

**PC**

**MAGAZINE**

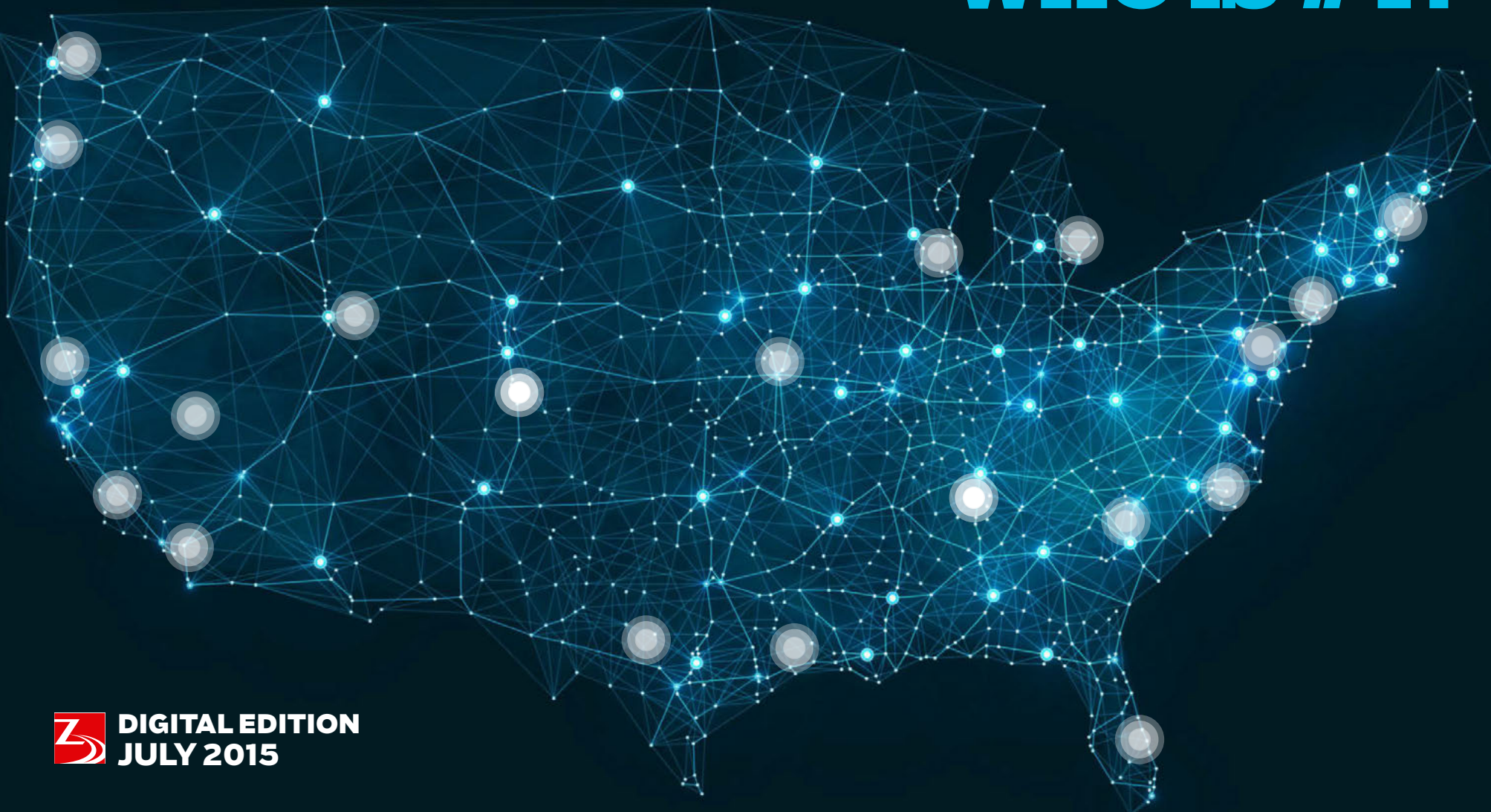
**2015**

**FASTEST**

**MOBILE**

**NETWORKS**

**WHO IS #1?**



 **DIGITAL EDITION  
JULY 2015**



**FEATURES**

**COVER STORY**

**FASTEST MOBILE NETWORKS 2015**

To find the fastest mobile Internet service in the United States, *PC Magazine* visited 30 cities and drove thousands of miles. See how AT&T, Sprint, T-Mobile, and Verizon stack up everywhere—including where you live.





# REVIEWS

## CONSUMER ELECTRONICS

**Myo Gesture Control Armband**

**Razer Nabu X**

**Nvidia Shield Android TV (16GB)**

**TCL 55FS3700**

**Asus ZenFone 2 (64GB, Unlocked)**

## HARDWARE

**Lenovo LaVie Z HZ550**

**Dell XPS 15 Touch (9530)**

## SOFTWARE & APPS

**Iolo System Mechanic 14**

**Our Favorite Apps for July**



Myo Gesture Control Armband



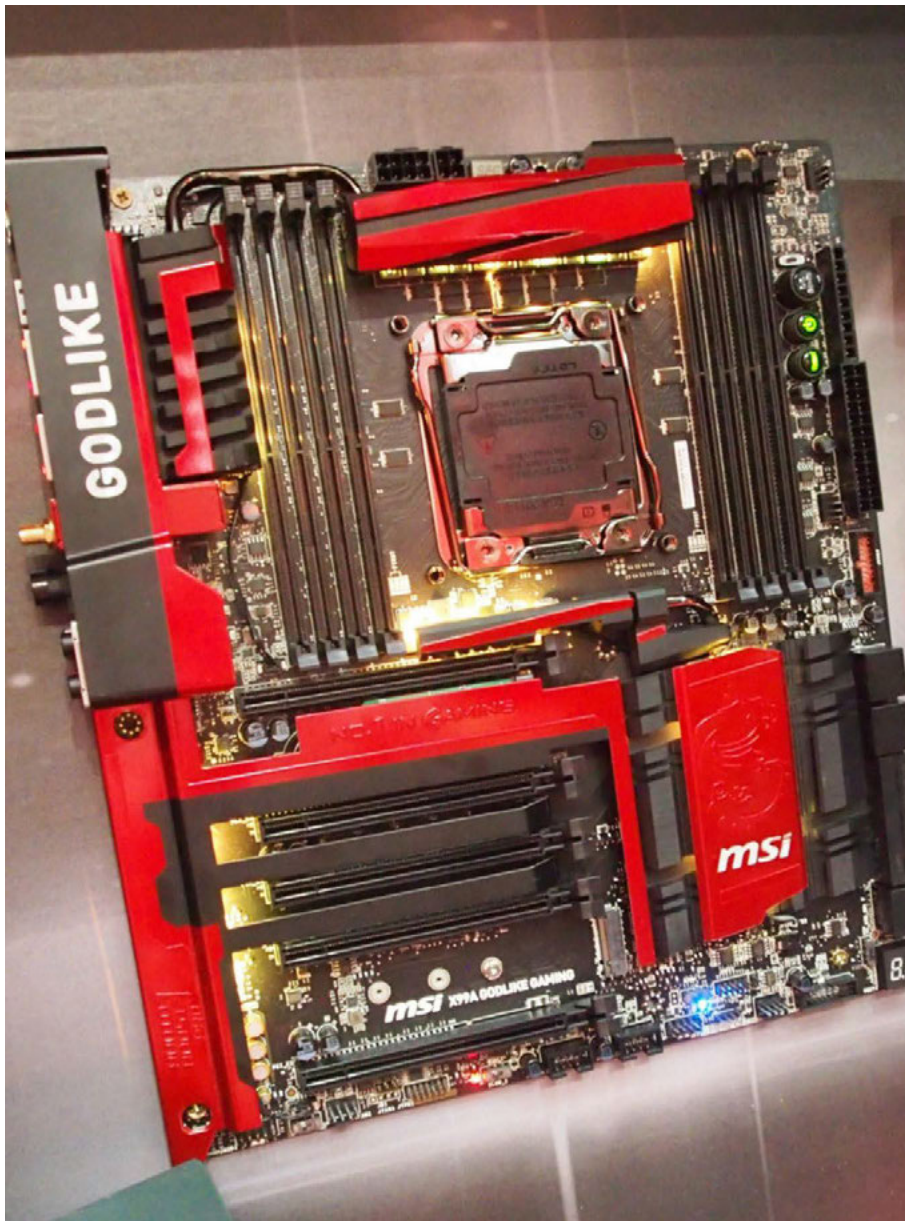
Nvidia Shield Android TV



Lenovo LaVie Z HZ550



# WHAT'S NEW NOW



## OPENING THE CURTAINS ON WINDOWS 10

Microsoft's newest—and last—OS arrives in July. Here's what you need to know to prepare for it.

## THE HOTTEST PRODUCTS AT COMPUTEX

The Computex trade show in Taipei revealed exciting hardware on the horizon. Here's what we liked most.

## IS THUNDERBOLT 3 THE ULTIMATE NEXT-GEN INTERFACE?

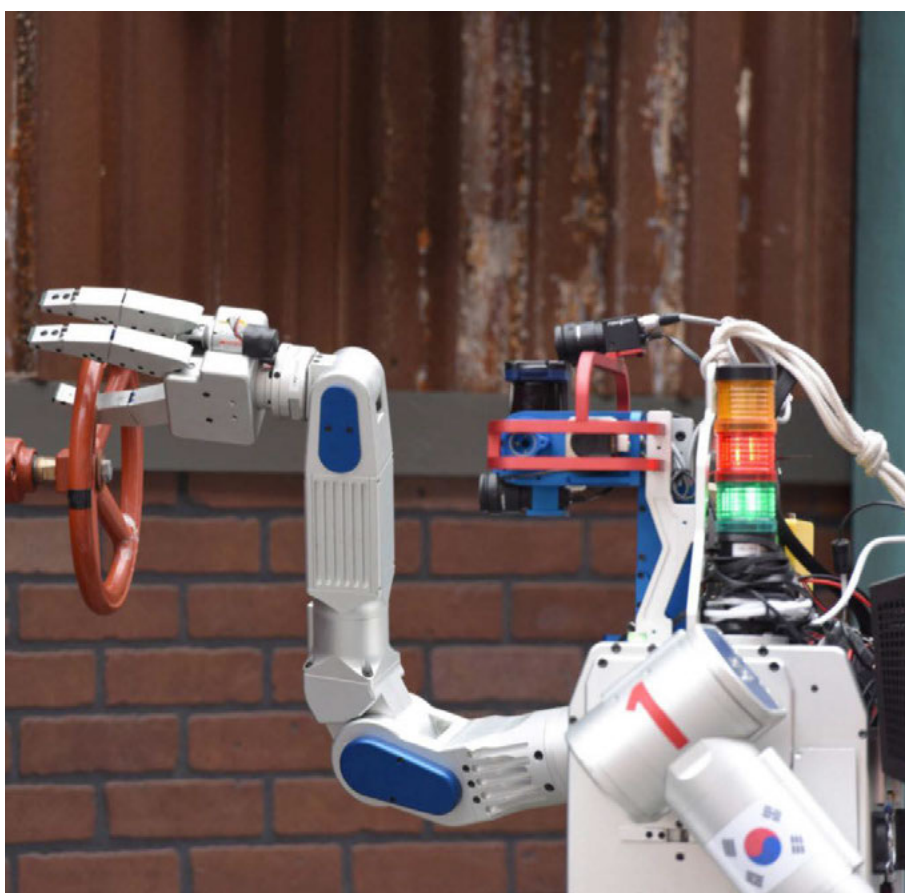
Because it fuses 40Gbps bandwidth with a USB-C plug, Thunderbolt 3 could change everything.

## BEHIND THE SCENES AT THE DARPA ROBOTICS CHALLENGE

This \$2 million competition showed just how important inventive robots will be in the future.

## TOP GEAR

## THE LIST: OUR FAVORITE NEW FEATURES IN MAC OS X EL CAPITAN





# OPINIONS

**DAN COSTA**

First Word

**READER INPUT**

**SASCHA SEGAN**

Apple Music Can Win Without Being Great

**EVAN DASHEVSKY**

Facebook, Google Want to Connect the Next Billion (and Make Money)

**ERIC GRIFFITH**

Making the Case for Cell-Phone Jammers



**After Windows 8, who can blame Microsoft for not wanting to take too many chances?**



**JOHN C. DVORAK**

Last Word

# DIGITAL LIFE



## GET ORGANIZED

11 Ways to Increase Your Productivity

## CONNECTED TRAVELER

Four Seasons Hotels Add Uber for Room Service

## GAMING

The Best Free-to-Play PC Games





## Fastest Mobile Road Trip

---

**I**t sounded like the perfect plan to both me and Lead Mobile Analyst Sascha Segan: Drive cool new cars across the United States just as summer starts, stop at interesting places, and record it all via social media. Not only would *PC Magazine* pick up the tab, but these would qualify as *workdays*. There was just one catch: There would need to be eight cellular phones in the backseat, running speed tests as the scenery rolled by. Once all the testing was done, we would drop the data into an Excel spreadsheet and find out which carrier really did offer the fastest wireless network in the country. And that's pretty much how Fastest Mobile Network has worked out for these last five years—just not for me.

*PC Magazine* sent three test cars all over America to conduct more than 130,000 speed tests during a three-week period in May, but when our brand-new Chevrolet Impala rolled out of New York City, Consumer Electronics Senior Analyst Will Greenwald was the one behind the wheel. I didn't get to tour the Fern Forest Nature Center in Coconut Creek, Florida—that was our lead software analyst, Michael Muchmore. And it was another one of our software analysts, Max Eddy, who enjoyed a bacon-wrapped hamburger at Ernie's Cafe in Columbia, Missouri. (Okay, it's probably good I missed that.) This year, like last year, I didn't get to do a single mile of driving for Fastest Mobile Networks. This was not the plan.

But we did get some great data.

Once again, Verizon Wireless' XLTE is the fastest wireless network in the country. It won 16



of the 30 cities we tested in, and also had the best speeds in the rural and suburban areas outside of major cities. You can dig into the results in this month's cover story, but the key takeaway is that wireless speeds are improving across the board. Even Sprint, which has struggled to roll out its LTE network, is once again competitive.

A lot of this has to do with the intense competition in the wireless space. Cell-phone penetration in the U.S. has passed 75 percent, according to comScore. If a wireless carrier wants to grow its subscriber base, it probably has to steal customers from other carriers. And to do that, the carrier has to compete on some combination of price, service, and speed. Fastest Mobile Networks shows that Verizon is keeping its edge over the AT&T, T-Mobile, and Sprint, although just barely.

In fact, looking over the results makes me wish that the broadband ISP market were as competitive as the wireless space. In any city in the country you can choose from between four nationwide carriers and a handful of Mobile Virtual Network Operators (MVNOs). But if you want broadband for your home, you'll be lucky if you have two options: most likely a single cable operator and maybe Verizon FiOS. The result? According to Speedtest.net (which *PC Magazine's* parent company, Ziff Davis, also owns), the U.S. ranks 28<sup>th</sup> in the world when it comes to broadband speed. Something to think about as Charter Cable gets ready to swallow up Bright House Networks and Time Warner Cable.

Of course, Fastest Mobile Networks is just one part of this issue. I also strongly recommend Jill Duffy's excellent primer, "11 Ways to Increase Your Productivity." I guarantee you there is something in that story that will make an immediate impact on your life. For example, I just



“

**It turns out  
that I am  
spending way  
too much time  
on Grantland.**

”

installed RescueTime on my work system to track my Web usage. It turns out that I am spending way too much time on Grantland.

Finally, I want to announce a milestone of sorts. We now have more than 90,000 paying subscribers to *PC Magazine*. Our readers are spread across Zinio, the Apple Newsstand, Next Issue Media, and bunch of other platforms. Your support is what makes this issue possible, and I want to say thanks.

That's why if you use the hashtag #ilovepcmag on Twitter before July 15, we will send you a link to subscribe to *PC Magazine* for just \$1 an issue. That's half off our regular subscription price.

My job may not let me drop everything and drive across the country for three weeks, but spontaneous magazine discounts? Those are totally doable.



[dan\\_costa@pcmag.com](mailto:dan_costa@pcmag.com)





## Spin Doctor

I do a lot of indoor spinning classes and it is important for me to know how many calories that I have burned during them. I am trying to decide which is a better fitness tracker to purchase: the Mio Fuse or the Fitbit Charge HR. I would like to know which of the two you feel would be better for me.

—“Dr. Vibe”

### OUR ANSWER:

The Mio Fuse is great, but the touch capacitive button can be a little finicky. What does that mean? Trying to start or end a workout and turn on or off the heart rate monitor didn't always work on the first try in my testing. The Fitbit Charge HR is a more enjoyable product for its Web and mobile app. It has a wonderful community of people, and I'm sure you'll find both friends and strangers to connect with to cheer each other on, or compete with on leaderboards. The heart rate monitor is, in my experience, a little less reliable, however.

If you want to get into a community, track your all-day steps and heart rate, splurge on the Fitbit Charge HR. But if all you want to do is track calories burned during spinning sessions, you might think about getting a simple heart rate monitor, such as a \$50 Garmin or Polar chest strap or the \$99 Mio Link, and pairing it with an app that can track spinning (or “indoor cycling”). This will give you a decently accurate calorie burn estimate—just as accurate as you'd get with Mio Fuse or Fitbit Charge HR.

—Jill Duffy, Contributing Editor

---

### FREE SPEECH?

I tried a friend's Rosetta Stone Spanish language-learning software once, but it is a little expensive. If Duolingo is such an exceptional product, why is it free, and how



does the site continue to operate? I have visited sites like this one before, where the product is free but your e-mail address is sold to third parties. Is this how Duolingo functions?

—*Ray Rawlings*

### **OUR ANSWER:**

Duolingo makes money by providing translations of webpages to partners, who pay for the translations. The translations are completed by the community. The people who founded Duolingo were graduate students and a professor who previously had studied whether it was the case that crowdsourced translation would be as accurate as one done by a fluent speaker of both languages. The answer was yes.

On Duolingo, when you opt into translating webpages, real webpages are used. Users help one another and rate the translations as they are entered. Over time, the best translations win.

—*JD*

---

## **WIPED OUT**

I had about four or five files open on Sunday, June 14, working on them, and a DVD-R disc in my CD/DVD player/drive, to save all information as I went along. Each time I would add information to a file I would save it on both my PC, under

“Documents,” and on the DVD-R disc I had in my disc drive. When I finished for the night I made sure I saved each file to both my PC and on the DVD disc in my player, which it did without fail. I also had about six or seven other Works and Wordpad files saved on this particular DVD. And because I had plenty of room I wanted to add/burn/copy some more my files that I had on PC to this disco also. So I clicked on to the files I wanted to copy/burn on to this disc and then it started copying them with no problem at all. I have copied/burned files, photos, etc., to DVD’s and CD’s a million times and have never had any problems doing it. Everything was going along perfectly. I even gave it a quick check before I actually fell asleep.

Well, when I woke up and went back to my computer I immediately saw that all of my original ten to 12 files were gone from the DVD. They were not listed at all. I assumed the files had been overwritten or something, which was a complete surprise to me. I’m not sure what the heck happened. And for some unknown reason, all of the data, my writings, photos, notes, information, etc., that I had saved over/during the last nine days had vanished, too. All the important data was gone, but everything up to June 6 was there. This has really scared me. I have no

idea if this has affected any of my other files. I am too scared to open any files or doing anything further, risking even more damage than what has been done already. It was a large chunk of very important information, personal writings, notes, etc., too. That is what really hurt, because it was quite a bit of information that I had been adding/saving to these files.

Can you give me some suggestions, help, advice, or recommendations?

—Karen Thomas

### OUR ANSWER:

If your only problem were a failed hard drive, I would recommend you contact the folks at DriveSavers ([drivesaversdatarecovery.com](http://drivesaversdatarecovery.com)). After an initial consultation, they'll send you a prepaid mailer to ship them the drive. They'll diagnose it, estimate what they'd be able to recover, and then discuss the cost. If you don't like their offer, they'll ship the drive back, all at no cost to you.

You've clearly got a lot more going on, however. Really, this isn't something that I or anyone could solve via email. Someone is going to have to sit down with that computer and dig in to diagnose and repair the problem. That means either a local repair shop with a good reputation, or a repair chain with a national reputation. *PC Magazine's* Editors' Choice in this area is Geek Squad, which we like for its low price (\$9.99 per month), deep resources, vast staff, and reasonable wait times.

—Neil J. Rubenking, Lead Security Analyst

## Ask us a question!

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





# What's New Now

**OPENING THE CURTAINS ON WINDOWS 10**

**THE HOTTEST PRODUCTS AT COMPUTEX**

**IS THUNDERBOLT 3 THE ULTIMATE  
NEXT-GEN INTERFACE?**

**BEHIND THE SCENES AT THE  
DARPA ROBOTICS CHALLENGE**

**TOP GEAR**

**THE LIST: OUR FAVORITE NEW  
FEATURES IN MAC OS X EL CAPITAN**

# Opening the Curtains on Windows 10

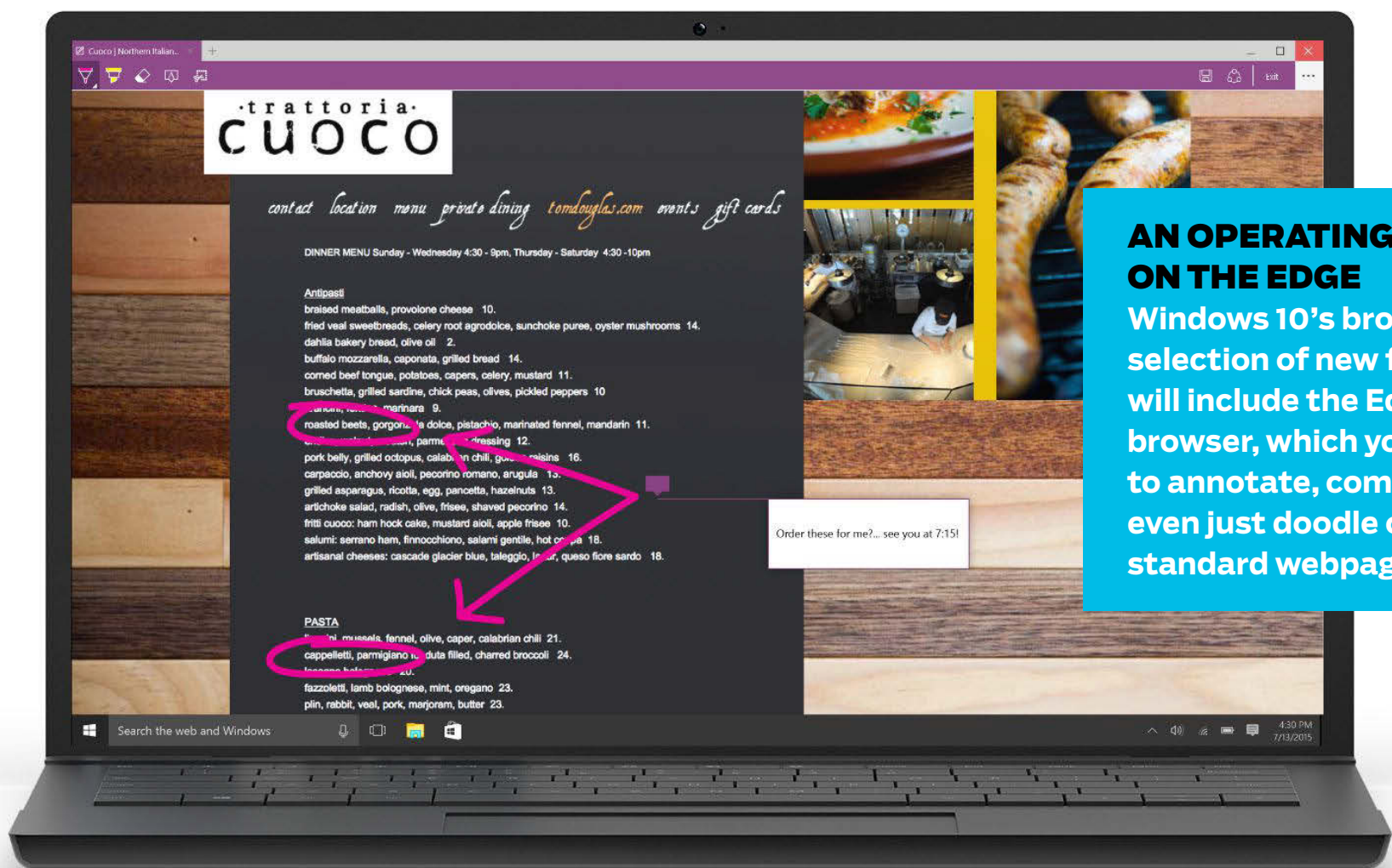
BY PC MAGAZINE STAFF



**T**he wait is almost over. Windows 10, the latest version of Microsoft's flagship operating system, will be available on July 29. On that date, all current Windows 7 and Windows 8.1 users will be able to upgrade to Windows 10 for free; this grace period will last one year. July 29 is also when it will be possible to buy a new PC with Windows 10 preinstalled. (The initial OS release will be limited to PCs and tablets; a Windows 10 upgrade for Windows Phone 8.1 devices will vary by phone makers and carriers.)

Designed to run on what Microsoft calls its "broadest device family ever," Windows 10 is compatible with PCs, tablets, phones, Internet of Things, Surface Hub, Xbox One, and HoloLens—"all working together to empower you to do great things," wrote Terry Myerson, Microsoft's executive vice president of operating systems, in a Windows blog post.





Windows 10 is slated to arrive nearly three years after the release of Windows 8, a controversial version of the OS that implemented a number of changes designed to improve interaction on mobile devices, and with apps. Though Windows 10 will roll back some of these for desktop and laptop owners, smartphone and tablet owners will still be able to easily interact via the touch-enhanced Start environment.

This release also marks the return of the traditional desktop Start menu, and promises faster overall speed with quicker startup and resume times. Windows 10 is also, as the tech giant boasted, “the most secure platform ever.”

New features will include the Cortana digital assistant (Microsoft’s answer to Siri); the revamped Edge Web browser; Windows Hello, which provides secure logins via face, iris, or fingerprint recognition; the “Universal” app model, so apps can work on any device that’s capable of running Windows 10; thoroughly revamped photo, video, music, maps, people, mail, and calendar apps that work equally well on all devices and sync through OneDrive; and Continuum, for easily transitioning between desktop and mobile devices.

In addition, Windows 10 will be the last major official release of the operating system, though Microsoft promises there will be “new innovations” over time. “Like Windows 10 itself, these updates will be free for the supported lifetime of your device,” Myerson wrote.

Like many of its predecessors, Windows 10 will be available in several versions organized to better meet the needs of certain types of users. Windows 10 Home is the primary consumer-focused edition, offering all the new features

in the familiar desktop environment. PCs running it will also have access to Xbox Live, where they can share gameplay and play Xbox One games from all Windows 10 PCs in the home. More advanced or business users will want to opt for Windows 10 Pro. In addition to what's available in Home, it supplies additional functionality for managing and updating devices and apps, protecting sensitive data, and utilizing cloud technologies. Microsoft touts Pro as ideal for Choose Your Own Device organizations.

(Other Windows 10 versions will be optimized for users of consumer smartphones and tablets; desktop and mobile enterprise users; and educational users such as students, teachers, and staff and administrators.)

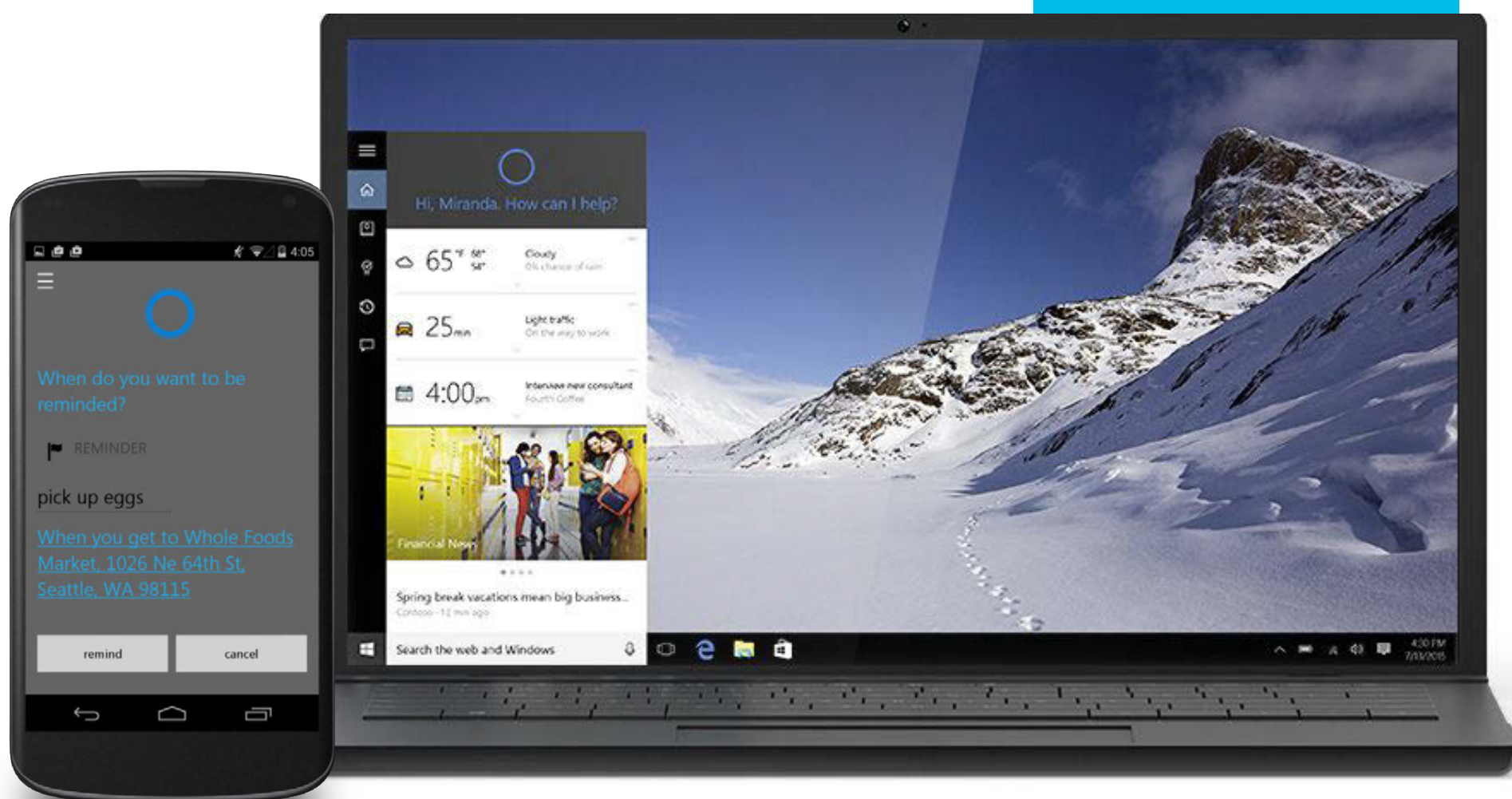
For those who need to buy a fresh copy of the operating system, such as those on an older machine running Windows XP or Vista or those who prefer to build their PCs from scratch, Windows 10 Home will be available for \$119 and Windows 10 Pro for \$199.

Be sure to check out next month's issue of *PC Magazine* for complete coverage of the Windows 10 release and a deep dive into everything it can do.

## 6 FEATURES DISAPPEARING IN WINDOWS 10

These are some of the more notable features from previous Windows versions that will not be included in Windows 10, though most will still be obtainable via third-party applications or manual update downloads.

1. Windows Media Center
2. DVD Playback
3. Desktop Gadgets
4. Minesweeper, Solitaire, Hearts
5. Floppy Drive Support
6. Windows Essentials' OneDrive Application





# The Hottest Products at Computex

BY JOHN BUREK



**S**ome years, the Computex trade show in Taipei—the second biggest one in the world for tech, apart from the Consumer Electronics Show (CES) in Las Vegas—is a strictly inside-baseball kind of event. It's parts suppliers and OEMs making and tweaking relationships, paired with rollouts of core computer technology such as chips and video cards. Other years, from a consumer and business-buyer perspective, it's a showcase for the best of PC tech coming out of four of Taiwan's biggest players: Acer, Asus, Gigabyte, and MSI.

In 2015, it was both—and that made it one of the most eventful Computex shows in memory.



Intel used the show as a venue to launch its long-awaited desktop Broadwell processors and lay out its vision for a future of wholly wireless computing; AMD detailed its low-power Carrizo mobile chips; and Nvidia started off the proceedings with a big salvo in the endless battle for graphics supremacy. And that's just the core-tech stuff: A parade of heavy-hitter laptops from the usual suspects showed up in marked and ironic contrast to a flood of light-duty mini-desktops of all shapes and sizes, suggesting that the current renaissance in desktop PCs is coming from models smaller than laptops!

Here's a rundown of the best stuff we saw over the course of the show.



## Best New Laptop: Aorus X5

We see the Aorus X5 as a worthy addition to the ranks of hyper-powered yet reasonably thin and light 15.6-inch gaming laptops. The 5.5-pound Aorus shares its siblings' swoopy design and dedicated macro keys, as well as fifth-generation Intel Core i7-5700HQ horsepower. It also doubles up, or triples up, on key components, with dual Nvidia GeForce GTX 965M graphics adapters in an SLI configuration and three M.2 SSDs in a RAID Level 0 array joining the hard drive.

The IPS screen offers 3K (2,880-by-1,620) resolution, plus Nvidia's G-Sync technology to reduce screen tearing and stuttering at the high frame rates the SLI rig generates. We liked the X7 Pro, but we like the idea of getting most of its gaming performance in a more portable package even more.





## Best New Desktop: Asus Zen AiO

Sure, it looks as if Asus airbrushed the Apple logo off the latest iMacs and slapped on its own. No matter: With its aluminum unibody tapering to just 6mm thick at the edges, this is one of the slickest-looking all-in-one PCs to date. And with DDR4 memory, PCI Express M.2 SSDs, and Nvidia GeForce GTX 960M graphics, you can configure it to be a serious performer, too.

Pricing was not yet set, and given the parts, it probably won't be terribly cheap. But we can't wait to get our hands on this deluxe model—or to listen to it, considering its 16-watt, six-speaker stereo.



## Best New Convertible Laptop/Tablet: Asus Transformer Book T100HA

When the Asus Transformer Book T100TA debuted in 2013, we called it the natural heir to the netbook. Asus came to Computex 2015 with the heir, in turn, to that laptop/tablet two-in-one.

The T100HA is a 10.1-inch detachable with a new Intel "Cherry Trail" Atom quad-core CPU, 4GB of RAM, up to 128GB of flash storage, and a cutting-edge USB-C port. Resolution has actually gone down a tad (from 1,366-by-768 to 1,280-by-800), but battery life has gone up to a promised 14 hours. The T100HA will be available in four colors sometime in the third quarter of this year.





## Best New Mini Desktop: Zotac EN970

Zotac, one of the earliest proponents of the palm-sized desktop PC with its extensive line of Zbox models, changed its brand messaging at the show to “The Original Mini-PC.” (The company’s systems range from smartphone-size models in its Pico line to Discman-size units with discrete video.)

Sometimes, original is indeed best, as was the case with this winner, which leverages Zotac’s expertise in small-PC design to work in the latest in mobile-graphics chipsets. The result: a compact killer that should be able to run with—and possibly outrun—big-dog compact PCs from the likes of Alienware and others. The Zbox EN970 features the no-slouch Nvidia GeForce GTX 970M graphics chipset and a fifth-generation Intel Core i5-5200U CPU, along with no fewer than four (!) HDMI ports, four USB 3.0 ports, and room for one M.2 plus two 2.5-inch drives.



## Best Concept PC: MSI GT72 Dominator Pro Tobii EyeX Edition and MSI AX24 AIO (tie)

Whether logging into Windows with no hands (simply by staring at first one picture, then another in a grid or mosaic of photos) or guiding your character in a game by glancing in the desired direction, the merger of MSI’s mighty GT72 Dominator Pro 17.3-inch gaming laptop and Tobii’s EyeX eye tracking technology opens up a whole new alternative to the trusty touchpad or external mouse. Cameras built into the lower screen bezel follow your gaze. MSI says the GT72 EyeX Edition (pictured here) is only a proof of concept for now.

Another MSI Computex prototype could revolutionize the all-in-one desktop just as much: The AX24 looks like any other AIO from the front, but a rear view reveals a unique piggyback module that contains a full-sized, full-powered desktop video card, offering not only game-worthy performance but upgradability that ends the category’s habit of obsolescence.





## Best New Tablet: Asus ZenPad S 8.0

So far, 2015 has been a quiet year for Android tablets, with few major-maker releases of note. Asus broke the silence at Computex, however, with a new range of ZenPad tablets that are just as notable for their designs and parts as they are for their elaborate accessories. With no set pricing or regional availability yet announced, it's hard to say whether the ZenPad 7.0, 8.0, and 10 will all show up in North America. But the star of the line, the ZenPad S 8.0, has the best chance. Built around Intel's Atom Z3580 "Moorefield" processor, the ZenPad S is the first 8-inch slate with 4GB of RAM, along with up to 64GB of solid-state storage. Dual front speakers and a 2,048-by-1,536-pixel IPS display with 324ppi delight the ears and eyes. Also nice: a set of fashionable carry cases that can transform the ZenPad S into a clutch or purse, and a Dolby-augmented six-speaker "audio case" that can pump up the sound output of the tablet in a big way.



## Best New Motherboard: MSI X99A Godlike Gaming

All of the usual motherboard suspects were showing off preliminary boards for Intel's upcoming sixth-generation Core (aka "Skylake") processors, and although some of these look spectacular, they're subject to change and on an uncertain timeline. Spectacular and workable in the now is MSI's wildly over-the-top X99A Godlike Gaming mainboard, which steps up the high end on the already rarified X99 Haswell Extreme Edition platform. This LGA2011-v3 board is all kinds of overkill in a good way, with three-way network-connection bonding via its Killer chipsets (you can join two Gigabit Ethernet connections and your Wi-Fi), along with a host of handsome details. Among these are onboard LED illumination strips (which are controllable via a mobile app) and metal reinforcements around the PCI Express slots.



## Best New Tablet: Asus ZenPad S 8.0

With AMD's long-awaited response to Nvidia's recent onslaught of Maxwell-based video cards rumored to be just a few weeks away, this title might have swung either way had AMD used Computex as the launching pad for its next-gen flagship video card. But instead, the graphics messaging at Computex was all-Nvidia, with the launch of its GeForce GTX 980 Ti, which proved, in our advance tests, to be a very able upgrade for no-compromise gaming at 4K and a near-equal to the elite, \$1,000 GeForce GTX Titan X. It's a fab card in its reference version by itself at \$649, and plenty of Nvidia's card partners were out in force at Computex with custom-cooler and overclocked variants for a little more money.



## Best Core Technology Release: Intel Core i7-5775C "Broadwell" CPU

Now, straight-up desktop-PC upgraders aren't going to get terribly excited about Intel's new line of fifth-generation Core ("Broadwell") processors. They work only with Z97-based motherboards (and that after a BIOS update), and most users with a PC built on that platform have a comparably powerful CPU in place already. But the reason this platform is especially important? The on-chip graphics.

Intel is making some bold claims for the Iris Pro silicon included on this chip and its Core i5 brothers. In our early tests, at least on the desktop OEM side, it seems AMD may have a bit more to worry about, as Broadwell's integrated graphics might finally give AMD's Radeon APU graphics a proper contest.





## Best New PC Case : Thermaltake Core P5

We've seen transparent-face "wall mount" PC cases from the likes of Lian Li in the past, so when our Thermaltake rep asked us what we thought the price of the Core P5 would be, we guessed \$500. Boy, did we overshoot that target.

The company is aiming at \$130 for this spectacular chassis, which will feature extra-high mainboard standoffs so you can run cabling easily under the board for a clean, mean, elegant look. The chassis has VESA mounting holes on the back, and is reinforced from the inside for solid, safe wall-hanging. The front panel allows for an unimpeded view of your parts while keeping curious fingers out. Though the sample build shown here uses a tinymainboard, you can install up to an ATX motherboard, depending on the other parts you choose. And given the price, it's cheap enough to experiment with as a fun project case.



## Best Concept PC Chassis: Deepcool Nephrite

The Beijing-based brand Deepcool made a splash at CES 2015 with its Tristellar PC case, a three-bodied modular chassis that was picked up by Cyberpower in its winning Fang Trinity gaming PC. Here at Computex, the company showed off the brilliant Nephrite, an ideal case for showing off that new high-end video card you just bought. The body, made of carbon fiber, was a slim ITX mini-tower made leaner by the fact that the video card is in a transparent display area up top. It supports up to three drives inside (one 3.5-inch and two 2.5-inch) and requires a compact SFX power supply. No pricing or availability was available yet, but we'll be first in line for this one when and if it debuts—joined, we are sure, by video card makers looking to this case as the perfect showpiece chassis for trade shows. In the brief time we were at the Deepcool booth, several reps from card makers swung by to inquire about Nephrite.





