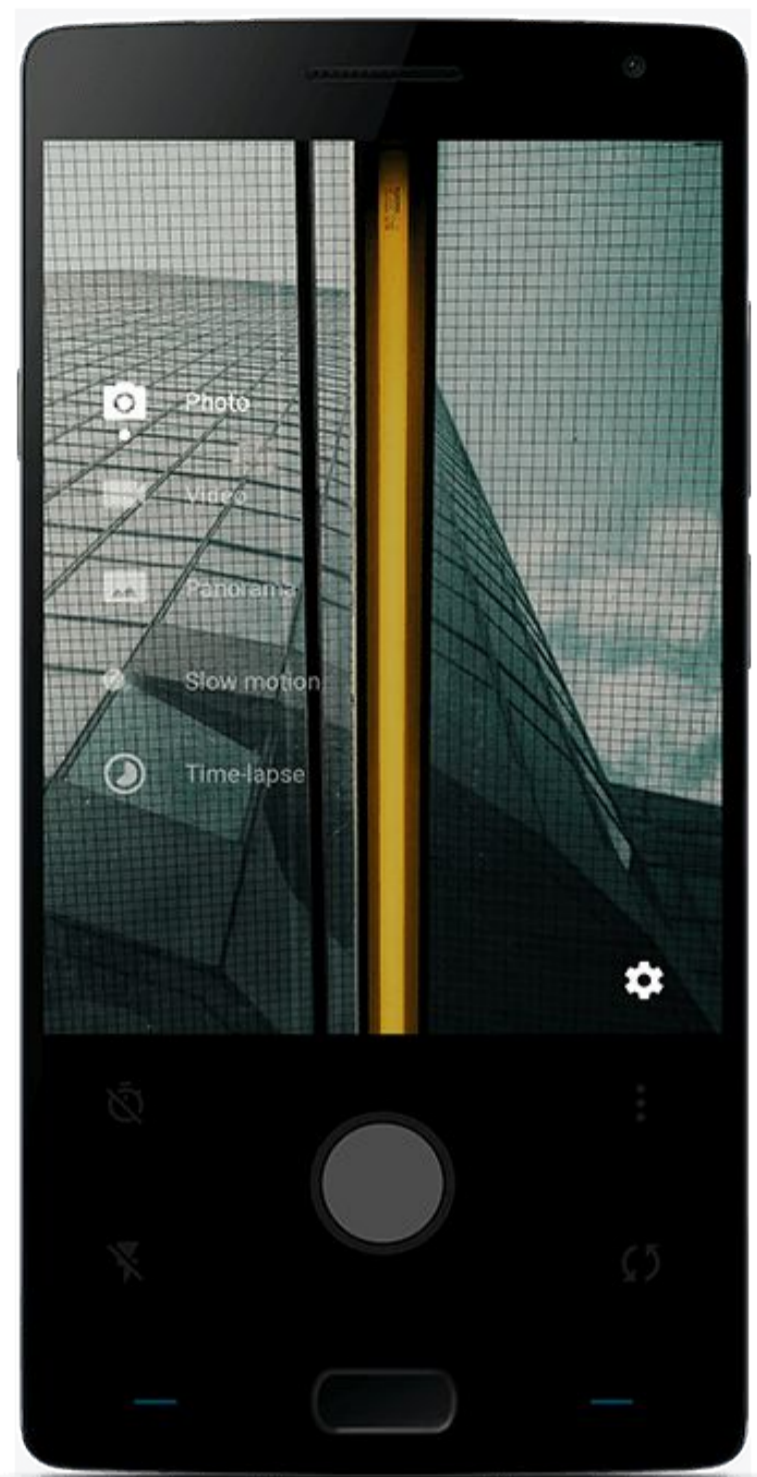
is very close to stock Android, with only a handful of thoughtful, unobtrusive additions. Gestures like double-tapping to wake and drawing a circle to open the camera are easily toggled on or off. You can also opt for software navigation buttons or just swap the Back and Recent Apps functions on the capacitive buttons. The most visible addition is the optional Shelf home screen feature. The Shelf is an adaptive screen that shows your frequently used apps and contacts, as well as a space for widgets. I don't find it all that useful, though, and it can easily be disabled.

Our 64GB test unit came with 53.01GB available out of the box. Bloatware is essentially nonexistent here: The only two preloads are an audio tuning app and SwiftKey's popular keyboard replacement.

In our battery rundown test, which involves streaming a YouTube video over LTE with screen brightness set to max, the OnePlus 2 lasted 5 hours, 19 minutes. That handily beats the Alcatel One Touch Idol 3's 4 hours, 12 minutes.

CAMERA AND CONCLUSIONS

There's a 13-megapixel, rear-facing camera with optical image stabilization. The 1/2.6-inch OmniVision image sensor is the same physical size as the Sony IMX240 image sensor featured on the Galaxy S6. Image quality was very good in my tests, and shots looked well-balanced and detail-rich in bright outdoor light. Under low indoor lighting, the OnePlus 2 was still able to eke out some nice detail and good-looking images, but results weren't quite up to the S6's. Image noise isn't overwhelming, but the OnePlus 2's shots showed more grain and smudged details, which could be a sign of overaggressive



SPOTTING SHOOTER

The camera on the OnePlus 2 takes excellent-looking shots in bright-light scenarios, but stumbles a bit more in dim, indoor settings.



noise reduction. For example, lettering on labels or books was more legible on the S6's shots in my test photos. Color accuracy is a strength here, though, as everything looked more true to life than Samsung's often oversaturated renditions. Focus and capture speed lag aren't nearly on the same level as with the S6's camera, which can make capturing action in low light with the OnePlus 2 tough. Video quality tops out at 4K, but footage looks slightly jarring due to lower frame rates. Full HD video quality is excellent and right in line with the Galaxy S6's output.

The OnePlus One was almost too good to be true—in fact, supply shortages along the way made us wonder if the company ever intended to sell many units in the first place. Now that OnePlus has had a year to work out the kinks, we're ready to put a little faith back into the company and its ability to actually get phones into customers' hands. The OnePlus 2 retains the power, polish, and aggressive pricing of its predecessor, making it the unlocked phone to beat and our Editors' Choice.

EUGENE KIM



**PHONE GOT
BACK(S)**

Don't like the way your OneTouch 2 looks? Replace the backplate with a new one in a selection of unique, distinctive materials.



**Bowers & Wilkins
P5 Wireless**

\$399.99



Stylish Headphones That Earn Their High Price



There's no shortage of Bluetooth headphones at the \$400 price point, but the Bowers & Wilkins P5 Wireless may very well sit at the very top of this populous mountain. At \$399.99, the on-ear headphones are a significant investment, to say the least. But too often, we test headphones in this high price tier that try to justify their cost by throwing in a multitude of extra features. The P5 Wireless earns its price in two ways: It's an exquisitely, thoughtfully designed product, and it delivers some of the best wireless audio we've heard.

DESIGN

Like the design changes made to a sports car line from year to year, the tweaks most Bowers & Wilkins products receive whenever the lineup gets an update are subtle. The signature looks of the P5 series are all present—supra-aural black leather pads with ample cushioning and perforated leather over the two 40mm drivers, the aluminum frame that twists into the earcups like a spiral staircase, and the black leather headband, with its stitching reminiscent of a luxury leather glove. The understated, classy P5 lineup is easily one of the best-looking headphone pairs made in the last decade.

The P5's Power switch is located on the right earcup, and doubles as the Bluetooth pairing button. Pairing was quick and simple with an iPhone 5s, and when the headphones are powered up again they auto-pair with your device if it's in range. The right earcup also houses a pinhole microphone for phone calls, and three control buttons—two for adjusting volume (these work together with, not independently of, your mobile device's volume), and one for controlling playback, navigating tracks, and managing your phone calls.

A micro USB cable connects to the right earcup for charging. It's a shame that headphones this expensive don't come with a dedicated wall plug; you'll have to use your computer or your own USB wall charger.

The P5 Wireless can also be used in passive, wired mode—the left earpad easily twists off, and the included 3.5mm cable plugs in just below the driver, held in place securely by the earpad, which itself is secured by magnets once you replace it. It's a clean design that also ensures your cable won't disconnect accidentally, but I have a feeling many users will wish that Bowers & Wilkins had provided an in-line remote for accepting phone calls, as well. At this price, that's a surprising omission.

Bowers & Wilkins P5 Wireless

PROS Fantastic audio performance. Smart, handsome design with secure, comfortable fit. Wired, passive mode automatically shuts off battery.

CONS Expensive. Included cable lacks remote control.





A REAL LOOKER
The upscale,
modern design of
the Bowers &
Wilkins P5 Wireless
is secure and
comfortable, too.

Just about everything else concerning the design is dead-on—the detachable cable, for instance, will power down your headphones when you connect it, saving as much battery life as possible. You’d think more manufacturers would make this feature standard, but a surprising number of high-end models don’t have it.

The P5 Wireless ships with a handsome carrying pouch with a black, quilted surface and a flap that closes magnetically—the headphones fold down flat at hinges to slide easily into the pouch.

Bowers & Wilkins claims the P5 Wireless has a 17-hour battery life, but your results will vary depending on your volume levels.

PERFORMANCE

On The Knife’s “Silent Shout,” a track with tremendous sub-bass content, the P5 Wireless delivers a deep, rich bass response that is both powerful and clean. At top, unwise listening levels, the headphones do not distort on this track, and at moderate, reasonable listening levels, the sense of bass is still palpable and well defined. The lows are not overly exaggerated, but there’s some boosting, for sure—balanced out by a crisp high-end presence.

On Bill Callahan’s “Drover,” which has less deep bass, the P5 Wireless delivers a wonderfully balanced sound signature. Callahan sounds more crisp than rich here, which is ideal—his baritone vocals need no extra help in the low-mids department. The drums on this track, which can often sound gaudy and massive if there’s too much bass boosting, sound natural and full. They’re neither too

thin nor a ridiculous subwoofer-style assault on the ears; the low-end presence anchors the mix without overwhelming it.

The kick drum loop on Jay-Z and Kanye West's "No Church in the Wild" gets the perfect level of high-mid presence to retain its piercing attack, letting it cut through the layers of the mix with authority. The sub-bass synth hits that punctuate this loop are delivered with plenty of thunder—it's a deep, ominous bass sound, and not one that all headphones can recreate accurately. What we often hear are just the raspy top notes of the synth hit, or an overly exaggerated sub-bass presence that upsets the mix's balance. These vocals get the ideal level of bright, crisp high-mid and high frequency presence—things are clear, never too sibilant.

The opening scene of John Adams' *The Gospel According to the Other Mary* is graced with a slightly boosted low end, adding a bit of pleasant resonance and spatial depth to the lower-register instrumentation. But tracks recorded and mixed in this more transparent manner typically have a natural bias toward the mids and highs, and the P5 Wireless lets those frequencies shine—the boosted lows don't upset the structure of the mix, they simply add a bit of punch and vibrancy in sections.

There aren't many Bluetooth headphone pairs that sound more balanced and full than the Bowers & Wilkins P5 Wireless, but at \$400, it's quite an investment. In this price range, another excellent Bluetooth option is the Sennheiser Momentum Wireless, which also offers noise cancellation, but costs more, too (\$499.95). If your budget is more modest, the AKG K845 BT (\$299.95), the Harman Kardon BT (\$249.99), and the Jabra Move Wireless (\$99.99) are all quality Bluetooth options, though obviously they can't quite compete with the P5's audio performance. Even at \$400, however, the P5 Wireless feels worth every penny—it's one of the best Bluetooth headphone pairs we've tested, and it easily wins our Editors' Choice award.

TIM GIDEON



Action Cams Get Small, Simple With GoPro's Latest

Where does a company go after defining and dominating an entire industry segment year after year with few changes to its basic formula? For GoPro, the answer is: smaller, simpler, and more fun. The \$399.99 Hero4 Session marks the first major redesign in the company's vaunted lineup of action cameras, packing largely the same experience into a pint-sized, easy-to-use package. Despite possessing some performance deficiencies compared with the same-price Hero4 Silver, the Session could easily gain a sizable following—it's the point-and-shoot member of the GoPro family, making top-notch action footage more accessible than ever. And with no fussy enclosures and one-button operation, the Session is just plain fun to use. The feature-rich Hero4 Silver remains our Editors' Choice, hitting the sweet spot of price and performance, but casual shooters will be more than satisfied with the Session's output.

DESIGN, FEATURES, AND SETUP

Despite the completely new form factor, there's a distinct GoPro flavor to the Session. It's still boxy by most standards (a roughly 1.5-inch, 2.6-ounce cube), and the lens looks like it was lifted straight off of the larger Hero4. The Session is pocketable, but it still produces a rather unsightly bulge. On top is a multifunction Shutter button and around back is a single

GoPro Hero4 Session

\$399.99



button for both power and pairing. That's it as far as on-body controls go, though there is a slim monochrome LCD that shows shooting mode, battery life, and a handful of menu options. A small door on the side pops open to reveal the micro USB port and microSD card slot. The Session supports cards up to 64GB, but no card is included with the camera.

Unlike every other GoPro, the Session is waterproof right out of the box, without the need for extra housing. In addition to added convenience and peace of mind, that also means your microphones won't be obstructed when shooting in wet conditions. That said, the Session is only waterproof to 33 feet; with waterproof housing, the Hero4 Silver is rated to 131 feet.

The Session's unique design also accommodates a new mounting system with a quick-release latch. And thanks to the cubic dimensions, the camera is more versatile when it comes to mounting position—you can simply unlatch the mount and turn the Session 180 degrees to capture a different perspective. Of course, the camera still uses GoPro's proprietary mounting hinge in lieu of a more standard threaded tripod mount. GoPro includes a number of mounting accessories, one of which swivels easily forward and backward, and a new ball joint mount allows for finer adjustments in any direction.

Setup and use is incredibly straightforward, but you will need to use a mobile device to get the most out of the Session. To pair with a mobile device, simply download the free iOS or Android app, then press the camera's Pairing button. Once paired, you'll be able to view a live feed from the Session and tweak video and photo settings. Unfortunately, you can't view a live feed once the Session is actually recording, so there's no way to be sure about precise framing—this isn't a huge issue, though, as the wide-angle lens reliably captured all of my test subjects without issue.

GoPro Hero4 Session

PROS Compact, low-profile design. Simple-to-use, always-on operation. Strong video quality. Improved audio. Waterproof without bulky housing.

CONS Expensive. Same-price Hero4 Silver performs better. No live-recording preview.



SMALL HERO

The GoPro Hero4 Session is the smallest GoPro yet, though you'll have to sacrifice some performance for the added convenience.



PERFORMANCE AND USE

The Session features a number of shooting modes, ranging from 1440p at 30fps to 480p at 120fps. I shot mostly in 1080p60 or 720p100 for slow-motion shots. Unfortunately, the Session does not support 4K shooting—for that, you’ll need to grab the Hero4 Silver or Black. Still images are captured at 8 megapixels, with options for time-lapse, burst, or single-shot modes.

For such a compact device, the Session performed admirably in my tests. In bright outdoor light video looked excellent, with vibrant colors, crisp details, and accurate exposure. Footage was lifelike and well balanced, but close inspection on larger monitors reveals a few shortcomings. Compared with the Hero4 Silver, the Session is prone to more noticeable compression artifacts that can rob shots of finer detail in small areas. These issues become more pronounced under indoor or low-light scenarios, where distracting noise starts to overtake shots. That’s true of even the best action cams, though, and shouldn’t be the deciding factor in your purchase. Something that might: Like the Hero4 Silver, the Session has no image stabilization system.

Audio quality is improved compared with even that of the Hero4 Silver thanks to a new dual-microphone design and native waterproofing. Unlike other GoPro models, the Session can record strong audio tracks even in wet shooting conditions, whereas older models can only capture muffled tracks in their waterproof housings. The dual-mic design also helps cut down on wind noise, though it doesn’t eliminate it completely.

GoPro also implemented a new QuickCapture mode that sets the Session apart from its peers. It’s essentially always on, ready to shoot at the press of a button. From standby, the Session powers on and starts recording video about 3-5 seconds after you press the Shutter button. Holding down the Shutter button activates a time-lapse, still image mode. This worked reliably every time



GO ANYWHERE

The Hero4 Session's design makes it easier to change mounting positions as circumstances demand. More nice features: It fires off shots quickly, it's small enough not to weigh you down, and it's waterproof right out of the box.

I tried it, even after leaving the Session idle overnight and using it the next morning. That makes capturing candid, unexpected moments that much easier, and I just found it to be a lot more fun to use in casual, everyday scenarios.

Battery life is rated at 2 hours, and I largely found that to be accurate. The Session had no problem lasting through an afternoon of capturing random 30-second clips, and idle battery life appeared strong.

CONCLUSIONS

GoPro breathes new life into its industry-leading line of action cams with the Hero4 Session. It's not only a departure in design, but it also seems to target a more casual audience with its always-ready, user-friendly operation. Video quality remains near the top of the pack, but falls short of what you get from the Hero4 Silver, especially if you want to shoot in 4K. Because it's priced the same as the Silver, the Session will be a tough sell to serious videographers—its primary advantages are more versatile mounting options and ease of use. More discerning adventure junkies should turn their attention toward the better-equipped Silver, which remains our Editors' Choice, or the beefed-up Hero4 Black (\$499.99), which has better performance and can shoot in 4K. Still, for more casual shooters, the no-fuss operation, native waterproofing, and compact design make the Session appealing in the crowded action cam space.

EUGENE KIM

**LG 65EG9600**

\$6,999.99



You Won't Find a Better-Looking 4K TV Than This



We've maintained for a while now that organic light-emitting diode (OLED) technology is the next big step in HDTVs. It's just a shame that it still costs so much, and so few HDTV manufacturers seem to be pursuing it. LG is the only major brand that has consistently released OLED televisions, and it continues to do so with the ultra-high-definition (UHD, or 4K), curved EG9600 series. It presents a superlative picture thanks to its curved OLED panel (the OLED part, not the curved part, offers all of the benefit), just like the EC9700 series before it. It's extremely expensive, but it simply has the best picture you can currently buy, and comes with loads of useful features in a beautiful design.

DESIGN AND FEATURES

LG has once again made an impressive-looking screen in the 65EG9600. The curved panel itself is less than half an inch thick, framed by a silver-colored band that hardly counts as a bezel. The display stretches almost edge-to-edge, trimmed only a half-inch from the silver band. The panel is mounted on a curved plastic case that takes up the lower half of the screen's back. This is where the inputs and electronics are stored. The plastic section also serves an important role as a supportive handhold for setting up and moving the thin HDTV.

A curved, silver-colored plastic base holds the 65EG9600 up almost magically; although the base itself looks solid and tangible, a completely clear strip of acrylic lifts the panel about an inch above it, both steadying the screen and making it appear as if it's floating. A small, curved LG logo hangs down in front of the acrylic support, lighting up when the HDTV powers on. The logo conceals a small control stick that doubles as a Power switch.

Three HDMI ports, three USB ports (including one USB 3.0), and a 3.5mm audio output sit on the plastic part of the back of the screen, facing left. Component and composite video inputs (3.5mm jacks that work with included RCA adapters), an Ethernet port, an optical audio output, a cable/antenna connector, and a service port face downward.

The included Magic Touch remote is larger than previous LG motion remotes, and features more controls. It feels like a curved version of a conventional remote control wand, with a number pad in addition to the standard navigation pad with scroll wheel, Volume Up/Down, Channel Up/Down, color, and other buttons. A small hole for the built-in microphone is at the top of the remote, between the Power and Input buttons. The remote functions as an air mouse, controlling an on-screen pointer with motion sensors.

The 65EG9600 runs LG's WebOS interface for

LG 65EG9600

PROS Top-notch picture quality with perfect blacks, "infinite" contrast. Accurate colors. Loads of connected features. Attractive design.

CONS Very expensive. Only three HDMI ports.



accessing connected features. It's a functional, easy-to-use system that offers access to all the major streaming media services, plus live television support with a program guide for suggestions, a Web browser, local and networked media playback, and screen casting via Miracast.

PERFORMANCE

We test HDTVs with a Klein K-10A colorimeter, a DVDO AVLab test pattern generator, and SpectraCal's CalMAN 5 software. With the screen completely lit up, the 65EG9600 displayed a peak brightness of 126.8 candelas per square meter (cd/m^2), which is low for an LED-backlit HDTV, but markedly higher than the $82.78\text{cd}/\text{m}^2$ the 65EC9700 showed. Like now-dead plasma television technology, OLEDs brighten significantly when they don't have to light up the entire panel, and when illuminating only part of the screen the 65EG9600 showed a blazingly bright $394.14\text{cd}/\text{m}^2$. Even better is the OLED panel's ability to show perfect blackness. The screen emits absolutely no light for black colors, even when other parts of the display show a picture. This means that once again an LG curved OLED holds the vaunted "infinite" contrast ratio, far outpacing every other LED HDTV we've tested.

Whites, reds, and blues on the set were all highly accurate, and greens appeared just slightly undersaturated. The color accuracy was as close to spot-on as an HDTV can reasonably be out of the box, without making individual calibration adjustments.

In our tests, 4K content, including very dark scenes, looked excellent on the 65EG9600. I watched *Daredevil* during testing and the shadow-filled scenes became inky black when necessary, but still showed fine details.

The vast majority of movies and TV shows currently available are in 1080p or lower resolution, which means the 65EG9600 has to upconvert most content to 4K.



Fortunately, it does this well. *The Big Lebowski*, with its older-looking film grain (compared with the mostly grain-free digital video that's since become a mainstay movie production), looks as crisp as can reasonably be expected, with fine details like hair and smoke appearing clear, if not quite as sharp as similar content in native 4K. The colors in the film are also excellent on the 65EG9600, with flesh tones appearing warm and natural even under the awkward light of the bowling alley.

INPUT LAG, POWER, AND CONCLUSION

Although the 65EG9600 offers excellent picture quality, it doesn't fare quite as well with input lag (the time it takes for a screen to update after receiving a signal). The HDTV showed an input lag of 56.6ms both in our calibrated picture mode and in Game mode, which can usually cut down lag on most HDTVs. This isn't a deal breaker, and the lag won't likely be noticeable unless you're a fighting or action game fanatic (in which case, a dedicated gaming monitor would be much more suitable). It's also in line with most other large HDTVs we've tested, with the exception of the Samsung JS9500 and its startlingly low 1ms input lag.

Big screens are power hogs, and OLED technology doesn't seem to help with that. Under normal viewing conditions, the 65EG9600 consumed 377 watts in our calibrated picture mode. That number drops to 189 watts with the Energy

THIN IS BACK

All the basic ports (though only three HDMI) are found on the back of the super-thin (half-inch) LG 65EG9600.





Saving feature set to Medium, which dims the screen notably but keeps it quite watchable. The HDTV also has an energy-saving APS picture mode, which seemed to split the difference between the two other settings: On it, the TV consumed 278 watts while appearing slightly more crisp and bright than with the Energy Saving feature enabled in the calibrated picture mode.

The picture quality, feature set, and design of the superlative 65EG9600 are all top-notch, but its price tag will be hard for most users to swallow. If you don't mind settling for 1080p, the 55-inch LG 55EC9300 is available for less than half the price of the comparable 55EG9600, and offers excellent OLED performance at a more accessible price. You can get a more affordable 4K television from Sharp's UB30 series that still looks good, and pay just \$1,000 for the 55-inch model. But if money's no object, the 65EG9600 is, without question, the HDTV to get.

WILL GREENWALD

This Tiny Desktop PC Is Big on Storage Potential



Just because small-form-factor (SFF) desktops are so, well, small doesn't mean they're not fully capable PCs. The Acer Revo One may be the same size as a mini milk carton, but it's one of the few SFF systems we've seen that has internal expansion room. On top of all that, it can also work as a personal cloud storage device that you can access inside or outside of your home. This PC packs plenty of power and versatility into its tiny frame.

DESIGN AND FEATURES

The Revo One has a small white polycarbonate chassis with rounded corners, and measures 6 by 4.25 by 4.25 inches (HWD). That's a smidge larger than the Apple Mac mini and the HP Pavilion Mini, but you'll welcome the extra height when you find out what you can do with it. There's a 1TB hard drive installed, along with two additional internal 2.5-inch drives bays. This means you can install extra hard drives or solid-state drives (SSDs) for up to 6TB more storage. That's perfect if you're a heavy downloader or if you have a lot of personal image and video files. The drive bays are tool-free, so you won't need a screwdriver.

Acer Revo One
(RL85-UR45)

\$579.99 (as tested)



Unfortunately, the system's memory isn't user-accessible, so you're limited to the installed 8GB of RAM, though that should be enough for most home users, even those who edit home videos as a hobby.

There's a surprising amount of connectivity options on the Revo One. An SD card reader is located on the top, but most of the ports can be found on the back panel. There, you'll find a number of other ports: Mini DisplayPort (for connecting to a 4K display), HDMI (to link to a 1080p HDTV), four USB (two 2.0, two 3.0), Ethernet, headset, and Kensington lock. Wireless options comprise Bluetooth and 802.11ac Wi-Fi, and the Revo One comes with a wireless keyboard and mouse combo with a USB 2.0 dongle. The mouse is serviceable, but the keyboard feels a bit cheap.

The fact that the Revo One can accommodate additional drives means that it has a capacity and functionality akin to a network-attached storage (NAS) or a personal cloud drive. To that end, Acer has included a set of "Bring Your Own Cloud" (BYOC) apps that work to back up and stream media to your smartphone or tablet, including photos (abPhoto), music (abMusic), general files (abFiles), and synced Office documents (abDocs). Because the system uses multiple apps, it's not as unified as programs made for NAS drives, but the apps work fine. For example, abPhoto will automatically back up all the photos you take on your smartphone. Acer's BYOC apps are both Android- and iOS-compatible. You can use the BYOC apps with the included 1TB hard drive, but the extra drive bays give you room to grow.

If you just want to play your media locally, you can download and use the Acer Revo Suite app on your Android phone or tablet. The app gives you access to an on-screen keyboard and touchpad on your smartphone or tablet, in case you misplace your wireless keyboard and mouse. Using the touchpad on your smartphone, you can control any media player installed on the

Acer Revo One (RL85-UR45)

PROS Compact chassis. Expandable storage. Supports 4K, 1080p video. Uses 802.11ac Wi-Fi. Includes personal cloud software.

CONS Lots of bloatware. Chintzy wireless keyboard. RAM not upgradeable. Remote app is Android-only.



DRIVE FOR DRIVES

Because you can add more drives to the Acer Revo One, it's ideal for use as a NAS or personal cloud storage drive.



MINI MONSTER
The Revo One delivers
surprisingly good
performance for a
system its size.

Revo One, from the ones built into Windows 8.1, Netflix, or Amazon Prime. The Revo Suite app isn't compatible with iOS devices.

Acer preloads a lot of apps; I counted at least 19, including usual suspects Amazon, Booking.com, eBay, Flipbook, Hulu Plus, Kindle, Netflix, and WildTangent Games. Although most of these can be useful, many require a paid subscription, and are therefore useless unless you subscribe. Budget an hour or two to remove the programs you don't wish to use. The Revo One comes with a standard one-year warranty.

PERFORMANCE

The Revo One has an Intel Core i5-5200U processor with integrated Intel HD Graphics 5500. It's not quite as speedy as the Core i5 in the Acer Aspire ATC-605-UB11, our current Editors' Choice entry-level desktop, but it's newer and slightly faster than the Core i5 in the Mac mini. For example, the Revo One's score on the PCMark 8 Work Conventional test (2,564) lagged behind that of the Acer ATC-605-UB11 (3,017). Other SFF desktops gave up much more performance. Systems with Celeron processors, like the Dell Inspiron Small Desktop 3000 Series 3646 (1,549) and the Zotac Zbox CI320 nano Plus (1,496), certainly trailed the Revo One.

Performance on our 3D gaming tests was quite slow, with the system returning frame rates akin to slideshows on the Heaven (12 frames per second, or fps) and Valley (13fps) tests, both at medium quality settings at 1,366-by-768 resolution. You may be able to play older games with all the quality settings turned to low, but save more modern games for your gaming PC.

The Core i5 processor proved useful for everyday media operations like video transcoding. The system took a short 3 minutes, 11 seconds, to finish our Handbrake test, which was a couple of seconds faster than the Mac mini (3:13). It was half of the time taken by the HP Pavilion Mini (7:19) and the Lenovo IdeaCentre Q190 (6:58), and far ahead of the Inspiron 3646 (10:22). The system completed our Adobe Photoshop CS6 test in 5:08. Thus, multimedia tasks on the Revo One are quick and easy, up to and including those that a hobbyist or prosumer would undertake.

CONCLUSION

The Acer Revo One offers a surprising amount of power, expandability, and connectivity in a compact package. It's one of the few SFF desktops with two additional hard drive bays, and it has a powerful Intel Core i5 processor and 8GB of memory to help you with media playback and small-scale, content-creation tasks. Even without the drive bays, it has double the storage and system memory of the Mac mini, our previous top choice for SFF desktops. Aside from Thunderbolt, the Revo One has better external I/O connections than the Mac mini, and it also comes with a wireless keyboard and mouse.

True, the Mac mini costs \$80 less, but the Revo One's extras are worth the extra money. You also own the BYOC storage on the Revo One, and you won't have to pay monthly or yearly fees after you've bought your drives. For all these reasons, the Revo One is our Editors' Choice for consumer SFF desktops.

JOEL SANTO DOMINGO



“The Acer Revo One offers a surprising amount of power, expandability, and connectivity in a compact package.”





**Asus
Chromebook Flip
(C100PA-DB02)**

\$299.99 (as tested)



Asus' Chrome Convertible Is Feature-Rich, Affordable



As the number of laptops running Google's Chrome OS has skyrocketed in the last year or two, we've seen models boasting touch screens, multimode hinges, and slim new chasses, but few that offered the chromebook's biggest selling point: affordability. The Asus Chromebook Flip not only synthesizes the best innovations in the category (a lightweight, convertible design, excellent performance, strong battery life), but it does so at a killer price.

DESIGN

The Chromebook Flip gets its name from its 360-degree hinge, which lets the display fold around and back. This extra flexibility makes it one of only two chromebooks that can claim tablet functionality (the other is the Lenovo ThinkPad Yoga 11e Chromebook), and gives you several different ways to use the device (Stand and Display are the other two options).

The Flip has aluminum construction, which on its own would put the system head and shoulders above plastic chromebooks; it's almost like having a Google Chromebook Pixel in miniature. But beyond the brushed aluminum, the Flip is also exceptionally slim. The compact laptop measures 0.61 by 10.35 by 7.18 inches (HWD), and weighs 1.96 pounds, making it slimmer and lighter than almost everything this side of a simple tablet. Even when in Tablet mode, the system is sleek and portable and extremely easy to hold.

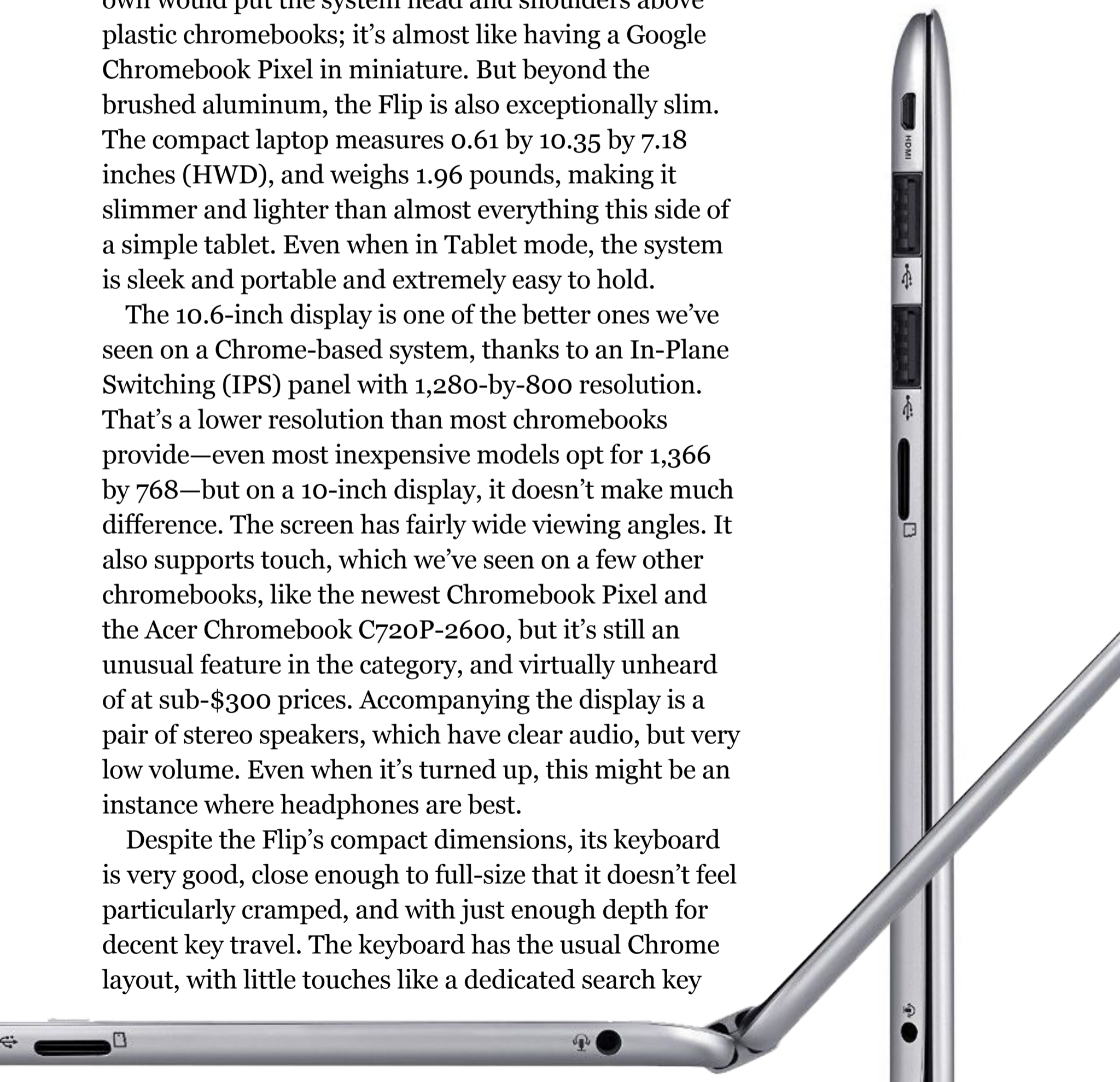
The 10.6-inch display is one of the better ones we've seen on a Chrome-based system, thanks to an In-Plane Switching (IPS) panel with 1,280-by-800 resolution. That's a lower resolution than most chromebooks provide—even most inexpensive models opt for 1,366 by 768—but on a 10-inch display, it doesn't make much difference. The screen has fairly wide viewing angles. It also supports touch, which we've seen on a few other chromebooks, like the newest Chromebook Pixel and the Acer Chromebook C720P-2600, but it's still an unusual feature in the category, and virtually unheard of at sub-\$300 prices. Accompanying the display is a pair of stereo speakers, which have clear audio, but very low volume. Even when it's turned up, this might be an instance where headphones are best.

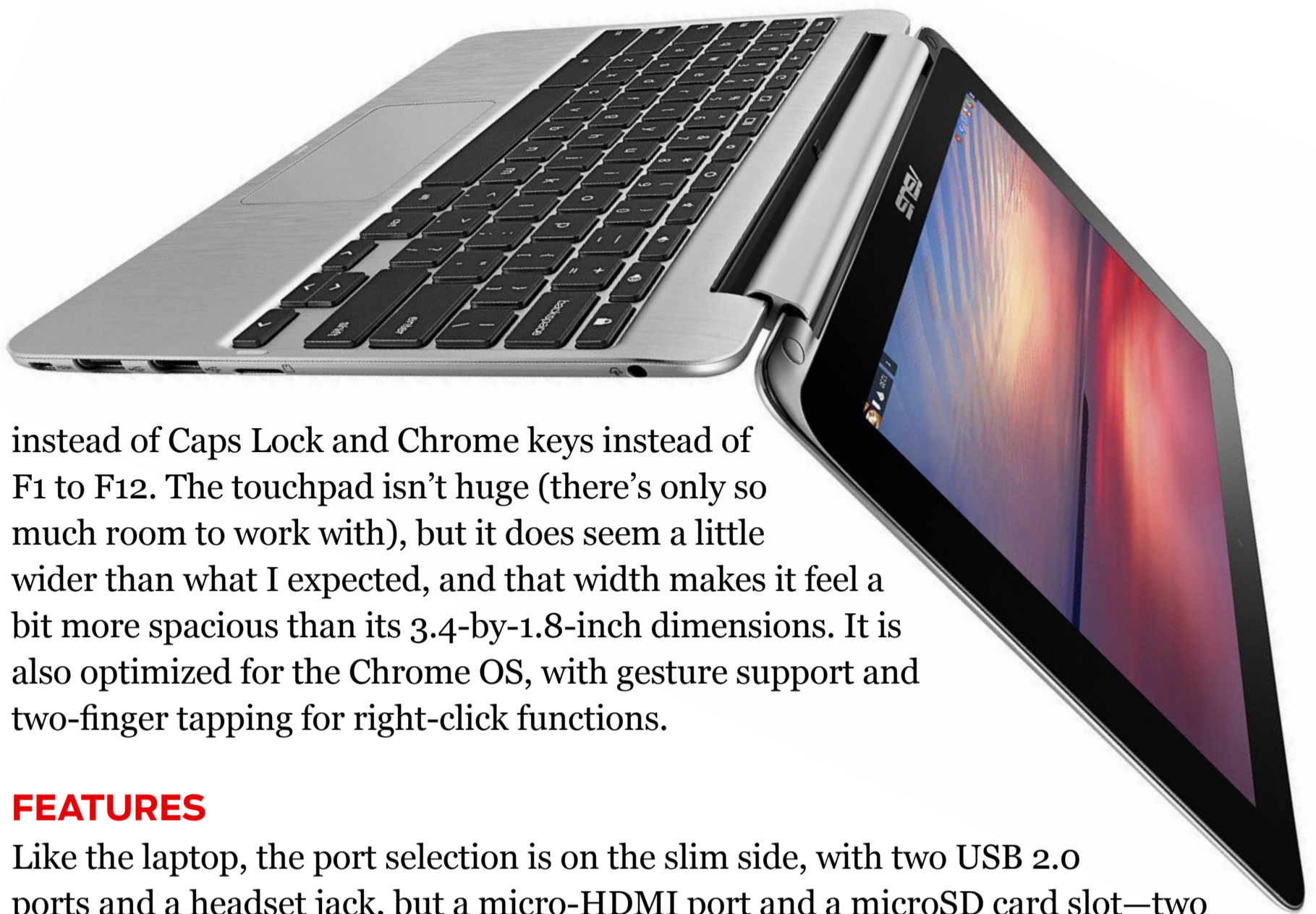
Despite the Flip's compact dimensions, its keyboard is very good, close enough to full-size that it doesn't feel particularly cramped, and with just enough depth for decent key travel. The keyboard has the usual Chrome layout, with little touches like a dedicated search key

Asus Chromebook Flip (C100PA-DB02)

PROS Aluminum construction. Convertible design. Touch screen. Solid performance. Long battery life.

CONS Low-resolution display.





instead of Caps Lock and Chrome keys instead of F1 to F12. The touchpad isn't huge (there's only so much room to work with), but it does seem a little wider than what I expected, and that width makes it feel a bit more spacious than its 3.4-by-1.8-inch dimensions. It is also optimized for the Chrome OS, with gesture support and two-finger tapping for right-click functions.

FEATURES

Like the laptop, the port selection is on the slim side, with two USB 2.0 ports and a headset jack, but a micro-HDMI port and a microSD card slot—two features that are usually full-size. All of the ports are on the right side of the system; on the left you'll find the Power port (which uses a small, reversible proprietary connector) and buttons for Power and Volume. For connectivity, the Flip has dual-band 802.11ac Wi-Fi and Bluetooth 4.1.

There's only a 16GB eMMC for local storage, which is common for less-expensive chromebooks, but it's not that much of a hindrance considering the reliance on Google Drive and its apps. The Flip comes with an offer for 100GB of free Google Drive cloud storage for two years, and between the USB ports and the microSD card slot there are plenty of options for local storage as well. Asus covers the Chromebook Flip with a one-year warranty.

PERFORMANCE AND CONCLUSION

The Flip is equipped with a 1.8GHz Rockchip RK3288C processor, the same quad-core ARM processor we saw in the education-focused CTL Chromebook J2. This inexpensive CPU has only just hit the market, and we'll be seeing it in plenty of inexpensive systems and chromebooks in the near future. But if affordability is a big draw for the processor, it also offers some surprisingly impressive performance when compared with the Intel Atom and Celeron processors we've seen in so many Chrome-based laptops.

Boot time was fairly average in our tests, starting up in roughly 8 seconds, but



the actual user experience was surprisingly smooth and robust. Most chromebooks slow down the moment you start streaming media or open up more than two or three tabs, but I was able to stream music through Pandora and video through YouTube while skimming through eight other webpages. It's some of the best performance I've seen on a chromebook without an Intel Core i3 processor.

The other place where the Flip really shined was battery life. In our rundown test, it endured 11 hours, 15 minutes, outlasting the HP Chromebook 11 (5:27), the ThinkPad Yoga 11e (6:14), and even the Acer C720P-2600 (7:20). It did not, however, outlast the Chromebook Pixel, which led by less than an hour (12:00) and had the benefit of a much larger battery. Another plus for the Flip: Its power cable is conveniently compact.

From its aluminum construction and convertible design to its Rockchip-powered performance and 11-hour battery life, the Asus Chromebook Flip is one of the finest offerings we've seen in the chromebook category. That makes it a shoo-in as our new Editors' Choice.

BRIAN WESTOVER

**Getac F110**

\$2,099 (as tested)



Need a Rugged Windows System? Take This Tablet Anywhere



The 2015 Getac F110 is a rugged Windows tablet that's built to take all sorts of punishment without succumbing to moisture, extreme temperatures, or even just the bangs and bashes experienced in the back of a fast-moving truck. Beyond meeting certification standards for MIL-STD 801G and IP65 ruggedness, this newest model of the F110 offers improved performance and battery life, and its lower price makes this an especially enticing system.

DESIGN AND FEATURES

Though it's fashioned out of magnesium alloy and stout ABS plastic, the Getac F110 is one of the thinnest and lightest rugged tablets on the market. It measures 0.96 by 12.3 by 8.15 inches (HWD), and weighs just 3.1 pounds. Compared with a regular, non-rugged enterprise tablet, like the 1.6-pound Dell

Venue 11 Pro 7000 Series, it's thick and heavy; but weighed against a convertible rugged laptop, like the Dell Latitude 12 Rugged Extreme (6.07 pounds), it's basically a featherweight.