## Best New Storage Product: SanDisk Extreme 900 Portable SSD

USB 3.1 is just starting to ramp up—quite a few storage makers were showing off compatible gear at the show—but the bigger question is how long it may take before hardware that can take advantage of the new interface’s huge bandwidth becomes mainstream. Flash memory giant SanDisk is doing its part with several new portable SSDs, and the drag racer of the lot looks to be the Extreme 900, which comprises two discrete, full 2.5-inch-size SSDs in one chassis the size of a laptop hard drive. The claimed speeds—up to 850MB per second, according to SanDisk—will wallop those of external portable hard drives.

It’s not cheap, especially at the top capacity of 1.92TB, but creative pros that need very fast data transfers of large image or data files on the road should be over the moon over this drive.



## Best New NAS or Networking Product: QNAP TVS-871T-i7

The wide proliferation of AMD CPUs into NAS drives and the entry of Synology into the consumer market were interesting Computex developments. But the biggest-impact consumer or business NAS we saw was undoubtedly the TVS-87T-i7. This eight-bay beastie capable of housing 448TB of storage is meant for the market of Mac creative pros and power users. It’s serious stuff for editing pros, built around dual Gigabit LAN and Thunderbolt 2. It can serve as direct-attached storage (DAS) to connect, say, an Apple Mac Pro via Thunderbolt 2 and achieve the fastest possible data transfers outside a network’s confines. The drive can also act as a conventional NAS unit, as well as an iSCSI storage-area-network (SAN) appliance. It’s intended for high-volume video-editing workflows where speed is essential and file sizes are large (read: 4K), as well as applications where enormous capacities are necessary.

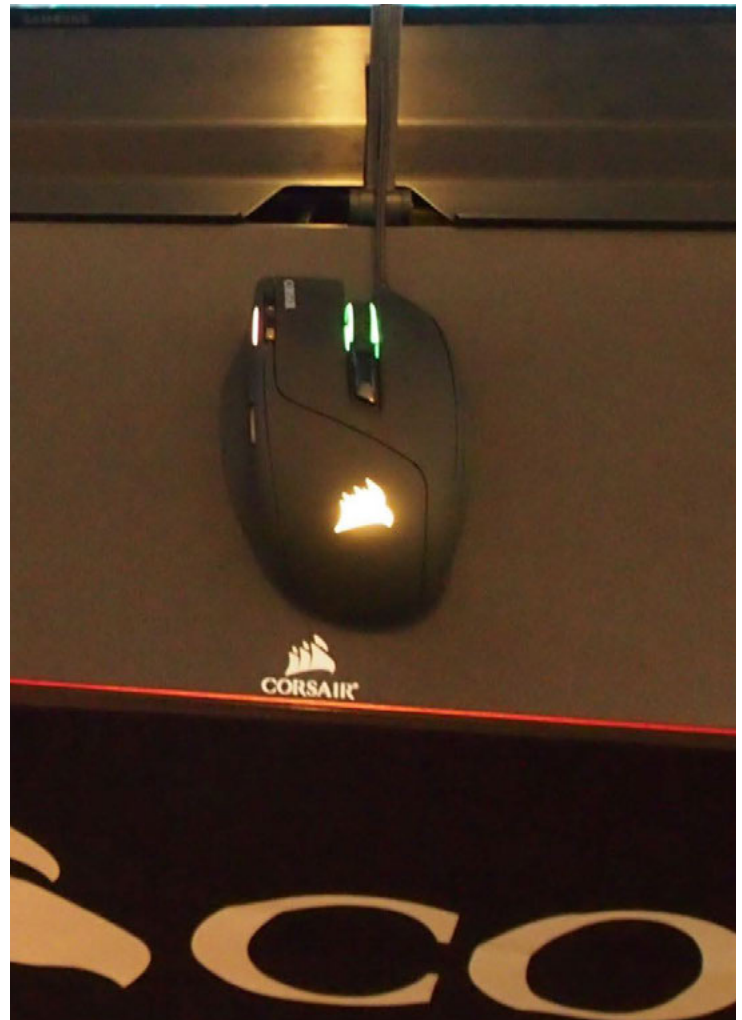




## Best Peripheral/Input Device: Corsair Lapdog

Technically, the \$89 Corsair Lapdog isn't an input device. It's a place to put two input devices: a keyboard and mouse, from which living-room gamers can wreak havoc from the couch while they enjoy big-screen gameplay via a console-style or home theater PC. It's a frame for a mechanical keyboard (it's \$199 bundled with Corsair's K65 RGB, and sized only for the K65 series of "tenkeyless" boards), paired with a specially surfaced 7-by-11-inch mouse mat with a cable riser. Together, the full Lapdog offers a spacious area for your hacking, slashing, and shooting jags.

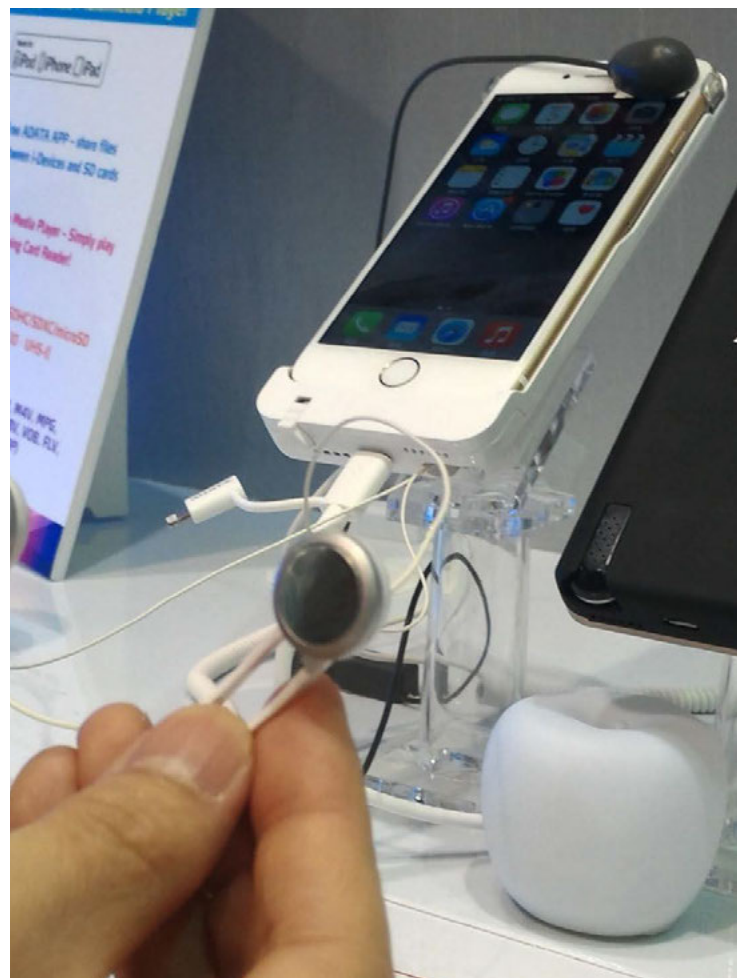
Under a flip-up cover across the top, you get space for stashing cables, as well as a four-port USB 3.0 hub. On the underside of the Lapdog, a thick memory-foam pad keeps the whole works as comfortable as your Chihuahua across your knees.



## Best Mobile Accessory: ADATA Battery Case With Retractable Earbuds (for iPhone 6)

This surprising little accessory from storage and flash mavens ADATA answers the eternal question: Where do you put your iPhone earbuds when you're not using them? Well, this case requires you to settle for ADATA's own 'phones, and it only supports the iPhone 6, but the implementation is as clever as any we've seen.

The earbuds snap together and retract into the case on the wire, and the case also serves as a supplemental battery. The power bank inside the case is rated for 2450mAh, and while the included earbuds are likely of modest quality at best, it's the best solution we've seen for keeping a set handy without a second carry case or wrapping them around your phone.



# Is Thunderbolt 3 the Ultimate Next-Gen Interface?

BY JOEL HRUSKA

Ever since Intel launched its high-performance Thunderbolt interface, it's been fighting to win market share away from USB. There's never been any question of which standard was faster—first-generation Thunderbolt blew USB 3.0 out of the water—but higher device costs, expensive cables, and limited OEM uptake have limited Thunderbolt's market penetration. With the recent announcement of Intel's Alpine Ridge, however, that schism is effectively over. Third-generation Thunderbolt won't just be faster than USB 3.0 or USB 3.1, it will offer all of its performance over the reversible USB-C plug.

Thunderbolt 3 accomplishes this by integrating a USB 3.1 controller directly on-platform, neatly bypassing the entire “Should I use Thunderbolt 3 or USB?” quandary altogether.

In other words, you can now run DisplayPort, Thunderbolt, USB 3, and PCI Express (PCIe) over a single Thunderbolt port. Even better, the port in question supports USB 3.1 Gen2, as opposed to USB 3.1 Gen1 (aka USB 3.0), which has already been seen on the USB-C port used on systems like the 12-inch Apple MacBook

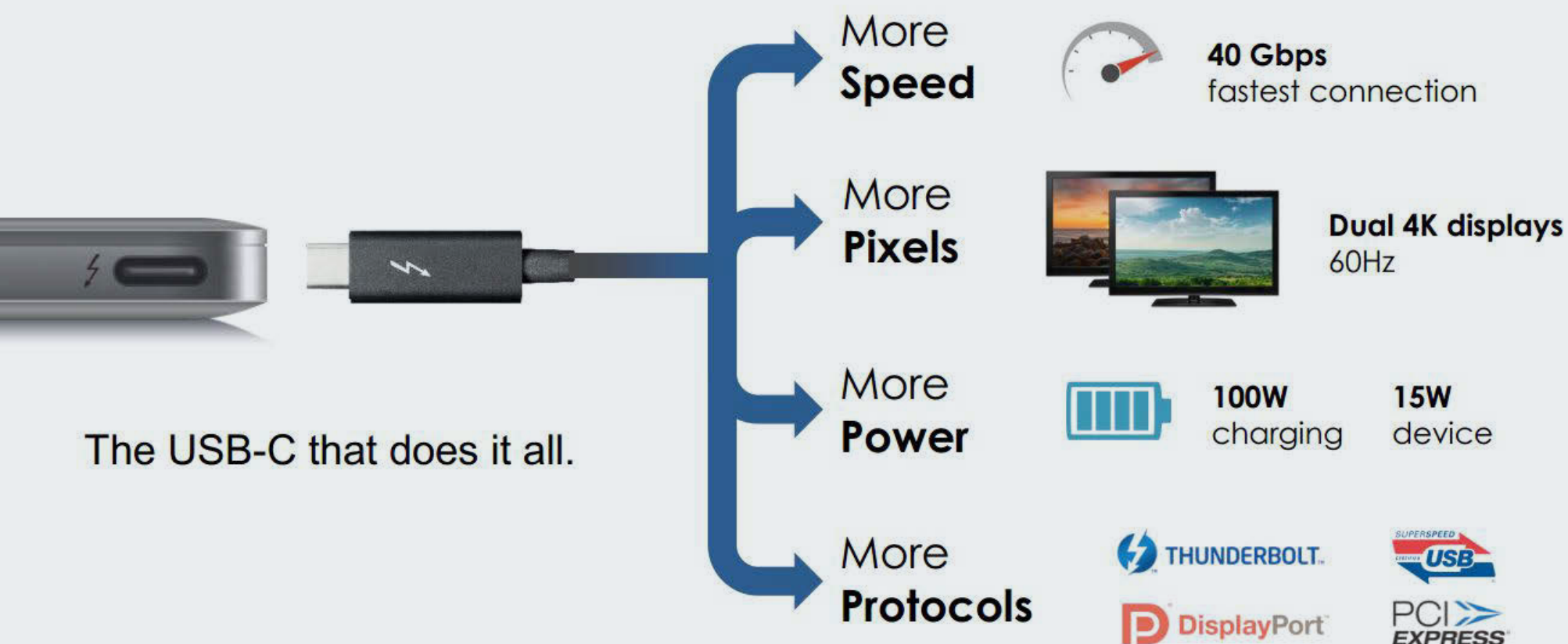


## **BOLT FROM THE BLUE**

Because Thunderbolt 3 delivers blazing throughput over a standard USB-C connector, it could be a major step toward unifying the two interfaces.



# Thunderbolt™ 3 brings Thunderbolt to USB-C



and the Google Chromebook Pixel. Unlike Thunderbolt 2, which kept total bandwidth the same as Thunderbolt 1 but allowed for more flexible bandwidth sharing options to improve performance, Thunderbolt 3 doubles real bandwidth to 40Gbps.

Intel doesn't include PCIe on its list of interfaces, but at this point it could. That 40Gbps speed works out to 5GBps worth of bandwidth, which means Thunderbolt 3 can provide roughly a bit less bandwidth than an older PCIe 2.0 connection. The new standard offers support for up to two 4K 60Hz panels or a single 5K 60Hz display (which makes sense, as that type of panel can display approximately 1.8 times as many pixels as a 4K panel). This works out to an x4 PCIe 3.0 connection. Although not exactly suited for multi-GPU configurations, it should be enough bandwidth to run a single card at near-full speed in the vast majority of cases.

The combined Thunderbolt 3 and USB 3.1 standard will offer up to 100 watts for laptop charging if the manufacturer certifies the port to draw that much power, and 15 watts for standard, bus-powered devices. Fifteen watts is significant because that's more than enough energy to run most hard drive docks or external peripherals, including low-power portable displays.

The new configurations are also supposed to be flexible. Second device ports offer all the same functionality as the computer port, meaning you can plug a USB device into a monitor, which then connects to the computer via a

Thunderbolt cable. Up to six devices can be daisy-chained. Intel is also pushing the entire concept of a Thunderbolt external graphics dock for mobile gaming, and even the use of Thunderbolt for networking purposes.

One of the problems with Thunderbolt has been its reliance on expensive cabling. Although the standard has never required the optical cables that were originally meant to debut alongside it, the available copper cables have often been expensive. Intel has improved the situation somewhat: Thunderbolt 3 will support passive cabling up to 2 meters with bandwidth of up to 20Gbps, active copper cables for full 40Gbps connectivity (again, up to 2 meters long), and 40Gbps optical cables with lengths of up to 60 meters (these are slated to arrive in 2016).

## COULD THUNDERBOLT 3 FINALLY CATCH ON?

I've always been dubious about Thunderbolt's chances of finding wide acceptance, but this latest announcement makes me think claims of its demise have been greatly exaggerated. FireWire may have lost its fight with USB, but FireWire never took the step of integrating a USB controller into the same package.

The two major questions remaining are how much Thunderbolt chips will cost and when they will ship. Intel has said it expects to begin shipping devices by the end of this year, which implies the new technology will show up on Skylake. If the licensing fees are reasonable, high-end devices with combined Thunderbolt and USB 3 ports could quickly become commonplace.



**FireWire may have lost its fight with USB, but FireWire never took the step of integrating a USB controller into the same package.**





# Behind the Scenes at the DARPA Robotics Challenge

BY SOPHIA STUART



**T**he first weekend in June, 24 teams from around the world converged in Pomona, California, to compete in the DARPA Robotics Challenge, and *PC Magazine* was there.

After a difficult assault course designed around a hazardous environment that required robots to drill through a wall, release a mounted valve, climb stairs, and drive an off-road utility vehicle, Team KAIST from Korea walked away with the \$2 million grand prize.

DARPA launched the competition in response to the 2011 Fukushima earthquake and tsunami when, if robots had been among the first responder teams, human lives could have been saved.



Oddly enough, considering the sensitivity of many of the new tech developments on display, the Fairplex at Pomona was open not only to international military personnel, academics, and industrialists, who were there to collaborate and learn about automated intelligent machines, but also to the general public.

On one side of what is usually a racecourse sat spectators in *Top Gun*–style aviator shades, typing furiously into the latest gadgets. Up in the grandstand, the cheap seats, hundreds of excited children and parents were ready for a modern-day gladiator spectacle. “Will there be killer robots?” asked one boy who was very disappointed to find out the steel humanoids were there to help rather than to destroy.

As the robots drove onto the course in a semiautomated fashion, weaving between obstacles, stopping at the barriers, and then disembarking from their vehicles, a roar went up from the crowd. “Finally,” someone said loudly. “The robots have really arrived!”

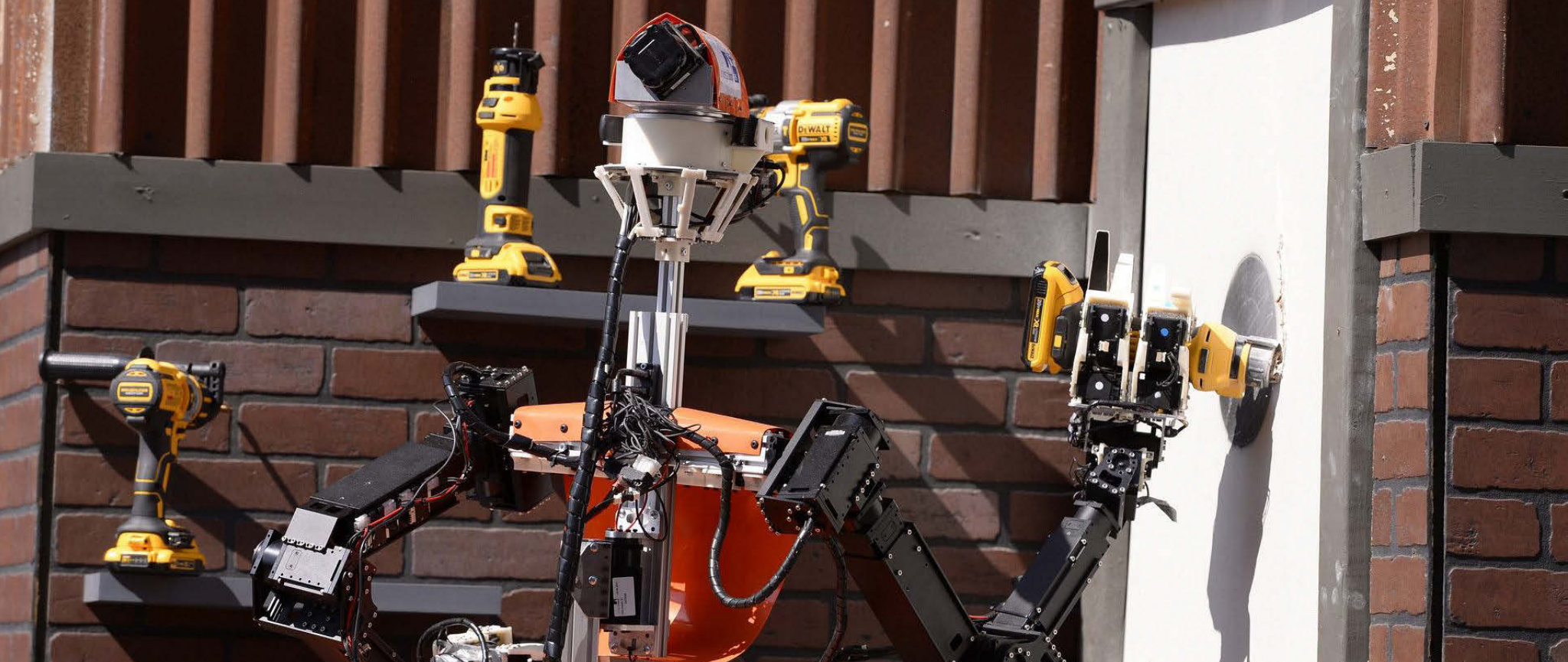
With all the debate within the industry over what constitutes true artificial intelligence and when exactly—if ever—we might enter the Singularity, it is curious to note that humans’ attitude towards these new machines turns on a dime. During the race, the mood at the Fairplex went from eager curiosity and fear about what the robots might be capable of to a fierce competition. There was a lot of checking the scoreboard, picking a team to support, and watching the replays on the giant video screens, but also compassion for a fellow being when the first robot fell.

### **THE MIGHTY EGRESS**

The Egress Test at the DARPA Robotics Challenge measured how well the robot contestants could exit a vehicle. Pictured here: The winner, DRC-Hubo from South Korea’s Team KAIST.







It was as if a horse smashed into a barrier and broke its leg in the Kentucky Derby. A gasp, a groan of disappointment coupled with sincere concern, came over the grandstand as people stood up to see the robot being gently lifted onto a stretcher, its metal arms helplessly inert, and carried back by its team. Of course, the people in the reserved seats at the front were sad for a different reason: A robot falling means exceedingly expensive repairs to a state-of-the-art hardware product with the latest software onboard.

## TEAM KAIST

So how did Team KAIST finish all eight tasks in less than 45 minutes to take the prize? *PC Magazine* spoke with team leader Jun Ho Oh in the garage behind the arena as they did last-minute checks on the DRC-Hubo robot. What was noticeable is that Korea is so accustomed to robots that team members did not consider this competition anything out of the ordinary.

“These are usual tasks for a robot,” Oh said. “But we ensured that we manufactured all the components ourselves at the Hubo Lab, did a custom design of the motor driver and an advanced air cooling system, to our specifications. The shape-adaptive gripper can accommodate different scenarios, with a payload of 13 kilograms.”

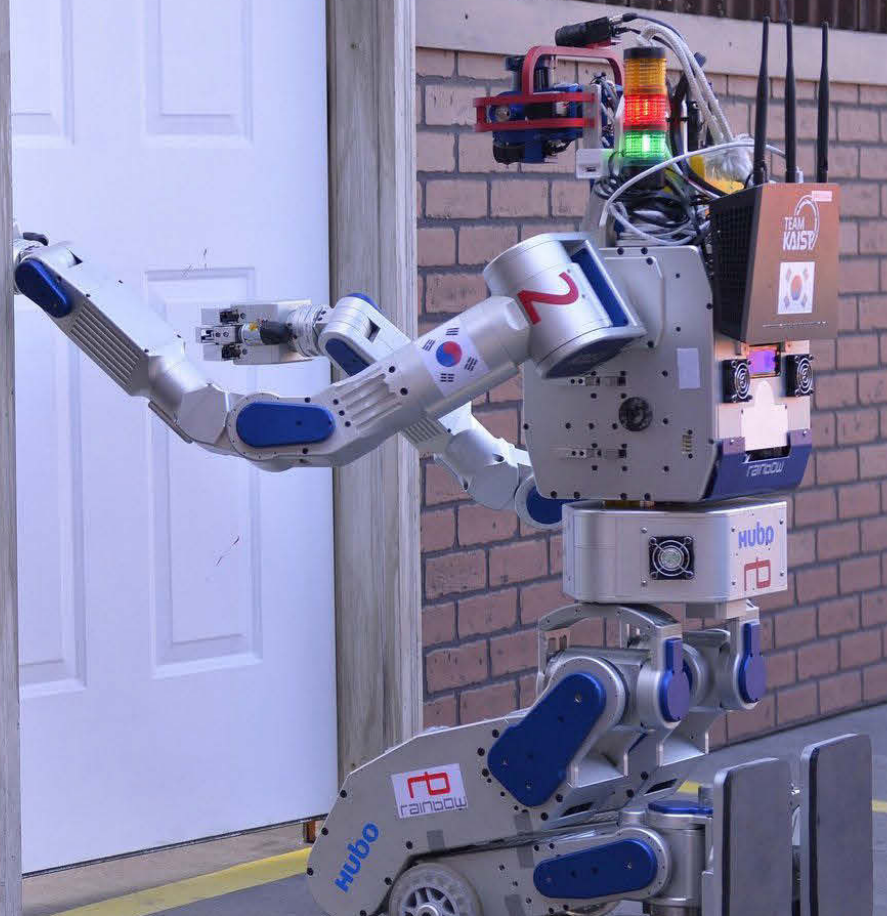
To prepare, the team built an entire replica of the expected course in a parking lot in Daejeon at the Korea Advanced Institute of Science and Technology, and did a code freeze early on. They also flew in from Korea a couple of weeks before the competition to practice incessantly on U.S. soil in Las Vegas, with weather conditions as similar as possible to California’s.

But in the end, the modification that set the DRC-Hubo apart was something that the other robots found difficult: the egress test, or getting out of the vehicle.



## IT ALL HINGES ON THIS

One important part of the DARPA Robotics Challenge tests how well its participants open doors. Pictured here, trying its hand, is Team KAIST's entrant, DRC-Hubo.



DRC-Hubo sat almost side-saddle, with one extended arm holding on to the top of the vehicle as if it was enjoying a fast dash down the Pacific Coast Highway to Malibu on a sunny day.

The car's motor controls were modified so driving was possible at that angle, and the robot slipped easily out of its vehicle in record time. Many of the other robots in the competition failed to dismount and had the indignity of their teams wheeling over the safety harness to tether and lift them out, losing points and time, before continuing other tasks.

## THE FUTURE OF ROBOTICS

At the workshop the next day, a theme emerged: Robot competitions are here to stay. Still, Dr. Arati Prabhakar, DARPA director, said, "We aren't in competition with each other.... We are in competition against the problems of the world."

Aging populations, environmental disasters, and dwindling natural resources are serious issues. But the glory, prize money and the global glow of publicity are nice, too. Government and university representatives in Japan, Korea, Singapore, the United Arab Emirates, and the European Commission have all announced contests coming up in the next few years, including a euRathlon in Italy and a Robot Olympics in Japan in 2020. The EU confirmed it has 100 robot projects currently running with more than 700 partners and is committing €70 to €80 million per year in funding for new robotic projects.

In the afternoon session on Future Technology, Dr. Rod Brooks, chairman and CTO of Rethink Robotics and iRobot cofounder, said that the next breakthrough needs to be in developing ease-of-use interfaces so nontechnical



people can program and train robots. His company produces manufacturing robots, which assembly workers train to join them in collaborative work.

Dr. Rob Ambrose, chief of the Software, Robotics, and Simulation Division at NASA Johnson Space Center, announced that NASA is going to give away several Valkyrie robots this fall, as well as open-source software together with a grant to further research into space exploration needs.

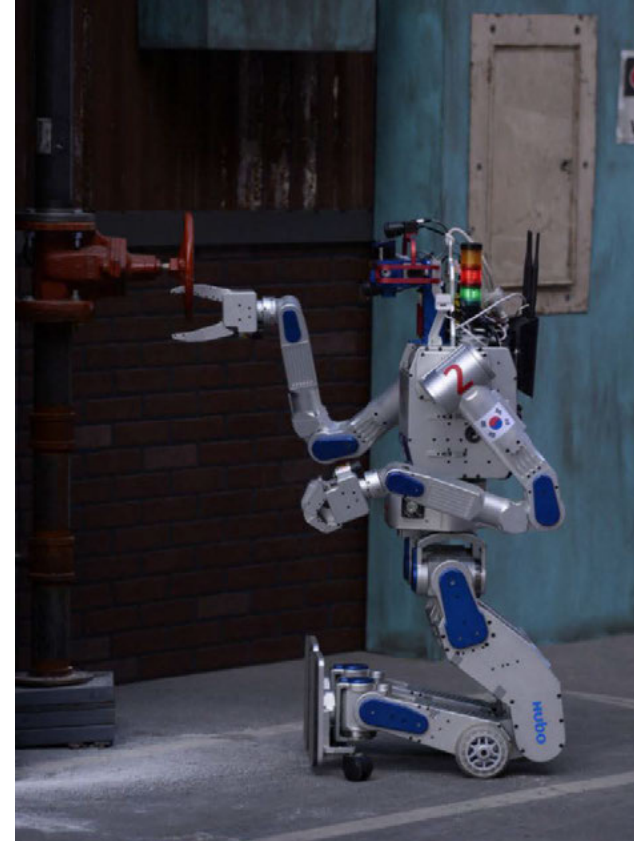
“We know that robots are going to be used in pre-deploying assets, such as equipment, for human Mars explorations, prepping the ground for human settlements,” Ambrose said. “However, launch windows to Mars might be every 24 months, so the robots would be on their own for most of the time, taking care of the equipment. We wouldn’t do that to a person, but robots can handle those tasks really well.”

The last speaker was Dr. Robert Griffin, deputy under secretary for Science & Technology at the U.S. Department of Homeland Security, who painted a more chilling counterpoint of how robots might be deployed in the field to patrol borders and airports.

Doom and gloom aside, Jerry Pratt, team leader for Team IHMC Robotics, whose Running Man robot came in second, summed up the buoyant mood of the DARPA Robotics Challenge. “Science fiction has become science fact,” he said, justifiably proud that his team’s robot, built at the Florida Institute for Human & Machine Cognition, proved equal to the tasks in the challenge.

Because the next time a natural or man-made disaster strikes, it is likely that robots will be on the front lines, smashing through doors, releasing valves, negotiating rough terrain, hauling out trapped survivors, and even driving them to safety. And, at nearby hospitals, another team of robots will be assisting surgeons in the emergency room.

The DARPA Robotic Challenge was a glimpse into the now not-so-distant future.





# What We Love Most This Month

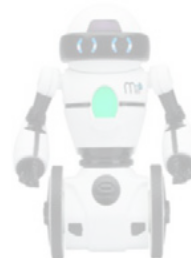
BY STEPHANIE MLOT



## AFTERSHOKZ BLUEZ 2

Have your cake and eat it, too, with the bone conduction technology hidden inside AfterShokz Bluez 2 headphones. The opposite of noise-cancelling, the wireless, behind-the-head device syncs with your smart gadget for music and calls, but doesn't tune out the rest of the world. Because the Bluez 2 rests behind your ears, not inside them, you retain maximum situational awareness—listen to birds chirp, horns honk—while still jamming out to Taylor Swift.

\$ 99.95 [aftershokz.com](https://aftershokz.com)





# What We Love Most This Month

BY STEPHANIE MLOT



## BELKIN LEGO BUILDER CASE FOR IPAD MINI

Belkin and Lego have taken customization to a new level with their Lego Builder Case for iPad mini. With an official Lego baseplate on one side and durable plastic on the other, you can unleash your inner child without worrying about scratching your adult toys. With all the trappings of a Belkin tablet caddy, the case has AutoWake magnets and easy-access buttons, and folds into a cinema- or typing-angle stand.

\$ 59.99 [belkin.com](http://belkin.com)



# What We Love Most This Month

BY STEPHANIE MLOT



## eTAPE 16

The eTape 16 digital tape measure takes the guesswork out of DIY. With its digital screen and wheel of features, the device makes it easy to calculate measurements. Whether you're fitting new shelves or checking the dimensions of a desk, the one-handed eTape 16 memorizes your measurements. Then it repeats them back in various forms, from inches to feet to centimeters, saving you the trouble of converting numbers.

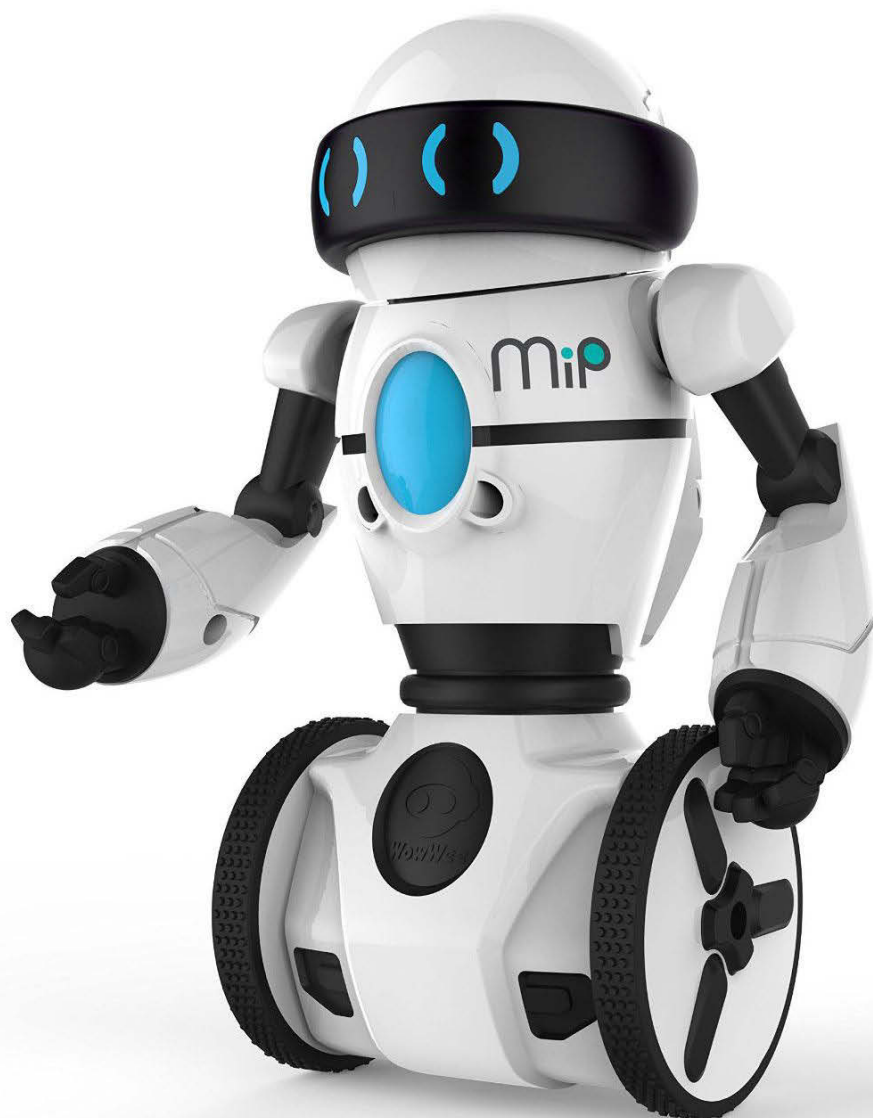
**\$29.95** [etape16.com](http://etape16.com)





# What We Love Most This Month

BY STEPHANIE MLOT



## MIP

No, it won't clean your house or make snarky remarks. But MiP is the closest thing you're likely to find to the Jetsons' robot maid, Rosie. The pint-sized machine comes equipped with a mood-swinging personality and gesture-sensing technology, as well as iOS and Android apps that let you command MiP to drive, dance, battle, and carry items roughly the weight of a soda can.

**\$99.99** [wowwee.com](http://wowwee.com)



# What We Love Most This Month

BY STEPHANIE MLOT



## NEUTRON A

Long car trips are a drag without on-the-dash driving directions and road trip tunes. The Neutron A phone and tablet holder takes the guesswork out of the windshield mount's fickle suction cup or that not-so-sticky dashboard pad. Available in silver or black, the Neutron A works with any smartphone or tablet, even in a case. And it promises that practically no magnetic field will pass through your device. If you don't drive, stick the gadget onto your fridge, bookshelf, or passenger-side sun visor.

**\$34.99** [bungajungle.com](http://bungajungle.com)





# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY

1

2

3

4

5

6

7

8

9

10



## Rock-Steady Familiarity

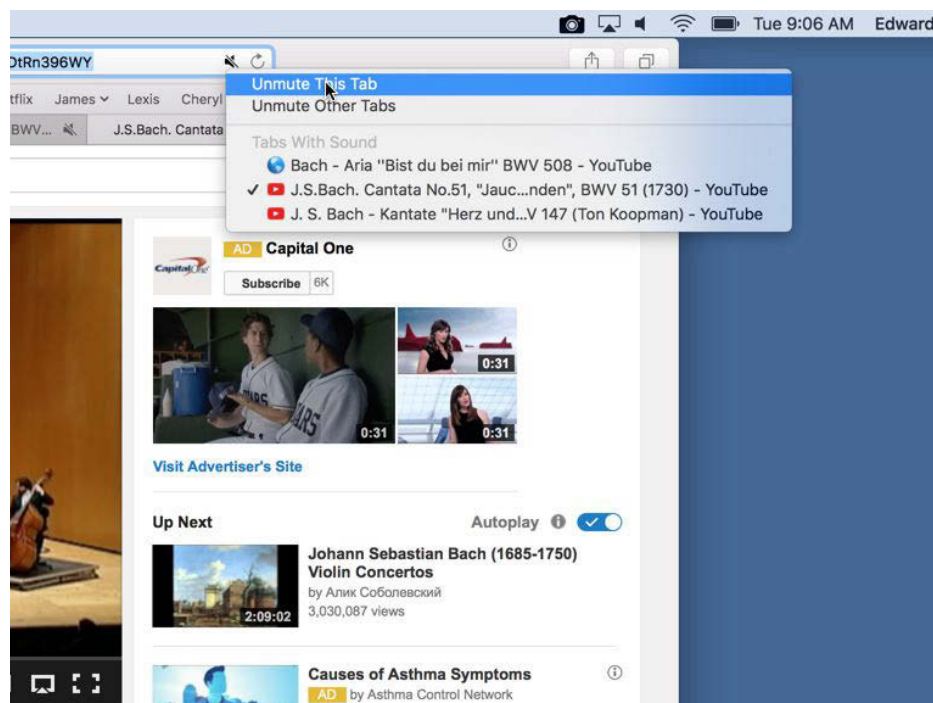
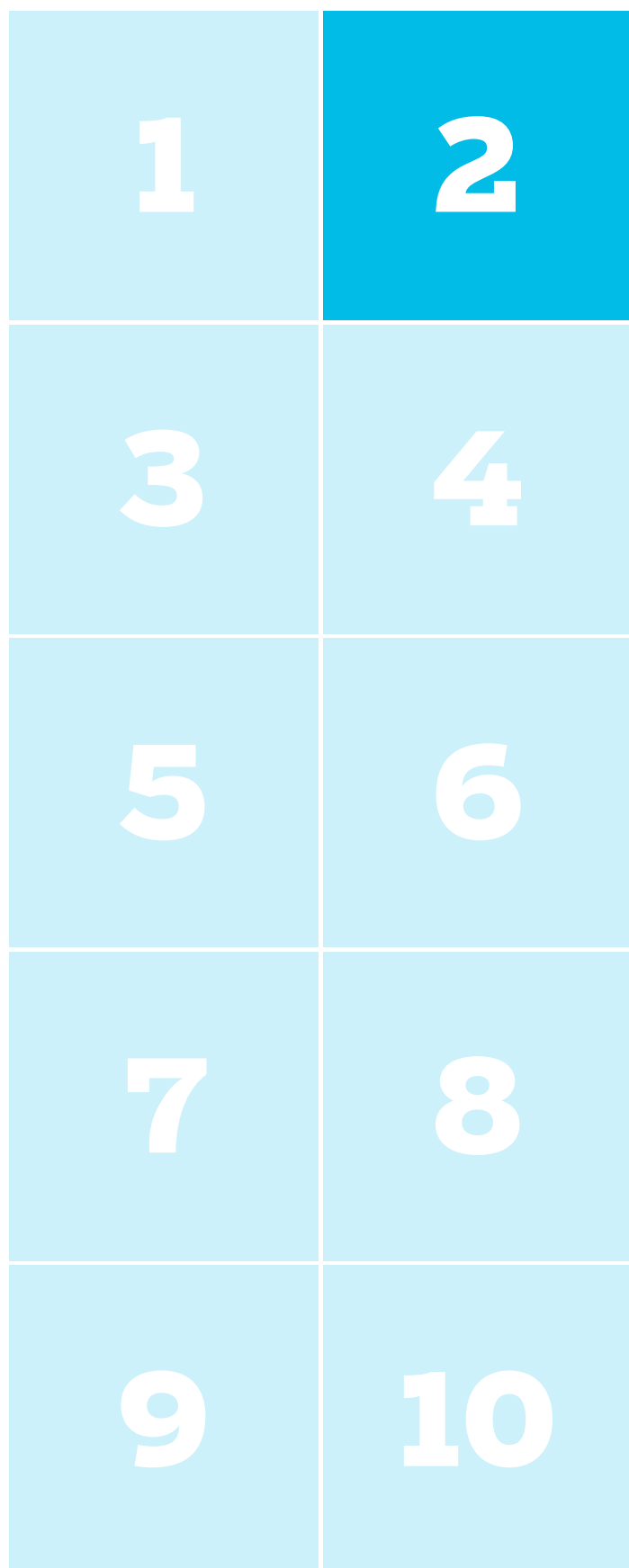
El Capitan's default desktop displays this gorgeous photo of the operating system's namesake rock formation, which is located in California's Yosemite National Park. The name is Apple's signal that this new version of Mac OS X is an incremental upgrade to the current one (Yosemite, naturally), not a massive overhaul.

Although the real-world El Capitan has an almost-vertical face that only the most expert climbers can conquer, Apple's OS presents a nearly flat learning curve for anyone who already uses OS X.

# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY



## Mute Points

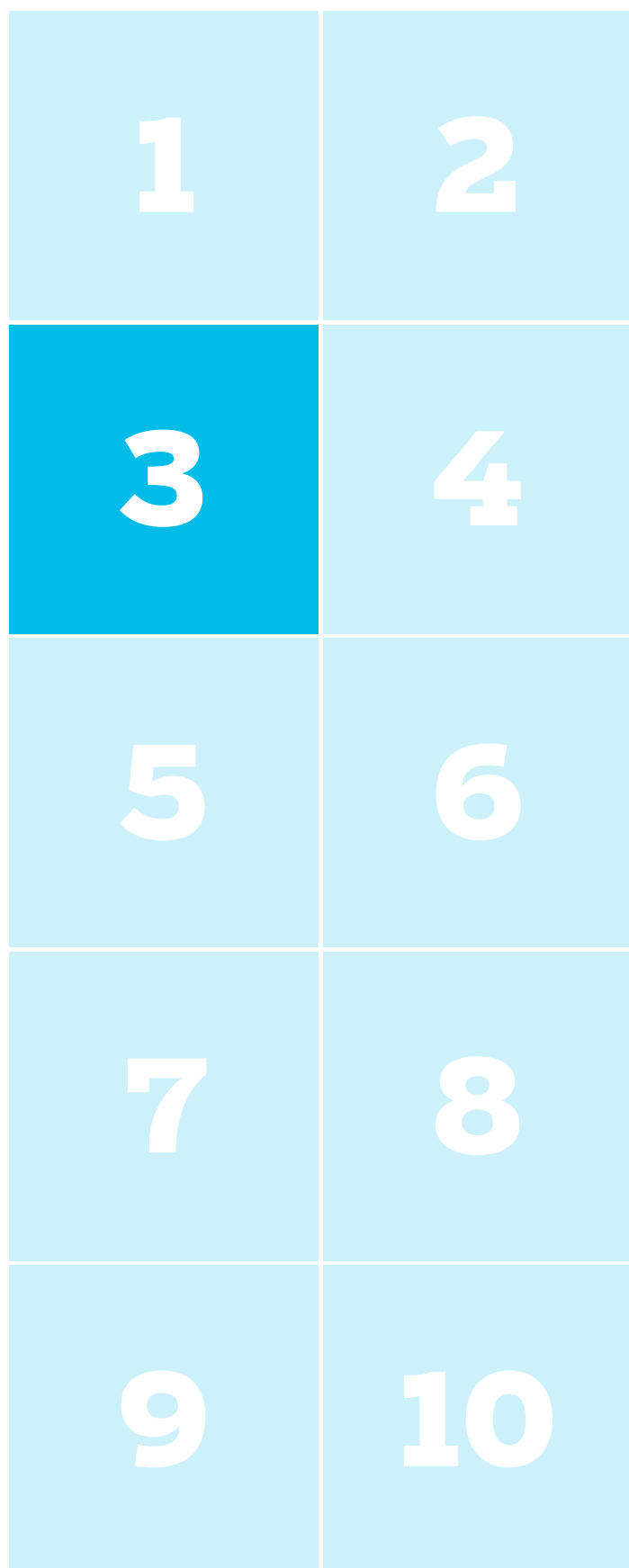
Apple's Web browser, Safari, gets mute buttons on individual tabs that play sounds, and a combined set of mute buttons is accessible by clicking the search bar. The AirPlay feature that sends music or video to an Apple TV now also works with HTML5 video in webpages.



# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY



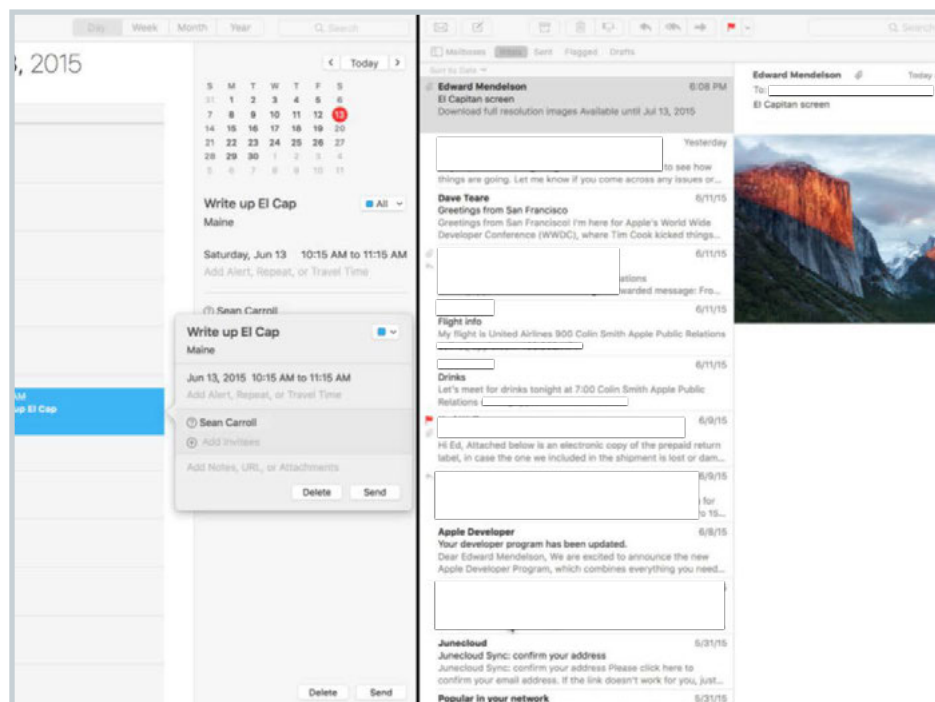
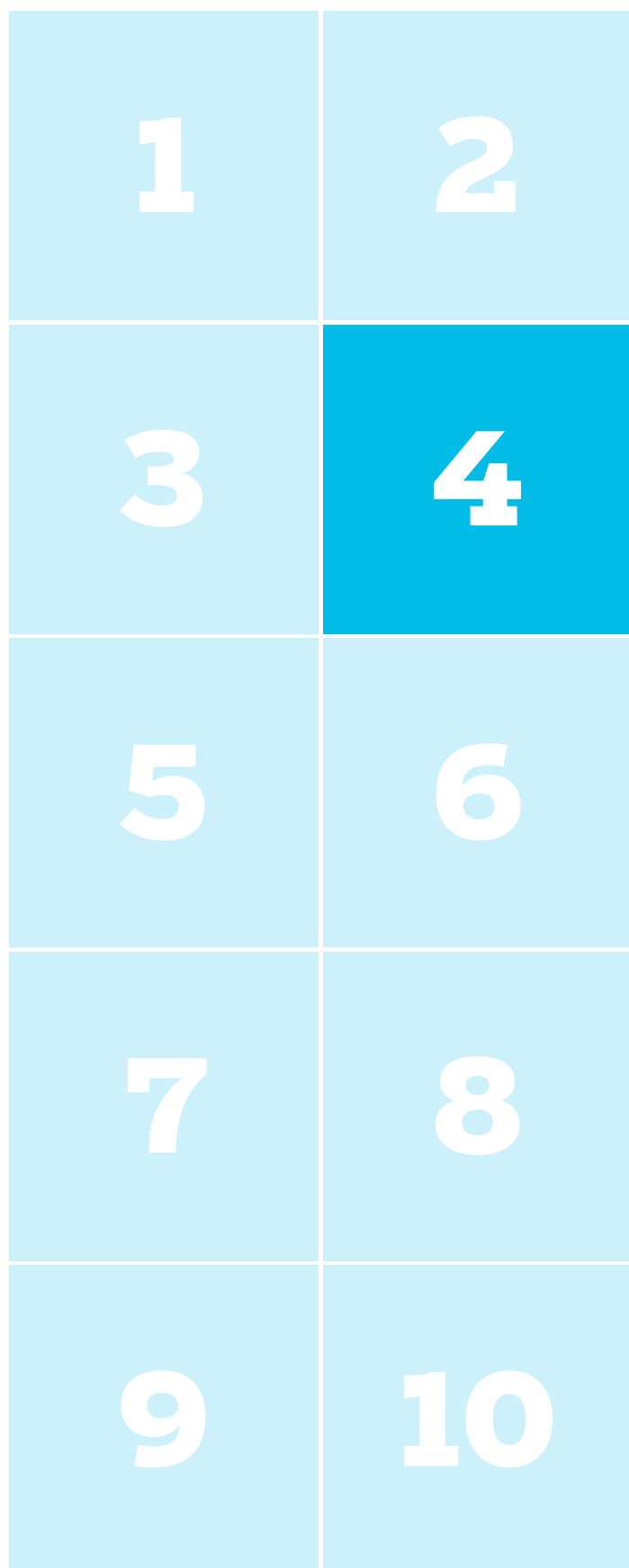
## Pinned Interest

Other changes to Safari include pinned tabs, which you have been able to use on Firefox and Chrome for a while now. A two-finger click on a tab opens the menu that lets you pin a tab; once you've done this, just click on the small icon at the left of the tab bar to visit the site with one click. Tabs stay pinned until you decide to unpin them, and each pinned tab gets an identifying icon, so they're all easy to distinguish from each other.

# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY



## You've Got Mail

With El Capitan, Mail gets some useful message management tools. Swipe to delete a message or mark it as unread, just as in iOS. And if you use the app on the full screen, you can compose multiple messages in a tabbed interface. Improved intelligence in the message window now lets you click a button to create a calendar event when an email mentions a meeting, flight, dinner, or anything else you may want to schedule. Another welcome innovation changes the way large messages are downloaded and listed, so you won't be annoyed by clicking on a message header and then having to wait for the content to appear.



# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY

1

2

3

4

5

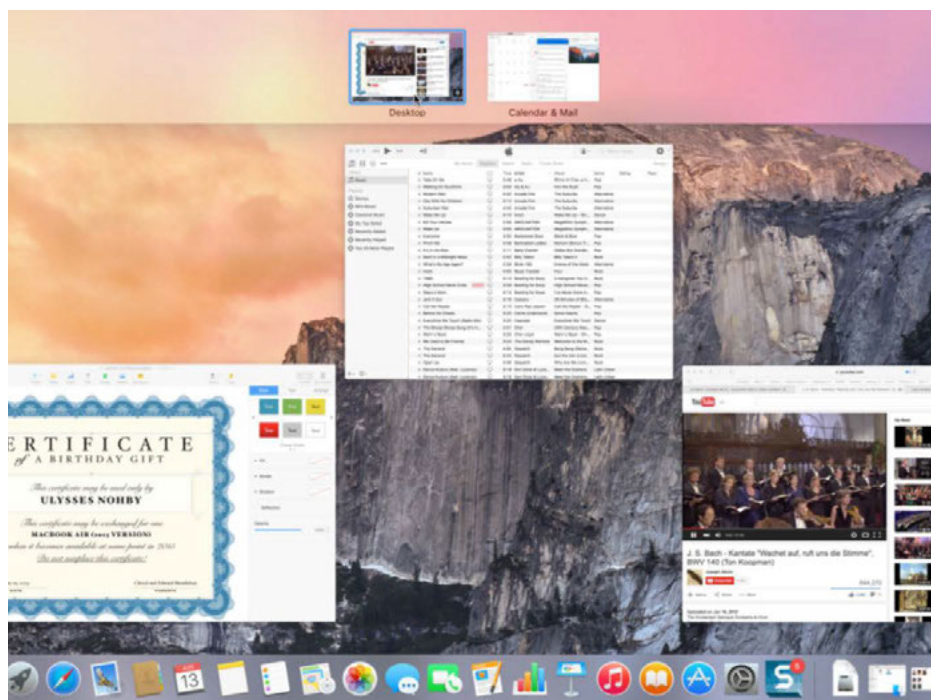
6

7

8

9

10



## New Ways to Do Windows

Until now, OS X has lagged behind Windows in window management features. These finally make their appearance in El Capitan, and Apple users may find their implementation here less annoying than in Windows. For example, you can make an app fill the screen by dragging it to the top of the desktop, but you have to hold it there to show OS X that you really want it to fill the screen. You can also split the screen by opening Mission Control and dragging application windows into the thumbnails of one or more desktops in the Spaces Bar. (This closely resembles a new option coming to iOS 9.)

# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY

1

2

3

4

5

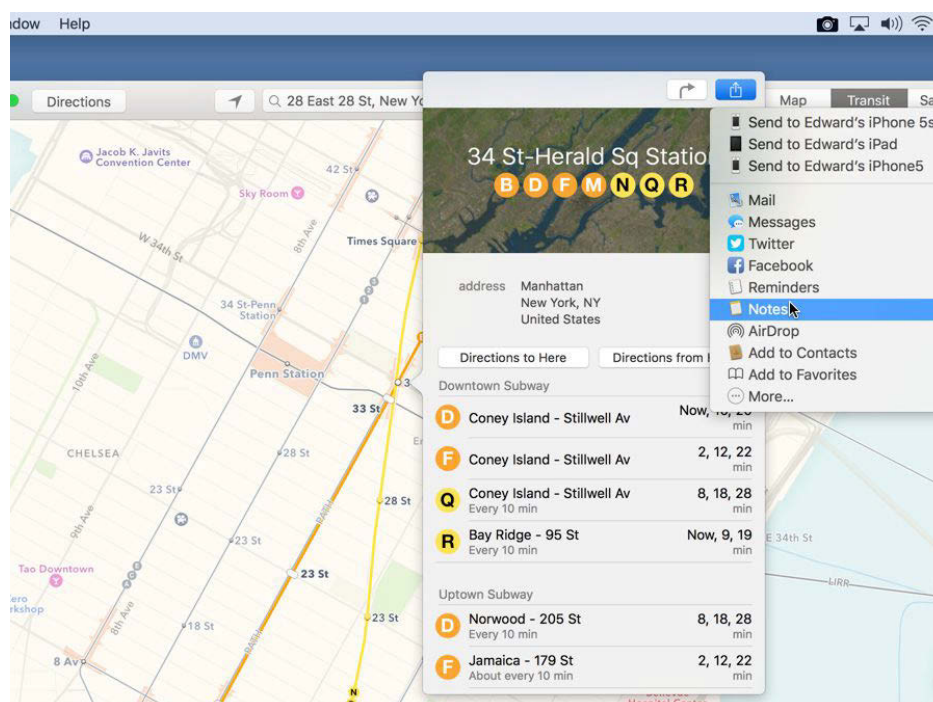
6

7

8

9

10



## In Transit

Maps now includes a Transit view, with detailed route and station information. Click on a subway stop, say, and you'll see a pop-up that shows other transit lines that are accessible from that station. Directions are clear and concise, and you'll be able to easily send them to an iPhone. The information is presented in an easy-to-read way that's quite different from what you'll find in Google Maps, but right now it's limited to only a few North American cities (though more than 300 in China are already included).



# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY

1

2

3

4

5

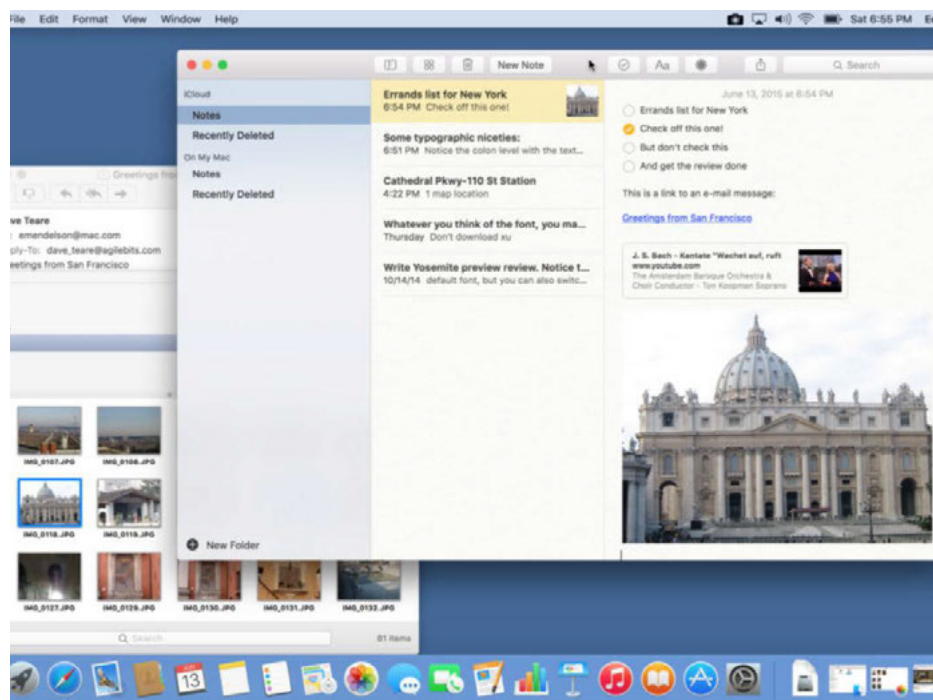
6

7

8

9

10



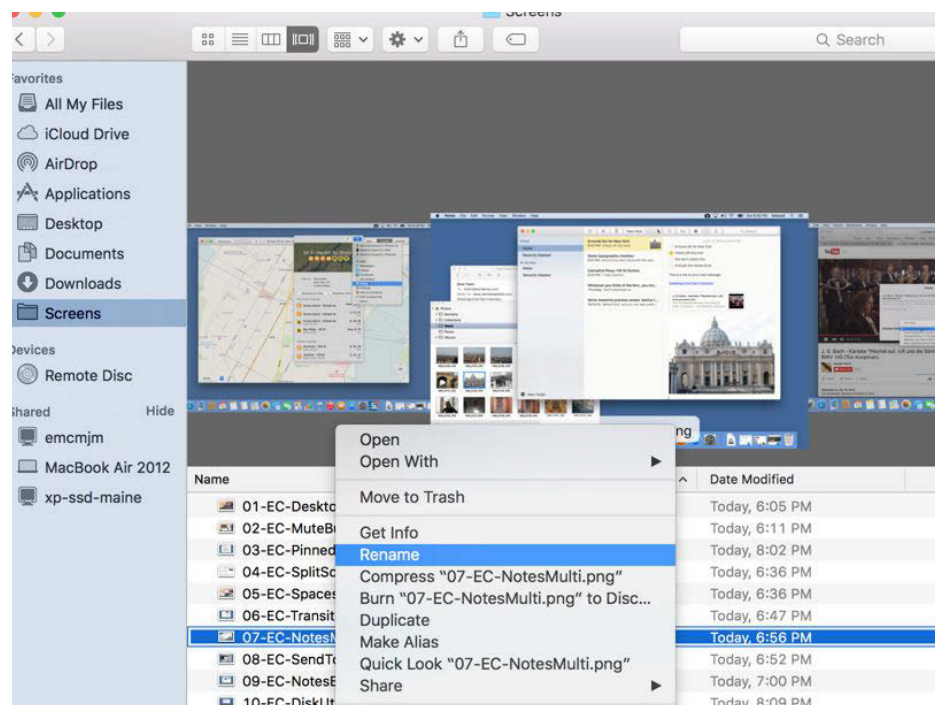
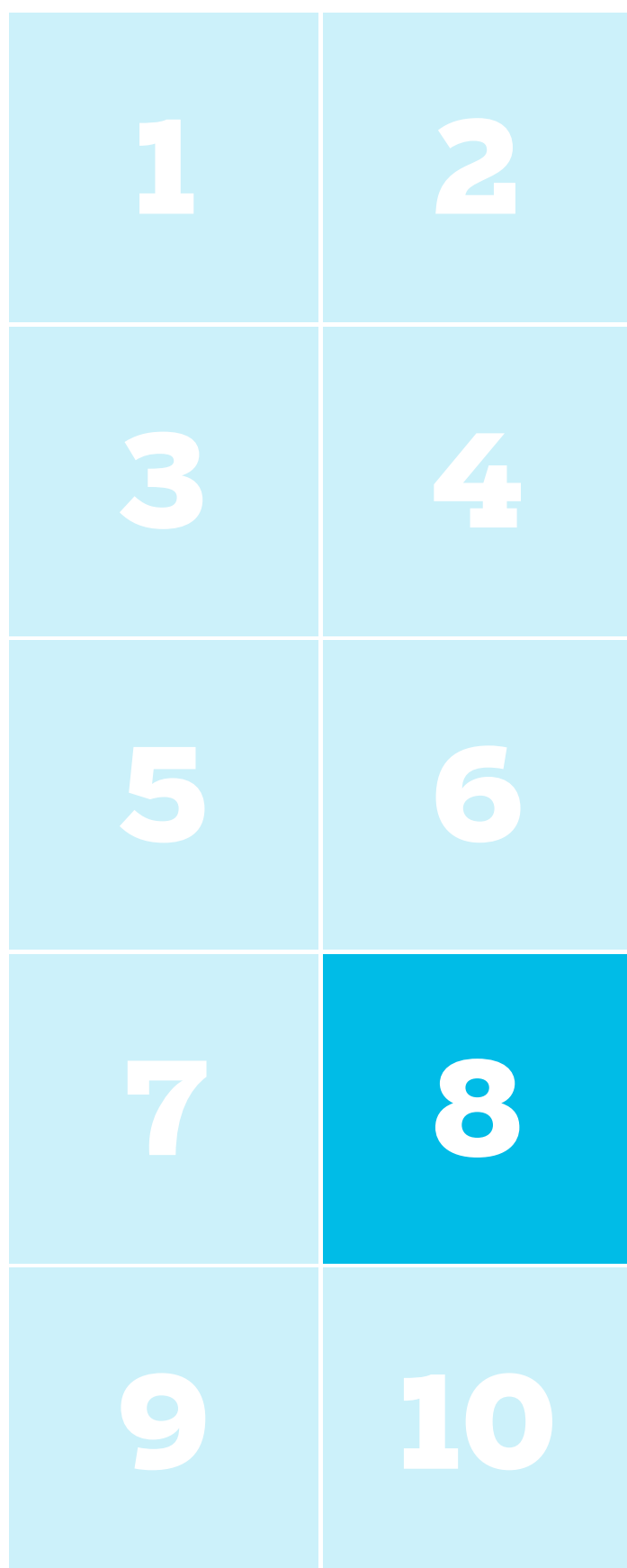
## Notes Padded

The new Notes app looks a lot like the old one, but it works more like Evernote or OneNote. You can use the Export button on apps such as Safari, Maps, or Keynote to save (for example) a map or webpage to a new or existing note. You can also drag a message from Mail into a note and create a link that opens the message. Another nice tweak lets you use the Font button to convert existing text into a dynamic checklist. Even better: Notes now accepts attachments of images, video, audio, and more, and you can access all that content from a built-in tabbed browser.

# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY



## New Interactions

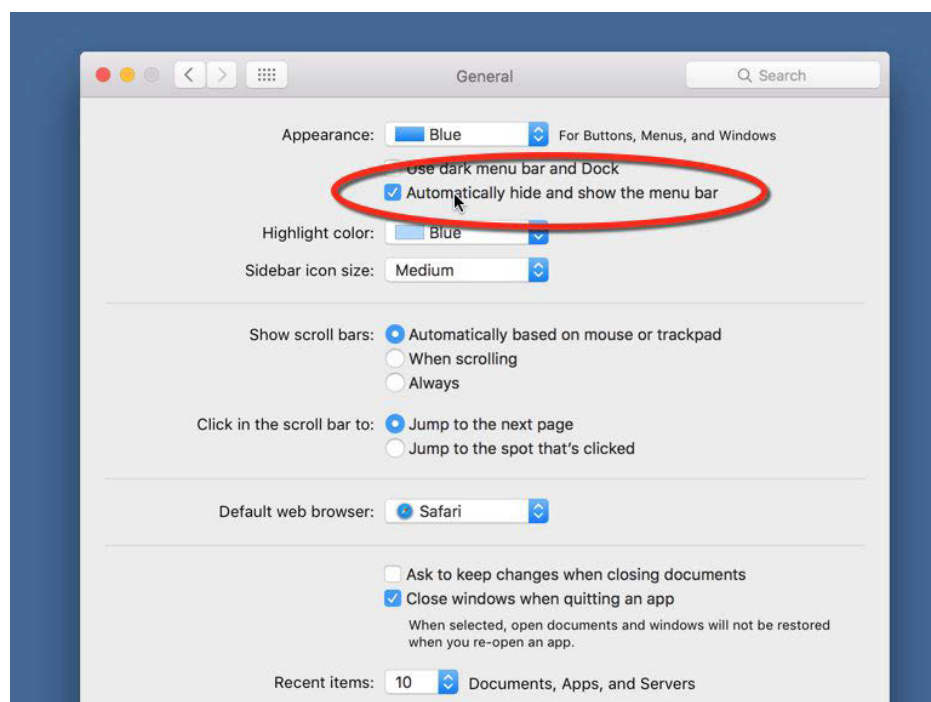
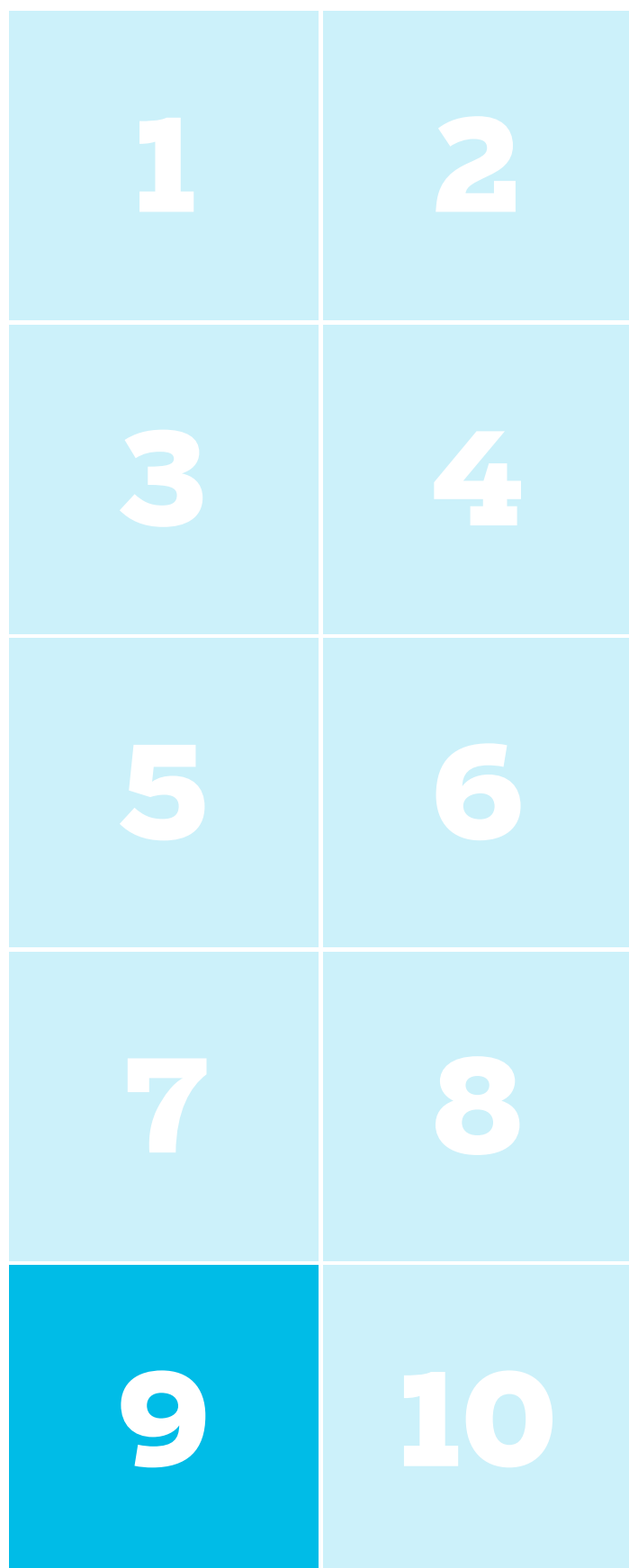
If you've ever wanted Spotlight to do more, you'll get your wish in El Capitan. The enhanced version in this OS now responds to queries like "documents created in November" or "weather tomorrow." (Similar natural-language smarts are built into Mail's search box, too.) And you can now reposition Spotlight by dragging it to the location of your choice. Another long-overdue update: The contextual menu now includes a Rename command, which will be a big time-saver for anyone who works a lot with files.



# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY



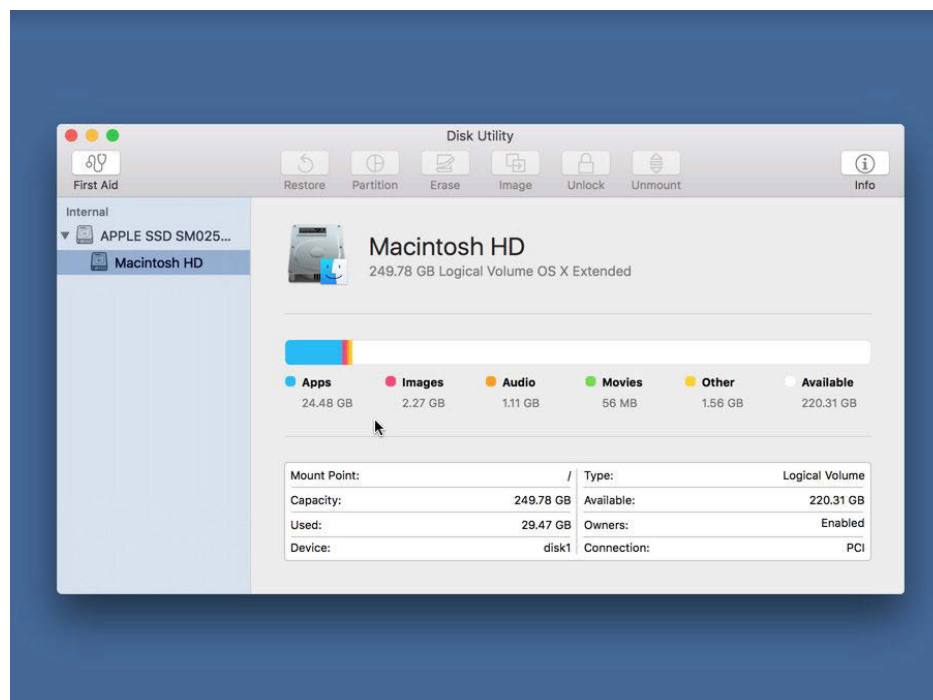
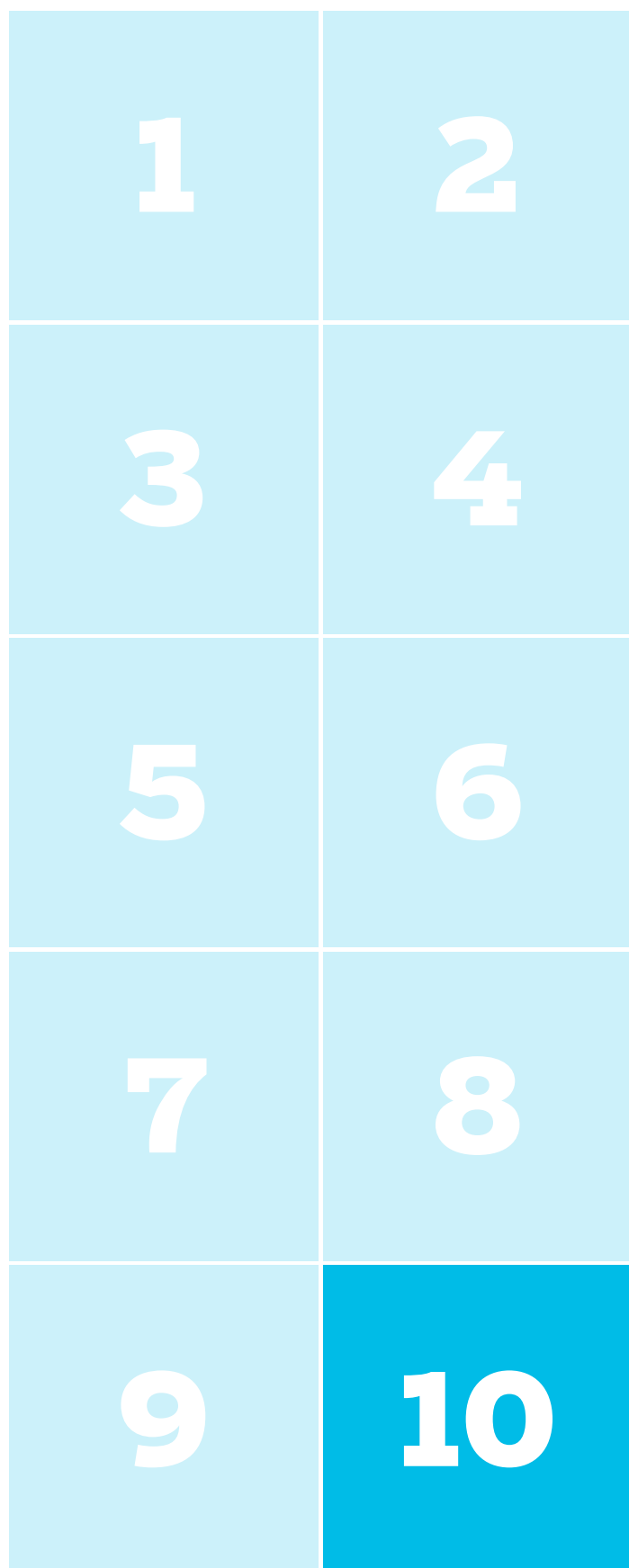
## Get Superficial

Apple doesn't always give you much control over how you use its software or hardware products, but you do have some new choices in El Capitan. There's the option to hide the menu bar until you move the mouse pointer to the top of the screen—just the way the Dock has worked for a long time. And replacing the older Helvetica Neue is the new San Francisco font, which is livelier in look and has some wry integrated smarts (such as a colon that changes position slightly when displaying the time).

# Our Favorite New Features in Mac OS X El Capitan

The upcoming upgrade of Apple's desktop operating system includes some solid advances.

BY EDWARD MENDELSON AND MATTHEW MURRAY



## Digging Deep

We saw notable speed improvements in our initial testing of El Capitan; among other things, Mail and Photos open far more quickly. And support for a new software technology called Metal should make more efficient use of GPU processing power in games and drawing software.

To help you better manage your storage, the Disk Utility has received some significant updates. It shows usage on your drives (with a display that echoes the one used in iTunes), in addition to providing the same partitioning and other functions that have been seen in earlier versions of OS X.



# Opinions

**SASCHA SEGAN**

**EVAN DASHEVSKY**

**ERIC GRIFFITH**

**A large portion  
of the planet's  
population  
has been left  
out of the  
Information  
Age.**

**EVAN DASHEVSKY**

FACEBOOK, GOOGLE WANT TO CONNECT  
THE NEXT BILLION (AND MAKE MONEY)

# Apple Music Can Win Without Being Great

**A**pple Music is not hugely innovative. Let's get that out there. It's a music streaming service—which is well-trodden ground dating back to Rhapsody in 2002—combined with a single radio station and a bunch of supposed artist pages, which I don't see as a huge draw.

That doesn't matter. Apple Music will not fail, because of the power of defaults. Apple Music is replacing the default music player in the dock of permanent apps on the world's most popular smartphone. This is ridiculously huge.

If you listen to tech reviewers, there are better third-party replacements for almost all of Apple's apps. This whine is best encapsulated in a recent rant from BuzzFeed's Charlie Warzel, who claimed that "Apple has had difficulty building the superior applications that truly excite."

Yawn. Apple's apps don't need to be better than competitors to win. They just have to be good enough and there by default.

If you look at streaming service usage statistics and email client market share statistics, you see that the vast majority of iPhone users don't act like tech journalists. Remember, Pandora, iHeartRadio, and Spotify are available for all mobile platforms and the Web, and iTunes Radio is pretty much only used on iPhones and iPads. (It's in the iTunes desktop client, but it's buried.) But iTunes Radio still makes it into third position.



Sascha Segan is the lead mobile analyst for *PC Magazine*. His commentary has appeared on Fox News, CNBC, CNN, and on radio stations and in newspapers around the world.



Similarly, the iPhone-only default Apple mail client has a significant lead over Gmail's position on all platforms, and that lead extends if you combine iPhone and iPad.

For more evidence, take a look at mobile browser statistics. Most people agree that Chrome is a better browser than the previous Android browser, but Chrome was only preloaded starting with Android 4.4. Over the past year, Chrome has grown from 18 to 30 percent market share, but it's been tracking with the growth of Android 4.4 and 5.0. Users of earlier versions of Android were not stepping up and downloading Chrome. By and large, they were sticking with the default.

Let's also not forget that Microsoft has gotten into massive hot water over defaults, at one point paying huge sums to the EU because developers said the default status of Windows Media Player was squeezing out competitors.

I remember back when Android was starting to take off, the question wasn't really whether it would offer a better user experience than iOS. Instead, the question was whether it would be good enough. Given other advantages, good enough is good enough to succeed. Being the default is a huge advantage. If Apple Music is almost as good as Spotify, that'll be good enough. It's the default. The bottom will drop out of Spotify's iPhone usage.

### **SPOTIFY: THE CARRIER CHOICE**

Carriers and Spotify are going to try to fight back by preloading Spotify on Android devices, I'm sure, but the fragmented nature of Android means they'll never get the positioning Apple Music has on its iOS devices. Carriers can't knock out Google Play Music or, often, the manufacturer's music player, so Spotify ends up

in some carrier folder and gets tarred as bloatware if it's preloaded.

Apple has a unique position in the bloatware debate anyway, because it controls the whole iPhone experience so tightly that nobody can agree what's bloatware. The line between OS features and apps is very blurred on the iPhone platform. When I asked my iPhone-toting Twitter followers what they considered to be bloatware, the only app everyone could agree on was the Apple Watch app; that makes sense, because it requires a piece of hardware that most people don't have.

That's not the case on Android, with its jumble of software from Google, OEMs, and carriers. It might not be so bad if phones had different music apps or browsers—that would be competition and differentiation. But preloading two browsers and three music players (and not letting users delete the ones they don't want) just confuses and irritates people.

I'm not as critical of Spotify as The Verge's Nilay Patel. He implies that Spotify is in a very difficult situation because it can't get enough users to pay for its services, but the recent funding round led by TeliaSonera points to another possible revenue plan: Spotify becoming the hero music service for wireless carriers, which will absorb its costs into their service plans.

That may still not be enough. Make no mistake: If tapping the big musical note at the bottom of an iPhone screen opens Apple Music, then Apple Music will cut a huge swath through the streaming industry as a whole. That's all it needs to do.

*[sascha\\_segan@pcmag.com](mailto:sascha_segan@pcmag.com)*



**If tapping the big musical note at the bottom of an iPhone screen opens Apple Music, then Apple Music will cut a huge swath through the streaming industry as a whole.**





# Facebook, Google Want to Connect the Next Billion (and Make Money)

**W**hile the tech press obsesses over the latest salvos in the ongoing war between marquee device manufacturers, there has been a quieter—but arguably more important—competition brewing at the other end of the economic spectrum.

The past few years have seen all the major tech players engaging in a “race to the bottom”—that is, a race to make cheaper devices and services tailored directly for the needs of the developing world. Many of these efforts are marketed as purely altruistic in nature (and surely, that’s part of it). But the corporations engaging in these pursuits are surely mindful of the economic potential that comes with serving “the rising billions.”

A large portion of the planet’s population has been left out of the Information Age (if not the Industrial Age), but it’s are being rocketed into the Digital Age via the mobile Internet. This is because mobile tech isn’t dependent on laying down the complicated and expensive infrastructure needed to, say, bring every home a phone line or a wired Internet connection. The result: billions of people are leapfrogging into the modern world. And Big Tech is more than happy to welcome them.

Case in point: Although mobile payments are



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*.

only beginning to take hold in the U.S., 68 percent of phone users in Kenya regularly use platforms like Vodafone's M-Pesa—which lets users send and receive money with feature phones—to engage in commerce. Mobile payments now account for 43 percent of that country's total economic output. Keep in mind that this is all happening in a region where less than 25 percent of people even have a bank account.

The takeaway here is that these billions of newly connected users represent a colossal untapped market that could eventually be worth trillions of dollars. And no one is more aware of this potential than the captains of industry in Silicon Valley.

That's exactly why companies are working to create cheaper and cheaper devices that use less and less computing power to connect.

Internet.org, the nonprofit headed by Facebook, is pursuing a number of initiatives that aim to connect billions of new users. The company plans to launch a fleet of solar-powered drones that will beam Internet directly to vast swaths of users below. More immediately, the company is working with local telecoms in South Asia to deliver free Internet to anyone with a smartphone. The catch is that this free Internet will be strictly limited to a number of preselected services (such as Wikipedia, local media, and of course Facebook). Users can then decide to purchase a subscription with the telecoms to access the full Internet.

Facing allegations that the plan violates the principals of net neutrality (along with several Indian companies dropping out altogether), Internet.org agreed to open up the free Internet tier to any website or service—granted it created a



version that was strictly limited in its bandwidth. (Some critics remain unconvinced, however.) More recently, Facebook released a “lite” version of its Android app that uses limited bandwidth, and is specifically designed for users accessing the platform in developing markets.

Zuckerberg and company are surely concerned with bringing more people online, but they’re also undoubtedly aware of studies in Asia that found that many regular Facebook users there don’t even realize they are using “the Internet.” As far as those users are concerned, Facebook is the Internet. And what tech company wouldn’t want that rep?

In light of this information, Google’s decision to launch its Project Loon—which uses a fleet of high-altitude balloons to beam the Internet to users—takes on a new dimension. No Big Tech company wants to depend on another one to be the doorkeeper to billions of users.

The whole competition reminds me of the scene in the HBO show *Silicon Valley* in which the CEO of the fictional version of Google reprimands his underlings by saying, “I don’t want to live in a world where someone else is making the world a better place better than we are.”

At least this war isn’t entirely self-serving. These companies will end up bringing billions of people online, and those people really won’t care what or who got them there.

[evan\\_dashevsky@pcmag.com](mailto:evan_dashevsky@pcmag.com)



**No Big Tech company wants to depend on another one to be the doorkeeper to billions of users.**



# Making the Case for Cell-Phone Jammers

**T**he news about teacher (and former pro-wrestler!) Dean Liptak getting into hot water for blocking cell phone signals in his Fivay High School classroom was exactly the wrong reaction on the part of administrators (and the government, to be honest).