At each corner of the Getac F110 is a rubber bumper, protecting the system against drops. The ports are all sealed off; the USB 3.0, HDMI, and audio jacks are behind locking hatches, and the power connection sports a rubber-stopper-style plug that seals out dirt and moisture. An expansion module can also be added for extra functionality, like a bar code reader, dedicated GPS, or 4G LTE mobile broadband (all optional, but available for custom configurations).

The 11.6-inch display offers basic HD (1,366-by-768) resolution, but it ramps up the brightness to 800 nits for readability, even in direct sunlight. You can read from the screen better under bright light than with most tablets we've seen. Viewing angles aren't as impressive. Even tilting the tablet slightly away from me caused a noticeable negative effect. You expect a tablet to include touch capability, but the F110 steps it up further with ten-finger touch for both hands and gloved fingers. An included stylus is also available for tapping and swiping, and can be stowed in a built-in storage area on the back of the tablet when not in use. The F110 has no physical keyboard, but typing and handwriting capture are available with on-screen inputs.

There are a few physical buttons on the tablet. On the right-hand bezel you'll find one for powering up and

Getac F110

PROS Thin-and light, tough-as-nails rugged design. Antiglare screen. Dual-battery system. Solid performance. Three-year warranty.

CONS Only one USB 3.0 port. Low-resolution display.

RUBBER-BUMPER RUGGED

The Getac F110 uses a rubber housing, sealed-off ports, and more to give the system added protection for all eventualities.



DOUBLE CHARGED
Two batteries give the
Getac F110 nearly 9
hours of battery life—
quite good for a
rugged laptop.



down, one that activates and deactivates touch input, one that's programmable, and two that control volume and brightness. On the bottom bezel is a physical Windows button. Along the bottom edge of the tablet is a docking connector for use with Getac's various docking accessories.

The tablet is equipped with 802.11ac Wi-Fi and Bluetooth 4.0, with several optional features, ranging from dedicated GPS and 4G LTE mobile broadband to integrated fingerprint reader and contactless smart card reader. For storage, our review unit was outfitted with a 128GB solid-state drive. Getac covers the F110 with a three-year warranty.

PERFORMANCE

The F110 boasts a 2.2GHz Intel Core i5-5200U CPU (one of the more powerful processors available for Windows tablets), which in our review unit was paired with 4GB of RAM (the tablet can be outfitted with up to 8GB). With this hardware, the F110 scored 2,942 in PCMark 8 Work Conventional. Although not all of our comparison units were tested under the same set of benchmark tests, this score does put the F110 ahead of the Dell Venue 11 Pro 7000 Series 7140 (2,586) and the Panasonic Toughpad FZ-M1 (1,470), indicating the tablet should be able to handle all sorts of uses, with full software support.

Despite the lead in PCMark 8, the F110 lingered toward the back of the bunch in our Photoshop CS6 test, finishing in 6 minutes, 28 seconds, behind the Editors' Choice Panasonic FZ-G1 (5:44). Some processor-intensive tasks may run a bit slowly, but they will still run—something that can't always be said of systems using Atom processors.



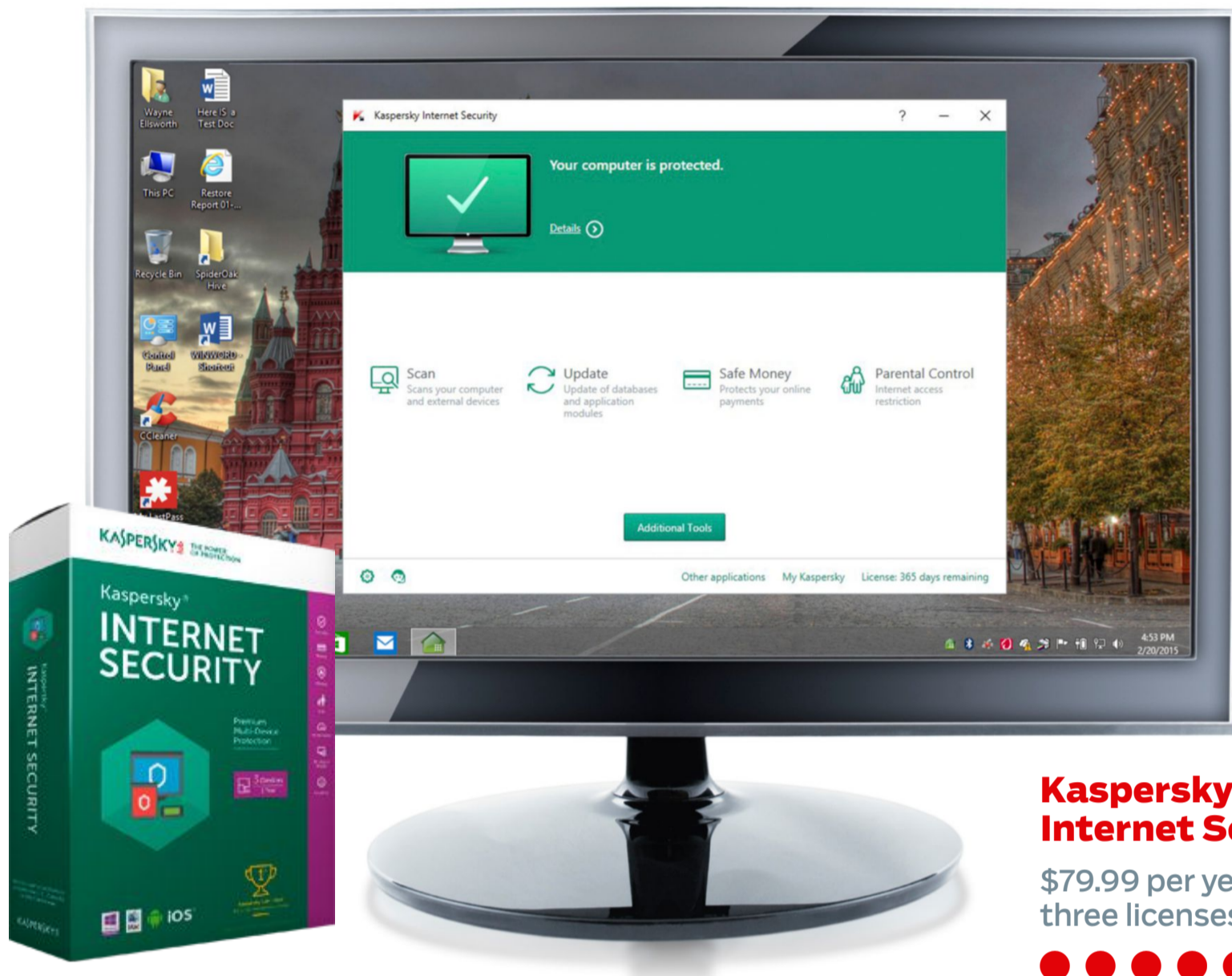
The F110 is built to withstand punishing circumstances, but those aren't all environmental threats. Sometimes the biggest enemy of mobile computing is time, or, to be more specific, the usable limits of battery life. To keep the tablet running without interruption for hours or even days on end, the F110 has two identical, hot-swappable batteries, which can be pulled out independently to recharge and continue use for as long as is necessary.

Each battery provides upwards of 4 hours of use on its own (tested at 4:28 and 4:36, respectively), and together they lasted 9:14. For rugged systems, that's a solid lead—the Panasonic FZ-M1 held out for only 5:04, and the Panasonic FZ-G1 petered out at 6:06 in the same test. If longevity alone is your prime concern, however, the non-rugged Dell Venue 11 Pro 7140 lasted 9:41 with its basic battery, and 15:58 with a secondary battery in a docking keyboard.

CONCLUSION

When you need a tablet that will survive the harshest of environments, whether it's an archeological dig in the desert, disaster recovery efforts in the islands, or even just a local construction site, the Getac F110 is an excellent option. Its performance is good, and there's no arguing with the price, which matches the competition feature for feature, all while saving you hundreds of dollars. Wherever you do your work, the Getac F110, our new Editors' Choice, is the rugged Windows tablet to take with you.

BRIAN WESTOVER



Kaspersky Internet Security

\$79.99 per year for three licenses

● ● ● ● ●

Start 2016 Secure With Kaspersky's Loaded Suite



Released in parallel with Windows 10, the 2016 version of Kaspersky's Internet Security package brings an auspicious start to the new security year, offering impressive protection across a wide range of coverage areas—as well as some interesting new features.

ANTIVIRUS PROTECTION

As far as test results from the independent labs go, Kaspersky's antivirus component is golden. It consistently receives top ratings from the major labs. In my own hands-on testing, Kaspersky detected 89 percent of my malware samples and earned 8.8 of 10 possible points. The best score among products tested with this same malware collection goes to Trend Micro Antivirus+ Security 2016, which managed 93 percent detection and a score of 9.1 points.

Confronted with 100 extremely new malware-hosting URLs, Kaspersky earned a 58 percent detection rating, blocking most of those at the URL level and picking off a few others by eliminating the downloaded malware file. The average in this test is 37 percent detection, so Kaspersky did well. Trend Micro holds the top score in this test, however, with 88 percent detection.

Phishing websites come and go sometimes in just a day or two, so a blacklist-only approach will always be behind the times. Like Symantec's Norton Security, our antiphishing champ, Kaspersky Internet Security employs a heuristic approach, analyzing unknown pages for signs of fraud. Its phishing detection rate came in just one percentage point behind Norton's, which is excellent. Among recent programs, only Bitdefender has done better than Norton.

ENHANCED FIREWALL

For some years now, Kaspersky's firewall has not bothered to put the system's ports into stealth mode. The product's designers feel there's no special merit in stealth mode as long as the ports are closed and the product fends off any attempted attacks. New in this edition, firewall protections launch early in the boot process, even before the suite itself starts up.

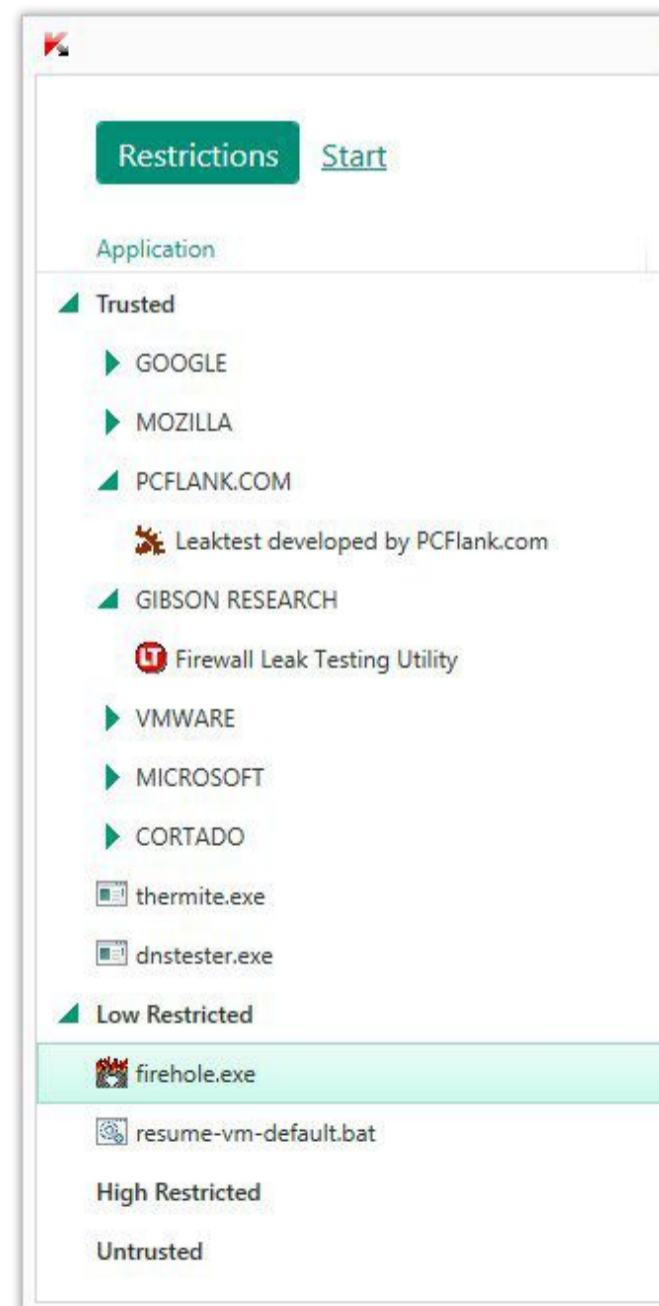
When I hit the test system with about 30 exploits generated by the Core Impact penetration tool, none of them actually breached security. That makes sense, given that I keep my test systems fully patched. Kaspersky did actively detect and block about 40 percent of the exploits, identifying quite a few of them by name. Note, though, that in a similar test, Norton actively blocked all of the attacks.

A malware coder intent on disabling this suite programmatically will run into Kaspersky's Self Defense feature. It doesn't expose any significant settings in the Registry. I found no way to terminate its processes. And my attempt to change settings for its single essential Windows service just got "Access denied."

Kaspersky Internet Security

PROS Top ratings from labs, good scores in hands-on tests. Accurate spam filter. Intelligent, no-hassle firewall. Comprehensive parental controls. Remote monitoring, management. Many bonus features. Small performance impact.

CONS Parental controls don't offer real-time notification, remote configuration.



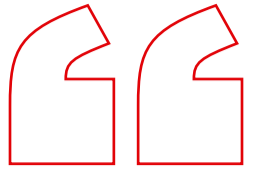
If you've been around computers for a while, you probably remember the early personal firewall utilities, with their numbing barrage of confusing pop-up queries. Rather than leaving the user to make decisions about which types of Internet access are permitted for each program, Kaspersky handles matters internally by assigning every program a trust level. Known and valid programs naturally receive full trust, allowing all reasonable access to the system and the network. Known malware is, of course, untrusted (and in any case, once it's quarantined it can't do anything at all). In between, programs may be labeled Low Restricted or High Restricted. For these, some actions are forbidden and others permitted only if the user confirms them. In practice, I didn't see any requests for confirmation, as the program handled permissions on its own.

This edition adds some useful new program control features. Trusted Applications mode will only start programs you've categorized as Trusted. And System Changes Control monitors program activity and prevents changes to important browser, network, and operating system settings.

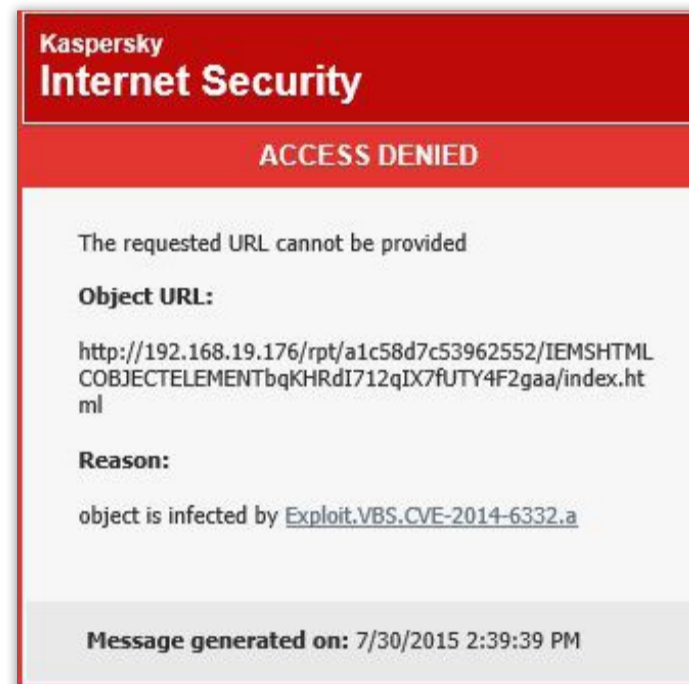
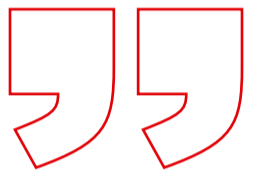
SPOT-ON SPAM FILTER

Because many users get spam filtering from their email provider, Kaspersky's antispam component is disabled by default. When enabled, it filters incoming POP3 and IMAP email accounts, marking messages as spam or probable spam. It integrates with Outlook, allowing automatic filing of spam messages into their own folder. Users of other email clients can simply define a message rule to divert the spam. The only setting most users will see is a simple slider that sets the filter's sensitivity level. Even the page of advanced settings isn't crowded with detail.

Downloading 1,000 messages with Kaspersky's filter active took about 1.9 times longer than with no spam filter. Most people never download more than a few



Kaspersky handles matters internally by assigning every program a trust level



EXPLOIT BLOCKED

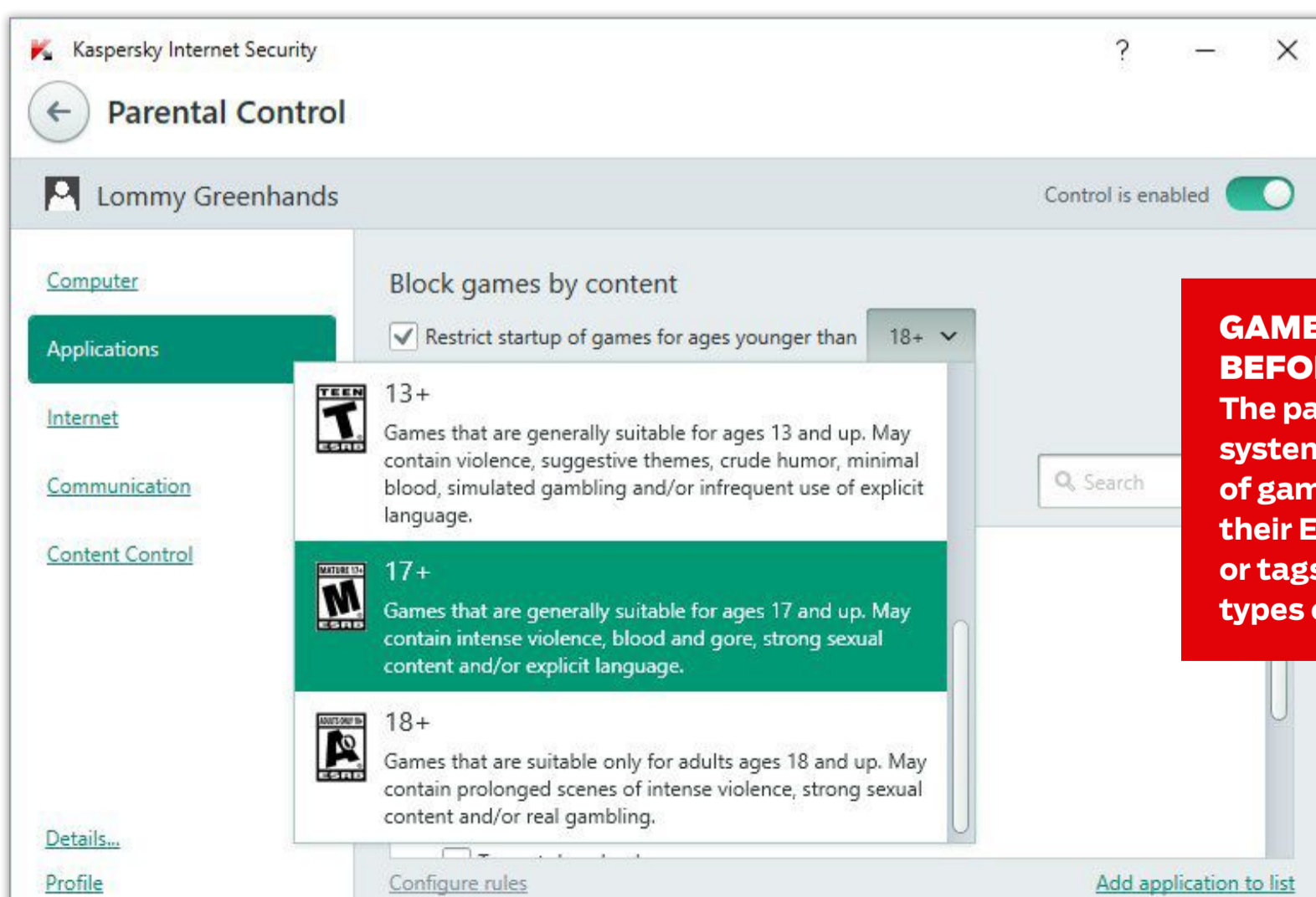
The 2016 version of Kaspersky Internet Security identifies and blocks many exploits that could attack your system.

dozen messages at once, and email downloading happens in the background. You won't notice any delay.

I let the spam filter process thousands of messages from a real-world spam-infested email account. Kaspersky didn't discard a single valid message, and it only let 8.1 percent of spam into the inbox. Norton and McAfee Internet Security 2015 also didn't block any valid mail, and respectively missed 7.0 percent and 4.4 percent of spam. Trend Micro had the lowest percentage of missed spam among recent suites (3.9 percent), but it did toss a tiny 0.1 percent of valid mail in with the spam.