Sure, what he did was technically illegal. The Federal Communications Commission says “use of ‘cell jammers’ or similar devices designed to intentionally block, jam, or interfere with authorized radio communications (signal blockers, GPS jammers, or text stoppers, etc.) is a violation of federal law.” For that matter, it’s illegal to even sell jammers in the U.S., but they’re easy enough to buy from overseas (as long as the retailer doesn’t get caught). The only legal buyers of such equipment are government employees.

Liptak got off light (a five-day suspension without pay); a Florida man with a jammer in his car for months got fined \$48,000. At least one priest has used a jammer after calls happened during sermons and even a funeral—and he supposedly got the go-ahead from the police.

Sure, the priest, the driver, and the teacher may have used questionable judgment, as the jammers blocked more than just their limited locations. But they all jammed with the best of intentions, and perhaps Liptak had the best reason of all: to get the little brats we call our future to pay attention for once.



*PC Magazine* features editor Eric Griffith has been on the founding staffs of several technology magazines, and is the author of two novels.



Back in the days of yore, in-class distractions were limited to things like seeing something out the window, passing folded notes, or maybe sneaking in comic books. Now, a student can do all that and a thousand other things on one screen. How does a teacher of any quality compete with the likes of YouTube, Snapchat, and Trivia Crack? Putting a filter on the local school Wi-Fi network might help, but it doesn't mean squat to a kid with unlimited data from mommy and daddy's family plan.

Rather than condemn Liptak, society should look into ways to empower teachers who need this assist. The FCC and Congress should be creating exceptions to the Communications Act of 1934, upon which many of the cell jammer limitations are based. Businesses should be allowed to find new ways to make easily controlled jamming devices. Let's face it: There are at least four kinds of places where jammers with limited, fine-tuned range would be an excellent idea.

## **THEATERS**

I've been on the wrong end of a couple of cell-phone calls at movie theaters in the last few years. People's phones didn't just go off, but their owners answered them and proceeded to have a conversation, at normal volume, as if that's perfectly okay, and not grounds for justifiable homicide. (At one of those films—the execrable *Land of the Lost*, so perhaps I should have been grateful for the distraction—I actually stood up and said to the offender, “Are you kidding me?” I like to think the rest of the audience applauded, but I couldn't hear anything over the hate-blood pounding in my ears.)

Concertgoers, Broadway aficionados, and film buffs would not need to worry about such rudeness if theaters utilized jammers that kicked in the second the lights dim. Sure, there will always be emergencies, doctors on call, or parents who must be sure the babysitter can reach them, and so on. But those people should find a different way to spend their night out.

## RESTAURANTS

The sign should read: “No Shirt, No Shoes, Using Phone, No Service.” Customers who can’t bother to place an order with a server because they’re in the middle of a call should get a 35 percent tip forced on their bill. Better yet, the bistro’s jammer should cut off this so-called customer—if the call is so important, they can go outside.

## THE WORKPLACE

There’s no question that in most offices, email and the Internet are absolute necessities. But are cell phones? In a survey by Pew Research, only 24 percent of adults with full- or part-time jobs listed a cell or smartphone as “very important” to getting their work done. In other research, 50 percent of bosses think a cell phone is a negative to workplace productivity.

There are plenty of places where it’s actively dangerous to be using a cell phone, but the devices are probably snuck onto warehouse or assembly line floors all the time. If employers could jam signals but allow for emergency calls—no harm, no foul.

## AT HOME

Parents can try parental-control and monitoring software all they like, but once a kid (or even a spouse or grandparent) gets the freedom of a



**There will always be emergencies, doctors on call, or parents who must be sure the babysitter can reach them, and so on. But those people should find a different way to spent their night out.**





smartphone with a data plan, good luck trying to get them to talk during family dinner.

Just as parents have the ability and right to cut off the Wi-Fi at home, they should have the option to cut the cellular signal if desired. Grabbing phones from hands to put them in airplane mode probably won't work, and making the house into a Faraday cage is an extreme only the tin-foil-hat crowd should try. But an in-home cell jammer should be an option whenever desired or necessary.

All of these examples are predicated on other lines being available for emergencies, or at least someone having the expectation of mobility sufficient to get outside of the jammer's range. For now, unfortunately, there's no way that even those with the best intentions could utilize the limited tech available in a way that wouldn't disrupt services well beyond the scope of their classroom, theater, office, or home. If you think there's an illegal jammer in use around you, visit the FCC's online complaint portal ([consumercomplaints.fcc.gov](http://consumercomplaints.fcc.gov)) or call 1-888-CALL-FCC (or 1-888-225-5322).

But before you do, consider if you really were harmed, or if maybe, just maybe, that hour without the cell signal was the best hour of your day. Besides, if your signal is jammed, you probably can't make the call anyway.

*[eric\\_griffith@pcmag.com](mailto:eric_griffith@pcmag.com)*



**An in-home cell jammer should be an option whenever desired or necessary.**



# Reviews

## **CONSUMER ELECTRONICS**

**Myo Gesture Control Armband**

**Razer Nabu X**

**Nvidia Shield Android TV  
(16GB)**

**TCL 55FS3700**

**Asus ZenFone 2  
(64GB, Unlocked)**

## **HARDWARE**

**Lenovo LaVie Z HZ550**

**Dell XPS 15 Touch (9530)**

## **SOFTWARE & APPS**

**Iolo System Mechanic 14**

**Our Favorite Apps for July**





### Myo Gesture Control Armband

\$199.99



## Control Your PC With Arm Gestures—Sort Of

**T**almic Labs' Myo Gesture Control Armband aims to give you motion control without the need for a Wii remote, a presentation controller, or anything else you have to hold. Instead, you just slip on an armband and control things with the movements of your fingers and wrist. What kinds of things? Well, not many at the moment. So far, the Armband's purpose is relegated mostly to PowerPoint presentations and media playback for apps like Netflix, Windows Media Player, and iTunes. Those are some pretty limited uses, and unfortunately, the gesture controls aren't all that reliable. That makes it difficult to justify spending \$199.99—right now, anyway.

### DESIGN

The band itself is a series of rectangular plastic "pods" held together by a rubber lining. On the underside of each pod you'll find three medical-grade stainless

steel EMG sensors that detect the electric impulses in your arm's muscles. Now, I understand the design allows the Armband to fit a multitude of differently sized forearms, but it looks a little too *Star Trek*, and not enough like something I'd want to wear at a business meeting to give presentations.

One of the pods—let's call it the main pod—sports two indicator LEDs. One is simply for the Myo logo, the other is a rectangular light that turns green to indicate when the band is charging and light blue when it's on and connected.

The Myo comes in at 7.5 inches for circumference, expandable to 13 inches. It weighs only 3.3 ounces, and each individual pod has a thickness of 0.45 inch. It's available in black or white.

## FEATURES

Along with the Armband, you get a standard micro USB cable for charging and a USB Bluetooth adapter for pairing the device with your computer. It also comes with ten sizing clips that can be used to readjust the band if it doesn't fit your arm properly.

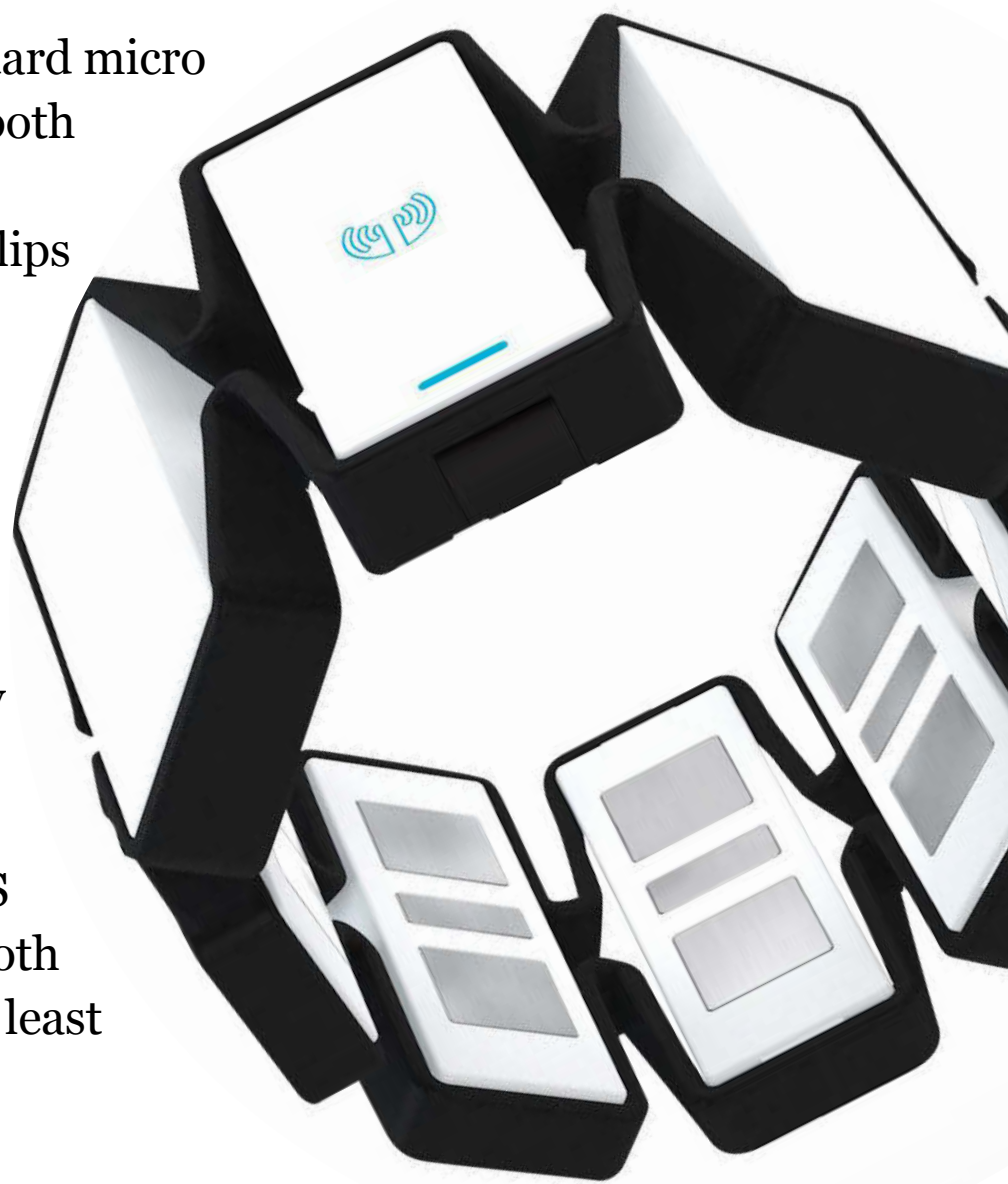
The Armband uses a three-axis accelerometer, a three-axis magnetometer, and a three-axis gyroscope to sense motion. An onboard ARM Cortex M4 processor talks with any connected devices via Bluetooth. The band is compatible with PCs running Windows 7 or later and Macs running OS X 10.8 or later. It also works with Bluetooth 4.0-equipped mobile devices running at least iOS 7.0 or Android 4.3.

According to Thalmic Labs, a built-in rechargeable lithium ion battery can keep the Myo going for one full day on a single charge. This seems accurate from my experience.

## Myo Gesture Control Armband

**PROS** Easy-to-use software. Simple setup. Growing app library.

**CONS** Unfriendly, limited gesture control. Finicky response. Can be uncomfortable to wear for long periods. Unattractive design. Inconvenient warm-up time, calibration.







## SETUP AND PERFORMANCE

To start the setup process, plug the Bluetooth USB adapter into your computer, connect the Myo with the included micro USB cable, then go to [www.myo.com/start](http://www.myo.com/start) to download and install the Myo Connect application.

The software manager prompts you to unplug and put on the armband. One video shows how to properly wear and calibrate it, and another how to sync it with a “Sync gesture.” The video does a nice job of showing the timing involved and exactly how to move your arm.

Next you’re greeted with two options: Present with Myo (essentially, to control presentation software like PowerPoint) or Build for Myo (to make things with Myo and see what it can do). The latter demonstrates the ways to control the band, and I followed its instructions. I double-tapped my fingers to unlock the band, then spread my fingers wide to cause a music file to play. I waved my palm to the right to skip to the next track, and to the left to return to the previous one. I didn’t actually get into the whole “build” aspect, but if you’re a developer who wants to make an app for the Myo, the software directs you to the Thalmic Labs site for downloading the SDK and other materials.

By contrast, Present with Myo is basically a tutorial on how to make slides go by. This is accomplished by more double-tapping and fist-clenching. It also locked the Myo in “Presentation Mode,” which made the band vibrate and my screen randomly zoom in. (I turned it off.)

Although the software does a nice job of getting you all set up, those basic waving and fist-making gestures are also the extent of the Myo’s abilities. You’re not going to be reenacting scenes from *Minority Report* anytime soon, so don’t expect to be able to pinch, grab, and resize files or images with a few shakes of the wrist or flicks of the finger.





## POINT POWER

The Myo Gesture Control Armband is designed for software such as PowerPoint, but its functionality is currently limited by reliability issues.

Even with its limited abilities, the Myo isn't as simple to use as it should be. For instance, the band only stays in unlocked mode for about 2 seconds—a small window of time to perform certain gestures, especially when they occasionally fail to register. I found this out while trying to control Netflix playback. I double-tapped to unlock the Myo and tried fast-forwarding, pausing, and playing a movie, but I couldn't get it to pause or play on the exact frame I wanted. I also never successfully controlled the volume, which requires making a fist and rotating your wrist.

It's possible to map your keyboard to the Myo, too, though you're given only five gestures—and thus five keys—to work with. I mapped the space bar to the “wave right” movement, but I still had to double-tap to unlock every time I wanted to wave right; the Myo would always lock immediately after I finished the gesture.

When I tried taking the Myo off and putting it back on, I had to recalibrate it completely. That takes a warm-up period of about five minutes, and redoing all the gestures to a new calibration profile. Without doing this, the gestures wouldn't catch.

## APP MARKET

A visit to the Myo App Market revealed a slew of compatible apps including Netflix, iTunes, and Windows Media Player, as well as some popular games such as Counter-Strike: Global Offensive, Civilization V, and older games like Tetris and Indiana Jones and the Fate of Atlantis. I can see the Myo working with point-and-click adventure games like Indiana Jones, Back to the Future, and Broken Age, as they don't rely on quick timing or dexterity. But Counter-Strike was a pain to play. It was extremely difficult to center the cursor in order



to aim, and the game generally freaked out and went haywire, especially in the menus. I found that selections were constantly made without my making them, and the Myo vibrated continuously, which seemed to indicate it was constantly disconnecting and reconnecting or locking and unlocking. Either way, it was annoying. A slower-paced game like Minecraft could probably work pretty well, but I still wouldn't recommend it, as the Myo didn't recognize several gestures while playing.

On top of this, during testing, I never forgot that I was wearing the Myo, the way I would with a smartwatch or a fitness tracker. It really does feel like a blood pressure sleeve—snug enough that it never truly feels natural.

## **CONCLUSIONS**

Will double-tapping your fingers, spreading your palm, and making fists, just to make slides go by, ever look good at the front of a boardroom? I'm not sure. I really wanted to like the Myo Gesture Control Armband. But between the price, the design, the finicky response, and the limited control it provides, I find it difficult to recommend. Perhaps it could be useful for a doctor who needs to keep his hands free, but I wouldn't want anyone relying on the Myo to operate on me. The band is intriguing in theory, but at present the overall experience is akin to using a Microsoft Kinect, only without as much compelling software.

**TIMOTHY TORRES**



# So-So Features Limit This Gaming-Minded Tracker

**R**azer's Nabu X represents the gaming peripheral company's first step into the wearable tech market, so it's not entirely surprising that it feels like a prototype. Branded as a "social wearable smartband" for gym-going gamers, its social functionality and vaguely defined gaming promises are supposed to set it apart, but these features are either underwhelming or absent. As a fitness tracker it gets the basics right, but ultimately the basics are all you get. For \$50, that's not too bad, but you'll probably want to spend your money on a dedicated fitness tracker.

## DESIGN

Like many fitness trackers, the Nabu X is a simple hypoallergenic rubber silicone wristband with fastening holes on one end and a simple set of prongs on the other that clasp the one-size-fits-all band around your wrist. A plastic electronic module that fits snugly in the middle of the underside adds a trim of color to the otherwise discreet bracelet. It's quite comfortable, and it comes in three color combinations: black with a green module, white with a gold module, or green with a black module.

## Razer Nabu X

\$49.99



The module in the center of the band holds three blinking LEDs that indicate smartphone notifications, fitness goals, and alarms. They glow red, blue, or green through the strap, and appear nice and bright indoors, but pretty faint when you're out in the sun.

For charging, the Nabu X uses a port that requires a short, proprietary USB cable. It would have been far better if it had simply used a standard micro USB cable. Thankfully, you don't have to worry about charging too much, because the Nabu X's lithium-polymer battery is long-lasting. I only charged it twice during my week-plus of testing. The Nabu X is also rated IP67 for water resistance, so it can survive in just over 3 feet of water for 30 minutes.

## SETUP AND APPS

To connect the Nabu X, you need an Android device running Android 4.3 or above, or an iPhone 5 or later. You also need to download the Nabu X Utility app from the Apple App Store or Google Play. Hook up the band to a power source via USB, open the app, tap the screen, let Bluetooth 4.0 do its thing, and you're good to go. I connected the band to an HTC One M9 in just a couple of seconds. Once the Nabu X is set up, you can connect additional bands, view the battery level for the band you have selected, personalize the colors that flash for notifications or alarms, adjust brightness and vibration levels, and set an alarm, among other things.

In order to actually track your fitness stats, you need to download another app. Nabu Fitness displays your number of steps taken, miles traveled, and calories burned. Those are the only parameters it tracks. There's no heart rate monitoring here; the Nabu X contains a three-axis accelerometer, a vibration motor, and not much else. As for the software, I would have preferred all of it to be bundled under the same app, instead of spread across several separate ones.

There are a couple of other apps available to

## Razer Nabu X

**PROS** Inexpensive.  
Good battery life.  
Decent fitness tracking.  
Comfortable.

**CONS** Frequently unresponsive.  
Confusing notification lights.  
Uses proprietary charging cable.  
Frustrating reset process. Minor social features. Gaming functions not yet available.





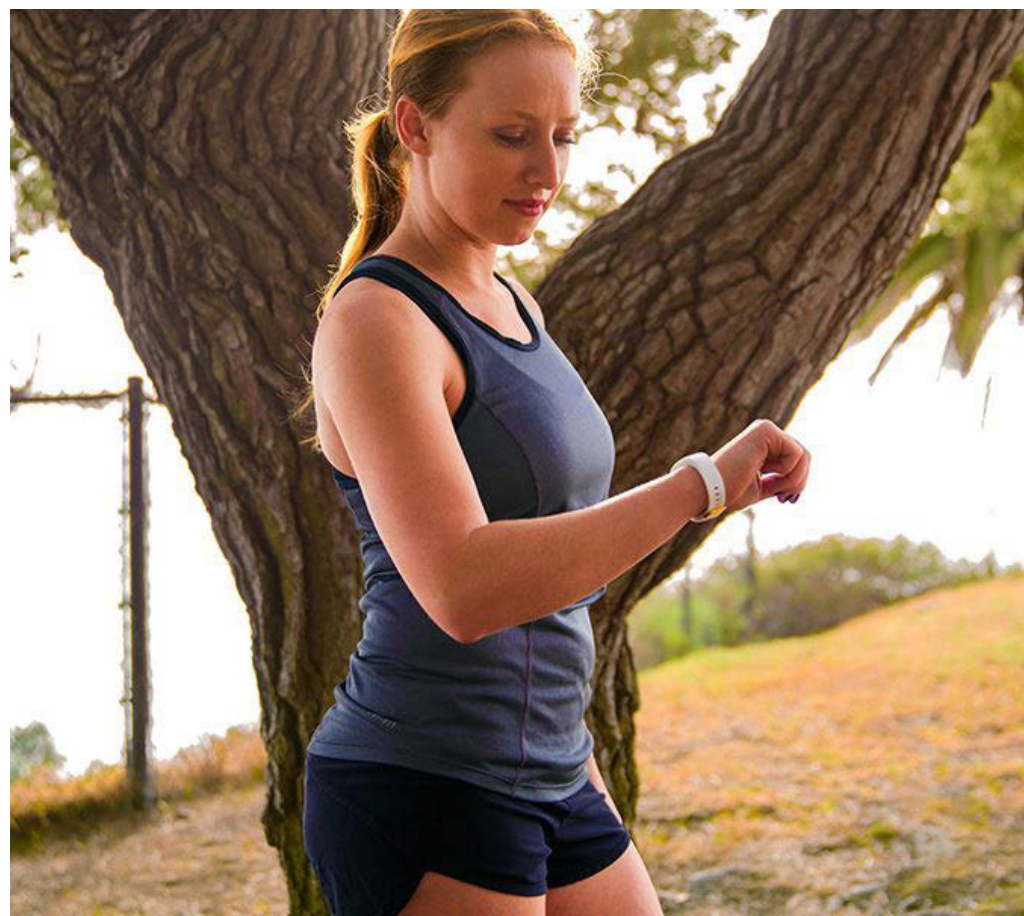
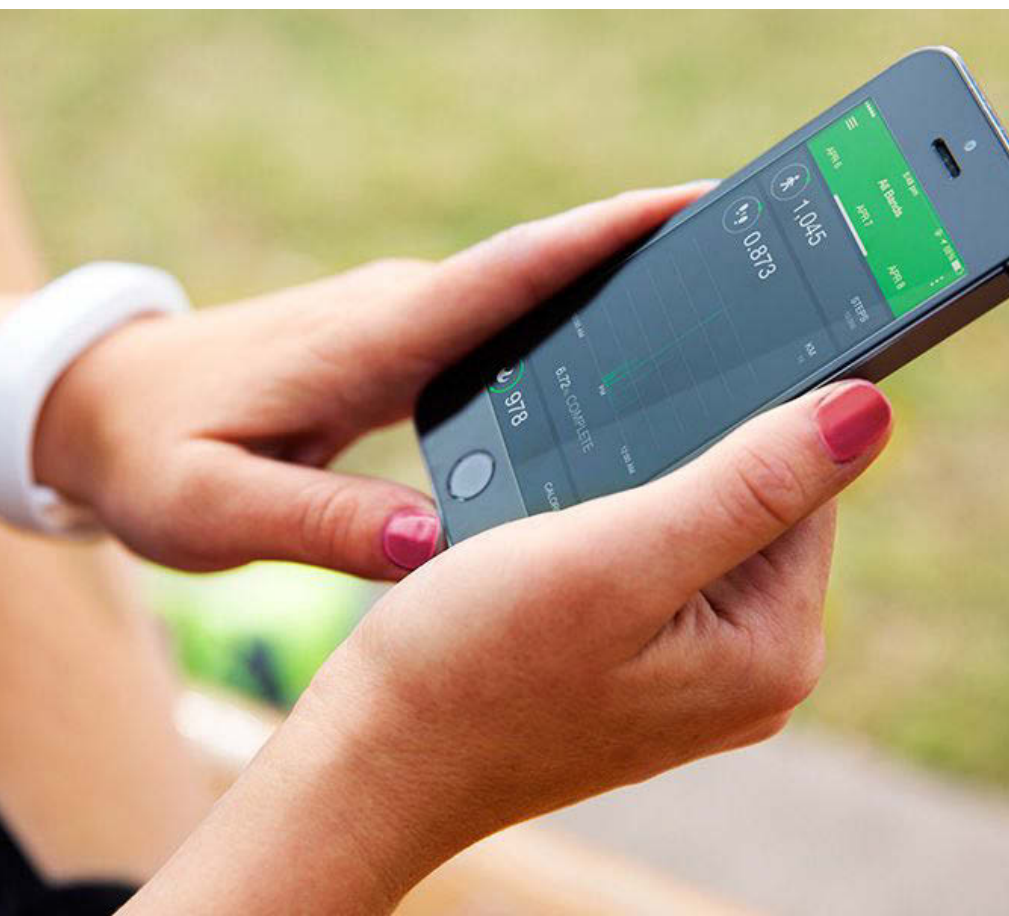
download, like Home for Razer, which replaces your Android phone's home launcher widget with a black-and-green-hued version that displays steps, miles, calories, and a personal goal progress bar. It's neat, but not all that essential. I switched back to Sense Home on the HTC One M9.

## **FITNESS TRACKING AND NOTIFICATIONS**

As a fitness tracker, the Nabu X is about average. I jogged a two-mile route one day and a three-mile one the next, and when I checked the app afterwards, the mile and step counts were both accurate. But the band was kind of an annoyance while out jogging. In order to see your progress you need to double-tap it, but the band would often fail to respond to my taps. Maybe one out of five times it would display how far along I was by blinking one, two, or three lights, but at that point—hot, out of breath, and dodging cars—I was fed up with it.

There's zero fitness guidance here, unlike trackers such as the Jawbone UP24, which can become your personal coach through various information menus and notifications. If you're looking for a roadmap to healthy living with the Nabu X, you're not going to find one.

Although fitness tracking is mostly fine, notifications are something of a disaster. Basically, the Nabu X always reacts the same way: It will blink three lights and vibrate, whether it's for a Google Hangouts message, a tweet, a Facebook message, or anything else. You have no way of knowing what's what unless you whip out your smartphone to check—in which case, what's the point? During testing, the band would often vibrate a bunch of times and blink all three LEDs in red, too; it felt a little too dramatic, and I had no idea what it actually meant because Razer's support page offers little insight. The sleep alarm, however, worked well, with low vibrations that nudged me awake.





## SOCIAL FEATURES AND RESET WOES

I enlisted fellow *PC Magazine* analyst Jeff Wilson to help test the Nabu X's data swapping feature. In theory, you can shake the hand of someone else wearing a Nabu X to swap fitness and social media data, like Twitter, Facebook, and Steam handles.

But first we had to reset one of the Nabu X bands, which meant going through a frustrating rigmarole. I mentioned before how finicky the double-tapping is, and that's the crux of Razer's reset method. It's not enough to just tap the band; Razer wants you to tap at just the right pressure and with just the right rhythm, or you have to do the whole process all over again. It was maddening. And then, while shaking it, the main plastic component flew out of the rubber band.

Once it was finally set up, we found out that you don't actually have to perform a handshake or a high-five or anything to exchange data. You just need to be in the same vicinity, verify that the Handshake option is switched on in the Utility app, and the Nabu X will vibrate. If you're on Twitter you get sent a direct message. And that's about it. I tried unfollowing Jeff and received another DM. We didn't get any Facebook notifications, just more DMs on Twitter each time our bands were within range of each other. There was no clear way to swap fitness data, either.

As for gaming, exchanging Steam handles via handshake is the extent of it. There is a Nabu Gamers app available to download, but when I opened that it referred me to Steam's login page. I signed in and went through the process of authenticating my account only to be told "No gamers are nearby," accompanied by a sad *Doctor Who* meme.



**GAME OFF**  
Though the Razer Nabu X's social features have promise, they need refinement; right now, they can be frustrating to use.





According to Razer, some augmented reality–type apps like rock-paper-scissors and a zombie-themed tag game will be available at some point in the summer. Hopefully some gamers will be nearby.

## CONCLUSIONS

The Razer Nabu X is a decent fitness tracker, though I can't help but feel disappointed by it. Two of the things that are supposed to set it apart—social connectivity and gaming prowess—are respectively unsatisfactory or absent, making it feel like an unfinished product. In addition, the confusing notification lights, frustrating unresponsiveness, and proprietary charging cable get in the way of an otherwise decent and inexpensive device. As it stands, you're better off buying an affordable dedicated fitness tracker, like the Misfit Flash (\$34.99) or the Jawbone UP Move (\$39.99). Or you can invest in a more advanced tracker, like our Editors' Choice, the Mio Fuse (\$123.99), which has an optical heart rate monitor that makes it a good choice for truly active users.

**TIMOTHY TORRES**

**Nvidia Shield  
Android TV  
(16GB)**

\$199



## Living Room Android Gaming, at a High Price

**N**vidia is moving its Shield line of gaming devices from portable handhelds and tablets right into the living room. The Shield Android TV microconsole is a remarkably powerful little system, but its price (\$199 for 16GB internal flash storage, \$299 for 500GB hybrid SSD/hard drive) dwarfs what you'll see with devices like the inexpensive Sony PlayStation TV. And though Nvidia's Grid and GameStream streaming game services open up the Shield to many PC games, it's still held back by the Android TV ecosystem, which still feels too limited when compared with stock Android.



## DESIGN

The Shield is a flat, matte black plastic object with skewed and jarring contours that make it look like an alien artifact. It measures 1.0 by 8.3 by 5.1 inches (HWD) and weighs 23 ounces: larger than the PlayStation TV, but smaller than every current-generation game system. The front edge holds only a tiny, nearly invisible Power button. Any other indication of power is relegated to a V-shaped light hidden in the edge between two angular panels on the top. A black brushed aluminum stand is available as an optional accessory, and it holds the Shield securely on its side with the power light facing to the left.

The back edge of the system holds a connector for the power adapter, two full-size USB ports, a micro USB port, an Ethernet port, and a microSD card slot. The Shield can accept up to 128GB microSD cards for additional storage, and you can plug in USB hard drives for even more space. Either option will likely be necessary if you get the 16GB version we tested.

The system comes with the same Shield Wireless Controller Nvidia released with last year's Shield Tablet. It's a Wi-Fi-based gamepad with dual analog sticks, touch-sensitive navigation and volume buttons, a built-in microphone, and a headphone jack that can stream audio directly from the Shield. You can optionally purchase the \$49.99 Shield Remote, or connect Bluetooth or USB keyboards and mice, or some third-party gamepads.

## ANDROID TV AND VOICE SEARCH

The interface is almost completely stock Android TV, with few readily apparent Nvidia add-ons. The main screen is organized in rows that show suggested content, and installed games and apps. The menus are very responsive, and the Shield loads games and apps quickly.

## Nvidia Shield Android TV (16GB)

**PROS** Powerful Tegra X1 processor. Supports 4K Netflix. Streaming PC game options expand the available library. Good voice search.

**CONS** Android TV store is limited. Sideloaded software is awkward. No Web browser.



Android TV's voice search is much more compelling on the Shield than it was on the Nexus Player. The Shield understood my requests through both the Controller and the Remote, and brought up search results quickly. Voice search is still heavily weighted toward the Google Play store and YouTube, but support for around 20 additional non-Google apps has since been added. Shows and movies available on Hulu Plus and other services now appear on the voice search results screen. Each app and service gets its own row, so you'll need to scroll to find what you want on the other services. The voice search can also answer simple factual questions and provide information like weather reports and sports scores.

## **SHIELD HUB**

Most of the Shield-specific gaming options are found in the Nvidia Shield Hub, Nvidia's game store front-end. Its Download Games section offers a broad, curated selection of Android-based games. There are many more choices, including upcoming Shield-exclusive Android games like Metal Gear Rising: Revengeance and Doom 3: BFG Edition, than the Android TV-native Google Play store. (You can, however, use your standard Google login and payment information; you don't need to create an additional, Nvidia-specific store account.)

The Stream Games section grants access to Nvidia's Grid streaming game service, which streams audio and video to your device from Nvidia's servers and responds to your controls entirely over the Internet. It's only available on Shield devices, and offers nearly instant access to a respectable library of games including Ultra Street Fighter IV, Saint's Row 4, La Mulana, and Psychonauts. Like all streaming game services, it requires a very fast Internet connection to be remotely playable. You can also stream games from your own computer over your home network with Nvidia's GameStream feature, but you need a powerful system with a GameStream-ready Nvidia video card.



## **SPEAK UP**

**You can issue voice searches to the Nvidia Shield Android TV via the included controller or this optional remote control (\$49.99).**





Even with all of these options, however, the Shield's game selection pales against the disc-based and downloadable libraries available for dedicated game consoles. Even the niche PlayStation TV has more compelling titles, thanks to its extensive back catalog of PSone Classics.

## **APPS AND SERVICES**

The Shield supports ultra-high-definition (UHD, or 4K) video streaming. In fact, it's the first non-HDTV that can stream 4K Netflix content. And because it runs Android TV, the Shield supports Google Cast, so you can stream content from your smartphone or tablet to your HDTV over your Wi-Fi network.

Besides those features, the Shield is clearly not primarily meant for non-gaming uses. Outside of the Nvidia Shield Hub, the system relies entirely on the Android TV version of the Google Play store. Unfortunately, this side of the app store is woefully understocked compared with the smartphone and tablet app store. A few hundred games and apps are available, including Hulu Plus, YouTube, Amazon Instant Video, and Sling TV, though you won't find some big names like Twitch or Spotify.

The Shield also completely lacks a Web browser. This was confusing on the Nexus Player, and it's just as inexplicable here. The analog sticks of the Steam Controller can move an on-screen mouse cursor easily enough, and the system supports mice, so Chrome's absence is just bizarre.

Sideloaded software is possible, but extremely inconvenient. You need to download a file manager (fortunately, one is available on the Android TV Google Play store) and unlock developer options to let the Shield install APK files from unknown sources—as you would with most other Android devices. But apps don't consistently appear in the Shield's menu system, even after you install them. We had to dive into the Shield's Apps list in the Android TV System menu to open sideloaded software.

## **PERFORMANCE**

The Shield is the first device to feature Nvidia's 64-bit Tegra X1 system-on-a-chip (SoC). The chip pairs four ARM Cortex A57 cores with four Cortex A53 cores. These are off-the-shelf parts that are distinct from Nvidia's Denver CPU



featured on the Shield Tablet; the chip is closer in configuration to Qualcomm's Snapdragon 810 SoC. The big difference here, though, is Nvidia's desktop-class Maxwell GPU, versus the Adreno 430 GPU used by Qualcomm.

Although we weren't able to run any of our usual processor-intensive or browser-based benchmarks, Android TV does have its own version of the graphics benchmark GFXBench 3.1. In the most demanding Manhattan test, the Shield Android TV turned in an impressive 44 frames per second (fps). The HTC One M9, which features Qualcomm's highest-end Adreno 430 GPU, managed only 23fps on the same test. The Shield Android TV also handily beat the Shield Tablet, which scored a still-respectable 30fps. The Shield's graphical prowess surpasses that of any mobile device we've tested thus far.

This performance translates well into running games. Android-native versions of Tales From the Borderlands and The Talos Principle both ran very smoothly, indistinguishable from their console and PC counterparts. The Tegra X1 can easily handle Android games like Asphalt 8, and we expect it to acquit itself well with the Android versions of Metal Gear Rising: Revengeance and Borderlands: The Pre-Sequel when they appear on the Shield this summer.

## CONCLUSIONS

The Nvidia Shield Android TV is a powerful device with plenty of impressive features. But it's still pricey, compared with full-fledged game systems its content library is minuscule, and it's otherwise hampered by the frustrating software limitations of Android TV. Like the PlayStation TV, it's the type of device that will greatly appeal to a very specific subset of gamers, but it's a hard sell for anyone who doesn't need to scratch that exact itch.

**WILL GREENWALD**



**TCL 55FS3700**

\$598



## Roku Makes This the Best Budget HDTV You Can Buy



If you're on a tight budget, buying an HDTV requires some form of compromise. It used to be that you had to give up both picture quality and features. You still won't get the best picture without spending an appreciable amount of money, but thanks to Roku TV, you can get a full-featured, affordable big TV for a very low price. Last year's TCL FS4610R series performed well and offered a slew of online services through Roku, earning it our Editors' Choice. It's being replaced by TCL's FS3700 line, of which we tested the 55-inch 55FS3700. Its \$598 retail price is a full \$80 less than the price of the 55-inch 55FS4610R from last year, and it delivers the same solid performance and loads of streaming media thanks to its Roku TV core.

## DESIGN

The 55FS3700 showcases TCL's typical understated, functional design aesthetic. The screen is surrounded on all sides by half-inch, flat, glossy black plastic bezels marred only by TCL and Roku logos on the bottom edge, and an indicator light just beneath the TCL logo. The screen stands on a clear-and-black rectangular glass base that holds it up steady but doesn't let it pivot. This HDTV won't catch anyone's eye, but it doesn't look particularly cheap, either; it blends well into any room you place it.

Facing right on the back of the screen you'll find three HDMI ports, along with a USB port, a 3.5mm headphone jack, a cable/antenna connector, an optical audio output, and a pinhole Reset button. Beyond those connections, the 55FS3700 also has a composite video input facing straight back, and that's it. A small joystick sits behind the screen on the lower-right corner and serves as a Power button and a simple input device, but it's best treated as a backup; you'll want to use the included remote whenever possible.

The remote is a curved black wand with a purple direction pad, playback controls, and four dedicated service buttons (Netflix, Amazon Instant Video, Rdio, and Vudu) on the front. Volume controls and a Mute button sit on the right side. It's an infrared remote, so it requires line-of-sight with the HDTV and, unlike the radio remote used with the Roku 3, it doesn't have the handy headphone jack for audio streaming. Still, it's very functional and easy to use.

## ROKU TV

Like all Roku TVs, the 55FS3700 uses Roku's interface to provide access to online services and apps through Roku's Channel Store. All of the major media services are available, including Netflix, YouTube, Hulu, Amazon Instant Video, SlingTV, and Twitch. There are also hundreds of topic-specific content channels and

## TCL 55FS3700

**PROS** Very affordable. Decent picture quality. Roku TV offers many media streaming options.

**CONS** Middling black levels. Roku TV interface prevents deep calibration.





apps. In addition, you can wirelessly stream media from your smartphone or tablet with the free Roku app for Android and iOS. The app lets you use your mobile device as a remote, as well.

The HDTV's input options show up on the main screen at the top of the channel list, above any Roku content channels you've added. You can rename each input so you don't need to remember which device is connected to HDMI 1 and which is connected to HDMI 3, for instance.



## PERFORMANCE

We test HDTVs using a Klein K-10A colorimeter, a DVDO AVLab 4K test pattern generator, and SpectraCal's CalMAN 5 software. After basic calibration, the 55FS3700 displayed a solid peak brightness of 273.35 candelas per square meter ( $\text{cd}/\text{m}^2$ ) and a disappointing 0.08 black level, for a 3,417:1 contrast ratio. It's unimpressive performance compared with what you find on more expensive screens, but it's standard for HDTVs in this price range. The 55FS3700 is a bit brighter than the 55FS4610R despite displaying the same black level, so its contrast ratio is just slightly higher than last year's model.

Color accuracy is imperfect. We found that white ran slightly cool and green quite warm, though blues and reds were fairly accurate. Unfortunately, the Roku TV system offers no in-depth color adjustments, so you can't tweak and calibrate the colors to perfection. Even simple adjustments like Brightness and Contrast are found under "Advanced Picture Settings," and you can't adjust color balance beyond three color temperature presets and a Tint setting.

The slightly skewed colors don't have much of an impact on the image. In *The Big Lebowski*, the purple of The Jesus' outfit and the warm earth tones of the bowling alley looked a bit too vivid, but reasonably well balanced despite the slight oversaturation. Skin tones also looked fairly accurate, though The Dude's face seemed a tad red. Fortunately, color saturation is one of the few picture settings you can change on a Roku TV, and turning it down just a bit improved the overall look.



*The Amazing Spider-Man's* dark alley scenes were filled with shadow detail, but the blacks weren't quite as inky as they could be. You can coax the blacks a bit darker by adjusting the contrast level, but that will obliterate any shadow detail. The 55FS3700's budget price should be remembered when considering its picture quality; you can't reasonably expect outstanding contrast on a 55-inch screen that retails for less than \$700, and with that in mind the 55FS3700's picture is perfectly serviceable, and its colors fairly accurate.

## **POWER AND CONCLUSIONS**

Although the 55FS3700's color accuracy is lacking, its response time is extremely impressive. Input lag, the time between when a screen receives a signal and updates the picture, was just 28.1ms in our tests. This is remarkable for a 55-inch HDTV, and about twice as fast as other similarly sized displays we've tested. The screen has a Game mode, but it only shaved the response time down to 27.9ms.

Under normal viewing conditions, the 55FS3700 consumes 99 watts of power. The HDTV's Eco Save mode cuts that down to 82 watts and dims the screen slightly. Again, for a 55-inch HDTV, that's a solid result, if slightly higher than the 55FS4610R's 91 and 77 watts respectively.

The FS3700 series shows that, once again, TCL and Roku can work together to produce a compelling budget HDTV. Though the 55FS3700's picture won't wow you, at \$600 for a 55-inch screen loaded with Roku's wide selection of content channels and media features, it presents a bargain that will. If you want a big screen with built-in Netflix, Hulu, YouTube, and other features for a low price, this set should be at the top of your list.

**WILL GREENWALD**





## The Most Powerful \$299 Phone Needs Design Help

I can't believe the Asus ZenFone 2 costs \$299. In terms of sheer power per dollar, it's unmatched. It has everything and the kitchen sink: 64GB of storage plus a memory card slot, two SIM slots, enough RAM to flip between several large games at once, and a surprisingly good camera. If you're going by benchmarks and performance measures, it's the best unlocked phone available for \$299.

But here's where things get personal. The ZenFone 2 is powerful, but I don't find it appealing. Much of that has to do with design: This is a big, heavy slab of a phone, with a dim screen and a cloying Android skin

**Asus ZenFone 2**  
(64GB, Unlocked)

\$299



that's overburdened with bloatware. A lot of that judgment is based on personal taste, and some of it is fixable. But I find the Editors' Choice Alcatel One Touch Idol 3 and the OnePlus One—though not as powerful—to be more appealing to hold and to use.

## PHYSICAL FEATURES AND CALL QUALITY

The ZenFone 2 tries to be stylish, but it's a heavy, ungraceful tank of a phone. At 5.98 by 3.04 by 0.30 inches (HWD) and 6 ounces, it's noticeably wider and much heavier than the One Touch Idol 3, which makes a significant difference in usability. The button layout is also very unusual: The Volume buttons are on the back (which works well), but the small, stiff Power button is on the top edge, where it isn't easily reachable. Fortunately, you can wake up the phone by double-tapping on the screen.

The 1,920-by-1,080-pixel, 5.5-inch display is disappointing. It has a sharp 401ppi density, but it's dimmer, with poorer viewing angles, than the Idol 3. You can tweak the display's color balance to a surprising extent with built-in utilities, but none of them makes the screen much brighter.

A removable back means you can access the SIM card slots and microSD memory card slot, but the 3,000mAh battery is sealed in. That's okay; the ZenFone 2 got a terrific battery life result in our rundown test with 6 hours, 50 minutes, of LTE video streaming. The Idol 3 pays for its slimmer, lighter body with just over 4 hours of streaming life.

The ZenFone 2 is the only one of our \$299 unlocked leaders with two SIM card slots, a big plus for frequent travelers. One of the slots allows for LTE, and the other only permits EDGE data. This works really well with T-Mobile's Simple Choice roaming; switch your T-Mobile SIM to the EDGE slot when you're abroad so you can keep your number, and use a local data SIM for high-speed data in the main slot.

## Asus ZenFone 2 (64GB, Unlocked)

**PROS** Amazingly fast, powerful for the price. Good camera. Dual SIMs. Lots of memory.

**CONS** Big. Heavy. Dim screen. Heavy Android skin. Too much bloatware.







Band-wise, the ZenFone 2 supports U.S. and foreign 2G and 3G GSM networks. For LTE, it has bands 1/2/3/4/5/7/8/17/20. That means it works on both AT&T's and T-Mobile's networks, and has LTE roaming in Europe and Canada. It lacks T-Mobile's new Band 12, though, which will reduce T-Mobile LTE coverage in some suburban and rural areas. The phone also supports 802.11a/b/g/n/ac, Bluetooth 4.0, NFC, and a raft of GPS systems.

Call quality, I'm happy to say, is generally good. The earpiece, though not raucously loud, has decent volume, and noise cancellation through the microphone is excellent. The speakerphone, on the other hand, is too quiet to use in many contexts.

## **ANDROID AND PERFORMANCE**

The 2.3GHz Intel Z3580 processor benchmarks like a pretty high-end chip, falling somewhere between the Snapdragon 801 and 805 on AnTuTu benchmark results, and just killing the Snapdragon 615 that Alcatel uses in the One Touch Idol 3. The ZenFone outpaces the Idol 3 on GFXBenchmark graphics tests, too, never mind lesser performers like the Moto G. It doesn't match up against the Google Nexus 6 or the Samsung Galaxy S6, but those phones cost twice as much.

Almost as important, the 4GB of RAM here really matters if you multitask. Android handles multitasking by tossing out old, suspended app processes when you run out of memory. With the ZenFone, I could play Asphalt 8, do some emailing and Web browsing,



play Epic Citadel, and then return to the suspended Asphalt 8. The Idol 3, with its 2GB of RAM, insisted on relaunching Asphalt 8 at that point.

Software-wise, though: ugh. Clearly, one of the ways Asus is making money on this phone is by renting it out for bloatware. There's a ton of it, fortunately deletable, from a "Dr. Safety" antivirus app that I'd never heard of to an "Omlet Chat" OTT messaging app that I'd never heard of.

Beyond the third-party bloatware, Asus' ZenUI is one of the most heavy-handed Android skins I've seen. There are too many "smart options," too many redesigned apps, too many slow animations (which you can turn off), and too many Asus-exclusive apps that are just a bit less usable than the standard Google versions. It doesn't look much like Android Lollipop at all, and it is, in fact, Android Lollipop. Alcatel's lighter approach is much more appealing.

I checked benchmark scores before and after removing the bloatware, and it didn't seem to slow the phone down. With 64GB of internal storage (54GB available), there's still plenty of room for your own data. Add a microSD card and you can get up to 192GB into the phone. But just as with the body, the software here left me with a bad aesthetic feeling when compared with the brighter, simpler Alcatel interface.

## **CAMERA AND MULTIMEDIA**

The ZenFone 2's 13-megapixel main camera is better than either the One Touch Idol 3's or the OnePlus One's. It locks focus much more reliably, so you have fewer blurry photos. The photos themselves are sharper than the Idol's best—so sharp, in fact, that they look like they've been through a sharpen filter, complete with artifacting. Still, I really appreciated the precision.

A few useful modes help as well. There's an intriguing low-light mode, which drops the resolution to 2.36MP but does indeed offer much better low-light performance than the One Touch Idol 3 does. There's a good HDR mode, and







**The Asus ZenFone 2 is a truly impressive piece of engineering and an amazing value for its price.**

an excellent auto-face-detecting rear-camera selfie mode. For video, the phone records 1080p footage at 30 frames per second, indoors and out, with the front and rear cameras.

The ZenFone 2 supports all the usual Google music formats, as well as MPEG-4 video, but not DivX, Xvid, or anything more exotic. That's fine; there are third-party video players available for these formats. The back-ported speaker is pretty bad. It's harsh and tinny.

## **COMPARISONS AND CONCLUSIONS**

The Asus ZenFone 2 is, by far, the most powerful phone you can get for \$299 unlocked. Its camera, especially, puts to shame those on the Alcatel One Touch Idol 3 and the OnePlus One. The 64GB of storage, 4GB of RAM for multitasking, and dual SIM capability all mean that it would make a terrific traveling companion, and it works on both AT&T's and T-Mobile's networks. But the ZenFone 2 is just too big, too heavy, and its screen is too dim, compared with the slim, attractive One Touch Idol 3. I also don't care for the overbearing Android skin, or the oppressive amount of bloatware. The Asus ZenFone 2 is a truly impressive piece of engineering and an amazing value for its price. But the Alcatel One Touch Idol 3 is the phone I would rather carry.

**SASCHA SEGAN**

**Lenovo LaVie Z  
HZ550**

\$1,699.99 (as tested)



## Being the “World’s Lightest Laptop” Isn’t Enough

**L**enovo has paired up with Japanese manufacturer NEC to bring “the world’s lightest laptop” to U.S. markets under the Lenovo brand name. The Lenovo LaVie Z HZ550 is that laptop, a high-end ultraportable with a jaw-droppingly thin-and-light design. But most users won’t find that reason enough to open their wallets, considering that other systems offer better battery life and lower prices.

### DESIGN

Lenovo and NEC have done everything to reduce the size and weight of the LaVie Z, from using a lighter magnesium-lithium alloy for the frame (instead of machine aluminum) to tweaking manufacturing processes. For example, the display panel is manufactured directly onto the lid, using the lid itself as backing. Though the laptop is, at 0.67 by 12.56 by 8.35 inches (HWD), about the



same size as the new Apple MacBook and the Asus Zenbook, it manages to be much, much lighter: only 1.87 pounds. But it feels incredibly light in your hand; weight differences of an ounce or two are barely noticeable, but a difference of nearly a pound is astonishing. Even after several days of use and testing, I'm still stunned every time I pick up this laptop.

As a rule, when systems are designed to prioritize portability and lightweight design, they do so at the expense of the quality and overall experience of the laptop. Obviously, the question becomes: Does the LaVie do this? A little, but not as much as you might expect. The chassis flexes very little when picked up by the corner, but there is a bit of flexing in the lid and underside of the chassis when it's held in your hands. To be fair, this kind of flimsiness is unavoidable on a system that uses so little material.

The 13.3-inch display impresses with its 2,560-by-1,440 (WQHD) resolution. That's not quite as high-res as the 3,200-by-1,800-pixel screens found on the Dell XPS 13 Touch and the Lenovo Yoga 3 Pro, but it's not far off from the Retina display on the latest 13-inch Apple MacBook Pro (2,560 by 1,600) and the 12-inch MacBook (2,304 by 1,440). It's also a big step up from the full-HD panel on the Asus UX305FA-ASM1. The display has a matte finish and no touch capability, but the better-than-HD resolution is a definite plus.

The two built-in speakers are located on the underside of the laptop near the front edge, and they sound lousy. Even after making some adjustments with the included Yamaha AudioEngine utility, the speakers have weak volume, a thin, tinny sound, and no bass to speak of. With so many similarly svelte laptops offering good or even excellent sound quality, it's jarring to hear speakers that sound this poor.

The keyboard isn't as bad as the speakers, but it's also not as good as the AccuType keyboard we frequently praise on other Lenovo systems. Instead, it's smaller

## Lenovo LaVie Z HZ550

**PROS** Currently, the lightest laptop you can buy. High-resolution display. Surprisingly good performance.

**CONS** Lightweight design feels a bit flimsy. No touch display. Cramped keyboard with confusing layout. Small port selection. Short battery life.





than full-size, with shallow key travel and none of the solid feel you get on other Lenovo laptops. The keys are small and widely spaced, but oddly laid out. The Enter key is extra-large, a common difference spotted on non-U.S. keyboard designs. But the arrow keys are uneven, with the Left and the Right keys full-size but the Up and Down keys unusually narrow. The right Shift key is half the size of the one on the left. The Backspace key is joined by an unexpected FWD Space key where the Delete key might be, which adds a forward space, just like the space bar; the Delete key is instead nestled in the bottom row between the Insert and Ctrl keys. The Backslash key has changed locations to accommodate the larger Enter key, and there's another next to the space bar. I'd hazard to guess that the LaVie Z has a Japanese-style keyboard layout, with the keys simply relabeled for English characters.

The accompanying touchpad suffers from no such problems; it has a lightly textured surface that matches the matte finish of the palm rest. The touchpad supports all Windows 8 gesture controls, and has clickable lower corners for right and left button functions.

## **FEATURES**

On the right of the system, you'll find two USB 3.0 ports, an HDMI-out port, an SD card slot, and a headset jack. On the left is a case-lock slot and Lenovo's squared-off power connector, along with the Power button. That's fewer connectors than you'll find on the Asus UX305FA-ASM1, which offers three USB ports, but it's more than the single USB-C port on the Apple MacBook. The



LaVie Z is outfitted with dual-band 802.11ac Wi-Fi and Bluetooth 4.0, for all of your wireless needs. Inside, the laptop packs a 256GB solid-state drive (SSD).

Lenovo doesn't load up the LaVie with too many extra programs. There are 30-day trials of McAfee Central and Microsoft Office, as well as Lenovo's SHAREit and REACHit apps, which allow simple file sharing and retrieval between your laptop and your phone or tablet by way of a mobile app (available for Android, iOS, and Windows Phone), but that's it. Lenovo covers the LaVie Z with a one-year warranty.

## PERFORMANCE

Other exceptionally thin-and-light ultraportables, such as the UX3050FA-ASM1 and the Yoga 3 Pro, have used less-powerful Intel Core M processors for their energy efficiency and cooler running temperatures. The LaVie Z, on the other hand, is outfitted with a dual-core 2.4GHz Intel Core i7-5500U CPU, which offers better processing power that I think is worth the extra millimeter or two of thickness.

In PCMark 8 Work Conventional, the LaVie Z scored 2,709, well ahead of the UX305FA-ASM1 (2,257) and the Yoga 3 Pro (2,094), and more in line with Lenovo's Core i5-equipped X1 Carbon Touch (2,646) and the XPS 13 Touch (2,987). The same difference in performance applies to tasks like media editing, as seen in our Photoshop CS6 test, which the LaVie Z finished in 4 minutes, 1 second. Core M-equipped systems like the UX305FA-ASM1 (5:58) and the 12-inch MacBook (6:24) were notably slower, and those with ultrabook-class Core i5 processors, like the X1 Carbon Touch (4:14), were considerably faster on the test.



**POWER PLAYER**  
The Intel Core i7 CPU gives the Lenovo LaVie Z HZ550 more processing punch than most laptops in its class can usually boast.

Using the processor's integrated Intel HD Graphics 5000, the laptop actually managed better graphics performance than most competing systems. In 3DMark Cloud Gate, our basic graphics test, the LaVie Z scored 5,232, putting it ahead of the XPS 13 Touch (4,852), the X1 Carbon (4,915), and Core M–based systems like the UX305FA-ASM1 (4,270) and the Yoga 3 Pro (2,977). The LaVie Z also earned leading scores in our Heaven and Valley gaming benchmark tests, though nothing in this category approaches truly playable performance.

The one area where I expected more than I got from the LaVie Z is battery life. In our battery rundown test, it lasted 7 hours, 40 minutes. That's not bad overall, but it's a far cry from what other systems offer. Apple's 13-inch MacBook Air leads the pack at 15:51, followed closely by the 12-inch MacBook (14:10) and the XPS 13 Touch (12:55 with extended battery). Even the X1 Carbon Touch (8:57), the Yoga 3 Pro (8:19), and UX305FA-ASM1 (8:10) did better. This is almost entirely the result of weight-cutting measures, as the Lenovo LaVie Z uses a battery that's smaller (29.6 watts) and lighter than you'll find in the others.

## CONCLUSION

The LaVie Z HZ550 is an impressive feat of engineering, material design, and manufacturing processes, and it unquestionably owns the “world's lightest laptop” tagline. But when you look at systems like the less-expensive Asus Zenbook UX305FA-ASM1, the fully featured Dell XPS 13 Touch, or the Retina display–equipped 13-inch MacBook Pro, it's hard to see many people opting for the LaVie Z based on the weight alone. If you prize low weight above all else, then the LaVie Z is the system for you. For everyone else, however, it's a little too light on features and short on battery life to justify its hefty price.

**BRIAN WESTOVER**



**If you prize  
low weight  
above all  
else, then the  
LaVie Z is  
the system  
for you.**





**Dell XPS 15 Touch  
(9530)**

\$2,549.99



## A 4K Touch Screen Doesn't Quite Sell This Dell

**T**he new benchmark for premium desktop-replacement laptops isn't design, port selection, or speedy storage. Rather, it's ultra-high-definition (UHD) 4K displays. The 2015 Dell XPS 15 Touch (9530) offers a 4K touch screen, bringing it into a rarefied circle of consumer laptops that includes the Toshiba Satellite P50T-BST2N01 and the Asus Zenbook NX500. This new Dell, however, doesn't quite dislodge our current Editors' Choice for premium desktop-replacement laptops, Apple's 15-inch MacBook Pro with Retina display—even though it doesn't offer 4K.

### DESIGN

Despite its similar appearance when the lid is closed, the XPS 15 Touch isn't simply another MacBook clone. The base of its chassis is made from carbon fiber composite, and the entire keyboard deck and palm rest are covered in a

soft layer of matte silicone rubber that provides a much more comfortable surface than the MacBook Pro's bare metal. The XPS 15 Touch measures 0.7 by 14.6 by 10 inches (HWD), and weighs 4.44 pounds, making it a hair slimmer than the MacBook Pro, but also about an ounce heavier.

The XPS 15 Touch has a full-size backlit keyboard, with chiclet-style keys that feel quite good. The stylized, all-caps font used for the key labels is actually a little hard to read at a glance, which may irk those who don't touch-type. The keyboard also has half-size arrow and function keys, which feel a bit small. The accompanying clickpad has gesture support, and right and left buttons are integrated into the clickable surface. Although the touchpad is pretty good on its own, the most interesting addition is the NFC reader located beneath the touchpad for automatically pairing smartphones and other wireless devices—just tap your NFC-enabled device to the touchpad.

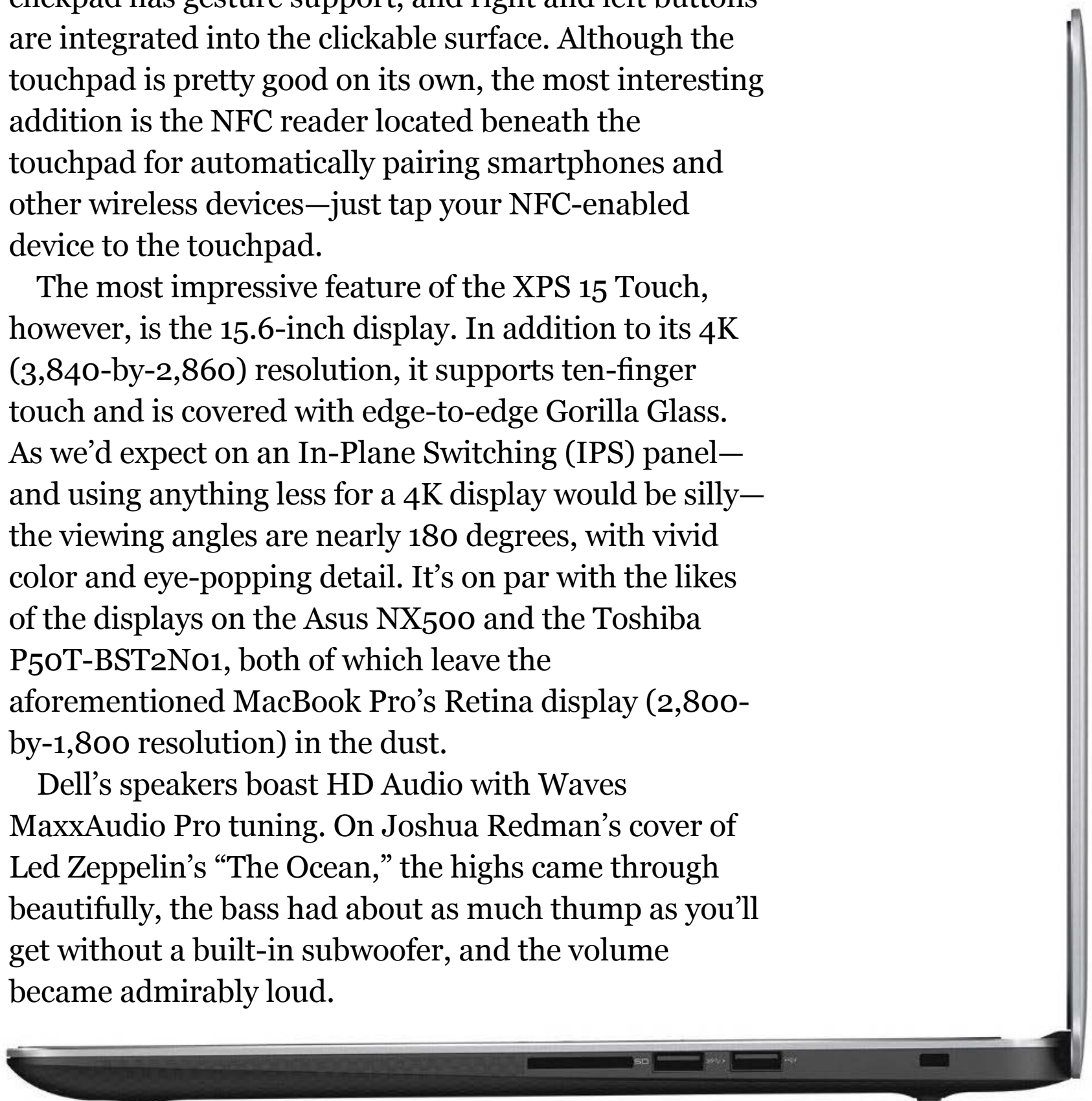
The most impressive feature of the XPS 15 Touch, however, is the 15.6-inch display. In addition to its 4K (3,840-by-2,860) resolution, it supports ten-finger touch and is covered with edge-to-edge Gorilla Glass. As we'd expect on an In-Plane Switching (IPS) panel—and using anything less for a 4K display would be silly—the viewing angles are nearly 180 degrees, with vivid color and eye-popping detail. It's on par with the likes of the displays on the Asus NX500 and the Toshiba P50T-BST2N01, both of which leave the aforementioned MacBook Pro's Retina display (2,800-by-1,800 resolution) in the dust.

Dell's speakers boast HD Audio with Waves MaxxAudio Pro tuning. On Joshua Redman's cover of Led Zeppelin's "The Ocean," the highs came through beautifully, the bass had about as much thump as you'll get without a built-in subwoofer, and the volume became admirably loud.

## **Dell XPS 15 Touch (9530)**

**PROS** Sleek, premium design. Impressive 4K touch screen. Decent port selection. Solid performance.

**CONS** Expensive. Battery not user-accessible, delivers only average uptime.







The only fault I could find with the XPS 15 Touch's overall design is that the battery and the internal components are not user-accessible. That means that if your battery starts to go, you'll need to send the whole laptop off for replacement instead of just swapping out the battery yourself.

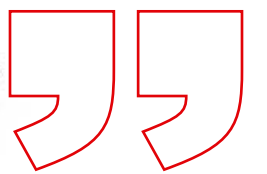
## **FEATURES**

The laptop is outfitted with three USB 3.0 ports and one USB 2.0 port, all with PowerShare, Dell's technology for charging phones and other gadgets even when the system is asleep or powered off. On the right, you'll find a case-lock slot and an SD card slot. On the left side is the system's power connector, an HDMI-out port, a Mini DisplayPort jack, a headset jack, and a battery-charge indicator—press the Battery Level button, and five white LEDs light up to indicate the remaining charge level. Inside, the system has Trusted Platform Module (TPM) 1.2 and several wireless technologies, including dual-band 802.11ac Wi-Fi, Bluetooth 4.0 LE, and the aforementioned NFC sensor.

The XPS 15 Touch is also equipped with a 512GB solid-state drive (SSD), which offers plenty of storage for most uses, but if you're storing a lot of 4K content, you may want to opt for an additional external drive. Dell doesn't clutter up the SSD with a lot of software, but does throw in a free 12-month subscription to McAfee LiveSafe, 20GB of free cloud storage through DropBox, a 30-day trial of Microsoft Office 365 for new customers, and Amazon Kindle Reader. Dell covers the XPS 15 Touch with a one-year warranty.



“  
**The discrete video card's extra muscle is essential to making the most of the XPS 15 Touch's high-resolution display.**



## **PERFORMANCE**

The laptop comes with a quad-core Intel Core i7-4712HQ processor and 16GB of RAM. In PCMark 8 Work Conventional, the XPS 15 Touch scored a class-leading 2,664, meaning it's more than speedy enough for day-to-day use. It also offered decent times in multimedia tests, completing Handbrake in 1 minute, 20 seconds, and Photoshop CS6 in 3:38. Both times are competitive with those we saw from other high-end systems, like the 15-inch MacBook Pro (1:17 on Handbrake, 3:25 on CS6) and the Toshiba P50T-BST2N01 (1:18 on Handbrake, 3:30 on CS6).

Graphics performance is another matter, thanks to the system's Nvidia GeForce GT 750M video card. Although the GT indicates that the card isn't intended for gaming, the discrete video card's extra muscle is essential to making the most of the high-resolution display. In 3DMark, the laptop scored 10,941 in CloudGate (our basic graphics test) and 982 points in Fire Strike (our extreme test), which is better than the Toshiba P50T-BST2N01 (10,273 points on Cloud Gate, 906 points on Fire Strike Extreme), but slightly behind the better-equipped Asus NX500 (scores of 12,869 and 1,537, respectively), which boasts a newer gaming-grade Nvidia card. Nonetheless, neither the XPS 15 Touch nor the comparison systems mentioned are built for gaming performance; rather they're tailored to push graphics at much-higher-than-HD resolutions.

As a result of the extra graphics hardware and the additional six million pixels on the display, battery life isn't spectacular on any 4K-equipped system. That





said, the XPS 15 Touch lasted 5 hours, 48 minutes, in our rundown test, which puts it squarely in the middle of the pack. The MacBook Pro is the leader with a time of 8:55, the P50T-BST2N01 brings up the rear (2:45), and both the Asus NX500 and the previous-generation Dell XPS 15 (9530) have comparable times (5:24 and 6:49, respectively).

## **CONCLUSION**

There's a lot to like about the Dell XPS 15 Touch (9530), from its 4K touch screen to its refined design and premium build quality. If your media collection takes advantage of the top-notch display, then this laptop might be the right choice for you, much like the Toshiba Satellite P50T-BST2N01 or the Asus Zenbook NX500. But good design and performance alone don't do much to make a laptop stand out from the crowd in this category, so despite the high quality of the system, our Editors' Choice remains the 15-inch MacBook Pro with Retina display. Its quality and performance are similar, and it still has a higher-than-HD screen—but it's much more affordable.

**BRIAN WESTOVER**



## Iolo System Mechanic 14

\$39.95



# Complete System Cleanup Well Worth Paying For



If your PC isn't blazing along at the same pace it did when you first pressed the power button a few weeks, months, or years ago, you should invest in Iolo System Mechanic 14. This tune-up utility suite whips your computer back into shape by defragmenting the hard drive, repairing Windows' problematic Registry, and tweaking CPU and RAM usage in real time. With this iteration, Iolo adds an unexpected and welcome new feature, PowerSense, which detects your PC's activity and throttles the CPU up or down as needed. System Mechanic 14 costs more than some of its competition, but Iolo's utility comes packed with features that make it worth its price.



## GETTING STARTED

System Mechanic 14 is compatible with all PCs running Windows XP and higher. Unlike most PC tune-up utilities, System Mechanic lets you install the software on any number of computers for personal (not business) purposes. This is a welcome (and needed!) feature in the age of the multi-PC household. More companies should follow suit.

The software's interface displays several options in the left pane: Dashboard, ActiveCare, Internet Security, Toolbox, and Reports, each which has subcategories that let you run specific tune-up tools. New this time around is a second, dedicated LiveBoost Window that lets you see how System Mechanic makes on-the-fly CPU and RAM usage tweaks. I'll touch on that in a bit.

## THE CLEANUP PROCESS

The Overview screen opens by default when the program is launched, and it's here that the Analyze Now button lives. Clicking the arrow next to it opens a drop-down box that presents two choices: Perform Quick Analysis and Perform Deep Analysis. The former is a quick (1-to-2-minute) scan that looks for the most common PC problems; the latter takes longer (5 to 7 minutes), but checks for all problems. After scanning, you're presented with the option to "Boost speed and stability by removing redundant programs with CRUDD Remover." CRUDD is Iolo's acronym for Commonly Redundant or Unnecessary Decelerators and Destabilizers—fancy talk for useless files on your PC.

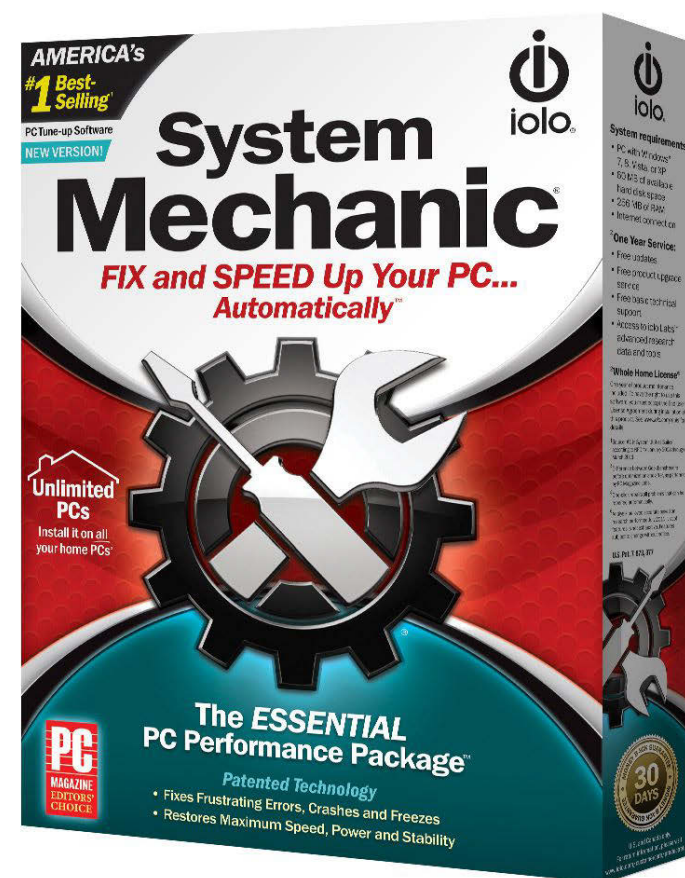
System Mechanic 14 doesn't just serve up a list of problems—it provides blurbs that explain how these problems slow performance. You can then check off the listed problems, click the Repair All button, and fix them all at once.

Iolo's Program Accelerator smartly realigns all of a program's dependent files on the hard drive. It's touted as being better than defragmenters, which can blindly

## Iolo System Mechanic 14

**PROS** Plenty of tune-up tools. Excellent explanations of PC problems. Unlimited installs. Useful desktop widget.

**CONS** Included NetBooster grants marginal Internet connection performance boost.



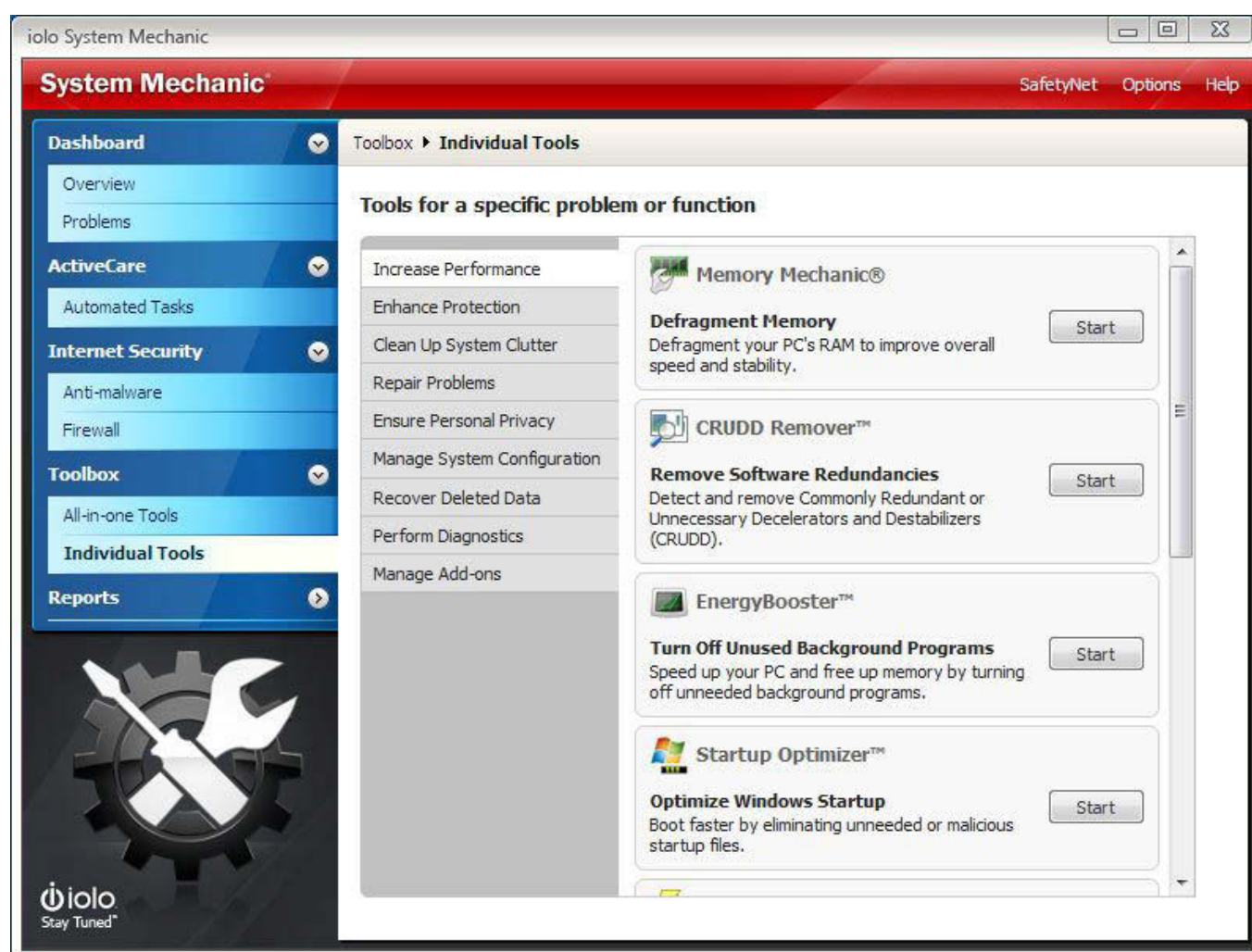
compact and separate files even more. Other tools packed into the suite include AcceleWrite (a new real-time feature that helps organize the way data is written to the PC's storage drives), IntelliStatus (which displays RAM and hard drive information and serves up cleaning tools), and Stability Guard (a tool that stops system threats using algorithms).

## PERFORMANCE IMPROVEMENTS

I tested System Mechanic 14's ability to whip a Windows 7 PC back into shape by performing two tests—running the Geekbench system performance tool and measuring boot times—before and after running the software to compare the computer's potency. I ran each test three times and averaged the results. Before Iolo scrubbed the system, the 2GHz Intel Core i7 X990 MSI Style-Note notebook with 4GB of RAM and an 80GB Intel solid-state drive (SSD) helped it achieve a 5,914 Geekbench score, and a boot time of 50.2 seconds.

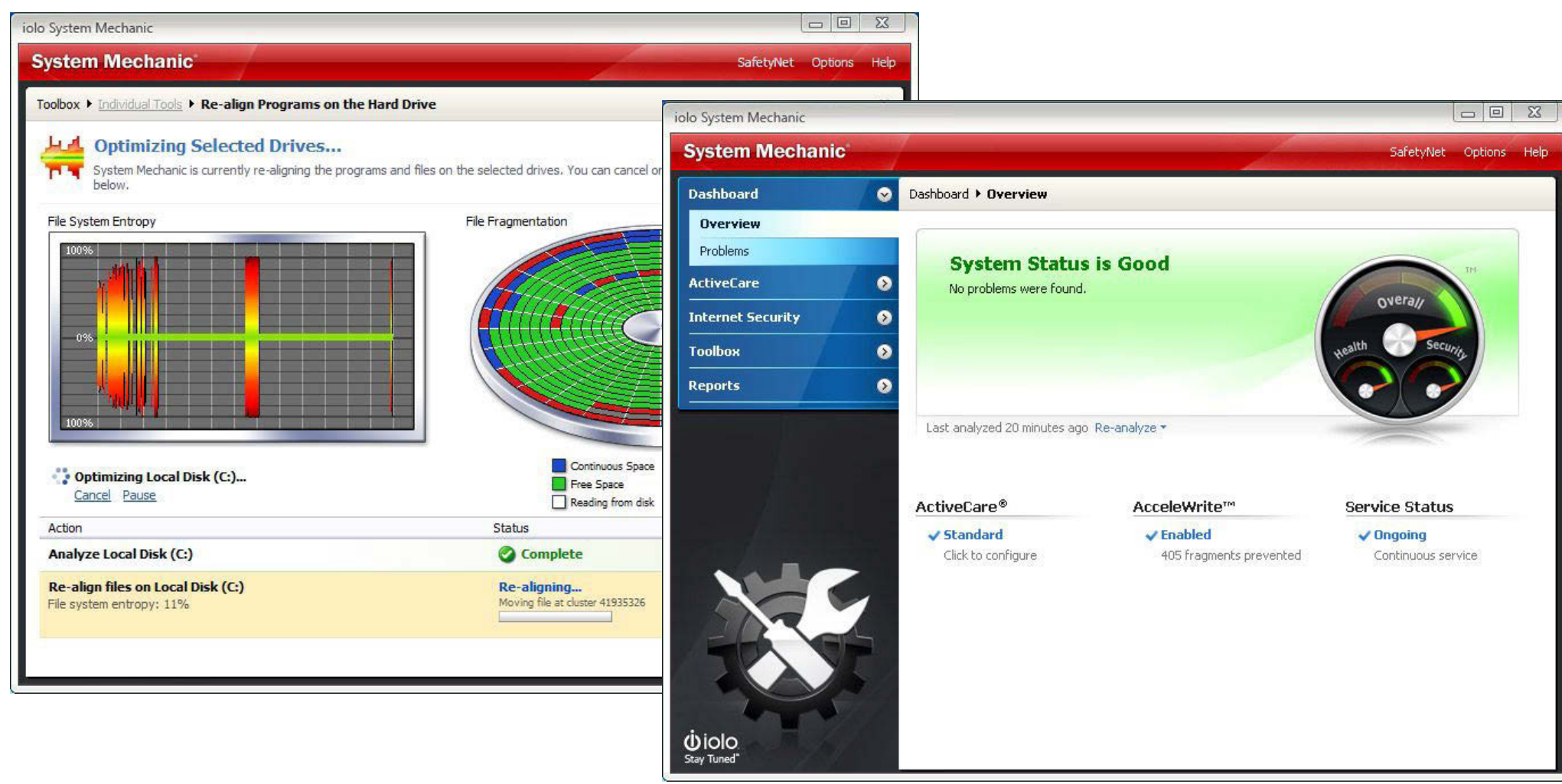
After I used System Mechanic 14, performance significantly improved: The Geekbench score rose to 6,369, and the boot time decreased to 39.7 seconds. Those are impressive numbers just beat out the free Slimware Utilities SlimCleaner's 6,338 Geekbench score and 41.1-second boot time.

After running the tests, I also used the computer extensively to get a sense of responsiveness had been affected. Performance was notably better—iTunes and Steam in particular opened faster in the fresh environment. The PC, for all intents and purposes, felt new. The NetBooster Internet-boosting tool had only a nominal impact on my download speeds, however.



**TUNE-UP TIME**  
Iolo System Mechanic 14 is loaded with handy tools for cleaning up older and unneeded files that may be slowing down your computer.





## POWERSENSE: THE NEW KID ON THE BLOCK

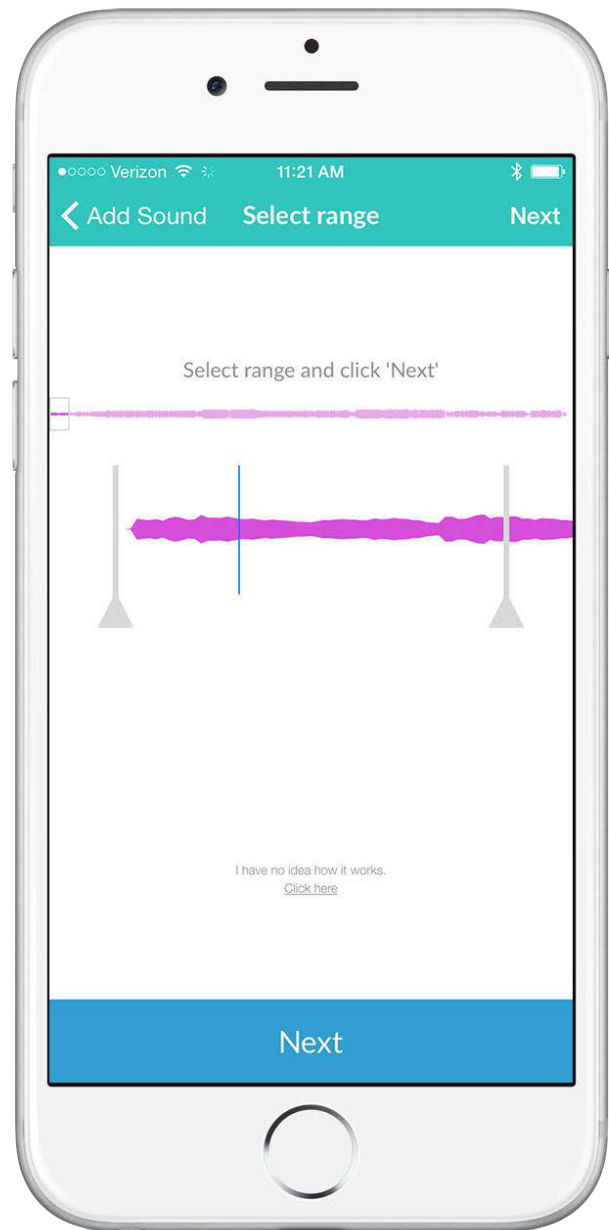
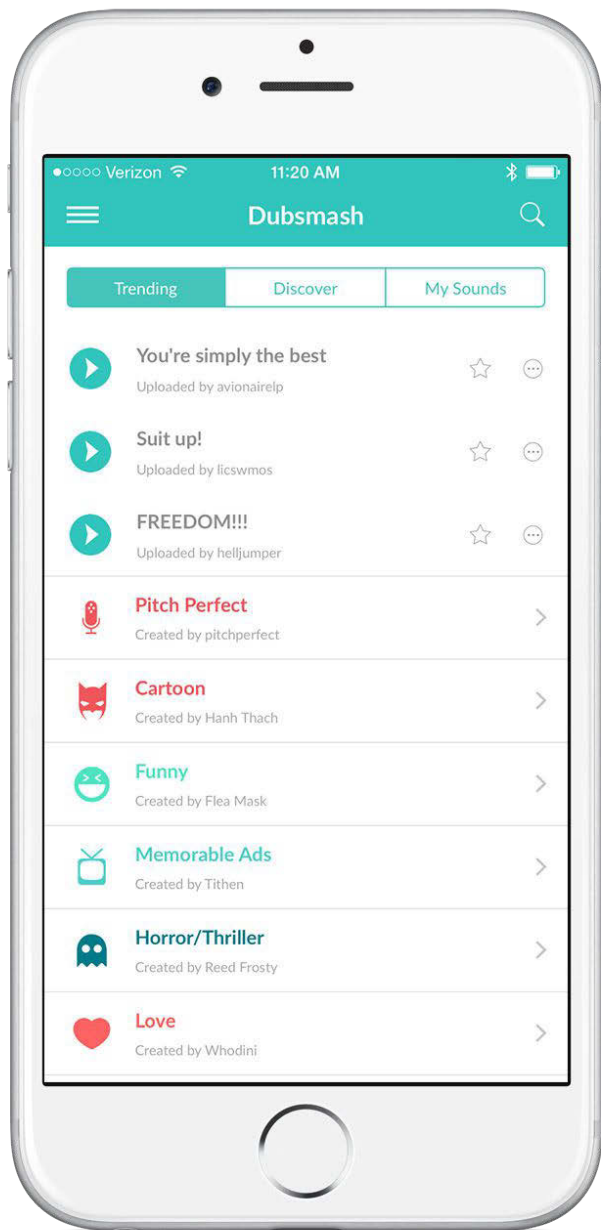
PowerSense is a new feature that dynamically senses PC activity and automatically adjusts the computer's power settings and processor modes in real-time to match the task at hand. For example, PowerSense kept my four-year-old gaming laptop in Balanced Mode (utilizing four of eight CPU cores, roughly 1.2GHz CPU clock speed, and 1.6GB of RAM) while I checked email and surfed the Web, but it kicked the computer into Ultra Performance Gaming Mode (which turns off nonessential background programs and activates all available CPU cores when I fired up Steam to play Metal Gear Rising: Revengeance. The power increase happened almost instantaneously. As a result, I had a slightly smoother gaming experience with fewer slowdowns when the action became fast and furious. You can manually switch the power settings and create your own power management profiles, too.