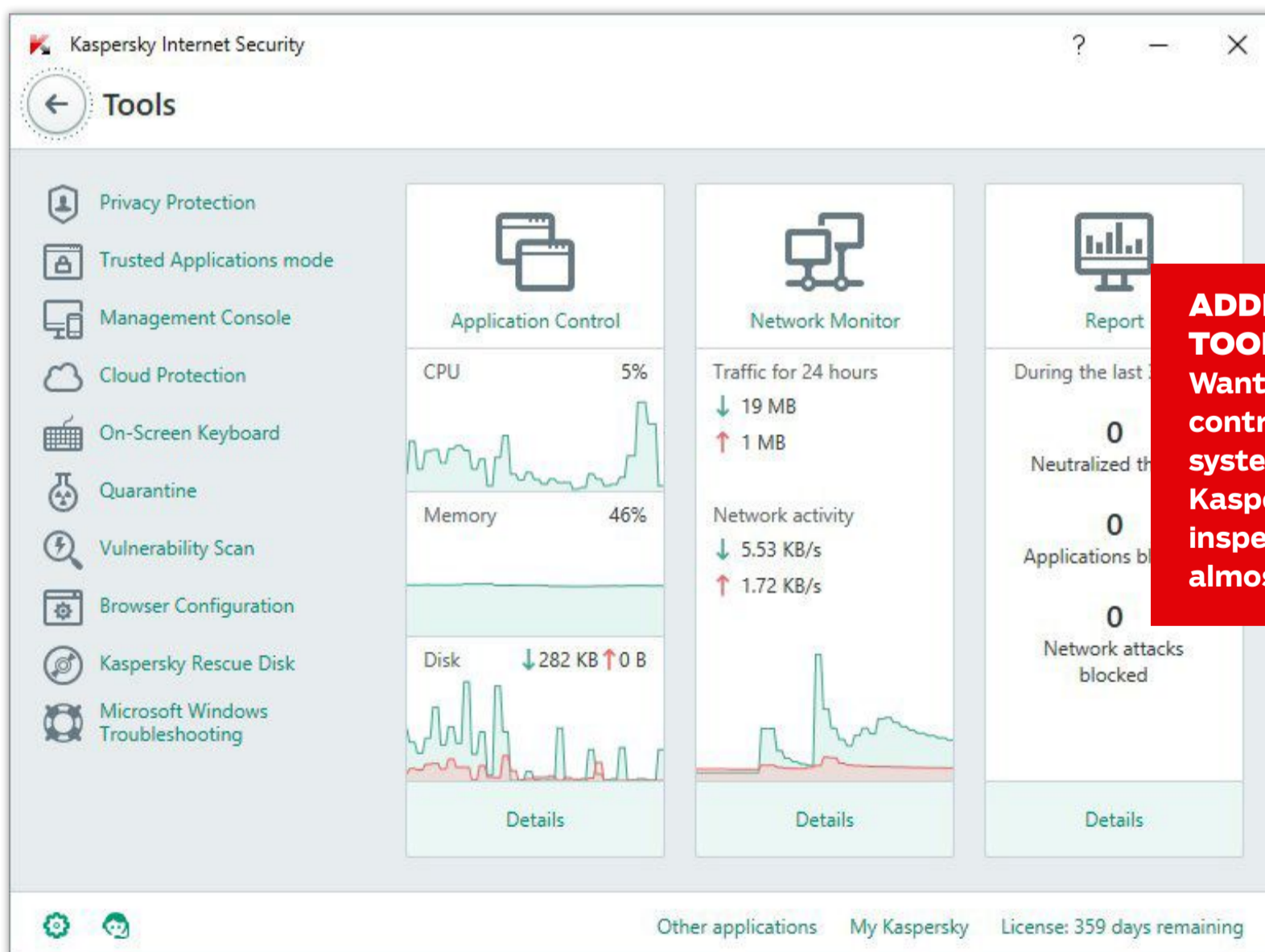
ADDITIONAL TOOLS

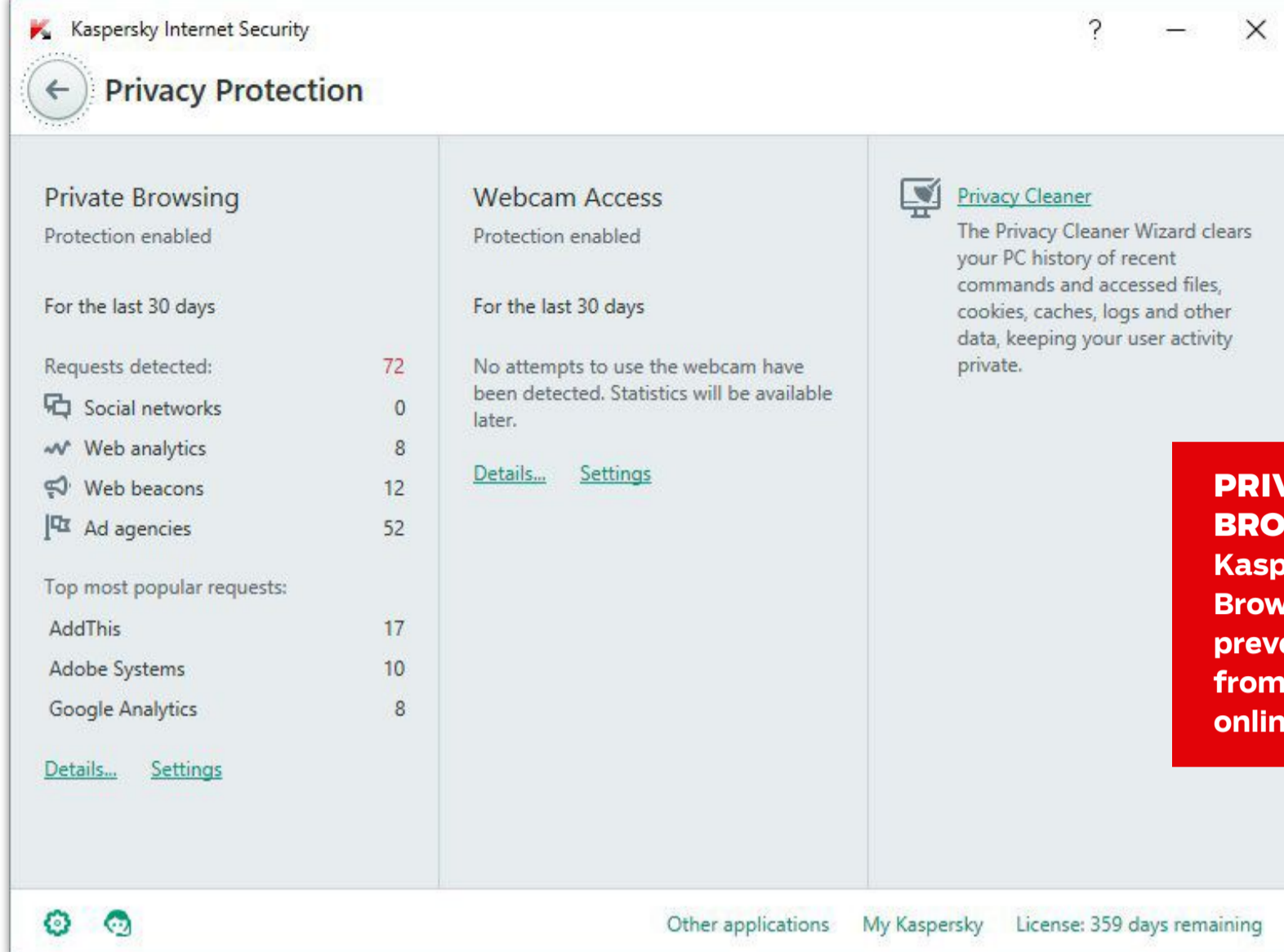
Kaspersky's parental controls have changed little since last year, which means they remain unusually effective for a parental control component of a security suite. Like many suites, it can block access to websites matching any of more than a dozen categories and define a weekly schedule for when each child is allowed to use the computer, as well as impose a daily cap on usage. But Kaspersky also lets parents block specific program categories or games based on ESRB rating or content, monitor and manage social networking contacts, get detailed reports about what kids are doing at the computer, cap Internet usage, and even require occasional breaks. You won't find every feature of the best standalone parental control systems in Kaspersky. It doesn't offer remote management, for example, and it can't apply time limits across multiple devices. Still, it's quite a bit more feature-rich than what you get with most other suites.



When you navigate to a financial website, the Safe Money feature offers to open that site in Kaspersky's protected browser. By default it remembers your choice and goes straight to the protected browser on your next visit. You can also manually identify any site as one that should use the protected browser. A green border clearly identifies that browser, which is protected from interference by other processes. This normally includes prevention of screen scraping, but on my virtual machine test system the safe browser warned (correctly) that screenshot blocking isn't supported by the current hardware.

Other tools in Kaspersky Internet Security (many of which also appear in the standalone Anti-Virus application) include scanners that look for exposed traces of browsing and computer use, unsafe browser settings, and Windows configuration settings that may have been tweaked by malware; a virtual keyboard for foiling keyloggers; an option to create a bootable Rescue Disk for fighting ransomware and other persistent malware; and a Private Browsing function that can actively prevent websites from tracking your online habits. And by logging in to the My Kaspersky online portal, you can remotely check the security of all your Kaspersky installations and even launch a scan or activate or deactivate components.





PRIVATE BROWSING
Kaspersky's Private Browsing feature prevents websites from tracking your online activity.

PERFORMANCE IMPACT AND CONCLUSION

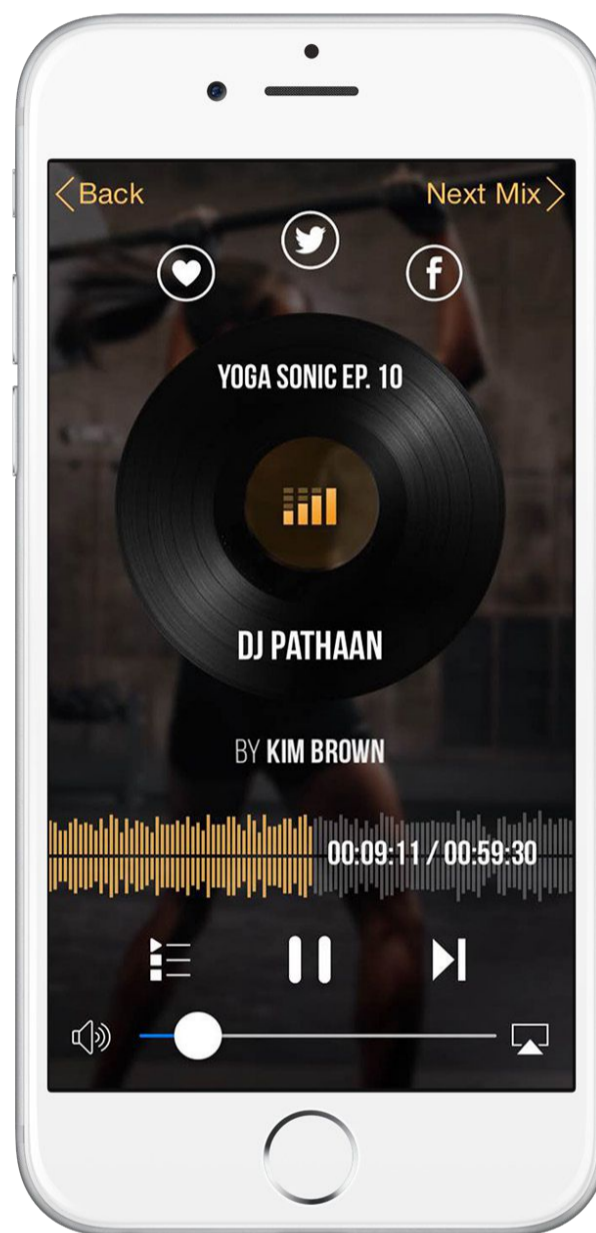
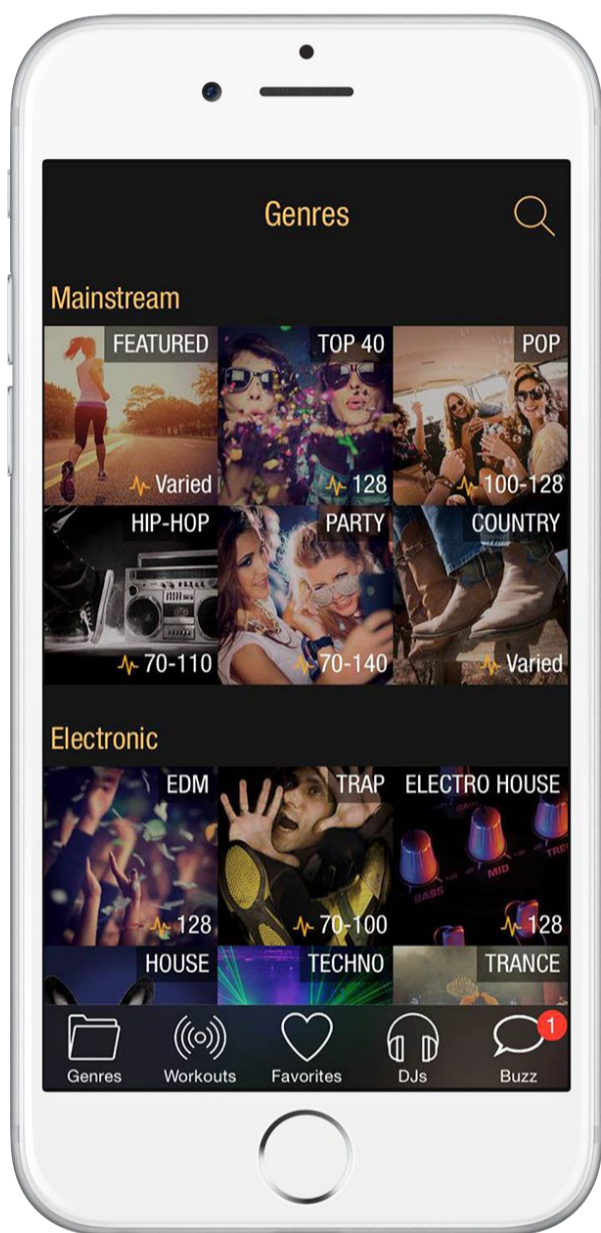
Security products must perform their duties without interfering with the user's activities—otherwise they'll get turned off. Kaspersky had little effect on system performance in my hands-on tests. One test measured how long it took from the start of the system boot process until the computer was ready to use. Averaging 100 runs with no suite and 100 runs with Kaspersky installed, I found no measurable slowdown of the boot process.

A script that moves and copies a gargantuan collection of files between drives took 15 percent longer with Kaspersky on the job. That's not bad, given that the current average is 20 percent. Another script that zips and unzips that same collection repeatedly took just 6 percent longer, again well below the average. You shouldn't notice any performance hit due to Kaspersky's protection.

Kaspersky Internet Security is an all-around excellent security suite. The independent labs praise its antivirus protection to the skies, its firewall does the job without hassling the user, and its spam filter is more accurate than most. Even the parental controls boast more features than most suites offer. Powerful remote management is icing on the cake. Kaspersky is our well-deserved first Editors' Choice award winner for 2016 security suites.

NEIL J. RUBENKING

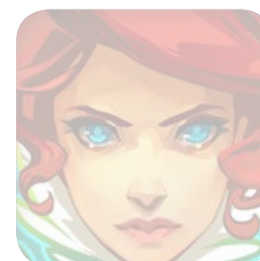
Our Favorite Apps



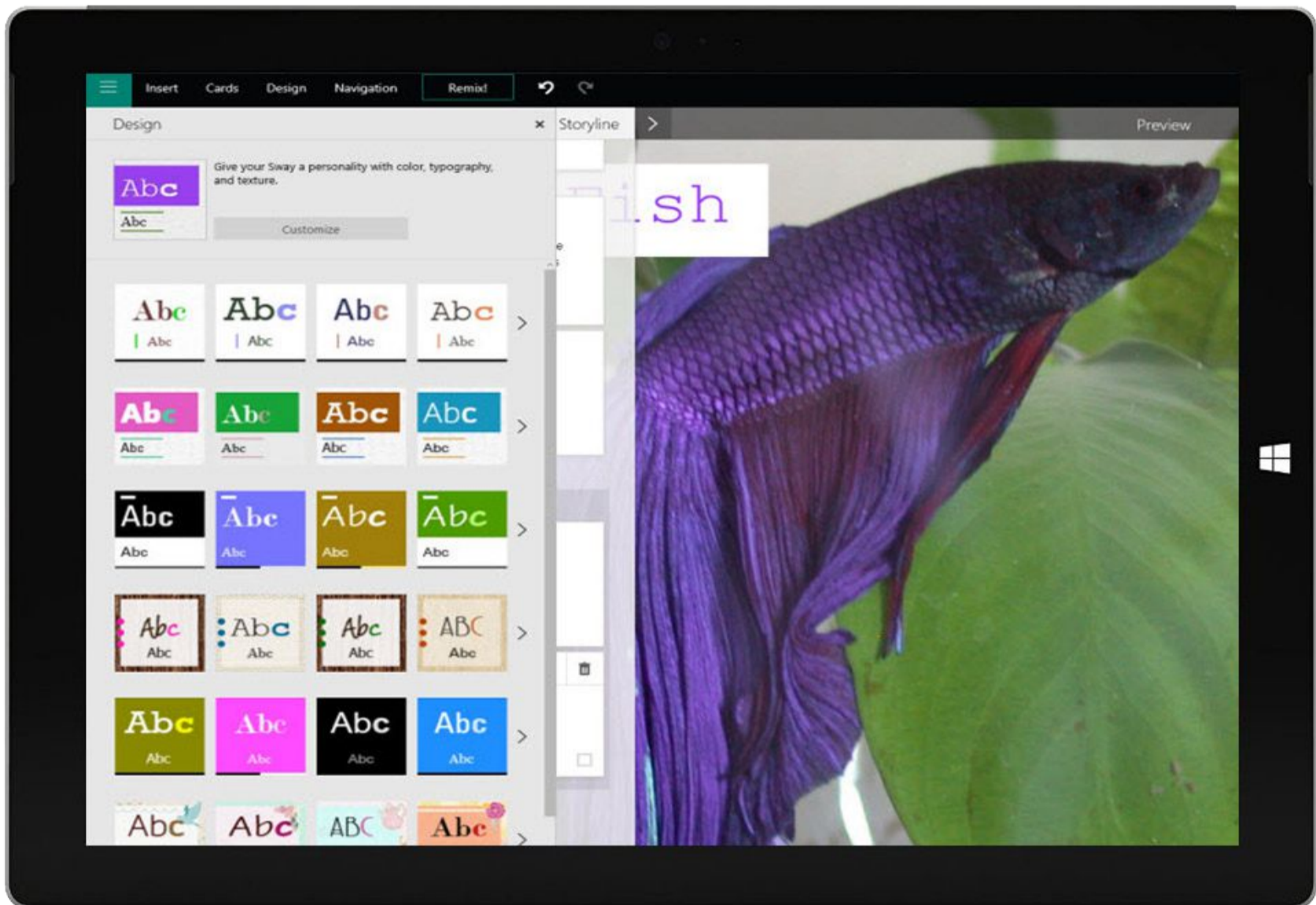
FIT Radio Android, BlackBerry, iOS



Want to get your heart pumping during workouts? The FIT Radio app streams DJ-created mixes of a wide variety of music tracks to better energize you during specific types of exercise—19 in all, from the basics (cardio, crossfit, and weightlifting) to the more specialized (yoga, spin, tabata). FIT Radio's free version is limited to only one genre of music; you'll need to upgrade to the \$3.99-per-month Premium service for a bigger selection, ad removal, and other features.



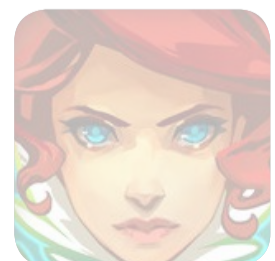
Our Favorite Apps



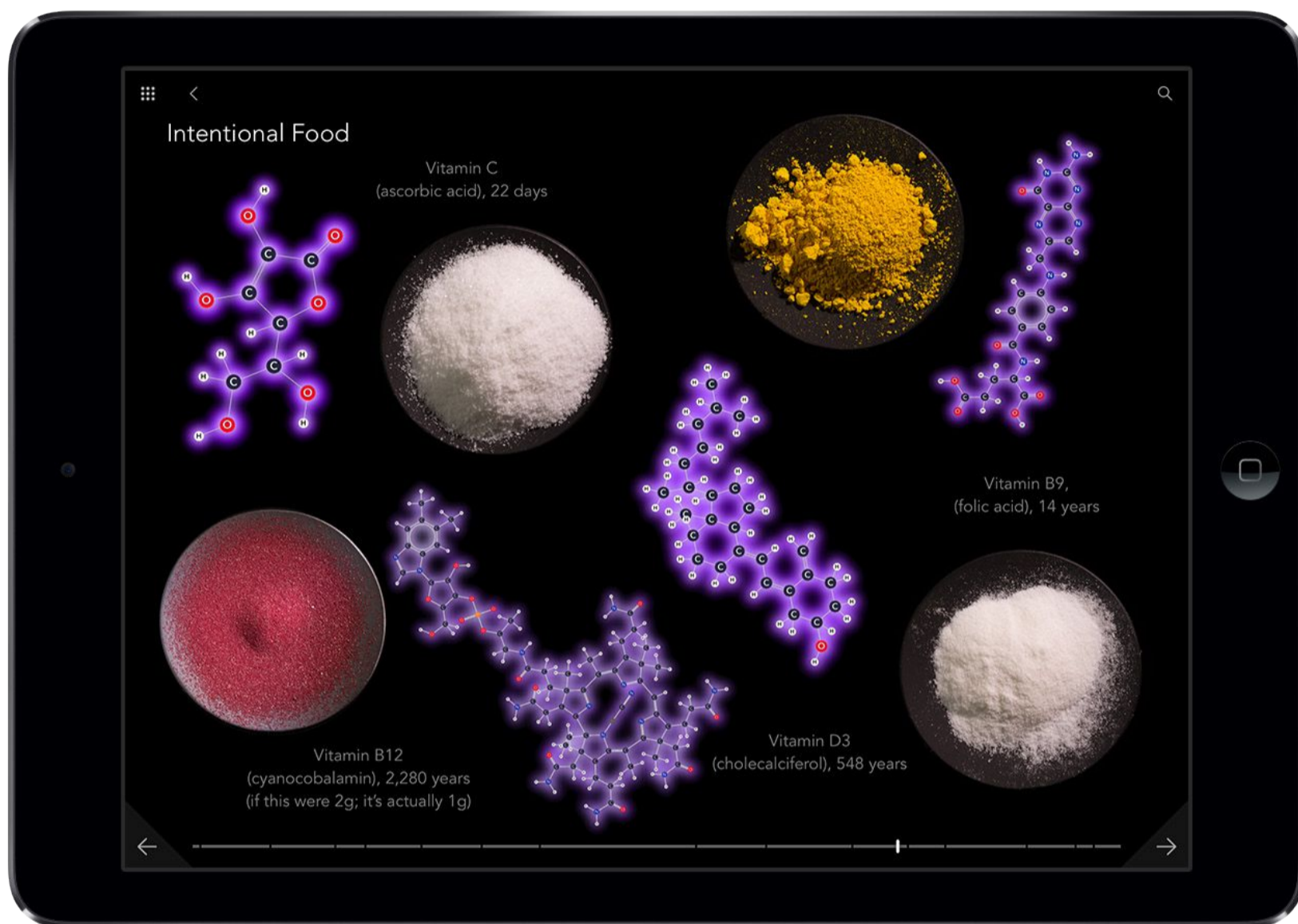
Microsoft Sway Windows 10



Sway is an example of a new class of app that lets you create “stories,” by crafting your words and images into well-designed, appealing, and easily navigable presentations that can be viewed on the Web. Its intuitive interface makes it simple to use, and the default designs are beautiful and responsive. Even though it offers fewer templates, clip art items, and animations, and lesser editing tools than something like PowerPoint, Sway is a nice, friendly alternative way to make lower-impact projects.