## EXCELLENT EVOLUTION

Iolo System Mechanic 14 may seem pricey given the existence of free competitors, but the software's evolution from tune-up utility to an all-around PC enhancer is one that you shouldn't overlook. If you want just the basic PC tune-up experience, the Editors' Choice-winning Slimware Utilities SlimCleaner is a fine free solution. But for a tool that can do more, System Mechanic 14 is the application to buy.

**JEFFREY L. WILSON**

# Our Favorite Apps



## Dubsmash Android, iOS

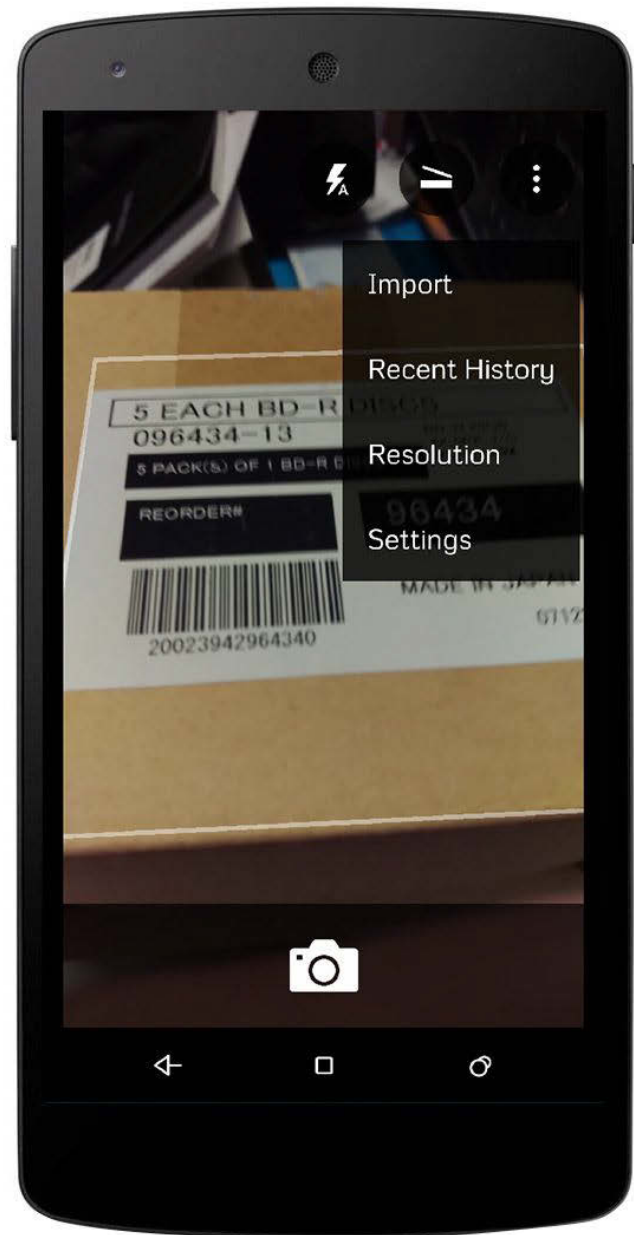
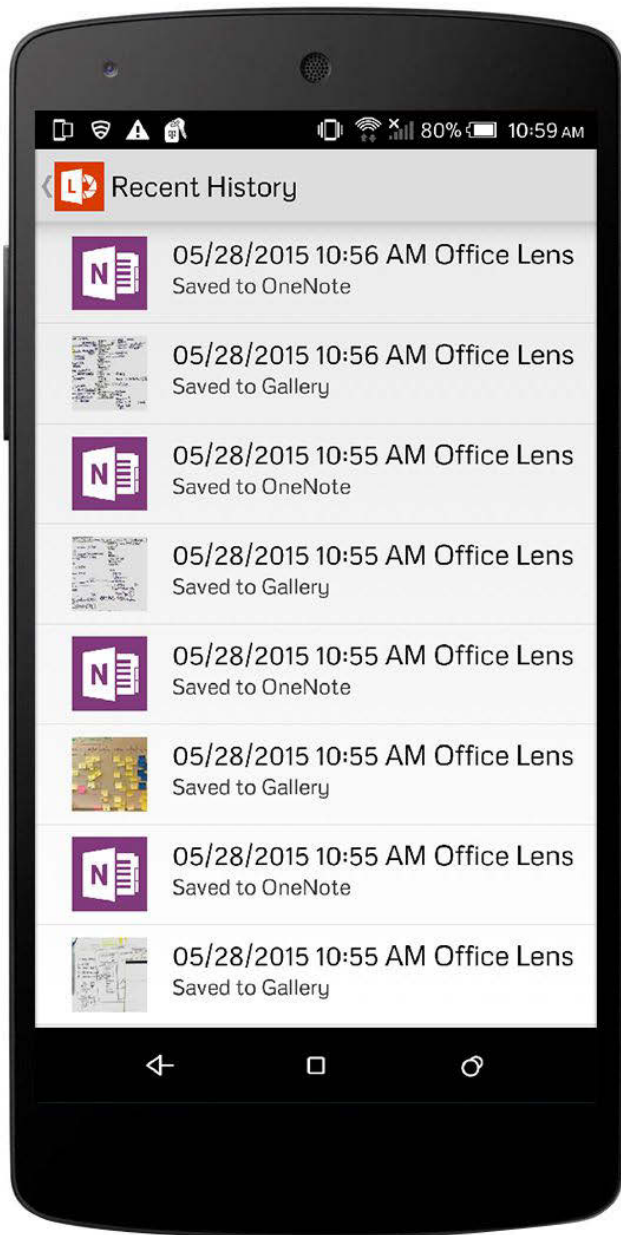


Dubsmash offers a new form of lighthearted mobile communication you never realized you wanted. It lets you record brief videos of yourself and sync the footage to a variety of wacky sounds, songs, movie clips, and more, all uploaded by the app's users. The experience isn't perfect; the clip lengths are limited, and the video quality is typically pretty low. But it's a nifty social novelty with outstanding comedic potential.





# Our Favorite Apps



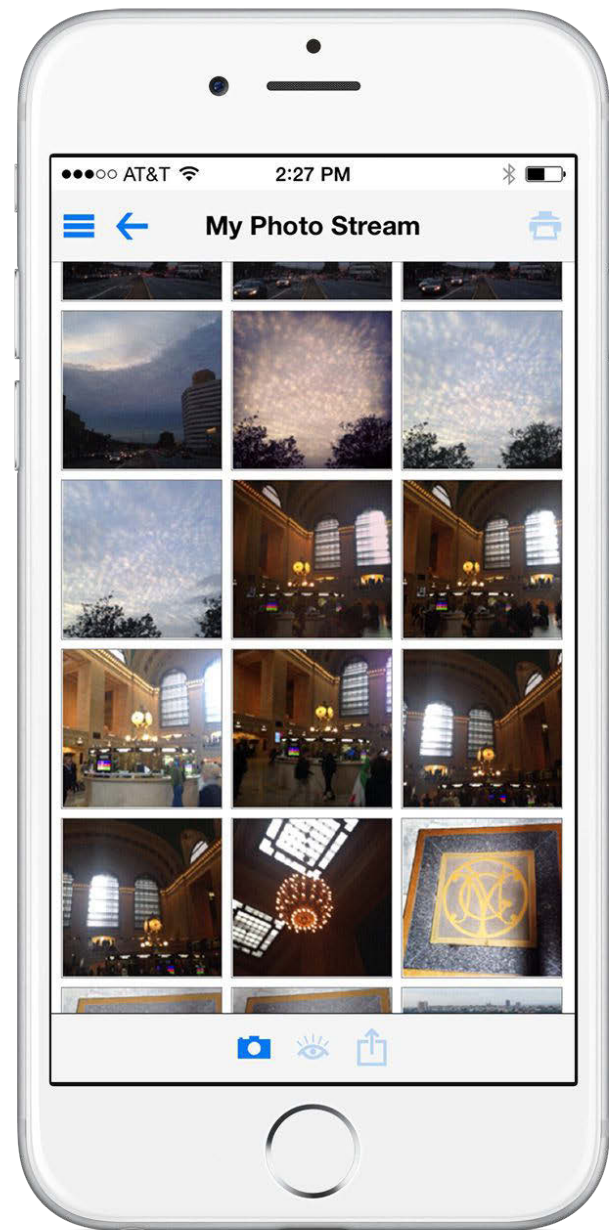
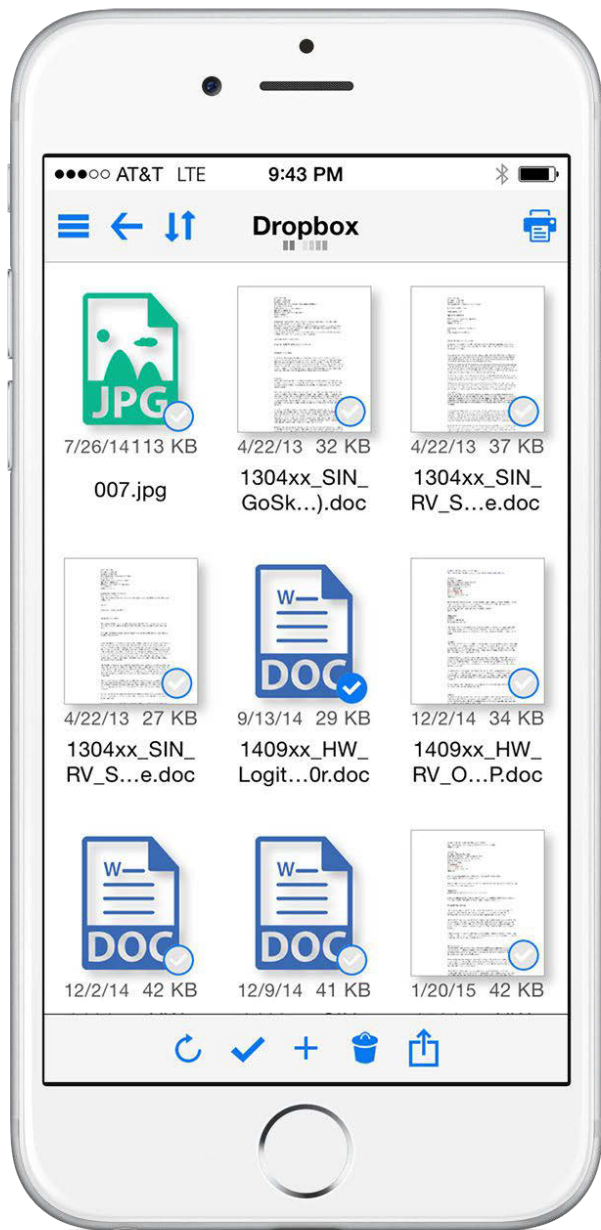
## Microsoft Office Lens Android, iOS



Microsoft has really amped up its efforts to reach out to competing platforms, increasingly offering its software and services on iOS and Android. One of the latest instances is Office Lens, which lets you shoot photos of written materials and convert their printed words into editable text through OCR. It even cleans up whiteboard shots and straightens images. We had difficulty using it on complicated business cards and curved surfaces, which reduces its usefulness. Still, it's still handy for those who rely on Microsoft apps like Word and OneNote.



# Our Favorite Apps



## PrintCentral Pro Android, iOS

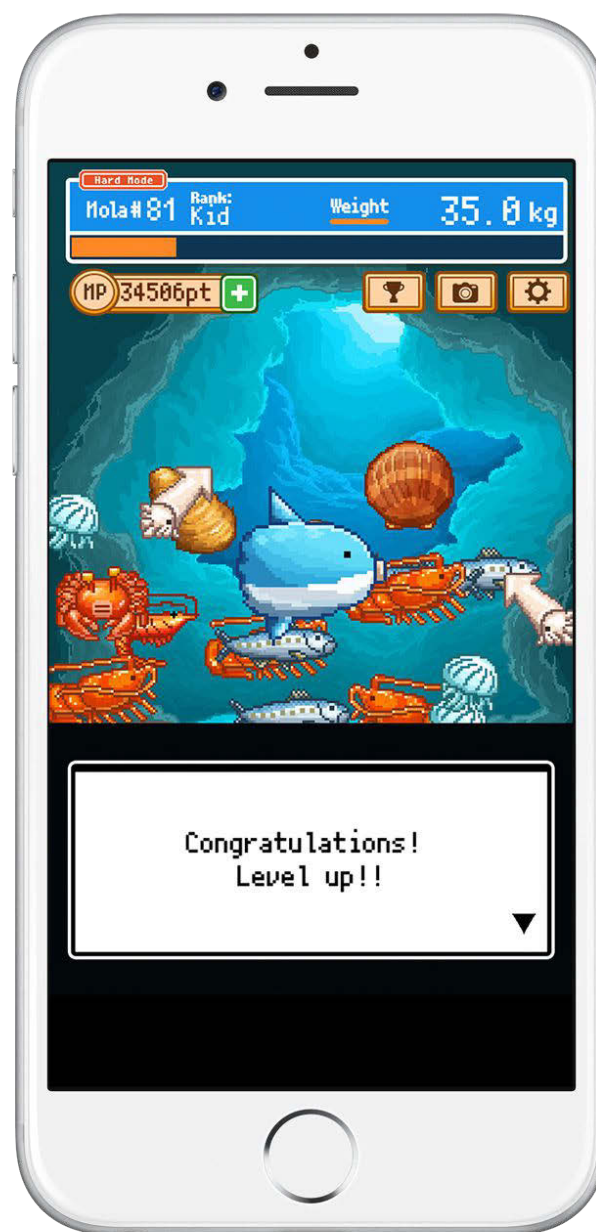
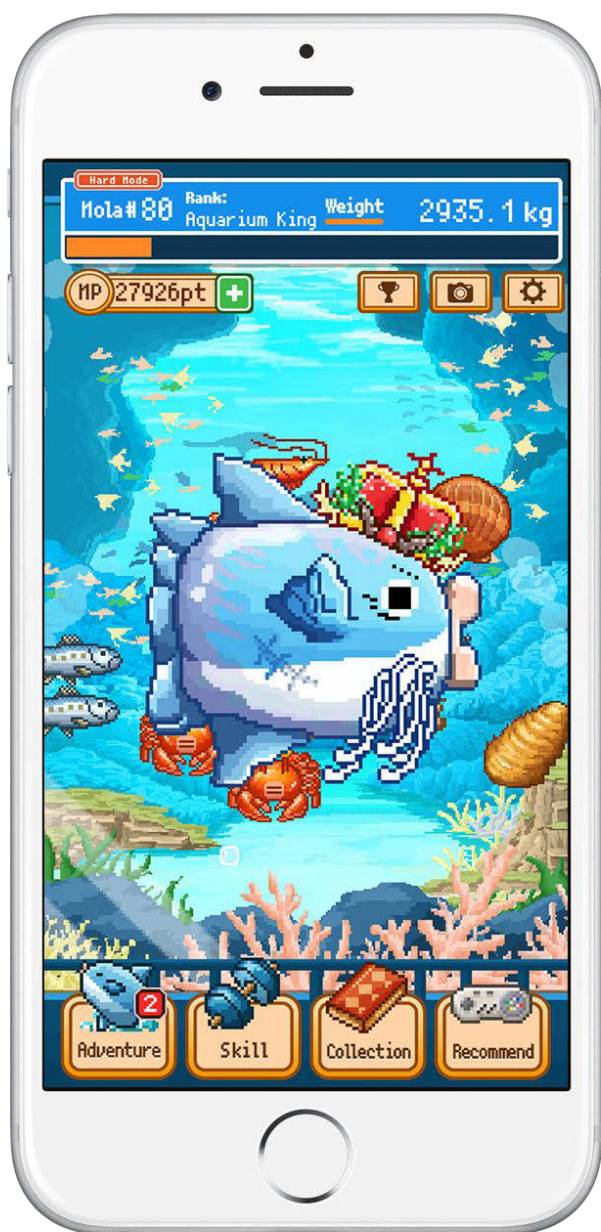


With the widespread adoption of mobile devices, the need for effective ways to print from smartphones and tablets has grown accordingly. PrintCentral Pro is a versatile solution that offers a way to print to printers from multiple manufacturers, and from a variety of sources include emails, the Web, cloud-based services, your photo albums and clipboard, and more. Although the app is expensive and feature-rich to the point of overwhelming, it's a good choice if you need to use a printer that doesn't otherwise support mobile printing.





# Our Favorite Apps



## Survive! Mola Mola! ios



In how many games can you feel accomplished when you die of old age? That's the state of mind you get into after playing enough *Survive! Mola Mola!*. In this funny, bleak twist on a virtual pet, you play an extremely large and goofy-looking sunfish, and struggle to become as big as you can while avoiding death from the adventures you undertake along the way. At its core, this game may just be a simple time waster, but it's one that will make you laugh, cry, and contemplate the hopelessness of existence.





# Features

**FASTEST MOBILE  
NETWORKS 2015**

**FEATURES**

# **EASTTEST MOBILE NETWORKS 2015**

BY SASCHA SEGAN




**F**or the second year in a row, Verizon Wireless takes the crown as America's fastest mobile network by delivering the fastest speeds and the best coverage nationwide. The nation's biggest carrier has maintained the quality of its "XLTE" network in the face of stronger competition than ever.

To some extent, everyone's a winner, because heightened competition is the big story of our sixth-annual Fastest Mobile Networks testing. Ever since we started, Verizon and AT&T have traded off winning the national title, largely because of far superior high-speed coverage when compared with Sprint and T-Mobile. But T-Mobile emerged as a force to be reckoned with last year, and now, for the first time, Sprint is competitive. The results show that the big four carriers didn't need to merge to succeed. They're doing just fine.


Focusing on coverage, we ran more test cycles than ever before: 131,000 cycles over 30 cities and thousands of miles of driving. Our new transportation partner, Chevrolet, lent us three vehicles equipped with AT&T OnStar 4G LTE so we could see if the big roof-mounted antenna improved coverage. See "OnStar Tested" (below) to find out how it did.

We found a more competitive landscape than ever. Verizon won about half the cities and all the rural regions, like last year. But the rest of the cities were almost equally split between AT&T, with strongholds in the Southeast and Texas, and T-Mobile, which was especially strong in Western cities.

Sprint only won one city, Denver, but I don't want to minimize its achievements. If we handed out a "most improved" award, Sprint would win it by a landslide. The carrier flipped over from an old WiMAX network to a spotty LTE network in 2013, and though it filled in coverage gaps in 2014, it offered very low speeds. This year, the carrier's Network Vision and Spark initiatives finally took hold, and Sprint's speeds doubled or even



**To some extent, everyone's a winner, because heightened competition is the big story of our sixth-annual Fastest Mobile Networks testing.**





tripled in most of our test cities.

Looking at our nationwide drive maps, we're also seeing 3G and LTE coverage expansions for every carrier except Verizon, which already had nearly perfect coverage in 2014. Both AT&T and T-Mobile have filled in their LTE gaps along I-95 in the Northeast and I-55 in Mississippi, for instance. T-Mobile's improvements were especially dramatic; the carrier used to only have LTE in little 30-mile bubbles around cities, but now it stretches far down the interstates. Sprint is still spotty, but considerably less than it used to be, with much broader coverage in the suburbs of Atlanta, Denver, Phoenix, and Houston, for example.

## Where We Tested

We perform our tests on the road because drive testing compares networks at the same time, in the same place, with similar devices. It also lets us find out where networks don't work well, as we can watch when our drive tests fail—something that crowdsourced numbers generally don't report. In a country where LTE coverage is still sometimes spotty, the information on when networks are failing is very important.

For the first time, we saw LTE on all four wireless carriers in all 30 of our test cities. We've been keeping the same list of cities for the past several years so we can watch the networks change; this year, we went to

### Northeast

**Boston, MA**  
**New York, NY**  
**Philadelphia, PA**  
**Baltimore, MD**  
**Washington, D.C.**

### Southeast

**Raleigh, NC**  
**Charlotte, NC**  
**Atlanta, GA**  
**Miami, FL**  
**Tampa, FL**

### North Central

**Detroit, MI**  
**Chicago, IL**  
**Indianapolis, IN**  
**St. Louis, MO**  
**Kansas City, MO**

### South Central

**Memphis, TN**  
**New Orleans, LA**  
**Dallas, TX**  
**Houston, TX**  
**San Antonio, TX**

### Northwest

**Seattle, WA**  
**Portland, OR**  
**San Francisco, CA**  
**Salt Lake City, UT**  
**Denver, CO**

### Southwest

**Las Vegas, NV**  
**Los Angeles, CA**  
**San Diego, CA**  
**Phoenix, AZ**  
**Tucson, AZ**





San Antonio and Tampa rather than the less-populous Austin and Jacksonville but left the other 28 cities the same, with five cities in each of six regions of the country.

Outside of the 30 cities, our drivers traveled on a mix of interstate and U.S. highways and along the way stopped in smaller cities such as Columbia, Missouri; Tallahassee, Florida; and Arcata, California. The data we collected contributed to a “suburban/rural” score for each of our six regions.

## What We Tested

This is Fastest Mobile Networks, so we’re focused on data speed and reliability. We didn’t test call quality, dropped calls, or coverage. To get a picture of wireless coverage near you, go to Sensorly’s website ([sensorly.com](http://sensorly.com)) and you’ll see crowdsourced coverage maps for all the major U.S. mobile carriers, enhanced with the data from our test drives.

Mobile networks are constantly changing, and almost always for the better. And because speeds vary based on tower location, network load, device used, and even the weather, we can’t predict performance in a specific location; rather, we’re giving a snapshot of a few days’ worth of usage in several locations across a given metro area.

## Testing Methodology

To test the nation’s mobile networks, we used field-test software from network testing firm Sensorly, loaded onto a collection of Android-powered smartphones.

This year, we mostly used a mix of phones: Samsung Galaxy S5 (at the request of AT&T and Sprint) and Galaxy Note 4 (at the request of Verizon and T-Mobile). We used these devices to



**GALAXY OF STARS**  
*PC Magazine* used two Samsung phones for Fastest Mobile Network testing this year: the Galaxy S5 (top) and the Galaxy Note 4.



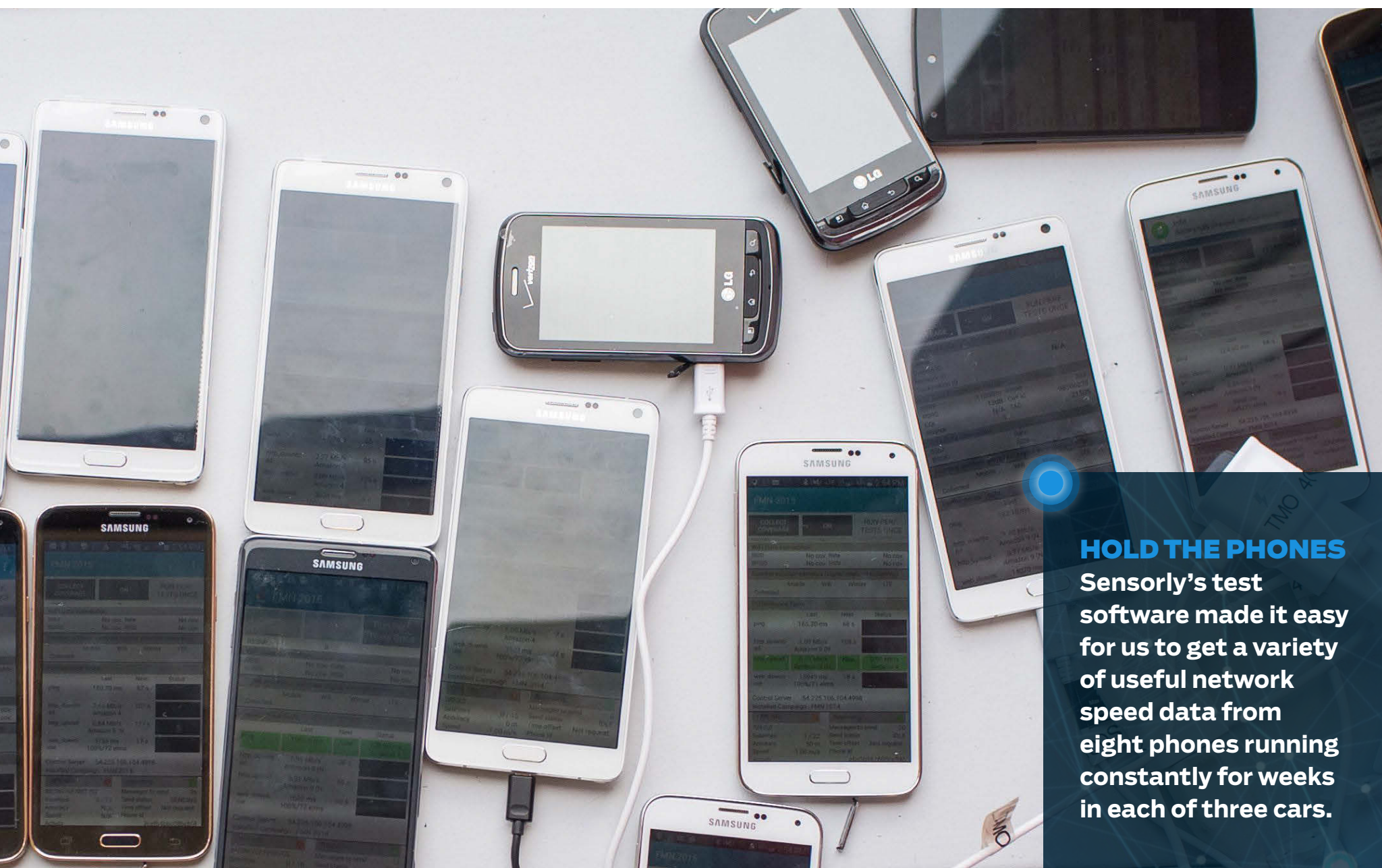
test both 3G and 4G LTE networks, with the exception of Verizon. We had to use older LG Enlighten phones to test Verizon's 3G network, because that's the only smartphone Verizon was able to give us without LTE service. With more than 20 million Verizon customers still on the 3G network, we think it's still important to make sure it isn't left behind.

We loaded the phones into a 2015 Chevrolet Impala (in the East), a 2015 Chevrolet Colorado (in the Midwest), and a 2015 Chevrolet Tahoe (in the West), equipped with power inverters to run the phones all day long.

Sensorly's software ran several tests every 3 minutes: a ping to test network latency, multithreaded HTTP upload and download tests including separate "time-to-first-byte" measures, and the download of a 1MB webpage with 70 different elements.

We tested mostly during business hours, during a period from May 4 to May 25, 2015; we visited different cities on different days. In each city, our drivers stopped in ten to 12 locations for at least 15 minutes (five test cycles) each. We also collected data while moving, both within and between cities.

We ended up with about 131,000 test cycles across our 30 cities, which amounted to a 95MB Excel 2010 spreadsheet. (We continue to use Excel 2010 because I don't want to have to rewrite my macros—there are a lot of them—and it works fine.)



**HOLD THE PHONES**  
Sensorly's test software made it easy for us to get a variety of useful network speed data from eight phones running constantly for weeks in each of three cars.

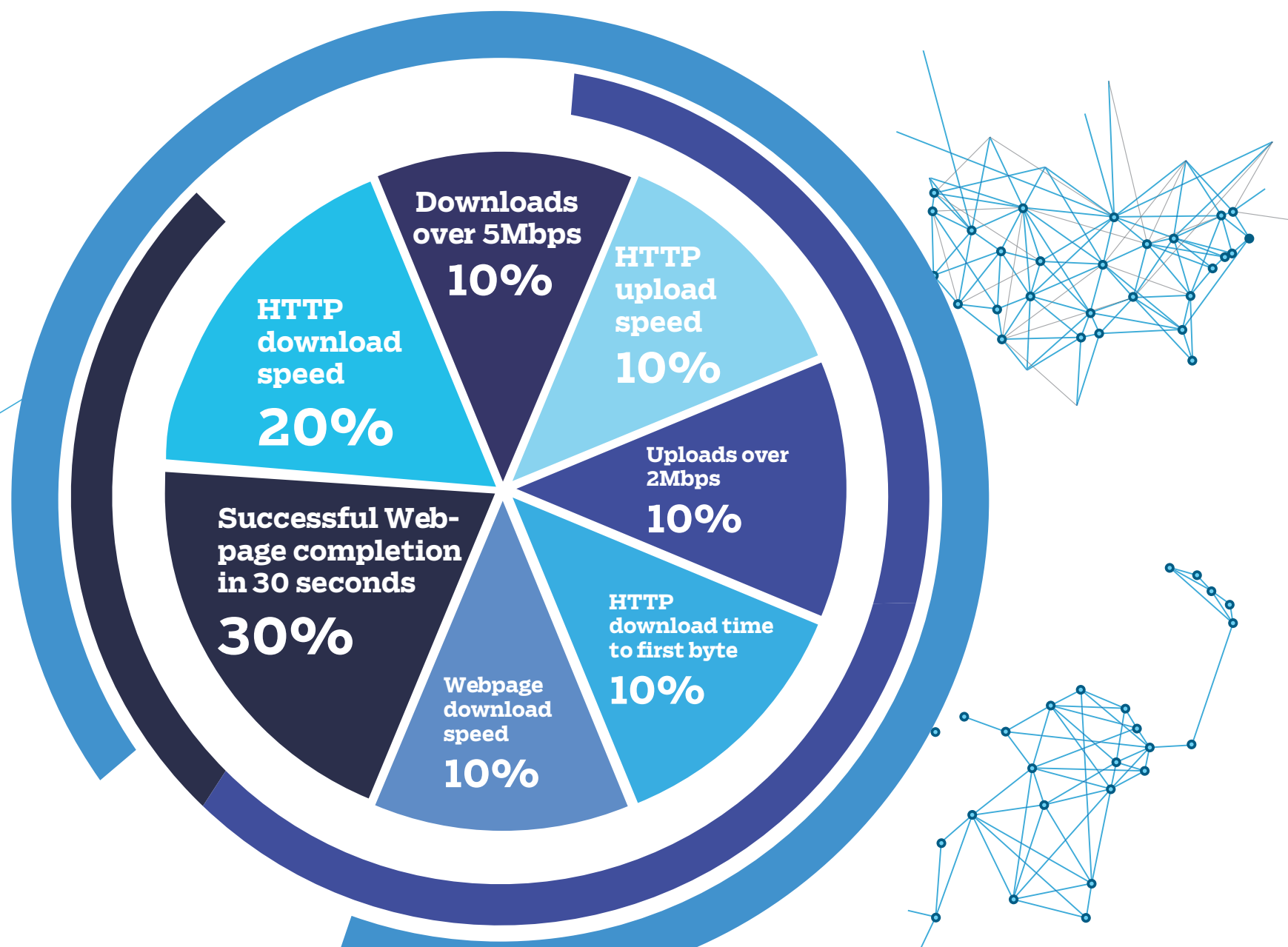


## The *PC Magazine* Speed Score

Our speed score this year, as in previous years, is a weighted average balancing 70 percent speed and 30 percent network reliability.

LTE networks can deliver awesome peak speeds. We saw upwards of 90Mbps down and 40Mbps up several times. But what really matters is whether you can hold down a 4Mbps Netflix stream consistently. Verizon and AT&T have both said that LTE networks should deliver 5 to 12Mbps down and 2 to 5Mbps up, so we're holding them to it. In consultation with Sensorly, we've decided that 3G networks should offer 1.5 to 5Mbps down and 0.5 to 2Mbps up. So we've established minimum download and upload thresholds: the percentage of tests exceeding 5Mbps/1.5Mbps down on LTE/3G and 2Mbps/0.5Mbps up on LTE/3G. In our results charts, you'll see the distribution of how many download tests score below the minimum, within the acceptable range, and better than the promised maximum.

The "webpage completion" metric needs some explanation. A Web test is counted as unsuccessful if the 1MB page doesn't download in 30 seconds or if an LTE device drops to 3G. So that number includes both network drops and stalled or just plain poky downloads for an overall picture of network reliability.



The regional and national scores are the averages of the cities and suburban/rural areas in each region, with a 16.6 percent (one-sixth of the total score) penalty for each city in which a carrier has no coverage.

We're also reporting average and maximum speeds. The average speeds are calculated by each of the ten stationary tests making up one-twelfth of the average, and the total of all mobile tests in a city making up one-sixth of the average. For suburban and rural areas, we just took an average of all tests.

## **OnStar Tested: Giving You Reach**

Our three Chevy vehicles for Fastest Mobile Networks all came with OnStar, which recently earned our Editors' Choice award as our favorite telematics system. OnStar has been around since 1995, using voice calling to connect with live operators, but the new 2015 model uses AT&T's LTE network. We ran 23 tests in rural areas around the country to see how it performed, as compared with an AT&T Samsung Galaxy S5 smartphone.

The new OnStar system uses a Qualcomm 9x15 modem, part of Qualcomm's Snapdragon Automotive Solutions platform. That's two generations old, and it lacks carrier aggregation, the technology that lets AT&T combine narrow swathes of spectrum to achieve the higher speeds we saw this year as compared with last.

What OnStar does have is a large external antenna, and in our testing that let the car capture signals in some fringe areas where the phone couldn't. Our phone dropped signal in seven of our 23 tests, but OnStar only had problems in five. You don't always have to be out in the boonies to hit a phone dead zone, by the way: OnStar captured signal where the phone couldn't in two hotel parking



**SEEING THE USA IN THESE CHEVROLETS**  
*PC Magazine* used three 2015 Chevys for this year's Fastest Mobile Networks: the Tahoe (top), the Colorado (middle), and the Impala (bottom). Each of the models was loaded with OnStar for telematics, plus a variety of other safety, communication, and entertainment features that are commonly found in current models.





**ONSTAR IS BORNE**  
General Motors' OnStar provides remote services, navigation, diagnostic tools, and more, all from the dashboard console or mobile app.

lots in San Diego and Los Angeles, at a shopping mall in Fort Collins, Colorado, and in central St. Petersburg, Florida. The phone, on the other hand, was better at capturing signal in downtown Kansas City.

Because of the lack of carrier aggregation, downloads were slower through OnStar than through the phone. We averaged 4.5Mbps down with OnStar as opposed to 12Mbps down through the phone in the same locations.

Now, this comparison assumes you're an AT&T customer. If you're on Sprint or T-Mobile and you travel outside of your coverage area, you'll find OnStar to be an excellent backup; AT&T's rural LTE coverage is still broader than Sprint's or T-Mobile's.

As our reviewer Will Greenwald said, OnStar's LTE system is better thought of as an emergency backup than as a primary hotspot. Your go-to mobile Internet access should be the hotspot mode on your phone, plugged into the car's USB charging jack. Beyond that, you can add the car to a shared data plan on AT&T for \$10 per month and take advantage of the differentiated coverage, or just pay for a day pass when you plan to go far out of town.





**FEATURES**

**FASTEST  
MOBILE  
NETWORKS**

**AND THE  
WINNERS  
ARE...**



# National Overall Winner VERIZON WIRELESS

Verizon Wireless still has the nation's fastest LTE network. Verizon pulled ahead of a competitive field this year, winning 16 of 30 cities and all of the outlying suburban and rural drive areas. And even where it didn't win, Verizon never did poorly. Although other carriers may be better in individual cities, Verizon is the leader if you're traveling from sea to shining sea.

|                                                                                                                                                                                                     | AT&T         | Sprint       | T-Mobile     | ★ Verizon    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| <b>PCMag.com Mobile Speed Index</b>                                                                                                                                                                 |              |              |              |              |
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Good</li> <li><span style="color: orange;">■</span> Average</li> <li><span style="color: red;">■</span> Slow</li> </ul> | 80<br>/100   | 69<br>/100   | 84<br>/100   | 89<br>/100   |
| <b>Download &amp; Upload Performance</b>                                                                                                                                                            |              |              |              |              |
| Average Download Speed                                                                                                                                                                              | 15<br>Mbps   | 12.7<br>Mbps | 15.3<br>Mbps | 19.1<br>Mbps |
| Maximum Download Speed                                                                                                                                                                              | 99.2<br>Mbps | 72<br>Mbps   | 100<br>Mbps  | 94.4<br>Mbps |
| Average Upload Speed                                                                                                                                                                                | 6.8<br>Mbps  | 5.3<br>Mbps  | 12.3<br>Mbps | 10.5<br>Mbps |
| Maximum Upload Speed                                                                                                                                                                                | 21.4<br>Mbps | 19.3<br>Mbps | 39.6<br>Mbps | 44.8<br>Mbps |
| Time to First Byte (In Milliseconds)                                                                                                                                                                | 212<br>ms    | 231<br>ms    | 242<br>ms    | 204<br>ms    |
| <b>Webpage Download</b>                                                                                                                                                                             |              |              |              |              |
| Average Web Download Speed                                                                                                                                                                          | 3.2<br>Mbps  | 2<br>Mbps    | 3.3<br>Mbps  | 3.4<br>Mbps  |
| Webpage Completion                                                                                                                                                                                  | 96%          | 87%          | 94%          | 95%          |





# Northeast Region Winner

## VERIZON WIRELESS

Verizon just pulled ahead of a resurgent T-Mobile in our five Northeast cities. Outside of the biggest cities, we saw a familiar pattern: T-Mobile's LTE coverage along the I-95 corridor is much better than it was last year, but it didn't quite match Verizon's, especially when we dipped into rural northeastern Pennsylvania. Both carriers look good, but Verizon is the gold standard if you leave the cities.

|                                                                                                                                                                                                     | AT&T         | Sprint       | T-Mobile     | ★ Verizon    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| <b>PCMag.com Mobile Speed Index</b>                                                                                                                                                                 |              |              |              |              |
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Good</li> <li><span style="color: orange;">■</span> Average</li> <li><span style="color: red;">■</span> Slow</li> </ul> | 85<br>/100   | 77<br>/100   | 95<br>/100   | 96<br>/100   |
| <b>Download &amp; Upload Performance</b>                                                                                                                                                            |              |              |              |              |
| Average Download Speed                                                                                                                                                                              | 15.2<br>Mbps | 12.5<br>Mbps | 16.3<br>Mbps | 19.9<br>Mbps |
| Maximum Download Speed                                                                                                                                                                              | 84.2<br>Mbps | 70.2<br>Mbps | 72.3<br>Mbps | 84.9<br>Mbps |
| Average Upload Speed                                                                                                                                                                                | 4.9<br>Mbps  | 6.2<br>Mbps  | 14<br>Mbps   | 11.5<br>Mbps |
| Maximum Upload Speed                                                                                                                                                                                | 19.7<br>Mbps | 15.1<br>Mbps | 25.8<br>Mbps | 35.2<br>Mbps |
| Time to First Byte (In Milliseconds)                                                                                                                                                                | 204<br>ms    | 207<br>ms    | 227<br>ms    | 208<br>ms    |
| <b>Webpage Download</b>                                                                                                                                                                             |              |              |              |              |
| Average Web Download Speed                                                                                                                                                                          | 4.3<br>Mbps  | 2.6<br>Mbps  | 4.4<br>Mbps  | 4.1<br>Mbps  |
| Webpage Completion                                                                                                                                                                                  | 97%          | 93%          | 97%          | 98%          |





# Southeast Region Winner

## VERIZON WIRELESS

The Southeast actually split pretty neatly, with AT&T taking North Carolina, T-Mobile taking Atlanta, and Verizon taking our two Florida cities plus the rural drives. Verizon's superior LTE coverage meant we didn't see a significant drop-off of LTE from Virginia to Florida, including in smaller cities like Tallahassee. (AT&T and T-Mobile both dropped to 3G now and then.) That helps Verizon win overall.

|                                                                                                                                                                                                     | AT&T         | Sprint       | T-Mobile     | ★ Verizon    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| <b>PCMag.com Mobile Speed Index</b>                                                                                                                                                                 |              |              |              |              |
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Good</li> <li><span style="color: orange;">■</span> Average</li> <li><span style="color: red;">■</span> Slow</li> </ul> | 91<br>/100   | 73<br>/100   | 88<br>/100   | 98<br>/100   |
| <b>Download &amp; Upload Performance</b>                                                                                                                                                            |              |              |              |              |
| Average Download Speed                                                                                                                                                                              | 18.9<br>Mbps | 14.5<br>Mbps | 16.6<br>Mbps | 22.7<br>Mbps |
| Maximum Download Speed                                                                                                                                                                              | 70.2<br>Mbps | 72<br>Mbps   | 100<br>Mbps  | 94<br>Mbps   |
| Average Upload Speed                                                                                                                                                                                | 9.4<br>Mbps  | 5.1<br>Mbps  | 11.7<br>Mbps | 12.7<br>Mbps |
| Maximum Upload Speed                                                                                                                                                                                | 21.4<br>Mbps | 14.8<br>Mbps | 39.6<br>Mbps | 44.8<br>Mbps |
| Time to First Byte (In Milliseconds)                                                                                                                                                                | 221<br>ms    | 234<br>ms    | 244<br>ms    | 194<br>ms    |
| <b>Webpage Download</b>                                                                                                                                                                             |              |              |              |              |
| Average Web Download Speed                                                                                                                                                                          | 3.7<br>Mbps  | 2<br>Mbps    | 3.7<br>Mbps  | 3.9<br>Mbps  |
| Webpage Completion                                                                                                                                                                                  | 98%          | 94%          | 97%          | 96%          |





# North Central Region Winner

## VERIZON WIRELESS

Verizon rocked four of our five North Central cities, with AT&T taking Indianapolis. So it's easy to give Verizon the title for this region, which also included tests in Michigan, Illinois, Missouri, and Indiana. Kansas City, especially, laid a lot of the competition low this year, but not Verizon, which plugged on with faster and more reliable uploads and downloads than the other carriers.

|                                                                                                                                                                                                     | AT&T         | Sprint       | T-Mobile     | ★ Verizon    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| <b>PCMag.com Mobile Speed Index</b>                                                                                                                                                                 |              |              |              |              |
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Good</li> <li><span style="color: yellow;">■</span> Average</li> <li><span style="color: red;">■</span> Slow</li> </ul> | 81<br>/100   | 72<br>/100   | 79<br>/100   | 98<br>/100   |
| <b>Download &amp; Upload Performance</b>                                                                                                                                                            |              |              |              |              |
| Average Download Speed                                                                                                                                                                              | 16.4<br>Mbps | 13.3<br>Mbps | 14.4<br>Mbps | 24.8<br>Mbps |
| Maximum Download Speed                                                                                                                                                                              | 84.9<br>Mbps | 68<br>Mbps   | 58.7<br>Mbps | 92.2<br>Mbps |
| Average Upload Speed                                                                                                                                                                                | 6.4<br>Mbps  | 6.3<br>Mbps  | 11.2<br>Mbps | 14.4<br>Mbps |
| Maximum Upload Speed                                                                                                                                                                                | 21.1<br>Mbps | 19.3<br>Mbps | 35.1<br>Mbps | 43.7<br>Mbps |
| Time to First Byte (In Milliseconds)                                                                                                                                                                | 204<br>ms    | 237<br>ms    | 241<br>ms    | 181<br>ms    |
| <b>Webpage Download</b>                                                                                                                                                                             |              |              |              |              |
| Average Web Download Speed                                                                                                                                                                          | 3.7<br>Mbps  | 2<br>Mbps    | 3.2<br>Mbps  | 4.2<br>Mbps  |
| Webpage Completion                                                                                                                                                                                  | 99%          | 93%          | 94%          | 94%          |





# South Central Region Winner

## AT&T

AT&T won three out of our five South Central cities: New Orleans, Houston, and Dallas. The carrier's performance was marked by high average download speeds and excellent reliability. Although AT&T has had strong LTE coverage in Texas for a while now, this year saw dramatic improvements in Mississippi and Louisiana, making it the most solid choice in this part of the country.

|                                                                                                                                                                                                     | ★ AT&T       | Sprint       | T-Mobile     | Verizon      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| <b>PCMag.com Mobile Speed Index</b>                                                                                                                                                                 |              |              |              |              |
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Good</li> <li><span style="color: orange;">■</span> Average</li> <li><span style="color: red;">■</span> Slow</li> </ul> | 96<br>/100   | 75<br>/100   | 90<br>/100   | 92<br>/100   |
| <b>Download &amp; Upload Performance</b>                                                                                                                                                            |              |              |              |              |
| Average Download Speed                                                                                                                                                                              | 16.6<br>Mbps | 9.4<br>Mbps  | 14.1<br>Mbps | 16.4<br>Mbps |
| Maximum Download Speed                                                                                                                                                                              | 69.6<br>Mbps | 58.7<br>Mbps | 85.6<br>Mbps | 69.5<br>Mbps |
| Average Upload Speed                                                                                                                                                                                | 9.1<br>Mbps  | 4.8<br>Mbps  | 12.1<br>Mbps | 7.2<br>Mbps  |
| Maximum Upload Speed                                                                                                                                                                                | 20.1<br>Mbps | 14<br>Mbps   | 39<br>Mbps   | 35.8<br>Mbps |
| Time to First Byte (In Milliseconds)                                                                                                                                                                | 208<br>ms    | 234<br>ms    | 282<br>ms    | 215<br>ms    |
| <b>Webpage Download</b>                                                                                                                                                                             |              |              |              |              |
| Average Web Download Speed                                                                                                                                                                          | 3.2<br>Mbps  | 1.8<br>Mbps  | 3.1<br>Mbps  | 3<br>Mbps    |
| Webpage Completion                                                                                                                                                                                  | 99%          | 98%          | 95%          | 95%          |





# Northwest Region Winner T-MOBILE

T-Mobile's coverage across the Mountain West is still shaky at best. But two cities went to T-Mobile, one went to Sprint, and two plus the rural areas went to Verizon. Factor in T-Mobile's two second-place finishes and its large win margins in Portland and Seattle, and the math narrowly went to T-Mobile. More good news: The carrier says we should see better coverage in the region later this year.

|                                                                                                                                                                                                     | AT&T         | Sprint       | ★ T-Mobile   | Verizon      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| PCMag.com Mobile Speed Index                                                                                                                                                                        |              |              |              |              |
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Good</li> <li><span style="color: orange;">■</span> Average</li> <li><span style="color: red;">■</span> Slow</li> </ul> | 72<br>/100   | 77<br>/100   | 95<br>/100   | 87<br>/100   |
| Download & Upload Performance                                                                                                                                                                       |              |              |              |              |
| Average Download Speed                                                                                                                                                                              | 9.8<br>Mbps  | 13.8<br>Mbps | 18.3<br>Mbps | 15.3<br>Mbps |
| Maximum Download Speed                                                                                                                                                                              | 77.5<br>Mbps | 61.9<br>Mbps | 92.3<br>Mbps | 93.9<br>Mbps |
| Average Upload Speed                                                                                                                                                                                | 4.5<br>Mbps  | 5.8<br>Mbps  | 12<br>Mbps   | 7.7<br>Mbps  |
| Maximum Upload Speed                                                                                                                                                                                | 19.3<br>Mbps | 13.7<br>Mbps | 36.7<br>Mbps | 43.2<br>Mbps |
| Time to First Byte (In Milliseconds)                                                                                                                                                                | 215<br>ms    | 227<br>ms    | 228<br>ms    | 213<br>ms    |
| Webpage Download                                                                                                                                                                                    |              |              |              |              |
| Average Web Download Speed                                                                                                                                                                          | 2.3<br>Mbps  | 2<br>Mbps    | 3.2<br>Mbps  | 2.5<br>Mbps  |
| Webpage Completion                                                                                                                                                                                  | 93%          | 89%          | 89%          | 94%          |





# Southwest Region Winner

## VERIZON WIRELESS

The Southwest is a land of big cities separated by sprawling spaces. Verizon and T-Mobile both did very well in the cities, but T-Mobile dropped off the map in some of the wide-open spaces, and Verizon kept on trucking all the way through Arizona and Southern California. Verizon was absolutely dominant in Los Angeles, although AT&T and T-Mobile gave it good competition in San Diego.

|                                                                                                                                                                                                     | AT&T                                            | Sprint                                           | T-Mobile                                        | ★ Verizon                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| <b>PCMag.com Mobile Speed Index</b>                                                                                                                                                                 |                                                 |                                                  |                                                 |                                                 |
| <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Good</li> <li><span style="color: orange;">■</span> Average</li> <li><span style="color: red;">■</span> Slow</li> </ul> | <span style="color: green;">■</span> 77<br>/100 | <span style="color: orange;">■</span> 49<br>/100 | <span style="color: green;">■</span> 92<br>/100 | <span style="color: green;">■</span> 94<br>/100 |
| <b>Download &amp; Upload Performance</b>                                                                                                                                                            |                                                 |                                                  |                                                 |                                                 |
| Average Download Speed                                                                                                                                                                              | 10.1<br>Mbps                                    | 8.3<br>Mbps                                      | 11.7<br>Mbps                                    | 17.6<br>Mbps                                    |
| Maximum Download Speed                                                                                                                                                                              | 99.2<br>Mbps                                    | 60<br>Mbps                                       | 78.6<br>Mbps                                    | 92.7<br>Mbps                                    |
| Average Upload Speed                                                                                                                                                                                | 5.7<br>Mbps                                     | 3.9<br>Mbps                                      | 12.5<br>Mbps                                    | 8.8<br>Mbps                                     |
| Maximum Upload Speed                                                                                                                                                                                | 21.1<br>Mbps                                    | 15.6<br>Mbps                                     | 39.2<br>Mbps                                    | 42.6<br>Mbps                                    |
| Time to First Byte (In Milliseconds)                                                                                                                                                                | 219<br>ms                                       | 245<br>ms                                        | 232<br>ms                                       | 214<br>ms                                       |
| <b>Webpage Download</b>                                                                                                                                                                             |                                                 |                                                  |                                                 |                                                 |
| Average Web Download Speed                                                                                                                                                                          | 2.3<br>Mbps                                     | 1.6<br>Mbps                                      | 2.2<br>Mbps                                     | 2.6<br>Mbps                                     |
| Webpage Completion                                                                                                                                                                                  | 90%                                             | 56%                                              | 89%                                             | 91%                                             |





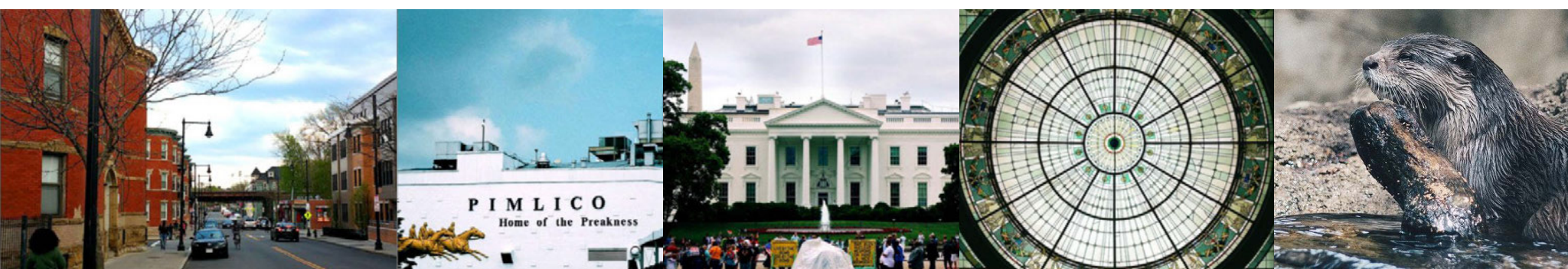
# Northeast



## Suburban/Rural Northeast T-MOBILE

Our Northeast drive had two components. Most of it was along the very highly trafficked, highly populated, primarily suburban I-95 corridor from Boston to Washington. But we also went out to Bloomsburg, Pennsylvania, on I-80, and then back through coal country.

All four networks did just fine along the I-95 corridor, although Sprint was the weakest. T-Mobile was the fastest of them all in our various suburban zones, netting it the prize. But here's the thing: Once we hit the New Jersey–Pennsylvania border, T-Mobile LTE dropped off the map. In rural Pennsylvania, AT&T was stuck on 3G and T-Mobile dropped to 2G. Sprint had LTE in town centers like East Stroudsburg, Allentown, and Bloomsburg, but not on the roads in between. That's a region where Verizon absolutely rules. So T-Mobile's win in this region reflects the more suburban—rather than rural—nature of this drive.





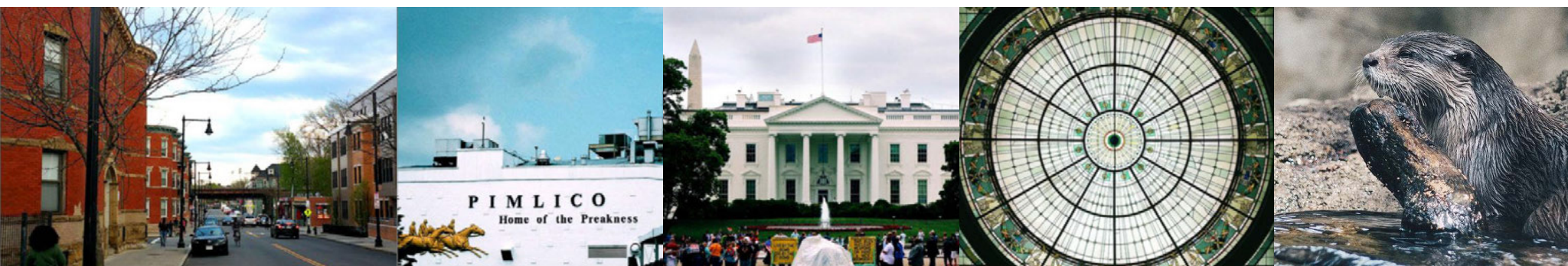
# Northeast



## **Boston, MA** VERIZON WIRELESS

All four carriers improved quite a lot in Boston this year, but Verizon improved the most. Fast, consistent download speeds were the key to Verizon's win.

Verizon and T-Mobile both kept their network quality pretty consistent compared with what we saw last year. But Sprint and AT&T made huge jumps forward—in AT&T's case by using carrier aggregation, and in Sprint's case by finally activating its Spark network, which was especially strong in Somerville and the Fenway area. Alas, that wasn't enough to catch up with the leaders, but it's sure to please the Sprint and AT&T users in town.



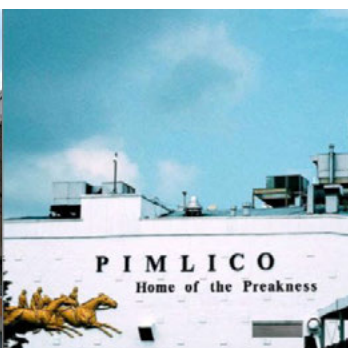


# Northeast



## New York, NY **VERIZON WIRELESS**

New York is Verizon's hometown, and last year the carrier seriously beefed up its network after some embarrassing performance problems in 2012 and 2013. Verizon's performance has declined a bit from just after it installed its XLTE system in 2014, but it's still doing very well, with the best speeds of any of the major carriers. T-Mobile suddenly vaulted into second place last year, and it's managed to keep performance on an even keel while quickly gaining subscribers.



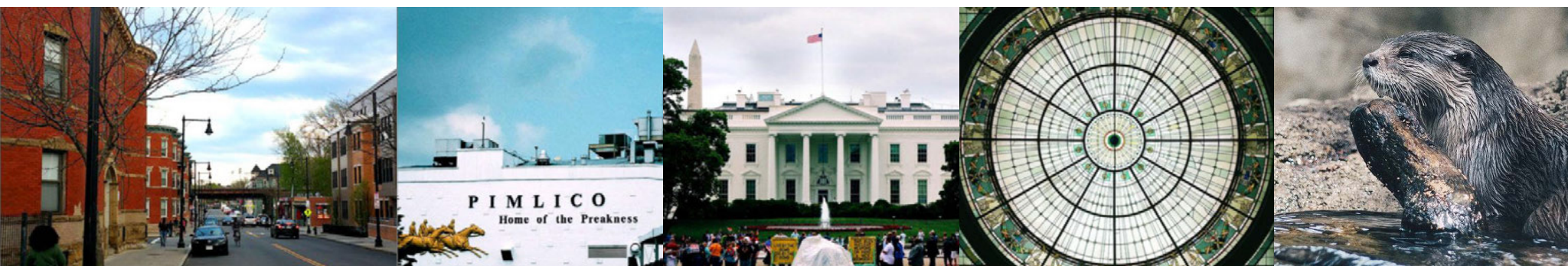


# Northeast



## Philadelphia, PA **VERIZON WIRELESS**

In New York, New Jersey, and Pennsylvania, Verizon Wireless ruled our speed and reliability tests. But Sprint more than doubled its speed in Philadelphia between last year and this year, putting it in the same class as AT&T and T-Mobile, and making it truly competitive in Philly for the first time in several years.





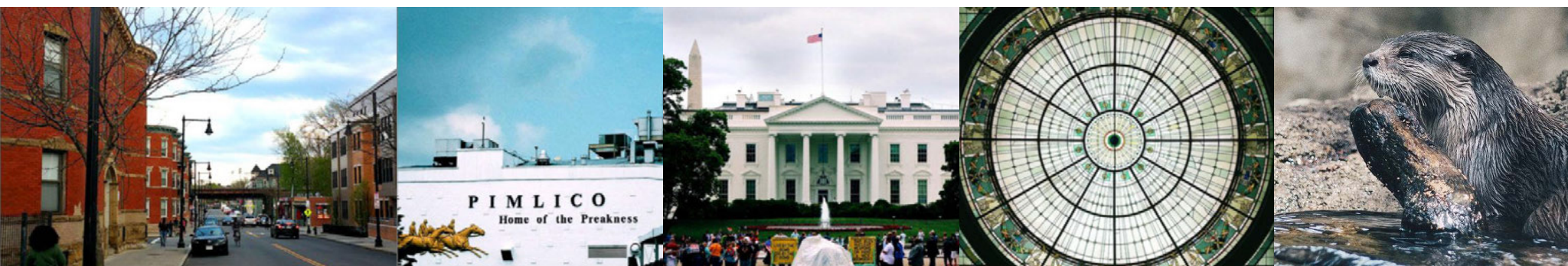
# Northeast



## **Baltimore, MD** VERIZON WIRELESS

Verizon absolutely dominated the Northeast this year, which shouldn't be a big surprise for anyone living in the region; it's Big Red's home territory. Verizon led in nearly every category with consistent, fast uploads and downloads.

Although Sprint came in fourth in Baltimore, it gets the "most improved" award. Sprint's speeds have languished there for several years, but this year we finally saw its Spark upgrades throughout the city, with an impressive 70Mbps down in Greenmount Cemetery. That said, Sprint still has some gaps to fill, and we were quite disappointed when we saw our Sprint phone drop to 3G both in Canton and north of John Hopkins University.



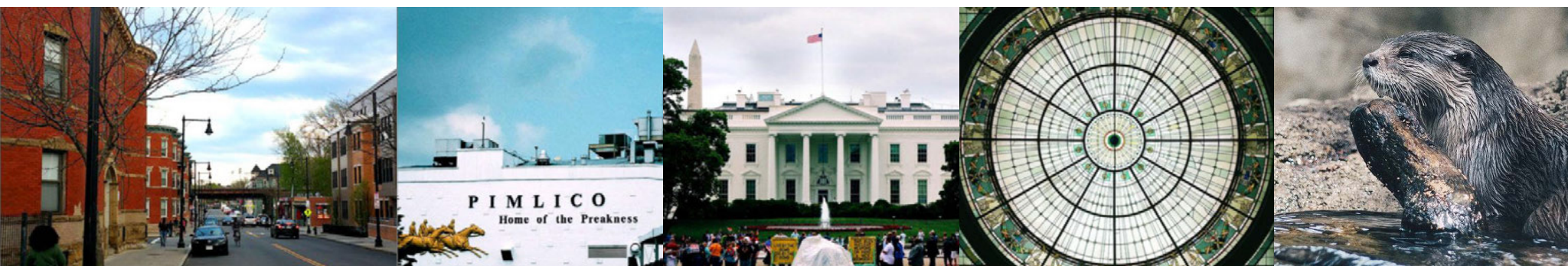


# Northeast



## Washington, D.C. T-MOBILE

T-Mobile's shiny, sprightly new network outpaced all of its competitors in Washington and Arlington, offering high speeds more often than the other three major carriers. Washington didn't show some of the spectacular high speeds we saw in other cities—we're talking 60Mbps, not 90Mbps—but T-Mobile was able to deliver solid speeds consistently across our 12 tests, making it the fastest network in the nation's capital.





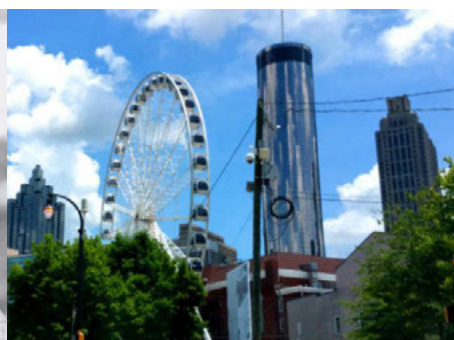
# Southwest



## Suburban/Rural Southeast **VERIZON WIRELESS**

This drive took us on I-85 through the Carolinas and Georgia, then down US 27 and US 98 through Florida to check some non-interstate coverage. We made a notable stop in Tallahassee.

As we saw in other rural regions, Verizon Wireless won by offering completely unbroken LTE coverage. Our Verizon LTE connection stayed strong in the most rural parts of Georgia and Florida—a major accomplishment. AT&T came in a close second, offering a fast LTE network with only occasional dropouts in extremely rural places like Fanning Springs, Florida. Both T-Mobile and Sprint LTE dropped off the map when we dropped off the interstate, showing that both companies need to fill in their network coverage along less traveled roads.



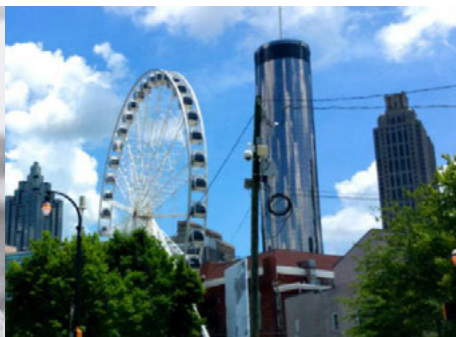


# Southeast



## Raleigh, NC **AT&T**

Our Triangle tests took us through Raleigh, but also into downtown Durham, the outskirts of Chapel Hill, and near the airport. AT&T beat all carriers in the region, with by far the best upload and download speeds, and the best overall reliability. Although AT&T, T-Mobile, and Verizon all have pretty solid LTE coverage throughout the most populated parts of the Triangle region, AT&T's combination of the fastest LTE network and the fastest 3G backup network definitely made for the best local experience.



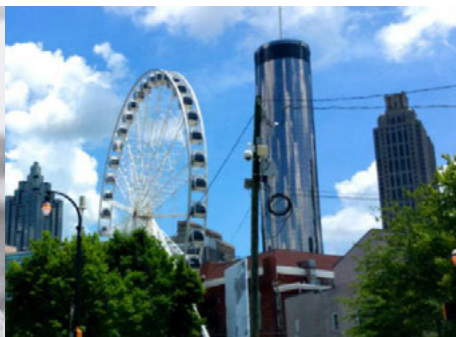


# Southeast



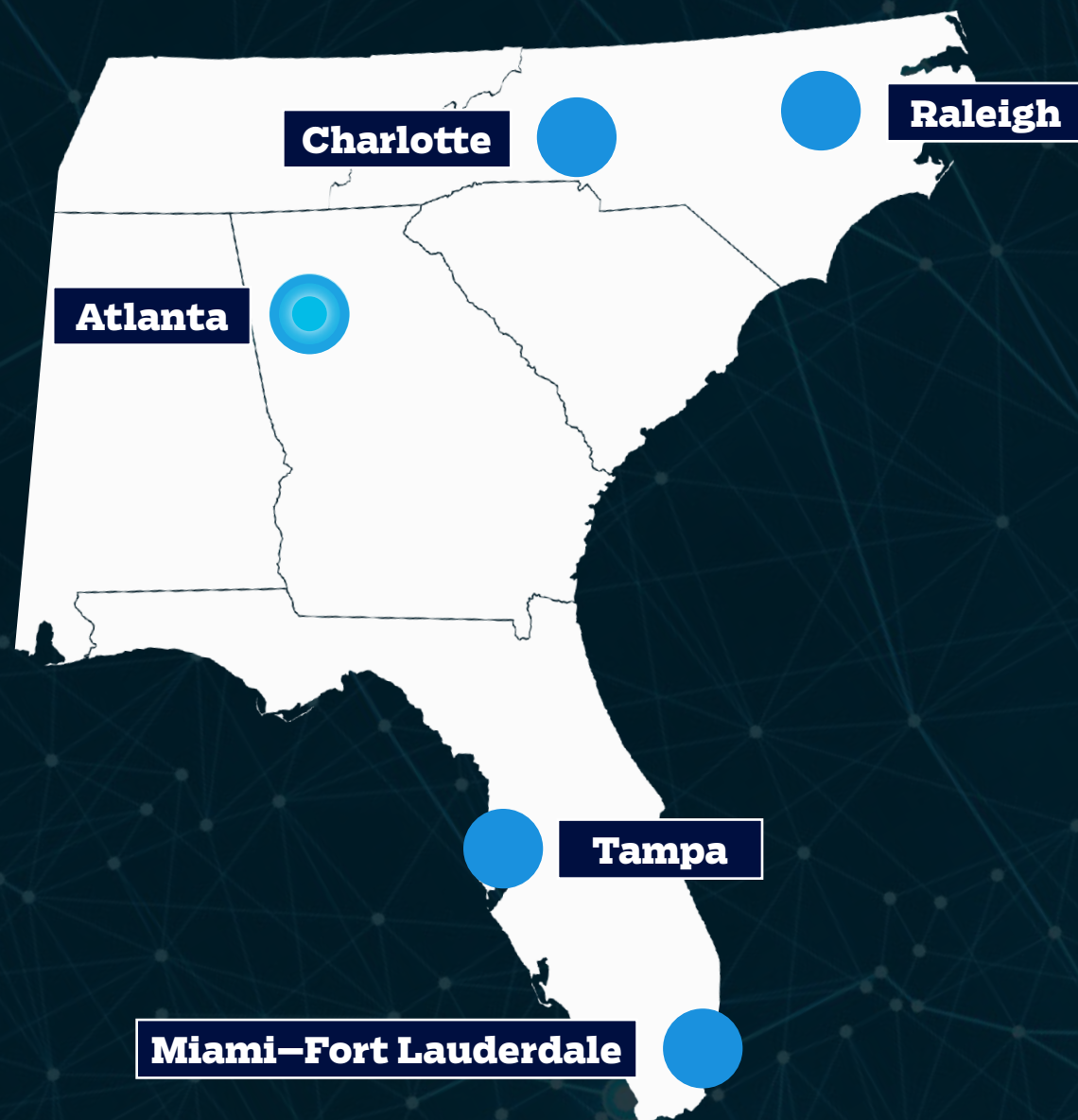
## Charlotte, NC **AT&T**

AT&T continued to rule North Carolina, just as it did last year. None of the four major carriers had terrifically reliable speeds in Charlotte in 2015, but AT&T definitely led the pack, especially on downloads. Verizon showed surprisingly slow results in our tests on the northeast side of the metro area, especially considering how well it did in much of the rest of the country. T-Mobile scored strongly throughout the city, but it just couldn't quite match AT&T's performance.





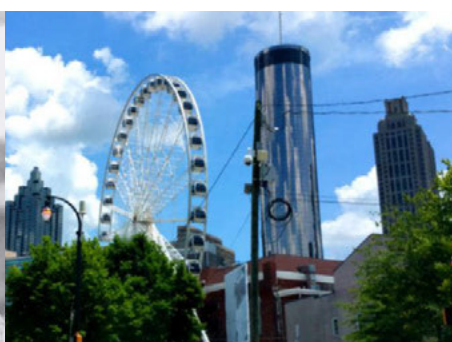
# Southeast



## Atlanta, GA T-MOBILE

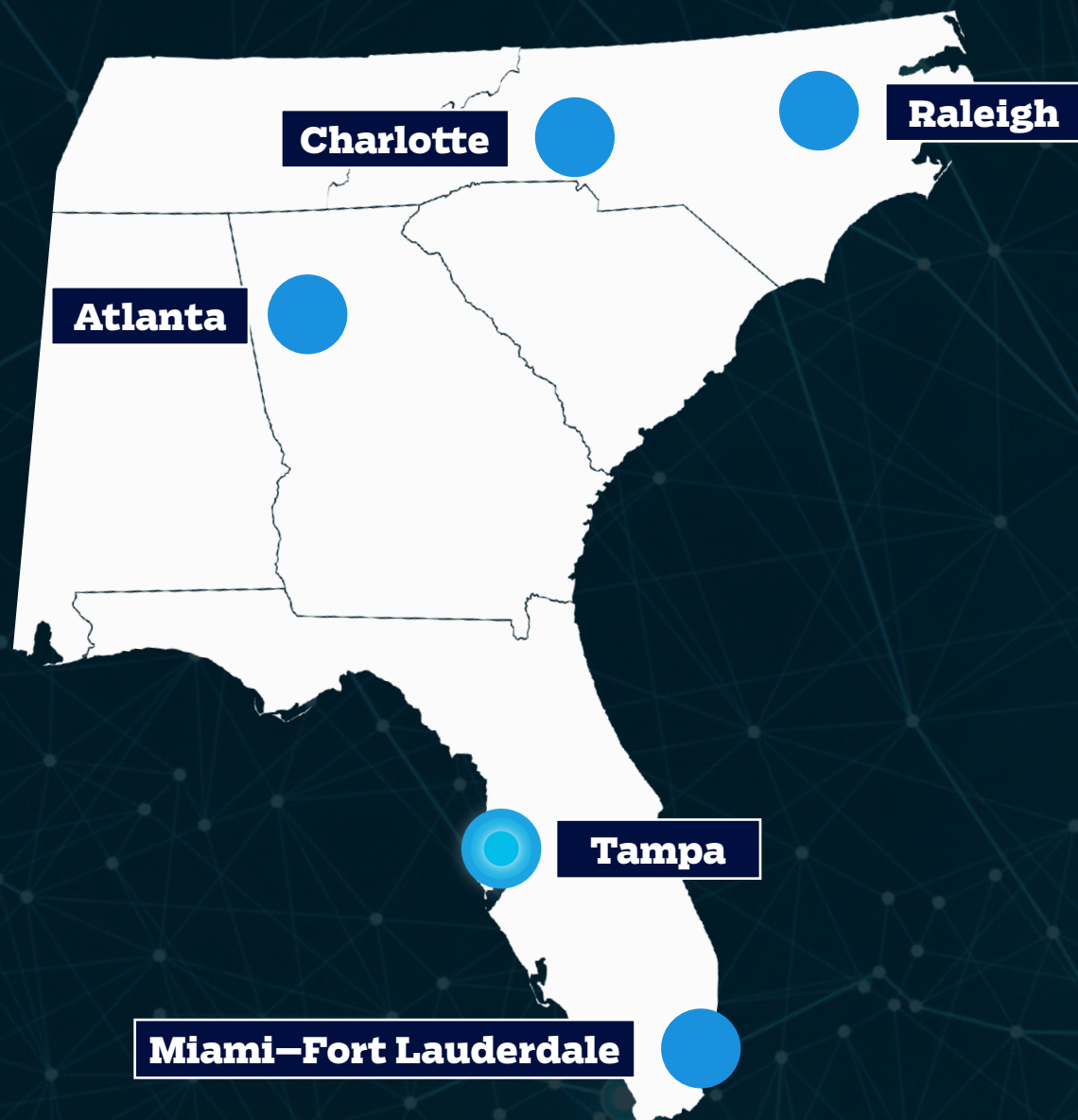
All four major carriers had strong performances at our 11 test locations in Perimeter, but T-Mobile stood out for most reliably delivering download speeds above 5Mbps and upload speeds above 2Mbps. T-Mobile and Verizon also each broke 90Mbps down in Atlanta, some of the fastest speeds we saw in the whole country.

Although Verizon had 100 percent LTE coverage in our drive around Atlanta, and often delivered excellent results (including 40Mbps uploads in East Atlanta), its speeds were hurt by dipping down in Decatur; T-Mobile never flagged. Both AT&T and Sprint, meanwhile, doubled their download speeds from last year, but that just put them on par with T-Mobile and Verizon.



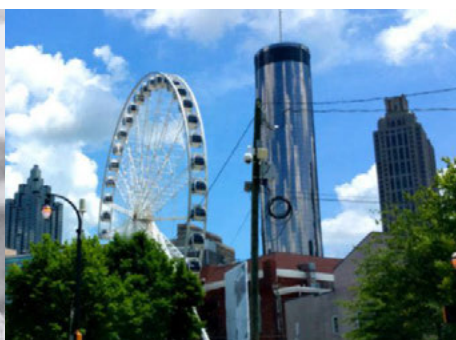


# Southeast



## Tampa, FL VERIZON WIRELESS

Our testing around the Tampa metro area took us through Tampa, St. Petersburg, and Clearwater. Verizon was the clear leader in all of these areas, with the fastest upload and download speeds. Verizon's one weak spot was in downtown Clearwater—possibly because of congestion—although it recovered with excellent download speeds along Seminole Boulevard as we drove down to the beach. We didn't test Tampa last year, but we found it to be one of the five fastest cities nationwide for overall speeds this year.





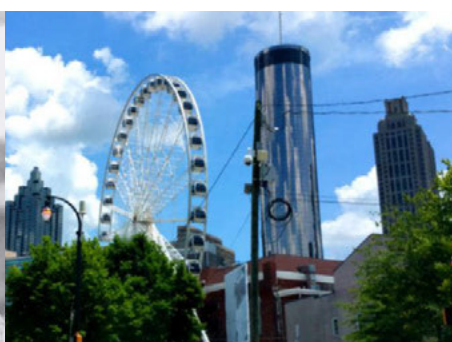
# Southeast



## **Miami/Fort Lauderdale, FL** VERIZON WIRELESS

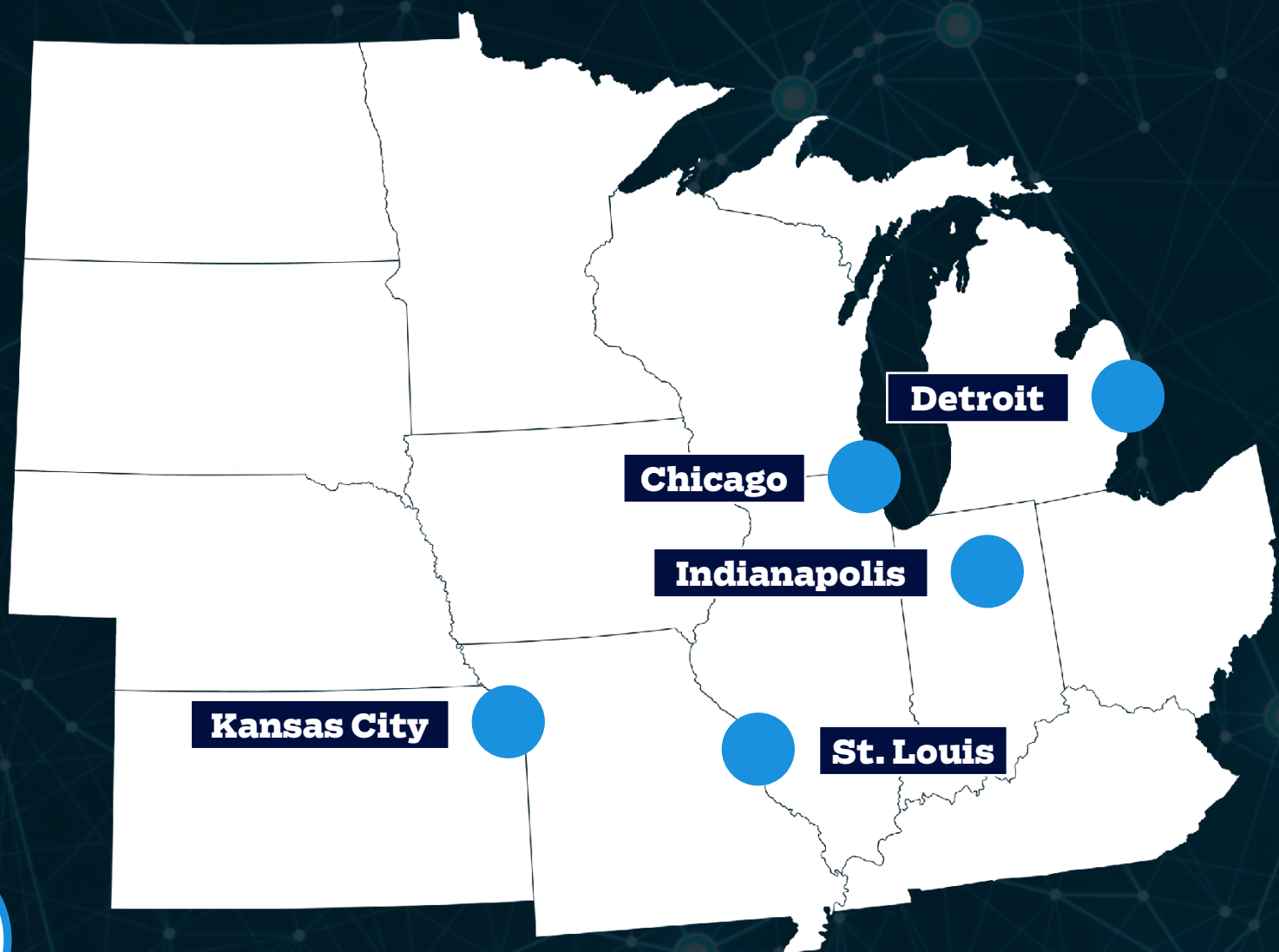
Our two days of South Florida testing had us roaming all over Dade and Broward counties. Mixing together those results, we found Verizon had a commanding lead in both areas, with average download speeds almost double its rivals'. Verizon's best performance in South Florida came at the very zero point of the Miami street grid: Flagler and Miami, with download speeds exceeding 90Mbps.

AT&T and T-Mobile nearly tied for second place, but Sprint also delivered very respectable performance, with a startling 50Mbps average download speed in Miami Lakes. Sprint's new Spark system was clearly visible at several locations across South Florida—fitting, perhaps, because Sprint's CEO Marcelo Claure is a former Miamian.





# North Central

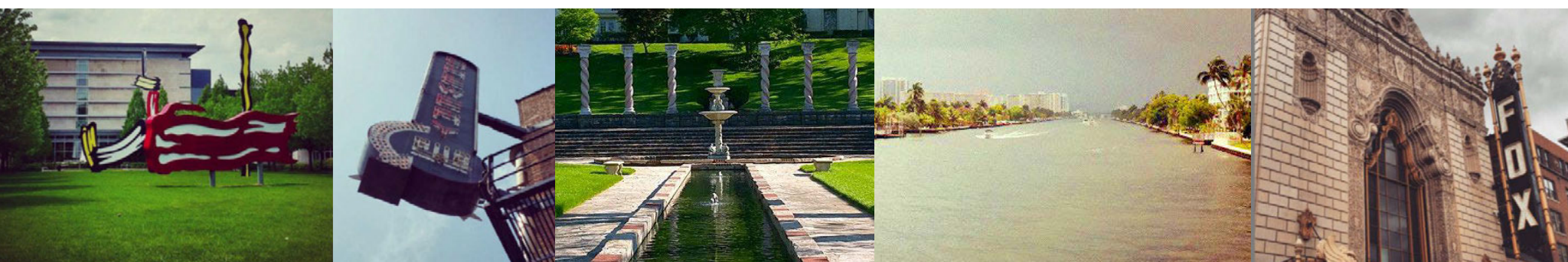


Rural  
North  
Central  
WINNER

## Suburban/Rural North Central **VERIZON WIRELESS**

Verizon blew away the competition as we zigzagged across Michigan, Indiana, Illinois, and Missouri, offering nearly unbroken LTE coverage even off the interstate on US 63 in Missouri (it was interrupted near the Arkansas border). Second place goes to AT&T, which dropped to 3G between Terre Haute, Indiana, and Effingham, Illinois—but AT&T’s 3G network is pretty fast, so it wasn’t too much of a problem.