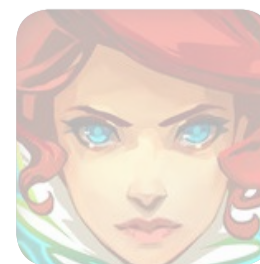
Our Favorite Apps



Molecules by Theodore Gray ios

EDITORS' CHOICE ● ● ● ● ●

The superb Molecules by Theodore Gray app is aimed at anyone interested in chemistry. It will help you learn more about the compounds and substances that make up the objects around us, from rocks to plastics to living creatures. It's both informative and fun, and chock-full of little-known facts, lucid explanations, and gorgeous 3D animations. Molecules by Theodore Gray is definitely pricey, but it's the rare app—educational or not—that gets basically everything right.



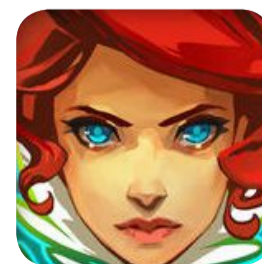
Our Favorite Apps



Transistor ios

EDITORS' CHOICE ● ● ● ● ●

A port of the popular PlayStation 4 title, *Transistor* remains beautiful, intelligent, and mechanically sophisticated now that it's come to iOS. You play Red, a lounge singer who's searching for her lost voice in a New York–like Jazz Age society called Cloudbank, which is under attack by a mindless menace called the Process. With a unique sense of style and clever move-based combat, *Transistor* makes a compelling, stimulating alternative to crushing candy and flinging upset avians.



Features

LIVING ROOM

BATHROOM

BEDROOM

KITCHEN

BACKYARD

The Smart Home Gets Smarter

BY ALEX COLON

When we first tackled outfitting the various parts of the home with connected technology last year, it was admittedly difficult to find devices for some rooms. That was certainly not the case this time around, with so many gadgets to sort through that coming up with a definitive list took a good deal of time and debate. It shows how much the connected home field has grown over the last 12 months.

Although many of these devices are still firmly entrenched in the enthusiast realm, they're becoming increasingly more useful and geared toward a mainstream audience. After all, who wants to spend thousands of dollars on a professionally installed alarm system when you can outfit your home to your exact specifications for just a fraction of the cost with a connected system? And why keep track of your weight in a daily diary when your scale can just send that information to the cloud and plot it out on a graph? These are just a couple of instances in which connected devices can make your everyday home life more convenient.

Chances are you already own one of the devices on this list, or at the very least have considered purchasing one. After all, every room inside (and outside) the house benefits from the addition of a little connectivity.



Smart Home LIVING ROOM

It's always fun to have people over for a board game night, but it's also pretty cool to watch the latest episode of *Game of Thrones* on the biggest, highest-definition screen in the neighborhood. Still, a fully equipped living room doesn't mean stuffing a huge TV into a small space. Instead, it's about finding the devices that work for you, and making the time you spend at home more relaxing and fulfilling. Just remember to get up off the couch and stretch every now and then.



LG 65EG9600

\$6,999.99 lg.com

We've maintained for a while now that organic light-emitting diode (OLED) technology is the next big step in HDTVs. LG is the only major brand that has consistently released OLED televisions, and it continues to do so with the ultra-high-definition, curved EG9600 series. The 65-inch 65EG9600 model we tested is extremely expensive, but it has the best picture you can currently buy, and comes with loads of useful features and a beautiful design. If you're looking to assemble the ultimate living room setup and money is no object, it should stand as one of your top options.



DEFINITIVE TECHNOLOGY W STUDIO

\$1,299 definitivetech.com

If you have the best picture you can buy, don't you also want the best sound? Definitive Technology makes some very impressive speakers that also tend to be relatively expensive. Both qualifiers certainly apply to the company's W Studio, a soundbar and wireless subwoofer combination that sounds excellent and offers high-end features like HDMI switching and multiroom Wi-Fi audio with Play-Fi. The W Studio also looks stylish and is built rock-solid, making it one of the best soundbars you can buy.



MICROSOFT XBOX ONE

\$399.99 xbox.com

Microsoft took a huge step forward with the Xbox One, offering the same hardware upgrade Sony gave the PlayStation 4 along with many new features that range from handy to completely game-changing. Kinect's voice controls, along with Xbox One TV integration and OneGuide turn a game system with some media features into an all-in-one media hub. From playing Halo to watching *Wet Hot American Summer: First Day of Camp* on Netflix, you won't find yourself running out of content options anytime soon.



AMAZON FIRE TV

\$99. amazon.com

Don't want to spend your entire living room budget on just the TV, but want to add connectivity to the one you already own? All you need is a free HDMI port in order to connect the Amazon Fire TV. Amazon's first foray into the crowded media hub arena is still our favorite. It has more features than the Apple TV and more raw power and potential than the Roku alternatives, not to mention extremely accurate and responsive voice search, right from the remote.

PHILIPS HUE GO

\$99 meethue.com

Another fun connected lighting solution is the Philips Hue Go. Unlike, say, the Hue connected bulb, the Hue Go is a wireless smart light that runs on a built-in, rechargeable battery and doesn't need to be connected to a hub to work. It offers a wide range of colors with an intuitive, simple-to-use control scheme (one button), and it's easy to carry around. And if you do connect it to a hub, you gain the ability to create customized lighting scenes and access personal alarms, as well as link it up with any of your other Hue lights.



LOGITECH HARMONY ULTIMATE HOME

\$349.99 logitech.com

With the myriad gadgets that reside in your living room, you'll probably want a universal remote so you don't have to sort through ten different ones every time you want to change the channel. True to its name, the Logitech Harmony Ultimate Home is the ultimate universal remote control. In addition to controlling your HDTV, cable box, and Blu-ray player, the Harmony Ultimate Home supports a wide array of connected home devices—including popular lights, locks, and thermostats—letting you control just about every digital device you own right from your smartphone or the remote itself.



ECOBEE3 SMART WIFI THERMOSTAT

\$229 ecobee.com

Two years before Nest released its Learning Thermostat, Canadian-based ecobee had already introduced a smart thermostat. Its ecobee3 is our top pick for this category: an attractive Wi-Fi thermostat that you can control from your iOS or Android phone and from your PC via the Web. The ecobee3 is easy to install and program, and it's loaded with features including a remote sensor for heating and cooling rooms outside of the thermostat zone, numerous reminders and alerts, a capacitive touch display, and a system monitor that tracks heating and cooling usage.



WINK CONNECTED HOME HUB

\$50 wink.com

The Wink Connected Home Hub works with more devices than any other hub we've tested. Credit that to its support for an impressive number of connectivity protocols; it works with Bluetooth LE, Lutron Clear Connect, Wi-Fi, Z-Wave, and ZigBee, which covers most of the major players in the connected home market. So if you own a number of connected devices and want to control them all from one place, chances are they'll work with the Wink.

BELKIN WEMO LIGHT SWITCH

\$49.99 belkin.com

If you're just dipping your toe into the home automation waters, Belkin's WeMo line is a good place to start. The WeMo Light Switch connects to your Wi-Fi network and can be controlled using a smartphone or tablet and an accompanying app. Installation is quick and relatively easy if you've ever changed a light switch, and setting everything up is a breeze. You can program the switch to turn the lights on or off according to the sunrise, connect it with other WeMo devices, and even use IFTTT (If This Then That) recipes to trigger the switch with certain events.



NEATO XV SIGNATURE PRO

\$449 neatorobotics.com

If you've been searching for a powerful robotic vacuum that won't cost you an arm and a leg, check out the Neato XV Signature Pro. It does an outstanding job of picking up all sorts of household debris, and is particularly tough on pet hair and backyard soil. Its laser-guided mapping feature works remarkably well regardless of how your furniture is laid out or how many walls you have, and its scheduling feature lets you set up cleaning times that precisely fit your lifestyle.



LOCKSTATE LS-5001 REMOTELOCK WI-FI DOOR LOCK

\$249.95 lockstate.com

With the LockState LS-5001 RemoteLock Wi-Fi Door Lock, you'll never have to worry about whether you remembered to lock up before you left for the day. It's an electronic push-button dead bolt lock that connects to your Wi-Fi network and can be controlled from a remote PC as well as Android- and iOS-based devices. Not only can you lock and unlock your door remotely, you can monitor the lock's activity, create individual user codes with specific entry rights, and receive alerts when the door is locked and unlocked.



RING VIDEO DOORBELL

\$199 ring.com

If using your phone to unlock your door isn't enough for you, you should check out Ring Video Doorbell. With the Ring, you can see who is at your door from the safety and comfort of your couch. It lets you accept or deny visitor calls, and uses motion detection to alert you of activity on your doorstep even when the bell hasn't been rung. The 720p camera delivers sharp video with good color, and it automatically records events and stores video of them in the cloud, so you can see who showed up even when you weren't there.



Smart Home BATH ROOM

Although the bathroom may not seem like the likeliest place to find a wealth of connected gadgets, it can actually be home to some of the most important devices you own. And considering that it's the room you'll probably visit more regularly than any other, it makes sense to keep it clean and comfortable at all times. Believe it or not, there are plenty of devices to help you do just that. So the next time you've got an itch to buy a cool new gadget, make sure to think outside the scope of the living room.



LEEO SMART ALERT NIGHTLIGHT

\$99 leeo.com

Bathing by candlelight may look nice in movies, it's not nearly as easy (or safe) as the Leeo Smart Alert Nightlight. The Leeo is a connected nightlight with soothing, customizable colors to light your way—or your baths—at night. And when you're not at home, it listens for potential smoke or carbon monoxide alarms, ready to send you a notification if one happens to go off. So not only can you relax better in the bath, but the Leeo also provides you with a greater peace of mind when you leave the house, which is truly relaxing.



SIMPLEHUMAN SENSOR PUMP

\$40 simplehuman.com

Above all else, the bathroom should be a place that feels clean. But how clean can you really feel when you're rubbing your hands over everything? The Simplehuman Sensor Pump is a good-looking soap dispenser that's equipped with a motion sensor for touch-free, high-speed soap dispensing. A silicone valve prevents it from making a mess, but the real benefit is that you don't have to worry about leaving any germs behind, either.



KOHLER NUMI TOILET

\$6,000 kohler.com

Hands-free soap dispensers are nice, but toilet handles are the primary source of germs in most bathrooms. You won't need to worry about that with the Kohler Numi toilet, which doesn't even have a physical handle. The Numi flushes automatically, and features a motion-activated, hands-free toilet seat and cover that also opens and closes. But it doesn't stop there. In addition to a striking, modern design, the Numi has built-in ambient lighting with a number of colors and programming options. It has built-in speakers as well, which can connect to your mobile device via Bluetooth.



KOHLER TOUCHLESS TOILET FLUSH KIT

\$99 kohler.com

If you can't imagine spending \$6,000 on a connected toilet, you can still add motion control to your existing bowl for less than \$100 using the Kohler Touchless Toilet Flush Kit. This is an easy-to-install retrofit kit that brings a touchless flush to most canister and flapper toilets. The flush is activated by a no-touch sensor mounted inside the tank, so all you have to do is hold your hand over the tank sensor to activate the flush. Installation is quick and easy, and because it uses standard AA batteries, you won't have to reach into your tank often for a recharge.

DELTA TEMP₂O SHOWERHEAD

\$85 deltafaucet.com

Being assaulted by water that's too hot (or, more frequently, too cold) is one of the worst parts about taking a shower, especially early in the morning. The Delta Temp₂O Showerhead takes the guesswork out of getting into the shower by using three color LEDs to let you know when the temperature is just right. Better yet, a battery-free, water-powered display shows an exact numerical readout, so you can be assured that the temperature is also safe for children or pets. And with six different spray patterns, you can customize more than just the temperature.



KOHLER MOXIE SHOWERHEAD + WIRELESS SPEAKER

\$199 kohler.com

Kohler is well known for making quality showerheads, so it's to be expected that the Moxie Showerhead + Wireless Speaker is well designed and attractive. What is surprising, however, is the design: A 1.5-watt detachable Bluetooth speaker is magnetically housed in the middle of the sprayface. The showerhead itself works well, and the speaker sounds excellent while you're soaping up. It pops in and out for easy recharging, and it's small enough to carry around with you for portable tunes outside the shower, too.



SONY XPERIA Z3 TABLET COMPACT

\$499.99 sonymobile.com

If a warm, relaxing bath is more your speed, wouldn't it be even better with a wealth of multimedia content at your fingertips? You wouldn't want to get most tablets anywhere near a large tub of water, but you won't have to worry about splashing the Sony Xperia Z3 Tablet Compact. The Z3 is a beautiful 8.1-inch Android tablet with a stunningly thin and light design. Better yet, it's rated IP68, which makes it waterproof and dust-resistant. You can submerge the tablet in up to 4.9 feet of water, which should cover even the biggest stress-reducing soaks.



IROBOT BRAAVA 380t

\$299.99 irobot.com

Cleaning is usually no one's favorite chore at home, but scrubbing the bathroom (understandably) inspires particular revulsion. The iRobot Braava 380t floor cleaning robot can help. The Braava dry and wet mops using reusable microfiber cleaning cloths. Its smaller profile makes it a good fit for rooms like the bathroom that aren't huge (this also simplifies storage). It's far less expensive than many robotic vacuums on the market (though the Braava doesn't actually have any suction), and better still, it's far less noisy.

WITHINGS SMART BODY ANALYZER

\$149.95 withings.com

Your bathroom's medicine cabinet doesn't have to be the only thing in there that can help keep you in good health. The Withings Smart Body Analyzer, for instance, looks like your average bathroom scale, but it does a whole lot more. It tracks weight, body composition, heart rate, and even air quality for up to eight people. The combination of weight and body composition is a great way to make sure you stay on top of your health, and knowing your resting heart rate is a useful indicator for overall fitness. This sure beats the old analog scales.



QARDIOARM

\$99 getqardio.com

A bit more specialized than a scale, but no less important for many people, is a blood pressure monitor. The QardioArm is an at-home blood pressure monitor and app that is dead-simple to use, read, and understand over time. In just 30 seconds the device will take your systolic and diastolic readings, as well as your pulse (heart rate), and your results will appear instantly in the app. If those numbers don't mean much to you, the app also plots out results on an easily comprehensible, color-coded chart that shows exactly where your blood pressure stands.



ORAL-B PRO 5000 SMART-SERIES WITH BLUETOOTH

\$159.99 oralb.com

And don't forget about proper dental care, which is also essential for good health. Unfortunately, brushing your teeth for the recommended 2 minutes is never any fun. The Oral-B Pro 5000 SmartSeries With Bluetooth toothbrush reduces the tedium by connecting to a smartphone app and giving you real-time feedback on your brushing habits. Not only that, but the brush itself removes twice the amount of plaque as a traditional manual toothbrush, and pressure sensors alert you when you're brushing too hard.



SEN.SE MOTHER

\$299 sen.se

If you're already happy with your current toothbrush, how about giving it something of an upgrade with the Sen.se Mother? Acting as a hub, Mother connects to Motion Cookies, which are small sensors that can be programmed using a simple app to measure or track a whole variety of things around your home, such as how much activity you get to whether and when your kids brushed their teeth. Mother sends alerts, too, by email, text message, voice calls, or even just by making a noise herself, to let you and your family members know about the different activities being tracked.



Smart Home BED ROOM

With too many stimulating gadgets in the bedroom, you run the risk of not being able to actually fall asleep. Thankfully, most of the devices mentioned here are focused on making the bedroom a more useful and tranquil space. So who knows? The more bedroom-centric gadgets you have, the better you might be able to sleep.



KINGSDOWN SLEEP SMART INTUITIVE

\$9,399-\$13,999 kingsdown.com

Without a doubt, the most important piece of furniture in a bedroom is the bed. And beds don't get much more innovative than the Kingsdown Sleep Smart Intuitive. It's a connected mattress that automatically adjusts to your movement, position, and sleep habits, thanks to the 21 air chambers on each side of the mattress that are controlled in six zones. The mattress connects to a box underneath that controls the amount of air needed in these chambers automatically. The Sleep Smart Intuitive also tracks how well you sleep and delivers that information via Bluetooth to an app on your mobile device.



AMAZON ECHO

\$179.99 amazon.com

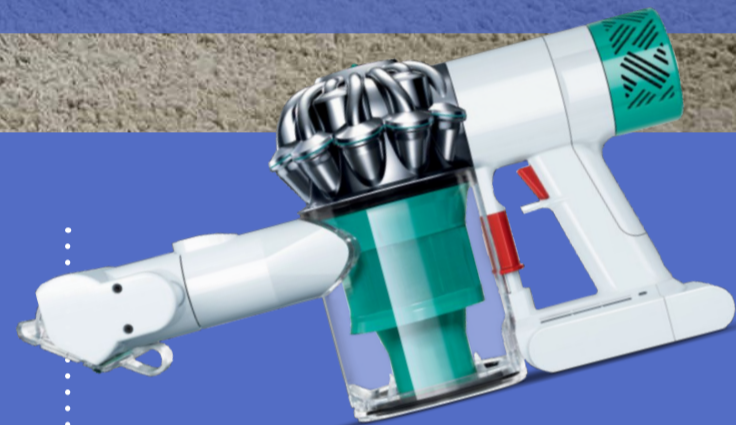
Plenty of people still rely on alarm clocks to wake up, but it's time for a high-tech upgrade. Perhaps the coolest replacement for the bedside clock radio is the Amazon Echo. Part Bluetooth speaker and part personal assistant, the Echo can tell you the time, set an alarm, make your grocery list, play your favorite song, and even turn on the lights, all via voice control. And because it hooks into your home Wi-Fi network, you don't even need your phone on hand after the initial setup. After adding an Echo to your room, it won't take long before you start to wonder how you ever got along without it.



PHILIPS HUE LUX

\$19.99 (single bulb) meethue.com

One of the lights you can control with the Amazon Echo is the Philips Hue Lux, a bulb that connects wirelessly to your smartphone or tablet. The Hue Lux offers almost the same exact functionality as the original hue bulb we recommended last year, but sells for half the price. What's the difference? Color. Lux bulbs are white-only, as opposed to the Hue's virtually limitless color palette. Because both bulbs work on the same bridge, you can mix and match them throughout your home, and the Lux bulbs are a good way to save some money where you don't need color-changing lighting.



DYSON V6 MATTRESS

\$249.99 dyson.com

How do you keep your fancy connected mattress clean? The Dyson V6 Mattress is a battery-powered handheld vacuum cleaner with a specialty: beds. Dyson claims that all of our mattresses are covered in dust mites and dust mite feces, as well as our own skin cells, hair, and other microscopic refuse. Unfortunately, Dyson is right. But the V6 Mattress can combat the micron-sized horrors with powerful suction, an assortment of attachments, and a hygienic-if-tiny dust receptacle. If you suffer from allergies, or you just appreciate Dyson's design aesthetics, consider the V6 Mattress.

WITHINGS AURA

\$299.95 withings.com

Plenty of activity trackers and sleep systems track how quickly you fall asleep, when you roll over in the night, and how many hours you sleep, but they leave it to you to make changes that will help you get to sleep quicker and wake up feeling more refreshed. The Withings Aura changes this setup. Instead of simply monitoring your sleep, it helps you fall asleep with white noise and a narrow red light spectrum that's emitted at you while you're dozing off. When it's time to wake up, the Aura looks for the ideal time in a window that you set for your alarm, and slowly projects different light and sounds to ease you out of slumber.



DYSON HOT + COOL AM05

\$399.99 dyson.com

If you find yourself breaking out a fan in the summer and a heater in the winter (or just leaving them both connected in the spring and fall), the Dyson Hot + Cool AM05 is the device for you. It's a gorgeous appliance that brings you the best of both worlds: It's a powerful fan when you're hot, and provides fast, even heat distribution when you're cold (an internal thermostat maintains the temperature between 33° and 99° F). It's safer and easier to clean than traditional options, costs approximately 30 percent less to heat a whole room than conventional fan heaters, and can lower energy bills by 20 percent if used in conjunction with air conditioning.



HOLMES SMART HUMIDIFIER WITH WEMO

\$199.99
holmesproduct.com

It's also nice to wake up in a room that isn't so dry that your throat is scratchy and your lips are chapped. The Holmes Smart Humidifier is a whole-house humidifier that connects to the WeMo app via Wi-Fi. This means you can turn it on and off even when you're not home, set schedules, and receive push notifications with status updates about the machine, like when water is running low or when the wick filters need to be replaced. The Smart Humidifier can cover up to 2,500 square feet of space.



QUIRKY PIVOT POWER GENIUS

\$99.99 quirky.com

Instead of reusing that bargain bin power strip yet again, breathe new life into old electronics using the Quirky Pivot Power Genius. The four-outlet power strip has a hinged design that lets you pivot each outlet, and it offers two Wi-Fi-connected outlets that you can control from an iOS or Android device. It offers an inexpensive way to control a couple of devices remotely, and its flexible design lets you place it in areas that won't accommodate a traditional power strip.

QUIRKY AROS

\$299.95 withings.com

Who can fall asleep in a room that's hot and sticky? The home air conditioner has long been due for a makeover. Considering it lives in many windows for nearly half a year (or more, depending on where you live), there's really no good explanation for the unattractive, inefficient boxes that define our summers. The Quirky Aros combines a beautiful design with a companion app that lets you control the window-mounted, 8,000 BTU air conditioner from anywhere. It's undoubtedly the best-looking unit on the market, and the app adds genuine utility.



Belkin WeMo Insight Switch

\$59.99 belkin.com

One of the simplest ways to tap into the benefits of home automation with regards to your home's lighting is by using the Belkin WeMo Insight Switch. It connects to your Wi-Fi network so you can turn your devices on and off remotely using an iOS or Android device. It lets you create schedules for every day of the week, and it supports IFTTT recipes. Belkin has even added power monitoring capabilities that tell you how long the outlet has been on each day, how much power you're using, and what it's costing you.



NEST PROTECT

\$99 nest.com

Every home should have a smoke detector. The Nest Protect is a combination smoke and carbon monoxide (CO) detector that uses a colored light ring and audible alerts to warn you of dangerous smoke and CO levels. Like the Nest Learning Thermostat, the Protect is artfully designed and connects to your home's Wi-Fi, so you can keep a virtual eye on things while you're away. The new, second-generation Nest Protect is smaller than the original, with a longer lifetime of up to ten years. It also features a brighter light ring, as well as the ability to test sensors and hush false alarms from your phone or tablet using the new Nest app.




ICONTROL NETWORKS PIPER nv

\$179.99 amazon.com

Want to keep tabs on what's happening while you're away? Use the Icontrol Networks Piper nv. This is more than just a surveillance camera—it's a security system and a Z-Wave home automation hub all rolled into one slick-looking device. Its 180-degree fish-eye lens and pan, tilt, and zoom capabilities provide a wide field of view, and integrated sensors let you know when somebody (or something) has entered your home or workplace and will trigger the camera to record video of the event. Moreover, the Piper's deafening siren will likely scare off even the boldest of intruders.

Smart Home KITCHEN



With all of the great gadgets available for the kitchen, it's tough not to feel a little inspired to start cooking and cleaning. (Okay, maybe not *cleaning*, but that's what the robots are for.) Still, not all kitchen gizmos are for everyone. Some people have no room for a dishwasher, and others simply have no need for a slow cooker, connected or otherwise. Luckily, no matter which kitchen gadgets you choose to adopt, dinner is only an app away.

ORANGE CHEF CO. PREP PAD

\$9,399-\$13,999 kingsdown.com

You can measure the nutritional value of everything you cook using the Orange Chef Co. Prep Pad. It's a smart food scale that gives you a detailed look at your overall nutrition, which is helpful for dieters and health fanatics alike. It logs the food you eat and creates attractive, easy-to-read visualizations of your meals, including the basics like carbs, fats, and protein, as well as micronutrient data like vitamins, calcium, fiber, and iron. You can even link it with certain activity trackers to provide you with custom nutrition recommendations based on your activity level.



MR. COFFEE SMART OPTIMAL BREW COFFEEMAKER WITH WEMO

\$179.99 mrcoffee.com

Even if you aren't ready to start brewing your own beer or following complex recipes, surely you wouldn't mind some help perfecting your morning cup of coffee? That's where Mr. Coffee's WeMo-enabled Smart Coffeemaker comes in. It's a high-quality coffeemaker you can control with your smartphone or tablet, letting you set automatic brewing schedules in advance. It even sends push notifications to your phone when your coffee is ready. That's much easier to wake up to than an alarm clock.



HAPILABS HAPIFORK

\$99 hapi.com

One kitchen staple we all use almost every day is the humble fork. But the Hapilabs Hapifork is no ordinary utensil. The Hapifork measures the time you take between bites, and it vibrates when you're eating too fast. It also connects to your phone via Bluetooth, letting you track your eating habits, including the duration of your meals, the number of fork servings with the average interval between bites, and your percentage of success rate, which is determined by your number of properly timed bites.



MIRACLE-GRO AERO GARDEN 3 SL

\$69.95 aerogarden.com

If you're into eating local, you can't get much closer than homegrown produce. No green thumb? No problem. The Miracle-Gro AeroGarden 3 SL is an electronic, soil-free indoor garden. It makes it virtually foolproof for anyone to grow and maintain a small garden right at home. I've never seen plants grow faster—or with less maintenance—than in the AeroGarden 3 SL. According to Miracle-Gro, the hydroponic Aero Garden grows plants five times faster than soil. I've never planted my own lettuce in soil, but judging by what I saw in the AeroGarden, this claim seems certainly possible.

ANOVA CULINARY PRECISION COOKER

\$179.99 anovaculinary.com

Tired of overcooking or undercooking all your favorite foods? Take away most of the guesswork by going sous vide. Until recently, immersion circulators have been cost-prohibitive for most home cooks, but now the Anova Culinary Precision Cooker has you covered. The Precision Cooker heats your food to the exact temperature you desire, and not a degree more. Because the food is sealed in plastic pouches, no moisture can escape and the food can't dry out; because the heat is precise, the food can't be overcooked. It even connects to your phone via Bluetooth so you can see the current water temperature and set it to the level your dish requires.



iGRILL MINI

\$39.95 idevicesinc.com

One of the biggest challenges I face when I cook is knowing when to take a piece of meat off of the grill. But that's pretty much a worry of the past when using the iGrill Mini from iDevices. The iGrill Mini is a Bluetooth thermometer that lets you check on the progress of your meal right from your smartphone. A companion app includes recommended cooking temperatures for just about every protein and level of doneness you can think of, and the thermometer has a range of up to 150 feet from your mobile device, so you can monitor the progress from afar and receive a notification as soon as your dish is ready.



CROCK-POT SMART SLOW COOKER WITH WEMO

\$149.99 crock-pot.com

If grilling still sounds like it's outside of your culinary skill level, the Crock-Pot Smart Slow Cooker with WeMo should be more your speed. It connects via Wi-Fi and can be monitored and turned on and off using an iOS or Android mobile device. You can also use an app to adjust temperature and timer settings on the fly, so whether you're getting home earlier or later than anticipated, you can adjust the cooking speed well ahead of time and return to a home-cooked meal.



PICOBREW ZYMATIC

\$1,999 picobrew.com

Brewing your own beer can be fun and rewarding, but it requires a significant time investment and a fair amount of equipment. With the PicoBrew Zymatic, most of the time-consuming work is automated, so you don't have to watch a boiling pot, regulate the temperature, or add hops every 20 minutes. The Zymatic also gives you access to an extensive list of online recipes, and it lets you share your own with an active online community. It comes with everything you need to start brewing, and you can buy preassembled ingredient kits online if you'd rather not buy your own ingredients.

DROP KITCHEN SCALE

\$99.95 getdrop.com

Another good device for cooking novices is the Drop Kitchen Scale. The Drop is a Bluetooth scale that connects to your iPad to tell you how much of an ingredient to add and when, so you can forego the standard measurement process. It makes it easy for all bakers, regardless of experience level, to whip up a ton of tasty confections.



PURE IMAGINATION PERFECT BAKE

\$69.99 perfectbakeapp.com

If you need the maximum amount of hand-holding, you should check out the Pure Imagination Perfect Bake. The kit works with your tablet to tell you how to make hundreds of baked goods and guides you through the process, measuring ingredients as you add them to a connected scale and automatically compensating for over-pouring. It makes it easy to pretend you're a professional baker, even if your only previous experience is warming up store-bought cookies in the microwave.



ICPOOCH

\$129.99 icpooch.com

After you're done baking, don't forget to feed your furry friends. No, I'm not suggesting you make your own dog biscuits. The iCPooch lets you place two-way video calls to your pet, and remotely dispense treats via an app on your mobile device. It's a good way to feel connected to your dog or cat, even at those times you're far from home.



IROBOT SCOOBA 450

\$1,999 picobrew.com

Perhaps you're already an accomplished cook and don't need any of the aforementioned gadgets to turn out a stellar meal. There's still one kitchen activity that no one will turn down a little help with: cleaning. And as long as you have traditional tiles or any other hard flooring, there's no better robot for the job than the iRobot Scooba 450. It may look like a Roomba, but it certainly doesn't clean like one. Instead of vacuuming, the Scooba uses a three-cycle process to soak, scrub, and dry your floors, leaving them just as clean as a good mopping.



Smart Home **BACKYARD**

As nice as it is to spend time in the great outdoors, there's no doubt it benefits from an infusion of technology. With all of the gadgets we've gathered here, you're sure to have one of the best backyards on the block—not to mention one that practically takes care of itself, with devices designed to clean your gutters and pool, and even mow your lawn. The best part? With all the time you save, you can actually sit back and enjoy it.



ICYBREEZE PORTABLE AIR CONDITIONER AND COOLER

\$249-\$425 icybreeze.com

What's a barbecue without the beverages? The IcyBreeze Portable Air Conditioner and Cooler looks like a standard cooler you'd pack full of drinks and sandwiches and wheel onto the beach. And it is, but it's also an air conditioner. That's right, an air conditioner. Using a fan and the chilled air inside the cooler, it can blow a constant breeze of cool air up to 25mph at up to 35° below the outside temperature. And it has a rechargeable battery, so you can stay cool whether you're on the beach, camping, or tailgating. We've come a long way from the misting fan.



IROBOT LOOJ 330

\$299.99 irobot.com

Clearing out your gutters is almost always a messy task made worse by the fact that you have to constantly climb up and down a ladder that needs moving every 6 feet or so. Enter the iRobot Looj 330, a robotic gutter cleaner that propels its way through your gutter trays, clearing debris as it goes. You'll still have to climb a ladder once in a while (although not as often), but this handy robot does the dirty work for you and makes the overall job a lot less miserable and quite a bit safer.



ROBOMOW RS622

\$1,699 robomow.com

If you're tired of paying a landscaper to cut your lawn, but don't want to spend your Saturdays pushing a lawn mower in the hot sun, let a robot do it for you. The Robomow RS622 is one of several robotic lawn mowers developed by Friendly Robotics, a robot manufacturer that also makes the Friendly Vac robotic vacuum cleaner. Designed for lawns of up to 23,000 square feet, the RS622 is a powerful, battery-operated mower that comes with everything you need to completely automate your grass-cutting chores.



POLARIS 9550 SPORT

\$1,195 polarispool.com

The pool is another space you'll want to keep well maintained. But put down the skimmer. The Polaris 9550 Sport is a well-priced robotic pool cleaner that uses a four-wheel drive system to traverse your pool bottom and climb its walls to clean the sides and waterline, while two scrubbers on its front end work to dislodge debris. Things like dirt, leaves, and acorns get trapped inside the canister, which uses a fine mesh screen to filter the water before sending it back into the pool. And an innovative Lift System makes it easy to remove the robot from the pool.

WHISTLE ACTIVITY MONITOR

\$99.95 whistle.com

If you have dogs that roam outdoors, you probably want to keep track of them. That's where the Whistle Activity Monitor comes in. The Whistle is basically a Fitbit for your pet. It's a small, lightweight device that attaches to your dog's collar so you can track its daily activity and long-term health trends through an app on your phone. You can even compare your dog's activity with that of similar pups, and set daily goals based on your dog's age, breed, and weight.



SUNBRITE SIGNATURE SERIES

\$1,495 & up
sunbrite.tv

If the beauty of nature alone isn't enough to relax you, perhaps a big-screen HDTV would help? The LCD HDTVs in the Sunbrite Signature Series are built to withstand rain, wind, sleet, snow, and bugs, making them ideal for backyard use. Sunbrite makes sets in a number of screen sizes, and they can handle temperatures as hot as 122° F and as low as -24° F across the board. If you want to bring stunning high-definition video to your deck or patio, it's worth checking out.



DIVOOM VOOMBOX PARTY

\$50 robomow.com

Hate cleaning gutters? The iRobot Looj is a gutter-cleaning robot that uses a high-velocity, four-stage auger to blast away leaves, dirt, and clogs while brushing your gutters clean. Once you've placed it in the gutter, the Looj travels down on its own, sensing and adapting to debris to provide the most effective cleaning. It's waterproof in up to 8 inches of water, easily cleanable with a hose, and can travel under gutter straps and over downspout holes, so it should be able to tackle just about any mess.



NETGEAR ARLO SECURITY SYSTEM

\$349.99-\$499.99 arlo.com

Installing a home surveillance system outdoors is easier than ever thanks to the proliferation of Wi-Fi cameras, but most of these still require an AC power source, which limits where you can place them. The weatherproof Netgear Arlo Security System, on the other hand, is a completely wire-free home surveillance camera system that uses a pair of palm-sized, battery-powered cameras and a base station. Place the cameras pretty much anywhere to track motion in and around your home, then view live and recorded video from your smartphone or PC.

RACHIO IRO SMART SPRINKLER CONTROLLER

\$249 rachio.com

You won't need to pay too much attention to the weather forecast—at least as far as your lawn is concerned—if you're using the Rachio Iro Smart Sprinkler Controller. The Rachio Iro can be controlled from your smartphone and offers manual and scheduled watering sessions. It also provides water usage reports, a history of timed and manual watering, and numerous alerts and notifications. Better yet, it uses your local weather data to automatically adjust your watering schedule to help conserve water. Lawn care doesn't get much easier than that.



DJI PHANTOM 3 PROFESSIONAL

\$1,519 dji.com

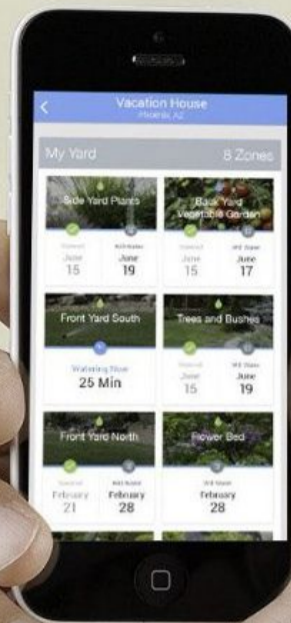
If ground surveillance isn't enough, how about your very own drone to monitor your property from above? Okay, I wouldn't actually rely on the DJI Phantom 3 Professional for around-the-clock aerial security, but it's the best drone we've tested, and can deliver some impressive footage of your entire neighborhood. It takes the ease of use of DJI's previous quadcopters and refines just about every aspect of operation. The video quality in particular is a huge step up—you can record 4K footage to a memory card and stream 720p clips to YouTube.



QUIRKY REFUEL

\$49.99 wink.com

If you're using propane to fuel your outdoor cookouts, few things can put a damper on a the fun quite like an empty tank of gas. Many grills come with a built-in gas gauge, but in my experience, that's usually the first part of a grill to stop working. Quirky is helping make sure you'll never run out of gas again with the Refuel, a connected propane gauge that can send updates on the status of your gas tank straight to your smartphone.



AMBIENT WEATHER WS-1001-WIFI OBSERVER

\$289.95

ambientweather.com

The Ambient Weather WS-1001-WIFI Observer gathers an incredible amount of weather data and can hook into the Weather Underground network. Once the device is in place, data flows from outdoor and indoor sensors to your base station. At a glance, the system shows you indoor and outdoor temperature and humidity, heat index, wind direction, wind speed, wind gust, wind chill, dew point, rainfall, barometer data, UV index, sunrise, sunset, and phases of the moon. Try getting all that from the news.

GET ORGANIZED

**How Scanning Apps
Keep You Organized**

TIPS

**Take a Bigger Bite
Out of Apple Music**

CONNECTED TRAVELER

**Airline, Make Me
a Sandwich**

Digital

Life

How Scanning Apps Keep You Organized

BY JILL DUFFY



If you have a smartphone, you need a scanning app with optical character recognition (OCR). Scanning apps help you capture all kinds of information in a split-second, from whiteboard notes to important documents. A scanning app saved my behind recently after I picked up a new passport. I scanned a copy of it on the spot, but then I had to immediately turn it over to someone else to apply for a visa. Before my passport was returned to me—more than two weeks later—I had to fill out a bunch of paperwork that required details from my passport. Good thing I had a legible copy!

If you're still wondering why you would need a scanning app, and preferably one with OCR, here are a few scenarios that might convince you.

Business cards. The next time someone hands you a business card, use a scanning app to save that person's contact information in less than 30 seconds.

Then celebrate being paperless by returning the business card (or recycling it later). Some apps automatically create a contact card or find the person on LinkedIn to make sure you two are fully connected.

Whiteboards and presentation slides. When you're in an important meeting, pay attention to the speaker, not every detail that's on the whiteboard or in the presentation. Just snap a picture of important slides as they appear, or scan the whiteboard as the meeting is coming to a close.

Important documents to email to others. Say your bank gives you an important document to sign, but you want your lawyer to check it over first, and quickly. You can scan the paper and email it to your lawyer on the spot. Some scanning apps even have a tool that lets you sign them digitally, too.

Important documents to back up. Take my passport example from above and swap in any number of important documents that you can't physically keep for one reason or another, but should. In many situations, being able to scan documents—even lengthy ones—in a matter of seconds saves you a time, money, and hassle. For example, when a “for sale” sign on a house catches your eye, a scanning app lets you grab a picture of the phone number, realtor's name, and even the street number on the door or mailbox, and you don't have to write down anything at all. Or when you pass by a shop that's closed and see business hours written on the door, you can snap a picture and save all that text somewhere safe and searchable.

WHAT TO LOOK FOR IN A SCANNING APP

The best scanning and OCR apps have a few key features.

Save and export options. The best scanning apps give you options for where you can save or export your newly scanned texts. You don't want an app that forces you to keep documents in a new place. Look for options such as the ability to export to Dropbox, Box, OneDrive, and other popular cloud storage services.

Search functionality. When pictures of text are turned into words, those words need to be searchable for you to get the most out of them. The best scanning apps run OCR on text in images, which helps give you strong and reliable search functionality. Just as good are scanning apps that export to a service that has strong OCR and search, such as Evernote.

Edge detection. A good OCR app automatically finds the edges of paper, no matter if it's legal-size paper, A-11, or a standard-size business card.

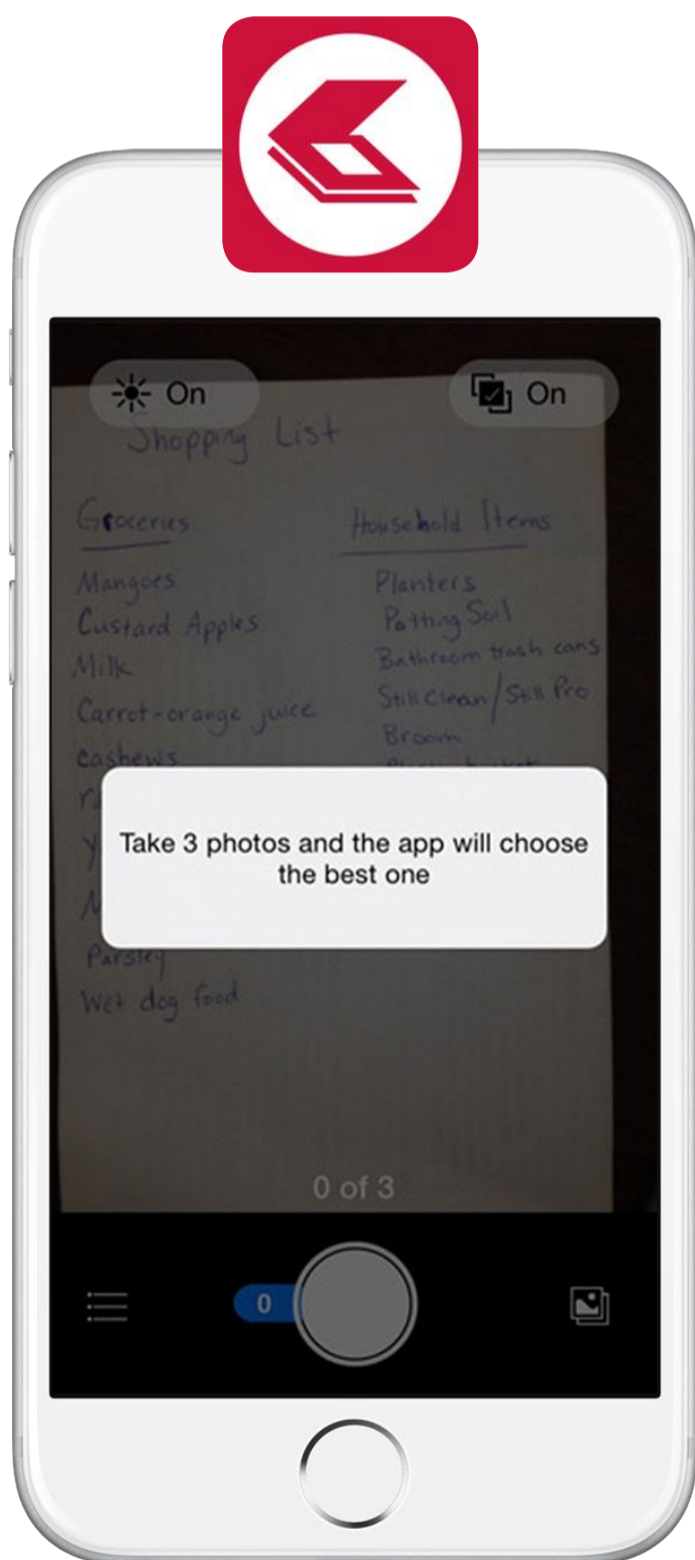
Speed. You want your OCR scanning app to fly through documents faster than

you can put them in front of your smartphone's camera. The better ones also collate multiple pages into a single PDF document with ease.

Free. Don't get suckered into paying for an expensive scanning app. Many of the best ones are free. If there is an up-sell, it's typically an enticement to pay for a premium subscription to get extra features. In a few of the very best scanning apps, the OCR functionality isn't included for free, but the cost to upgrade is nominal.

RECOMMENDED SCANNING APPS

Now that you understand what scanning apps can do and why you might want one, here are a few I recommend, with notes on their strengths and limitations.

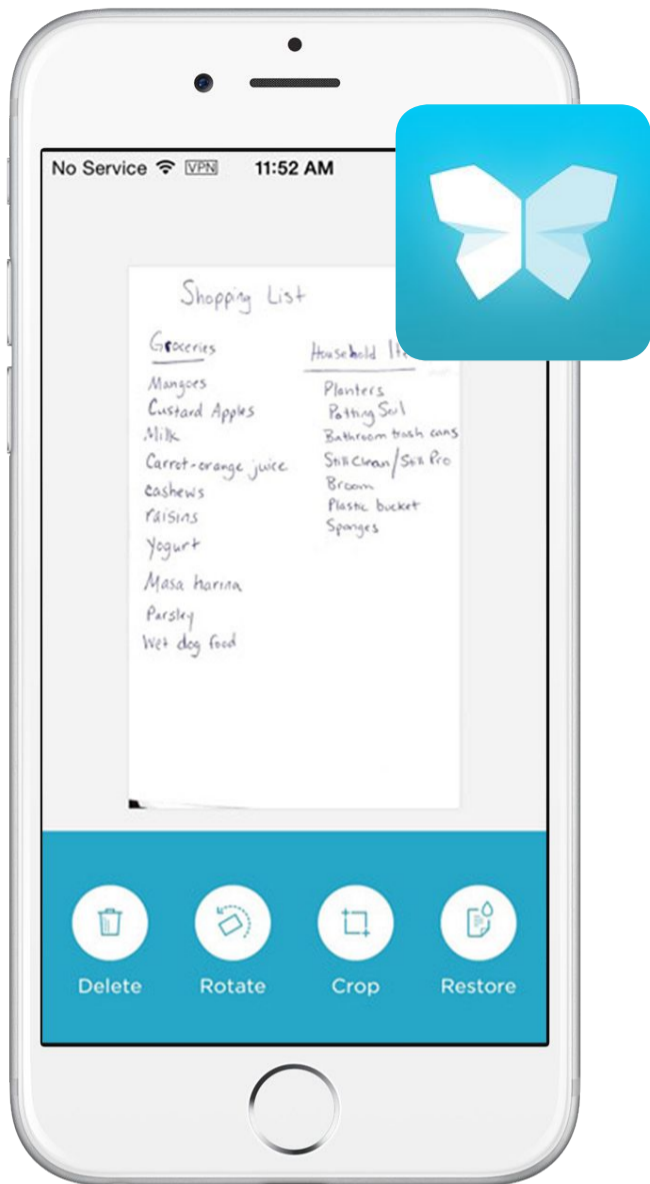


ABBY FINE SCANNER

Platform: iOS

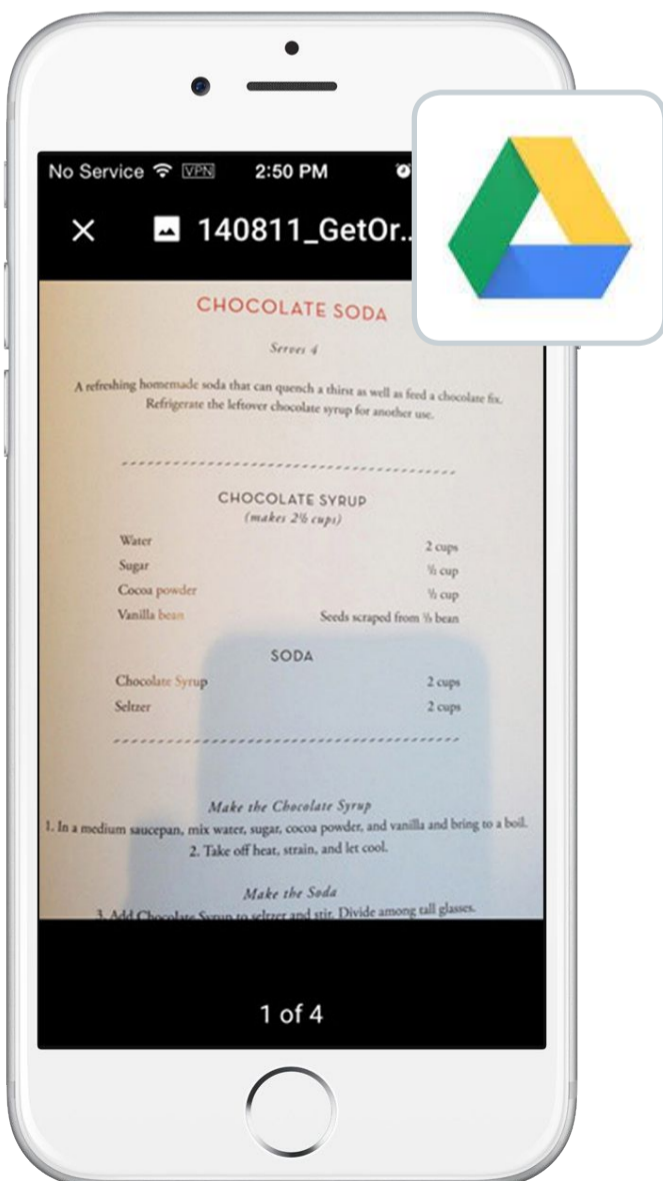
Price: Free; \$4.99 per month for premium features, including OCR

Abbyy FineReader is the best OCR software for your computer, so it's no surprise that the company's mobile app, called FineScanner, is of equally high quality. FineScanner can export PDFs and Word documents of your scanned images to Box, Dropbox, Evernote, Facebook, Google Drive, Yandex.Disk, iTunes, and iCloud Drive for iOS users. It can send files elsewhere, too, when you look for sharing options: email, Evernote, FaxBurner, and other compatible apps and services that you have installed on your phone. One neat feature is that you can take three quick pictures of the same document and let the app decide which one is of the best quality. You'll need to pay for a Premium account (\$4.99 per month) to get OCR, but other perks include support for 44 languages and the option to password-protect PDFs you create using the app. Though this app is for iOS only, the company also makes a business-card-reader app for Android, iOS, and Windows Phone.



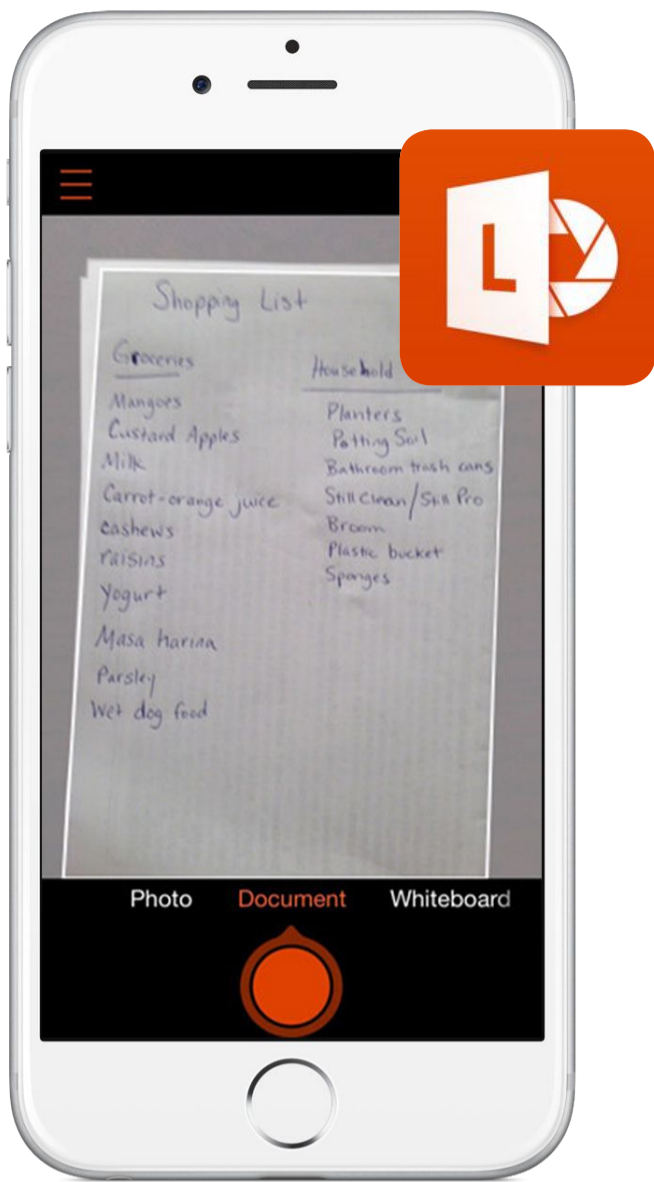
EVERNOTE, & EVERNOTE SCANNABLE
Platforms: Android, iOS, Windows Phone; Evernote Scannable for iOS only
Price: Free; \$49.99 per year for Premium, including increased upload allowance.

Evernote is my first choice in scanning and OCR apps. The namesake Evernote app lets you scan business cards, documents, and any written, typed, or handwritten text into the app, where it runs OCR on the results and makes it all searchable. The OCR is included free. Business cards scanned into Evernote are transferred into a contact card, and you can opt to connect to LinkedIn for even more details. A companion iOS-only app, Evernote Scannable, makes quick work of scanning stacks of business cards or multipage documents, which you can save directly into Evernote or another supported service. For \$49.99 per year, a Premium Evernote account increases your upload allowance, which is crucial if you create a lot of large PDFs by scanning. Excellent edge detection, export options, and OCR included free all make Evernote and Evernote Scannable wonderful apps to help you stay organized.



GOOGLE DRIVE
Platforms: Android, iOS
Price: Free

When you upload pictures that contain text to the Google Drive mobile app, they are scanned and run through OCR to become fully searchable. Note that this functionality does not show up in the separate Google Docs and Sheets apps.

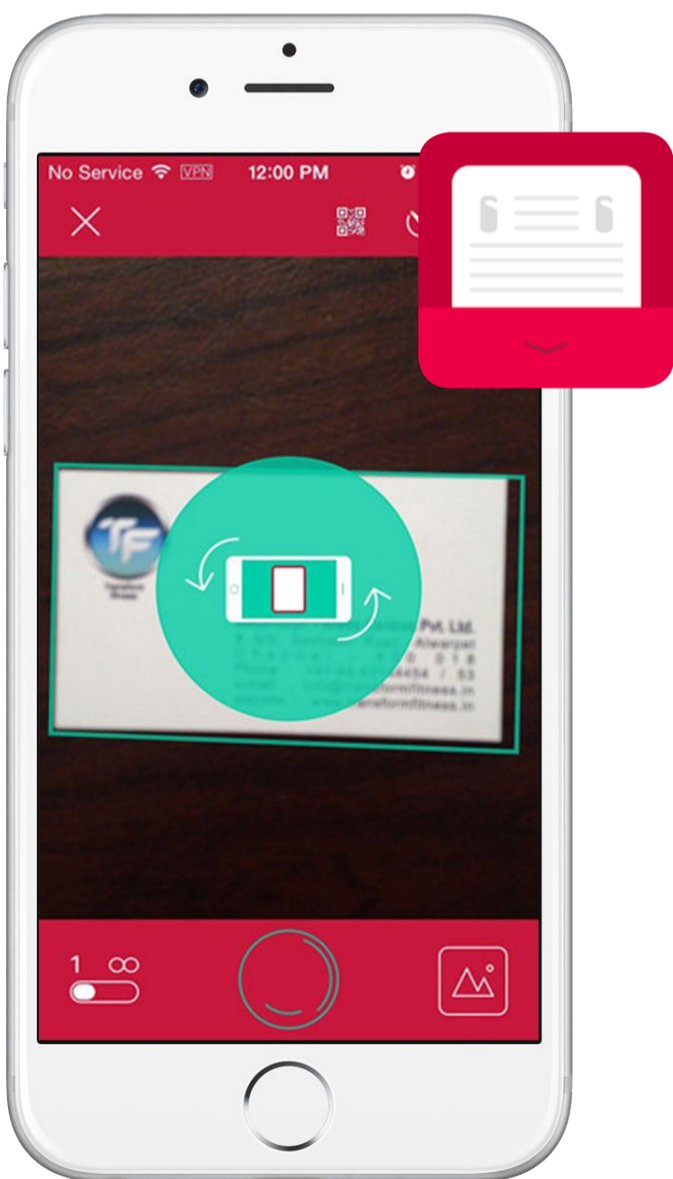


MICROSOFT OFFICE LENS

Platforms: Android, iOS, Windows Phone

Price: Free

Earlier this year, Microsoft released Office Lens, its take on a mobile scanning app. This means that Office Lens works especially well with OneNote, OneDrive, Word, and other Microsoft apps. It's not as zippy as Evernote Scannable, and it doesn't offer as many places where you can export files as Scanbot (see below), but it does have a Whiteboard setting, which few other scanning and OCR apps have. The Whiteboard mode cleans up photos of whiteboards by straightening and cropping appropriately, and applies a high-contrast filter to the image to make the board's contents more legible. Unfortunately, OCR isn't supported for handwritten text on whiteboards as of this writing.



SCANBOT

Platforms: Android, Android for Amazon devices, iOS

Price: Free, \$4.99 one-time fee for Pro features, including OCR

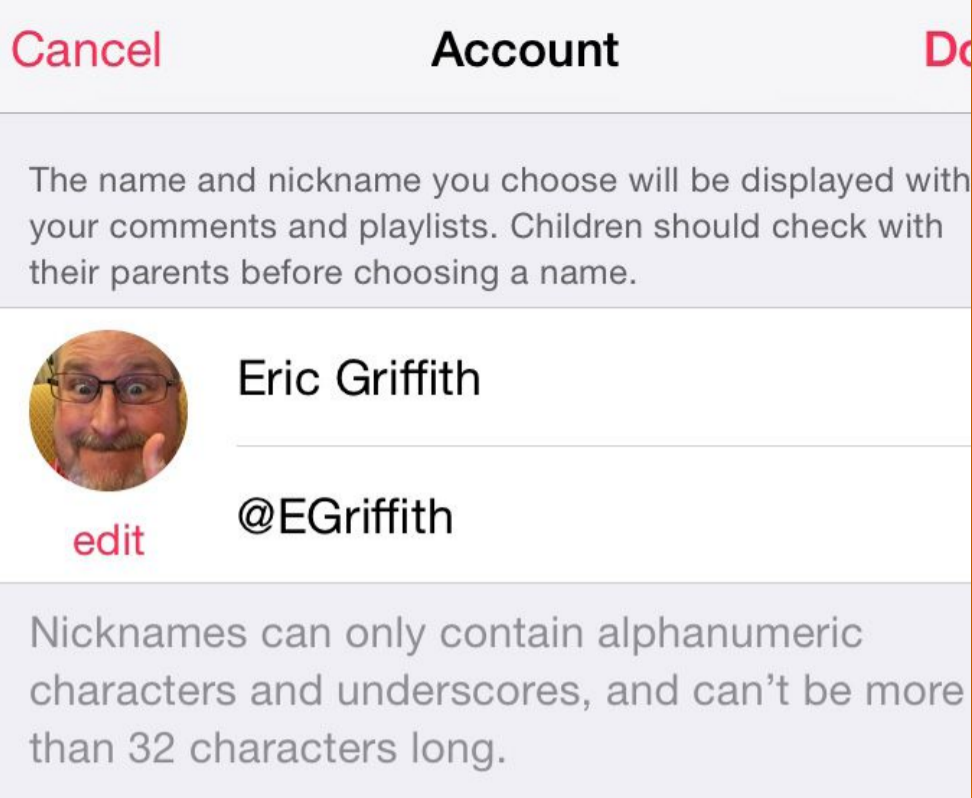
Scanbot is another scanning and OCR app, though to get OCR you have to upgrade to Pro by paying a \$4.99 one-time fee for a lifetime membership. That's not a bad price at all, and throw in another good Pro feature—the ability to edit documents, including adding a signature—and you're talking big benefits. Scanbot can save your scanned documents to Dropbox, Google Drive, Wunderlist, Slack, Evernote, OneDrive, Box, Yandex.Disk, WebDAV, Telekom Cloud, and Shoeboxed. On iOS, it can also sync to iCloud Drive.

Take a Bigger Bite Out of Apple Music

BY ERIC GRIFFITH



Few services get to explode onto the market and into the public consciousness like Apple Music. Backed by the Apple marketing juggernaut and millions of existing iTunes users, it's automatically become one of the premier services for streaming music, and well worth its \$9.99-per-month price (though there's also a three-month free trial). These tips will help you get the most out of the "revolutionary" service, or at least prevent it getting the better of you.



GET YOUR CONNECT NAME

When you post comments or playlists in Apple Music, it'll show your name. You can claim a special nickname for the Connect social aspect, if you're quick about it. (No one wants to be told they should be egriffith646985.) In the Music app, tap the little head icon in the top-left corner, select your name up top, and enter a name and add a photo.

TURN OFF AUTO-RENEW

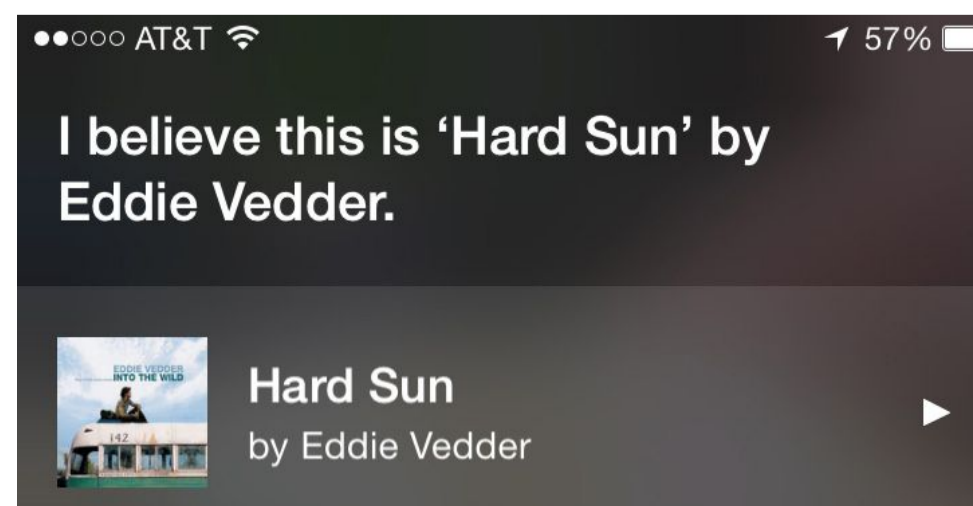
After your three-month trial of Apple Music, Apple is just going to assume you love it and want to subscribe for \$9.99 per month. Prevent that charge from automatically appearing on your credit card. While in the Music app, tap the head icon in the upper left. Select View Apple ID and log in, then choose Manager under Subscriptions at the bottom. Turn off Automatic Renewal. A pop-up will tell you how long you have left in your trial. Remember, after your trial ends, any music you've added via Apple Music to playlists and the like will disappear.

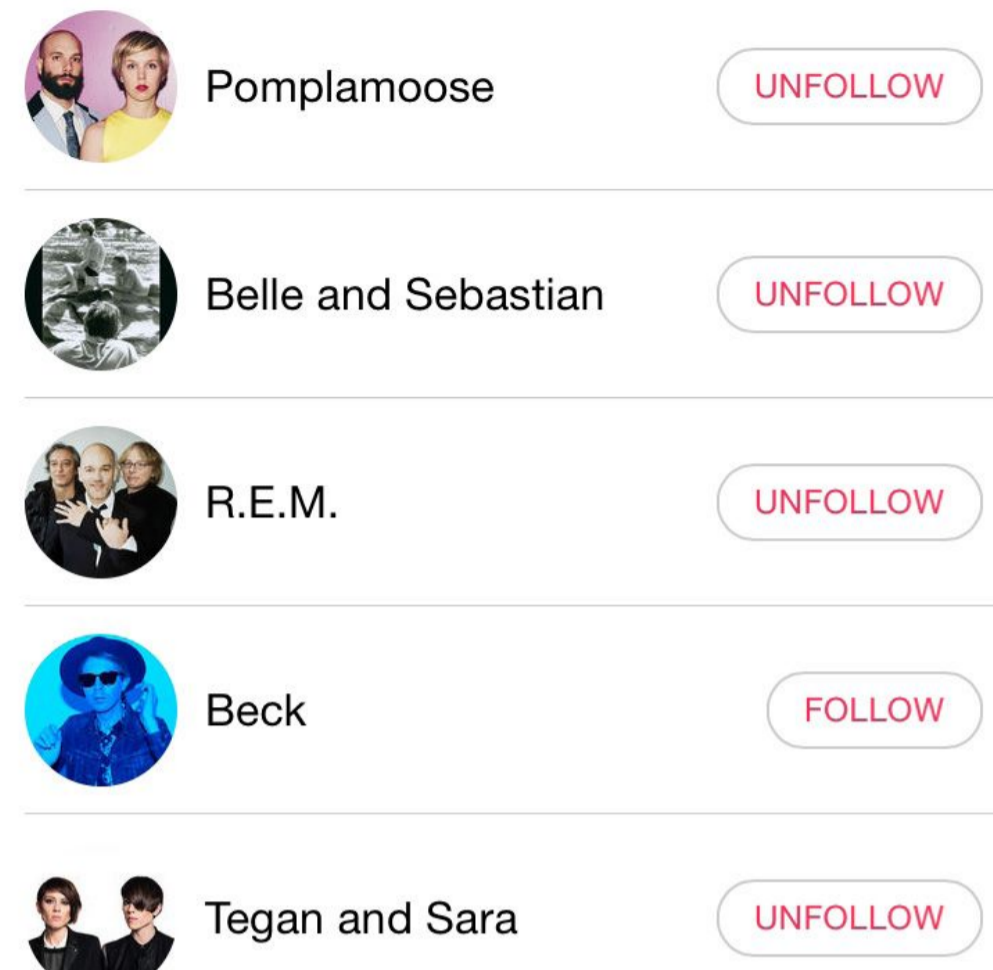
TAP TO LIKE, DOUBLE-TAP TO LOVE

Services like Spotify and Apple Music live by mining what you like musically, so they can recommend more. In Apple Music, you're asked from the get-go for suggestions of favorite artists and styles when you tap "For You." To make changes later, tap the head icon and then Choose Artists for You. Pink bubbles with musical genres and then specific artists will appear. Tap to tell Apple you like it. A double-tap, however, indicates a deep, abiding love, and that singer or band or genre is going to weigh heavily into future suggestions. If there's a genre in a bubble that you don't like at all, tap and hold it to get rid of it.

ENLIST SIRI

The ties between Apple's audio AI and Apple Music are pretty good. You can use Siri to search for music ("Find White Christmas by Bing Crosby on Apple Music" brought it right up), but also to do things like shuffle songs (hold down the Home button while in a playlist and say "Shuffle Songs"). Remember that Siri also has built-in Shazam, so ask Siri to identify a song playing around you, and when she does, you can then immediately click the arrow button to start playback.





SKIP CONNECTING VIA CONNECT

By default, any artist you add to your library is going to be one you follow using Apple Music's new social network component, Connect. In fact, any artist from whom you've ever bought music in iTunes, even that one weird single from years ago, is automatically followed. Go back to your Accounts and click the Following section. There, you can not only unfollow individual artists—who might, in fact, use the service to try and stay in touch with you about new releases—you can also tell Connect to stop auto-following artists you've added to your music library. Any artist you don't follow on Connect won't appear in the Connect Section of Apple Music, naturally.

KILL CONNECT ENTIRELY

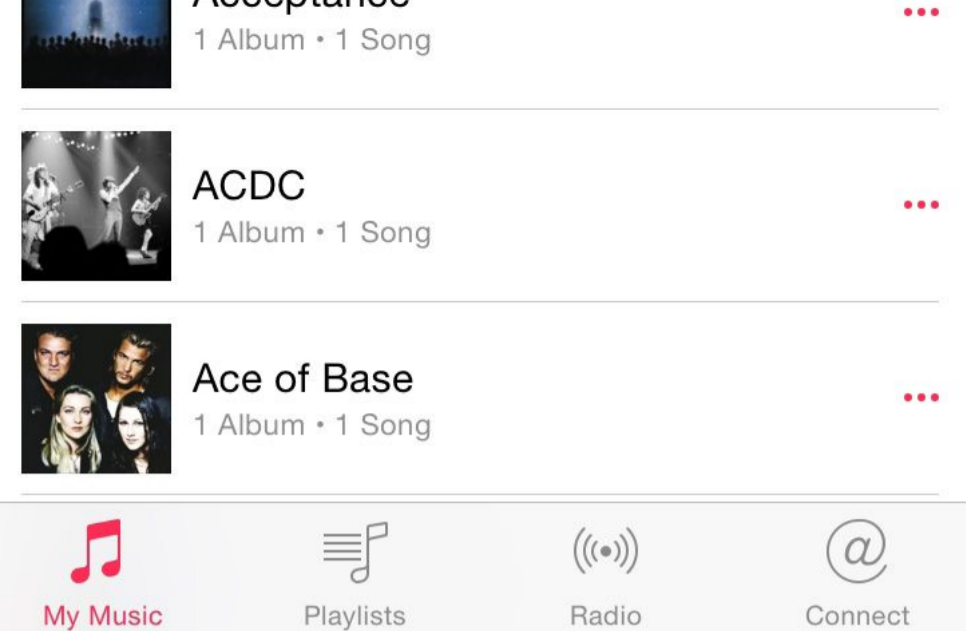
Want to do away with Connect? On iOS, go into Settings > General > Restrictions. Turn them on if they're off. Scroll down to Apple Music Connect and turn on the restriction. After that, go back to the Music app—you'll see the Connect tab has been replaced with "Playlists."

LIKE FROM LOCK

Listening to Apple Music with your phone locked is a godsend. If you hear a new song you like, but you don't want to go back into the app to indicate that you like it, just click the heart outline on the iOS lock screen. It will turn solid red to indicate your preference.

Note that doing this does not add anything to your phone or playlists; it just lets Apple know that you like the music in question, so that future recommendations can reflect your refined tastes. You'll find those recommendations on the For You tab.)





HIDE APPLE MUSIC SUGGESTIONS

Hate that For You tab because you already know what you like and already have all the music you want? You can stay subscribed to Apple Music while hiding it from view, so you can get access without it smacking you in the face in the app. On the iPhone go to Settings > Music and turn off Show Apple Music. The next time you open the Music App, you'll see not only that the For You tab is gone, but so is the New tab—you just get My Music, Playlists, Radio, and Connect (assuming you haven't turned it off).

DOWNLOAD FOR OFFLINE LISTENING

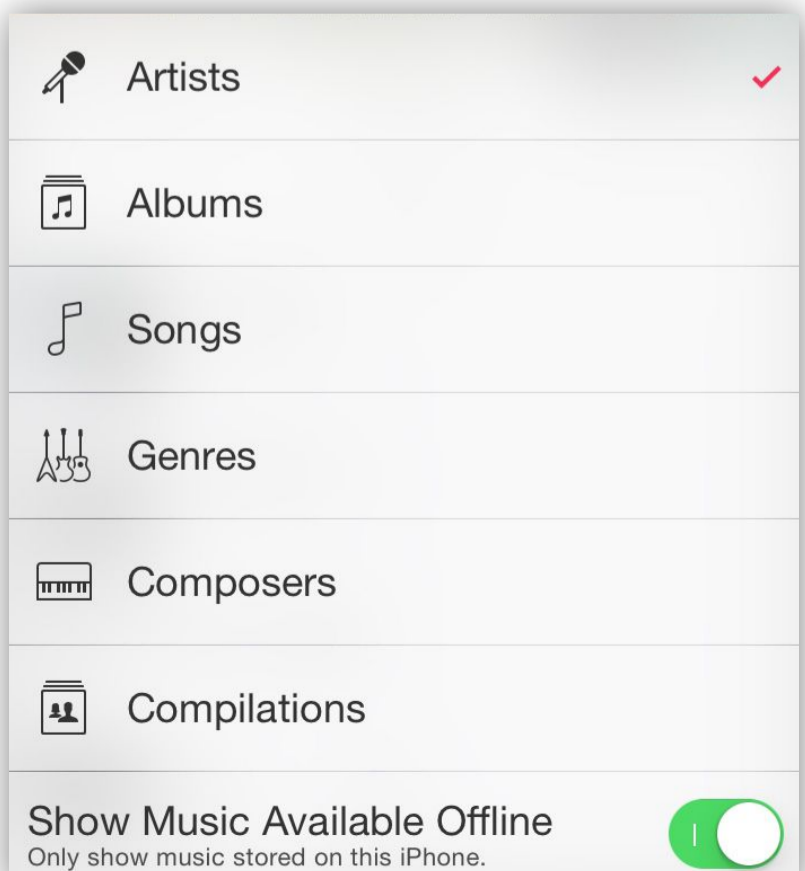
You're a paying Apple Music customer, or soon will be, so enjoy the fruits of that by making music you wouldn't necessarily buy otherwise available to listen to anytime, anywhere—even when you're offline. All you do is click the three-dot menu next to a song (or an entire album) and on the menu that pops up, click Make Available Offline. (If you want to buy it so you'll own it forever even if you stop using Apple Music, click Show in iTunes Store.) This also works from within Beats 1 Radio.

DOWNLOAD OVER CELLULAR

The default setting is that you only get to download music to the phone using Wi-Fi. You can change that by going into iOS settings, then to iTunes & App Store. Turn on the Use Cellular Data option. It's up to you to make sure you don't hit your data cap, if you have one.

VIEW DOWNLOADED ONLY

Let's say you have a huge library of music showing in your My Music tab—but most of it's streaming. If you want to know what's available when you're offline (namely, the tracks you've downloaded), click on My Music, and at the top of the tracks click Songs or Albums or whatever shows just below the album covers. It brings up the menu where you change how to sort music. At the bottom of that menu, toggle Show Music Available Offline to only see what's stored on the phone. (This doesn't quite work for iTunes Match users; on my phone, I still saw all my Match titles, even though they're not locally stored.)





PUBLISH TO APPLE MUSIC

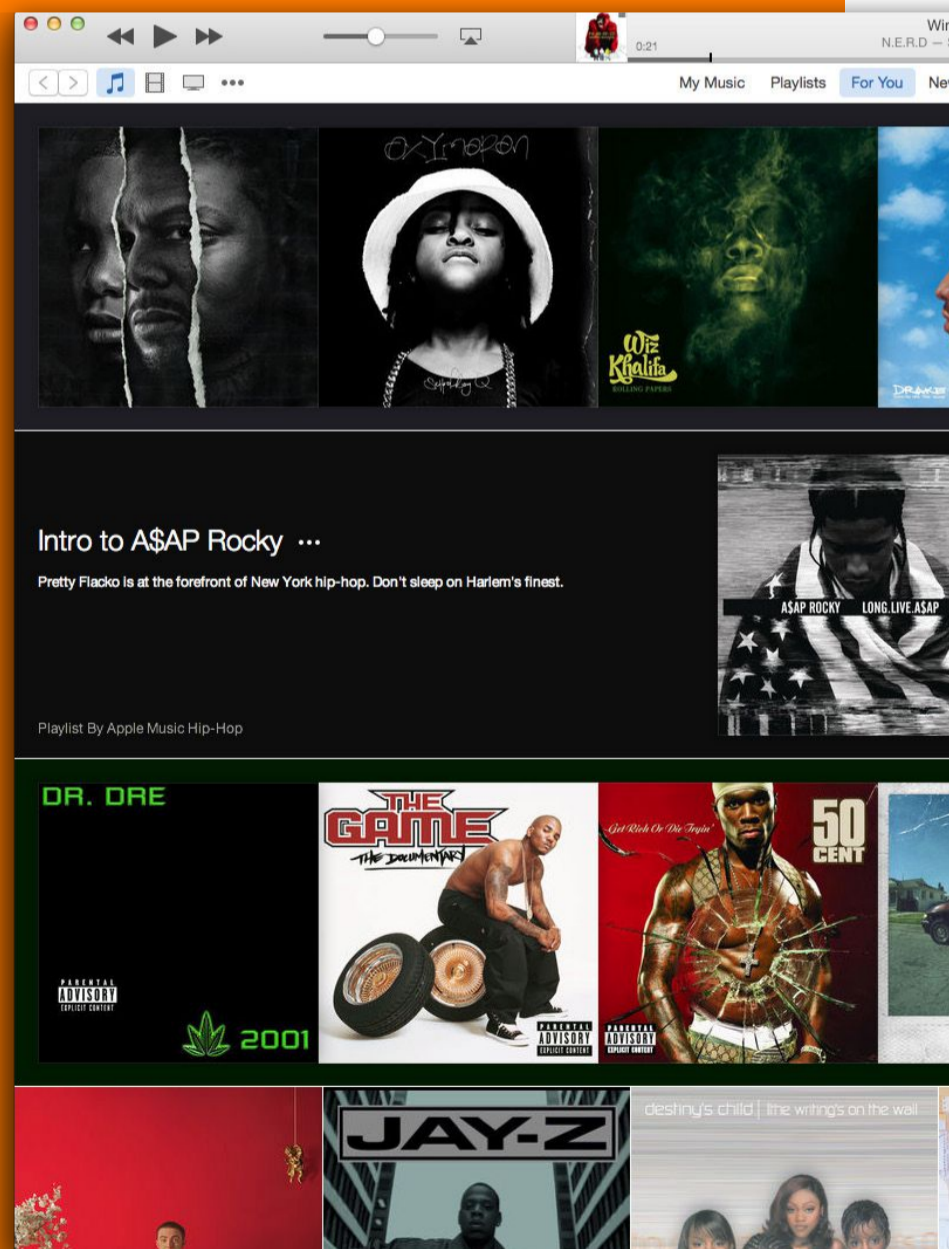
Spotify isn't the only place you can push your tunes to! On iOS, music crafted with GarageBand can be shared directly to Apple Music Connect. (This doesn't yet work on the Mac desktop.) Naturally, an Apple Music account is required, and chances are if you ever leave the service behind, it will kick your music to the curb. And, to be honest, it's not exactly going to replace SoundCloud for original music sharing anytime soon. But it's an interesting start.

WAKE TO APPLE MUSIC

Any song in the Apple Music library of 30 million tracks can now be what you wake to in the morning. Save a favorite song to your library (click that three-dot menu as a song plays and select Add to My Music)—after that, go into the Clock app, create or edit an alarm, and under Sound, click Pick a Song. From there, find it in the lists by album, artist, song, or just search for the individual track. (If you let the subscription lapse, you won't have that song to wake to, of course.)

ACCESS APPLE MUSIC ON THE DESKTOP

You'll need to make sure you're using the latest version of iTunes, but if you are, the software that has always held your Apple-based music collection becomes your streaming center. Along with the usual tabs for My Music and Playlists, you'll see Apple Music–specific tabs at the top including For You (seen here on both mobile and desktop), Radio, and Connect. If you're all thumbs, this is the best way to do some of the detail work, such as adding things to playlists, creating Smart Playlists, and so on.



Airline, Make Me a Sandwich

BY SASCHA SEGAN ✉



If you tend to get peckish in the air, try using Routehappy to search for your next flight. The company, which offers flight amenity data to online travel agencies, just added listings that detail whether you can get food on board.

Routehappy harvests the data from airline websites, global distribution systems, and traveler and airline interviews, the company's data research manager, Jason Rabinowitz, said. Although many airlines have really been ramping up fresh food for sale within the U.S., they all have slightly different rules as to which flights it's offered on, making it a prime topic for a search engine. (The rules generally vary depending on flight length and time of day.)

Routehappy is a fine example of how data aggregation and presentation can

9.2 Virgin America JFK to LAX Nonstop 6h 10m duration

Timeline
Fri. Aug. 14, 2015

4:55p

Virgin America Flight 413 Main Cabin

8:05p

JFK New York J F Kennedy Intl Airport Terminal 4

Los Angeles Intl Airport Terminal 3 LAX

Flight Amenities

- A320**
Airbus single aisle, narrowbody aircraft (several inches wider than peers)
- Roomier (32"+W)**
Roomier seat (32" pitch with extra width)
- Layout: 3-3**
Standard single-aisle jet layout. See if you can get a window or aisle seat
- Fresh food (\$)**
Fresh snack or meal is available on this flight for a fee
- Power +USB**
Power outlet & USB outlet at all seats
- Better Wi-Fi (\$)**
Flight offers better Wi-Fi than the basic kind
- In Seat (AVOD+TV) \$/free**
Free seatback Live TV and paid on demand entertainment

Report Issue

transform online experiences. All of Routehappy's data is available through either airlines' publicly facing websites or through travel agent systems. But it's often scattered, fractured, and hard to find.

"There's just so much nuance to this," Rabinowitz said. "It's so incredibly difficult for the average flier to figure out something as simple as, are they going to give us a sandwich on board or not."

With more airlines offering Wi-Fi and seatback entertainment across their fleets, they're now trying to differentiate with food for sale, Rabinowitz said. Of the large U.S. airlines, only Southwest and Spirit have not yet gone that route.

"Over recent years, airlines have really been improving their game when it comes to food quality, quantity and selection," Rabinowitz said.

Routehappy isn't the only firm doing amenity aggregation. TripAdvisor's Seatguru, for instance, collects more detailed aircraft-by-aircraft seat data and gives food information that's in some ways more precise, but in other ways vaguer than Routehappy's.

For instance, Seatguru tells you that American Airlines snack boxes cost \$4 each, but leaves it up to you to know whether your specific flight fits within American's food-for-sale time restrictions. And for in-seat power, for instance, Routehappy just says "power (some rows)," where Seatguru forces you to figure out which airplane configuration you're flying on before informing you exactly which rows have power.

Routehappy's real strength is in presenting its data in a way that attractively merges in with flight search results from top online travel agencies like its customers Expedia and Google Flights. SeatGuru's plane-by-plane pages don't combine well with long lists of flight prices; you have to click through for the most detailed data, and use SeatGuru's or TripAdvisor's sites to get there.



DRILLING DOWN FOR A GOOD MEAL

If you want to be assured of getting a meal you like, you should probably still bring your own food. I've been on enough flights that sold out of the meal I wanted to learn that lesson. It's especially important for people who request special dietary-restriction meals on international flights, Rabinowitz notes.

"Where things really do start to get a little haywire, is you have to keep your fingers crossed that the caterers will load your specific meal," he said.

Although you may only see "Fresh Meal" or not on RouteHappy's site, the company clearly knows a lot more about the food than it's saying. For example: Aer Lingus lets you preorder an Irish breakfast on transatlantic flights. Delta's Comfort+ transcontinental seats come with free Luvo sandwich wraps and frozen Greek yogurt bars, Routehappy said.

"When an airline says a 'refreshment' is served on board, it could be anything from a cup of orange juice to a fully plated meal," Rabinowitz said.

Currently, the food data is only available on Routehappy's site, which you can use to search for flights but not book them. Routehappy offers up an API to its clients, so they'll probably be incorporating it soon.

Once you see the basic info about food, you might want to skip over to AirlineMeals.net, a user review site with tens of thousands of photos and reviews of specific airline meals. Yes, it's anecdotes rather than data, but it's all



The ABCs of Alphabet

Google has reorganized and will become a wholly owned subsidiary of a holding company known as Alphabet, which will also house all the screwball ventures the company has started or acquired over the years.

There has been a lot of speculation and confusion over the move. But it appears to be the only thing Google could do to avoid becoming another Yahoo, which bought many up-and-coming and successful ventures only to watch them deteriorate or fold completely.

Google was heading down the same path, ignoring its core competencies. Larry Page and Sergey Brin got where they are as world-class developers and leaders in the search engine game. Does this mean they suddenly can manage a thermostat company? Or a venture capital firm? Or a bank? Yahoo tried it and failed miserably.

The abject failure of Google Glass likely drove the company to conclude that simple divisions between business units cannot and will not work the same way as standalone companies.

A standalone company will reveal if something has any real potential to be successful. I sifted through various comments on different sites regarding Alphabet. An ex-Google [X] employee called it a disaster because it will be harder to poach employees from one division to another. But that's a problematic element. A company on its own cannot effortlessly take a superstar for temporary assignment to shore up the defects. Poaching was part of the problem, not the solution.

As CEO of Google, meanwhile, Sundar Pichai can focus on the company's core mission without the distraction of projects that Page and Brin have taken on.

Google has a lot of offshoots that are too off-the-wall to be managed by Google's CEO, from Google Fiber to self-driving cars. It would be wise to spin off Android from Google proper, and I think that will eventually happen. But for now, it's convenient to keep Android and even YouTube with Google.

Some have equated this structure with Berkshire Hathaway, where you have a big holding company and a lot of standalone corporations. The holding company provides guidance and makes sure there are no screw-ups without meddling too much in daily affairs. Valley insiders know that Page and Brin are fans of Berkshire Hathaway chief Warren Buffett. Alphabet is indeed similar enough to make the comparison, but has more standalone companies evolving from internal R&D than Berkshire Hathaway.

My initial thought was that Alphabet is some financial scam or a scheme to allow the founders to maintain control. You never know with Google. But logic says otherwise. None of the top folks at Google need to pull any shenanigans. It's pointless. This is a way to create a viable, long-term structure that is more Berkshire Hathaway and less Yahoo. It's a winner.

A handwritten signature in black ink that reads "John Dvorak". The signature is fluid and cursive, with a large loop at the end of the last name.

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