T-Mobile’s rural coverage in these states improved a lot over last year, when the carrier’s LTE network was only available in bubbles around the big cities. Now it extends over most of I-70 and I-49 in Missouri, for instance. Sprint is also increasing its radiuses around towns like Springfield and Columbia, Missouri, but still has some gaps to fill.



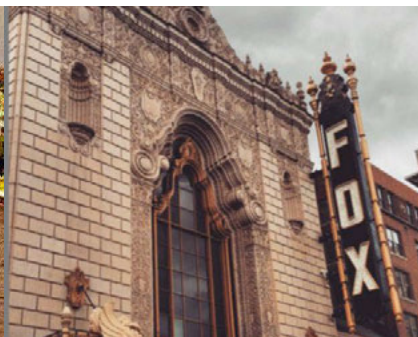


# North Central



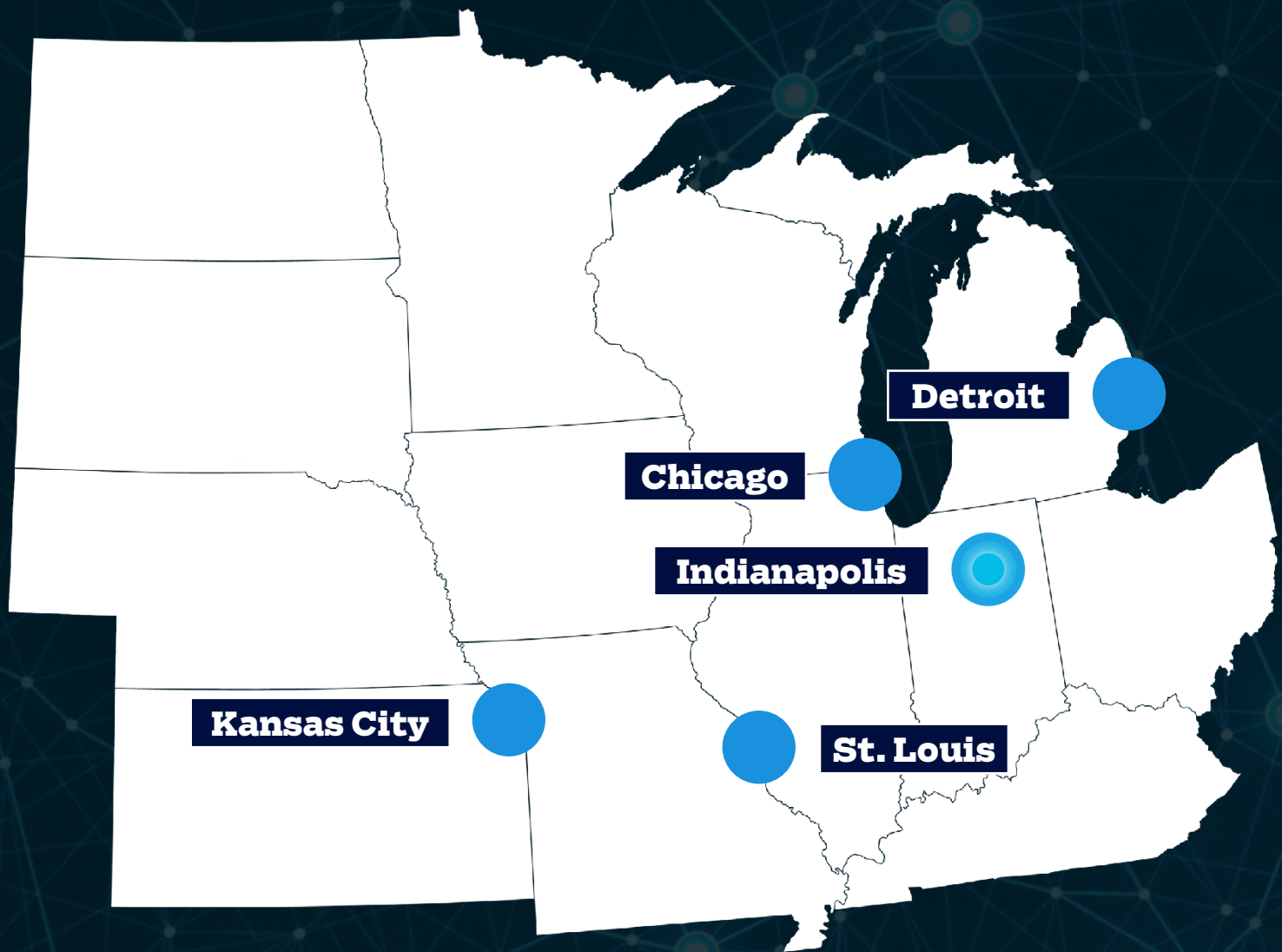
## **Detroit, MI** VERIZON WIRELESS

Verizon powered through our 12 Detroit tests, which mostly kept us within the boundaries of the city, but also took us to Dearborn and Grosse Pointe. Detroit saw some of the nation's fastest upload speeds, with uploads higher than 40Mbps on the winning Verizon network in Midtown. A 60Mbps test sequence downtown was also pretty impressive. T-Mobile makes a good low-cost alternative, with solid speeds and reliability across the city.



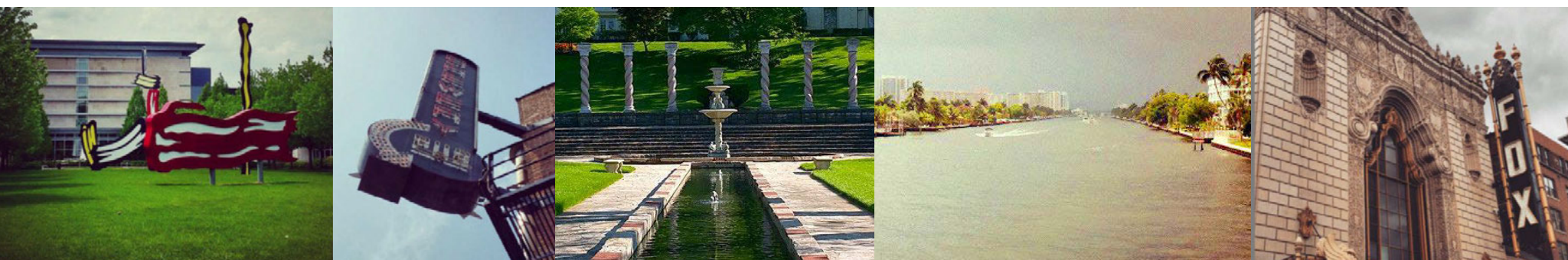


# North Central



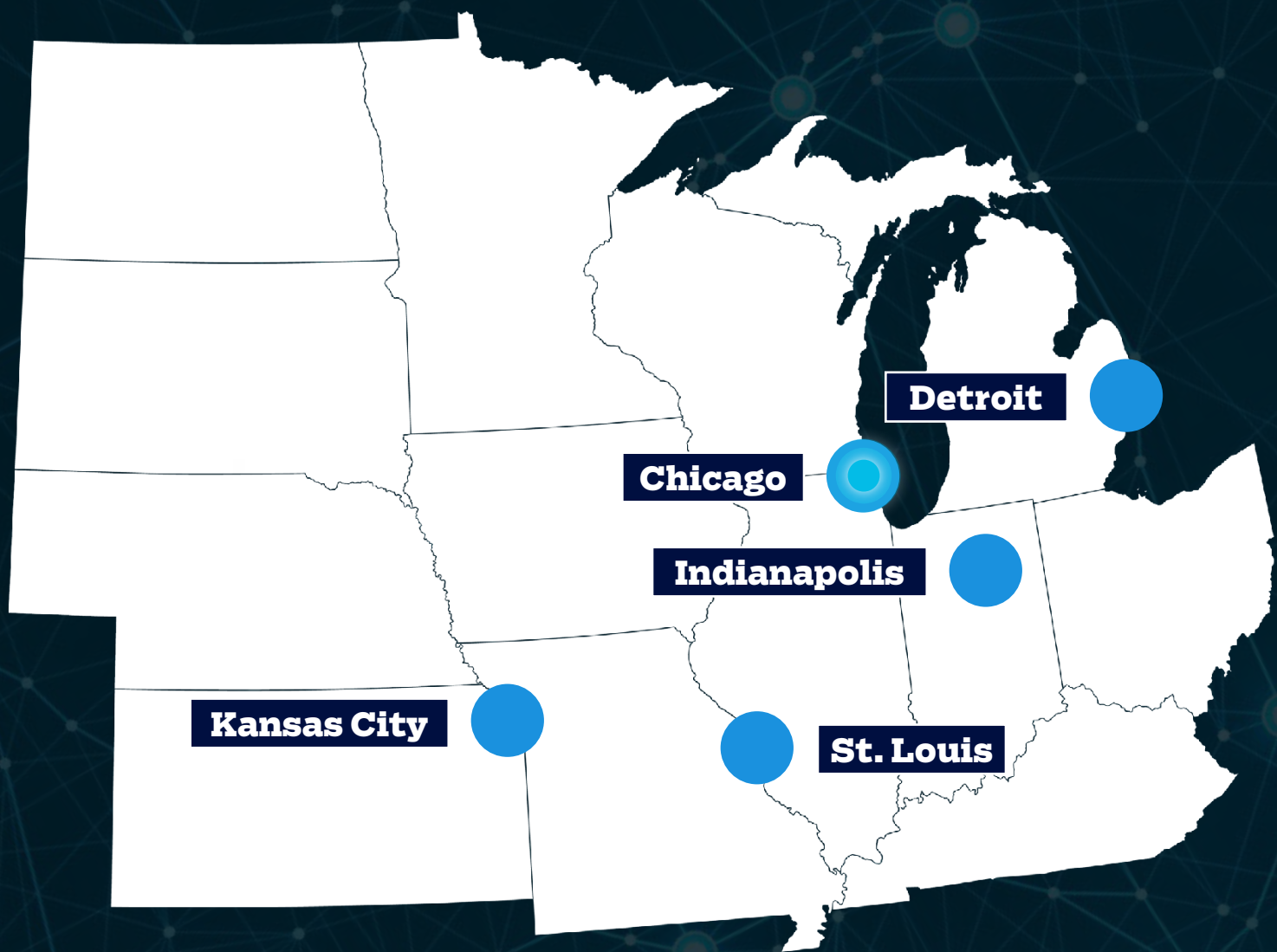
## Indianapolis, IN AT&T

AT&T won Indianapolis with the fastest upload and download speeds, and the most reliable LTE service. Verizon also did very well, but AT&T outpaced it in most measures. T-Mobile and Sprint came in together as a second tier. A low reliability score for Verizon 3G reflected how dreadfully slow that backup network is—another point for AT&T, which had the fastest of the 3G backup systems in Indianapolis.



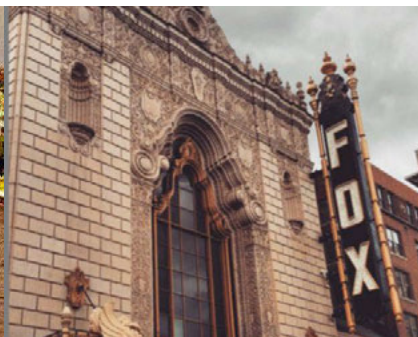


# North Central



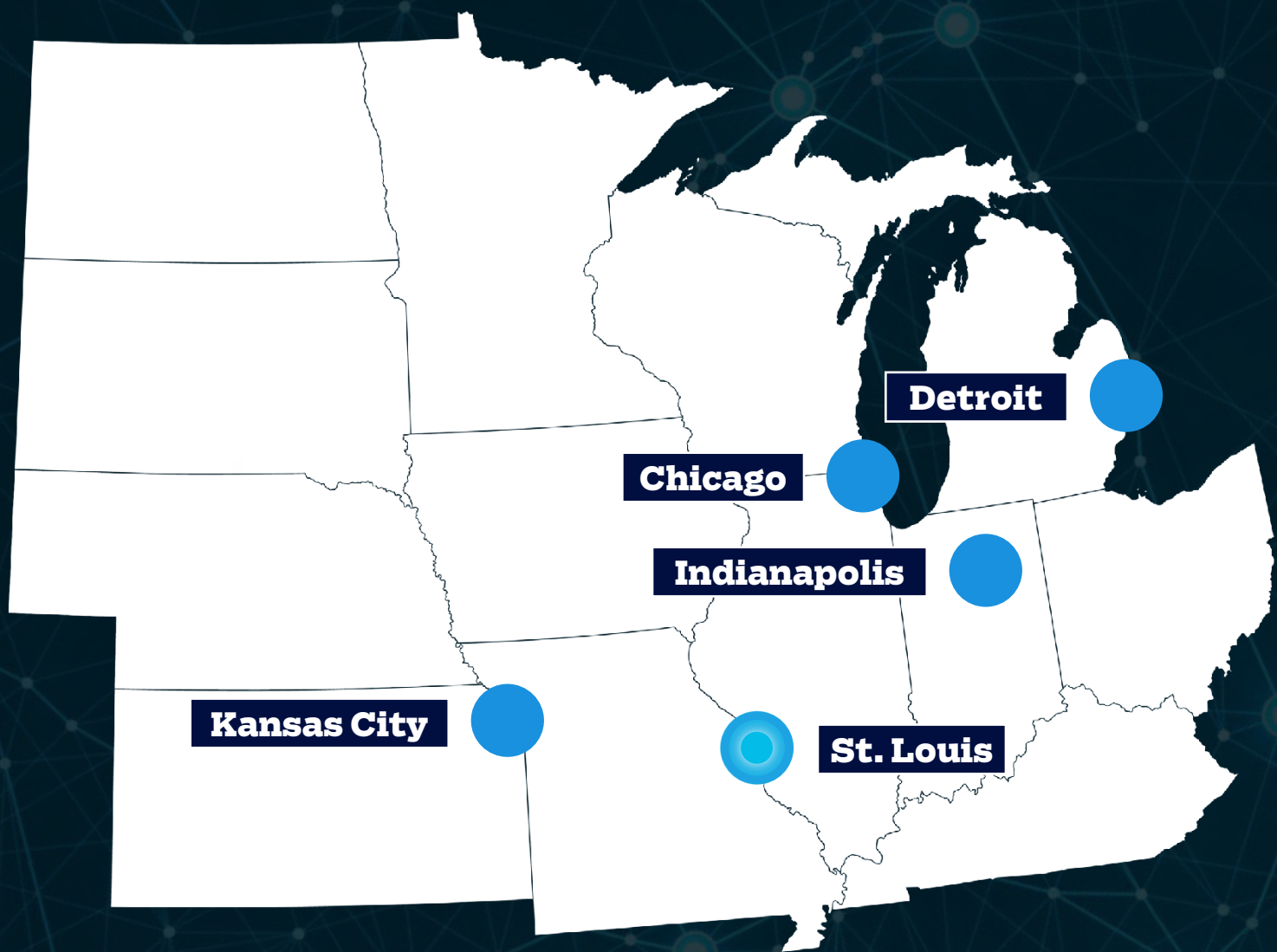
## Chicago, IL **VERIZON WIRELESS**

Verizon delivered amazing speeds in Chicago, topping out with downloads at the corner of N Rush and E Chicago avenues that topped 90Mbps. But both Verizon and AT&T look like excellent choices here: You're unlikely to need 30Mbps down on your phone, so take a look instead at those reliability percentages, as speeds varied sharply across our 11 Chicago test sites. Verizon, for example, averaged 50Mbps at several test sites, but hit a rough patch in Logan Square. Across the city, Verizon and AT&T offered over 5Mbps down around 85 percent of the time. And as a low-cost alternative, Sprint is improving quickly.



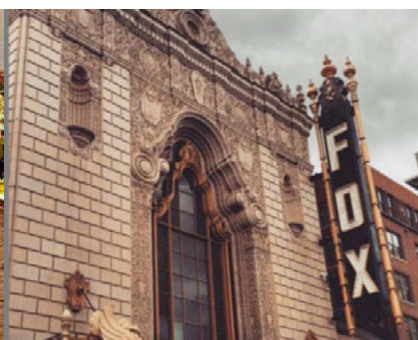
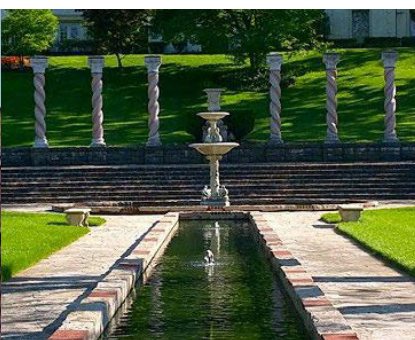


# North Central



## St. Louis, MO **VERIZON WIRELESS**

Verizon was the clear winner in St. Louis, thanks to a commanding lead on download speeds. Our 11 St. Louis tests were focused mostly in the city, with one up by the airport. Although we saw strong spots with other carriers, Verizon was the most consistently strong across the city, with its only weak spot coming in our test in Soulard. Sprint dramatically improved its performance in St. Louis between last year and this year, but not enough to top Verizon.



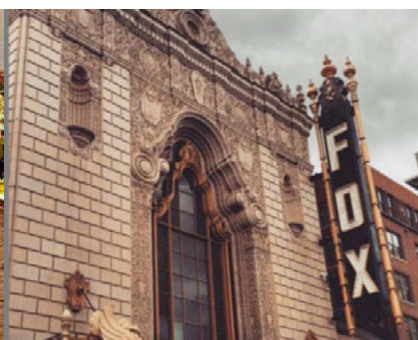
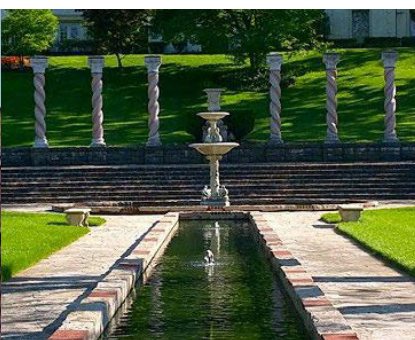


# North Central



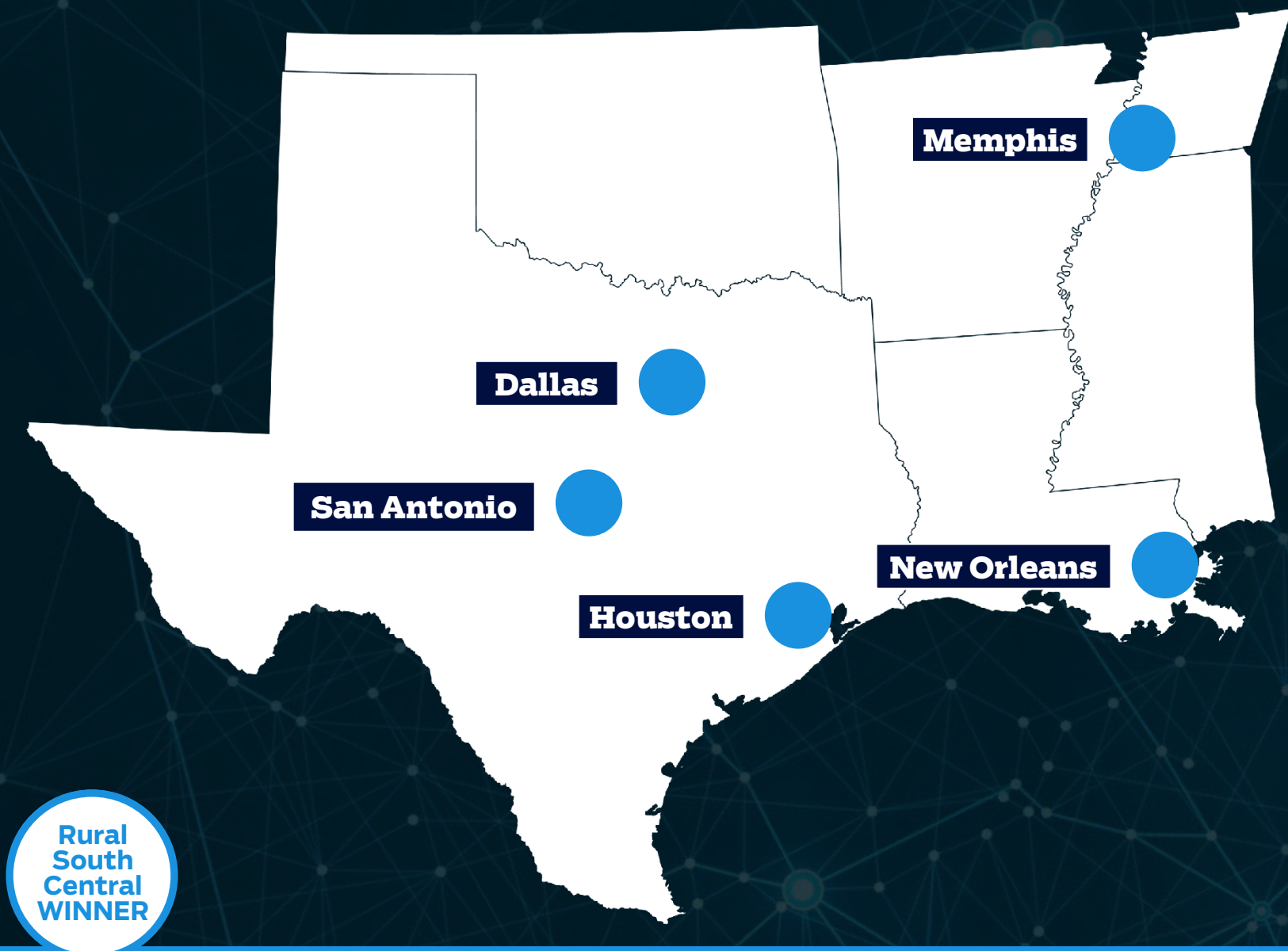
## **Kansas City, KS** VERIZON WIRELESS

Thanks to Google Fiber, Kansas City is one of the fastest cities in the country for home Internet. It's also Sprint's headquarters. But Verizon has a commanding lead when it comes to wireless speeds, with the fastest results on every one of our measures. Hometown hero Sprint comes in second place, bumping its average download speed from 7Mbps last year to 13Mbps this year. Kansas City is a surprisingly slow city for T-Mobile, with speeds declining noticeably from last year.





# South Central



## Suburban/Rural South Central **VERIZON WIRELESS**

This drive took us down US 63 through Arkansas, I-55 through Mississippi, and then I-10 and I-35 through Louisiana and eastern Texas.

Verizon, once again, showed nearly unbroken LTE coverage the whole trip. AT&T had some rocky 3G times in Arkansas, but recovered when we got to Memphis, and was a reliable partner through Mississippi, Louisiana, and Texas. We didn't have that experience with the other two carriers, especially T-Mobile, which had serious LTE problems in Arkansas and Louisiana.

Texas has very good connectivity along the critical Houston–San Antonio–Austin–Dallas corridor, with high AT&T and Verizon LTE speeds to reflect that.



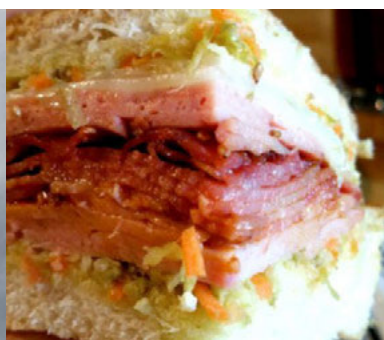


# South Central



## Memphis, TN VERIZON WIRELESS

Something odd happened in Memphis this year: All the carriers slowed down except Verizon. T-Mobile, especially, crashed to Earth, possibly by going from having very few LTE customers in Memphis to having a lot more. Verizon, on the other hand, kept the faith and kept its speeds steady, delivering good LTE performance around 80 percent of the time—noticeably more than any of its competitors.





# South Central



## Dallas, TX AT&T

Dallas is one of AT&T's home towns, and it's traditionally been a real wireless battlefield with strong performance from several different carriers. This year, AT&T took the crown for both speed and reliability. Download speeds at most of our test sites were in the 20-30Mbps range, and AT&T's 3G backup was considerably faster than Verizon's sputtering 3G service. T-Mobile has a ton of spectrum in Dallas thanks to its old MetroPCS frequencies, and it came in with a strong second-place result.





# South Central



## San Antonio, TX T-MOBILE

None of the major carriers performed particularly well in San Antonio this year, and the four slow LTE networks generated some weird results. For instance, T-Mobile's 3G HSPA+ network had higher average download speeds than its LTE network, although that still resulted in a slower overall consumer experience because of T-Mobile 3G's very long time to first byte. All of the LTE networks fell under our 5Mbps threshold at least a third of the time, which was pretty disappointing. T-Mobile was the best of the bad bunch here, with good reliability across the city and a combination of 3G and 4G networks delivering adequate, if not spectacular speeds.



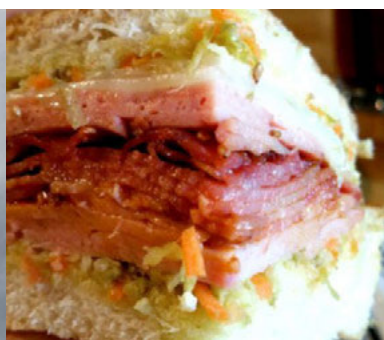


# South Central



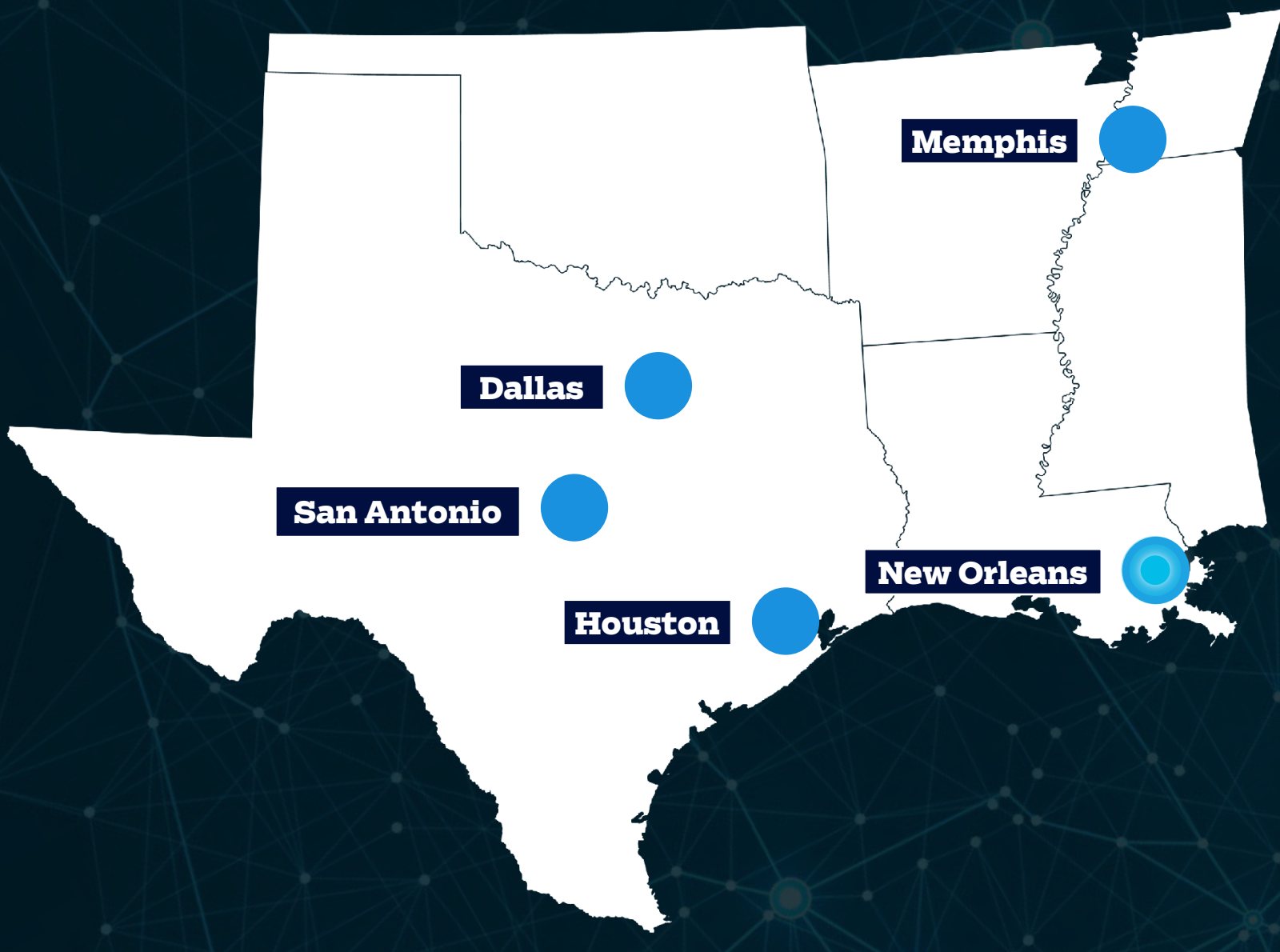
## Houston, TX AT&T

Houston is very big, so we kept most of our testing inside the 610 inner loop. AT&T eked out a narrow win over Verizon in this sprawling metropolis. But to tell the truth, everyone performed pretty well: Even Sprint delivered downloads over 5Mbps more than three-quarters of the time. Texans love to roam, though, and where AT&T and Verizon reign supreme is in the hinterlands: Neither carrier dropped LTE coverage during our drive from Houston to San Antonio, Austin, and Dallas.





# South Central



## New Orleans, LA **AT&T**

New Orleans wasn't a particularly fast town for any of the major carriers this year, but AT&T came out convincingly faster than the competition. With all the major 4G systems periodically dropping to 3G in our New Orleans testing, a fast 3G backup system becomes critical in your carrier choice, and AT&T's 3G HSPA+ network was much faster than any of its competitors. Adding to AT&T's triumph, T-Mobile had coverage trouble in the suburbs, and Sprint's LTE system turned out slower than AT&T's 3G.





# Northwest



## Suburban/Rural Northwest **VERIZON WIRELESS**

We drove I-80 through Wyoming, traveled through Utah on US 40 and I-15, and a combination of I-5 and US 101 up the California, Oregon, and Washington coasts.

Verizon Wireless is still basically the only choice for LTE between cities. It's the only network that had enough coverage that we were willing to rely on it, especially in the Mountain West. That said, the second choice in these areas, hands down, would be AT&T; although it had poor LTE coverage, its 3G coverage was excellent and speeds were decent. T-Mobile had very high speeds, but really struggled with coverage, both for its 3G and 4G networks. (It has, however, improved since last year, and the company says it will expand LTE coverage in the West in the second half of 2015.) This is important: None of the carriers had good coverage on Route 1 between San Simeon and Monterey, or through the forests north of Mendocino. If you do a lot of traveling in those areas, you may want to consider an external antenna or booster.





# Northwest



## Denver, CO SPRINT

Sprint! Sprint won its first city since 2010 in Denver, showing that, yes, even mobile carriers can make a comeback. Sprint's LTE download speeds thoroughly trounced every other carrier's in Denver and its inner suburbs, with highs that topped both Verizon and AT&T. T-Mobile came in second place. Sprint's wins came in part thanks to strong speeds between 40 and 50Mbps at the University of Denver, the Denver Botanic Gardens, and S Downing and E Alameda.

Denver is just the prow of Sprint's battleship, too. No, Sprint didn't get a lot of wins or second-place scores. But the carrier's improvement across all 30 of our cities was truly dramatic. Sprint is now competitive again.





# Northwest



## Salt Lake City, UT **VERIZON WIRELESS**

Verizon Wireless is, overall, the best carrier in the Mountain West, thanks to its combination of solid in-city coverage and an unmatched rural LTE network. In Salt Lake City, Verizon pulled ahead of the competition because of reliability—its speeds fluctuated less than its competitors', resulting in a more even LTE experience around the metro area. Sprint made a surprise second-place finish here, showing how quickly and aggressively the carrier has been improving its network. We couldn't recommend Sprint in Salt Lake City before; now we can.





# Northwest



## **San Francisco, CA** VERIZON WIRELESS & AT&T (TIE)

We saw pretty good performance from all four major carriers in the San Francisco/Silicon Valley area, but where Verizon and AT&T really stepped ahead of Sprint and T-Mobile was on reliability. The 280 was T-Mobile's Waterloo, and our Sprint phone had trouble recovering from some dead spots south of San Jose. Within San Francisco itself, AT&T, T-Mobile, and Verizon all delivered similar high-quality service, and Sprint tripled its download speeds from last year to become a real competitor in the area for the first time. Verizon has really shaped up its speeds in central San Francisco: Downloads on that network broke 90Mbps at the corner of Van Ness and O'Farrell, for instance.





# Northwest



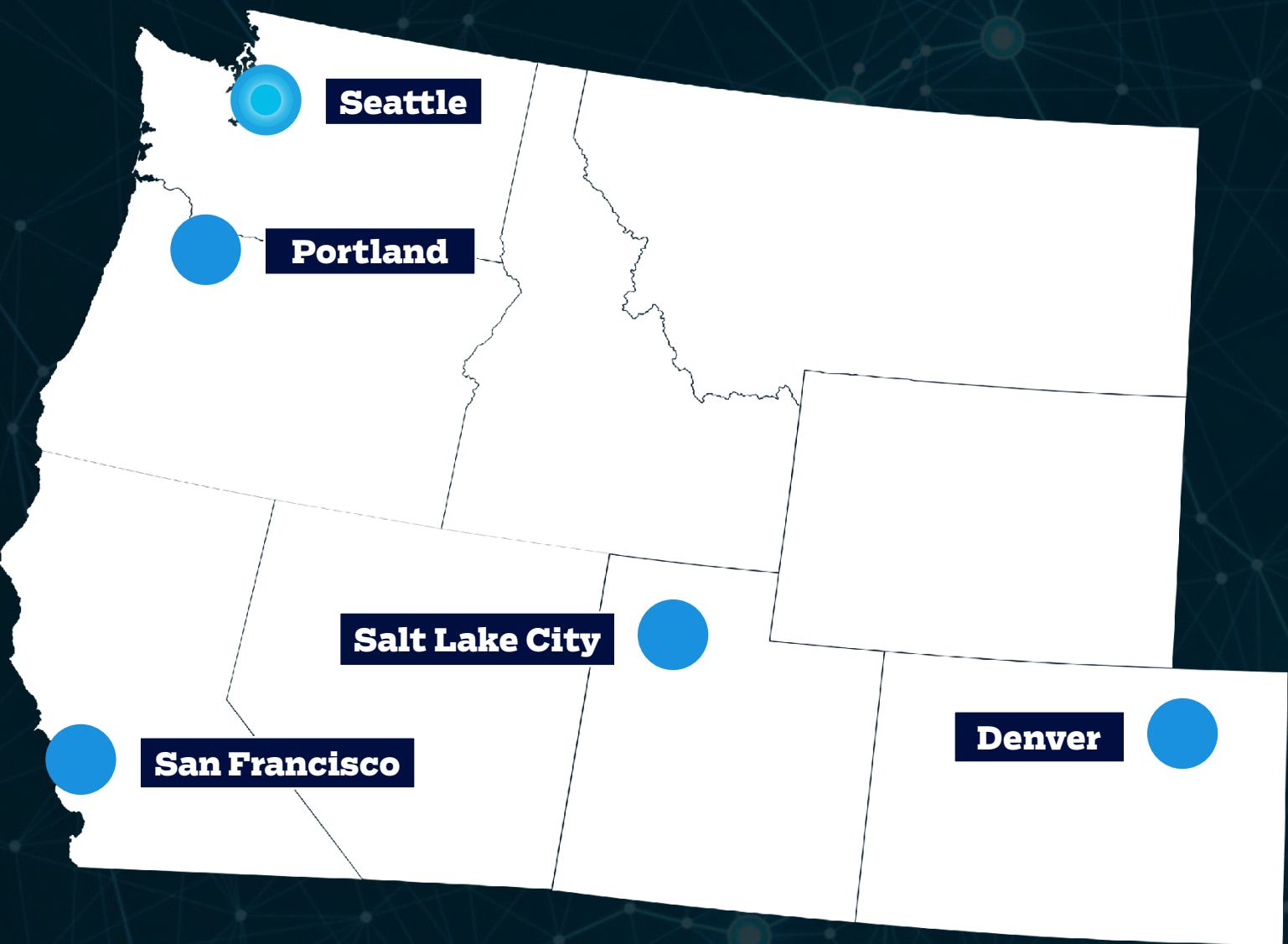
## Portland, OR T-MOBILE

T-Mobile, a Seattle company, did very well in both Portland and Seattle. Its upload and download speeds were both double those of its nearest competitors, Verizon and Sprint. (AT&T did very poorly in Portland.) Speeds varied quite sharply around the city, though. We saw 50Mbps down at Burnside and NW 10<sup>th</sup>, but much slower speeds in the parks on the west side of town. T-Mobile and Sprint's Portland coverage areas are also both still quite urban; if you want to cover nearby rural areas, Verizon is more reliable.





# Northwest



## Seattle, WA T-MOBILE

T-Mobile is Seattle's hometown carrier, and it's owning Seattle this year. AT&T and Sprint both dramatically improved their Seattle results between last year and this year. But T-Mobile came through as the clear speed and reliability leader on nearly all of our measures. The carrier has extended its LTE coverage through the Seattle suburbs, too, making for a better experience than last year. T-Mobile's best result: more than 90Mbps down at the Kubota Japanese Garden in south Seattle.





# Southwest

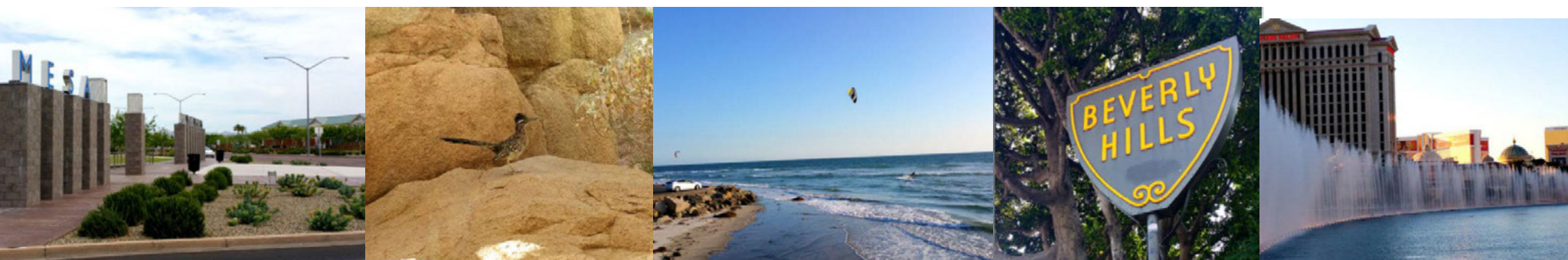


## Suburban/Rural Southwest **VERIZON WIRELESS**

Our Southwestern results represent a combination of drives in southern Nevada, major interstates in the western half of Arizona, and I-8, I-5, and US 101 in Southern California.

Verizon and AT&T are both very good choices for Arizona and Southern California, but Verizon's a bit better. Verizon had considerably better LTE coverage than any other network, especially out in the desert, with slightly faster speeds than AT&T.

T-Mobile's rural Arizona coverage is especially poor, but it did better in the populated areas of Southern California, following the rule that T-Mobile works pretty well where there are plenty of people to use it. Sprint still needs to do so much work all over this region that it didn't reach 33 percent coverage and had to be disqualified.



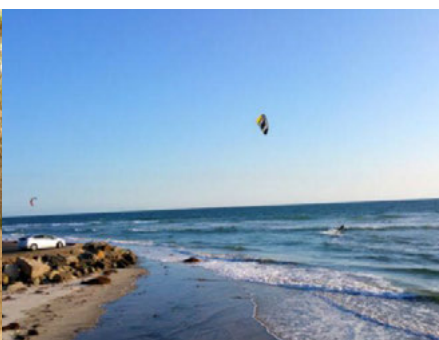
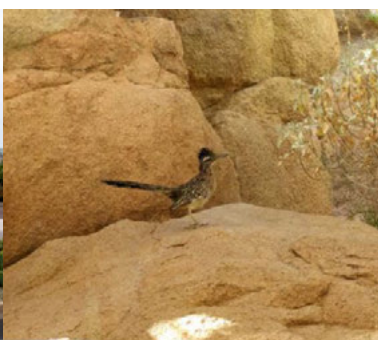


# Southwest



## **Tucson, AZ** VERIZON WIRELESS

Verizon dramatically increased its speeds in Tucson while maintaining excellent coverage, making it the clear best choice for that city this year. What struck me most about our Tucson results, though, is how Sprint and T-Mobile haven't improved there the way they have in many other cities. Sprint LTE remained startlingly spotty, and T-Mobile cut out on the southeast side of town by the UA Tech Park. Although Verizon didn't quite win Phoenix, its performance in Tucson, Phoenix, and areas in between makes it the best overall choice across Arizona.



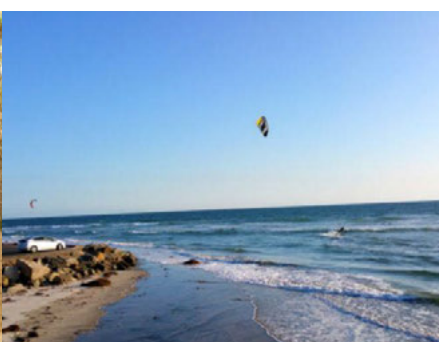
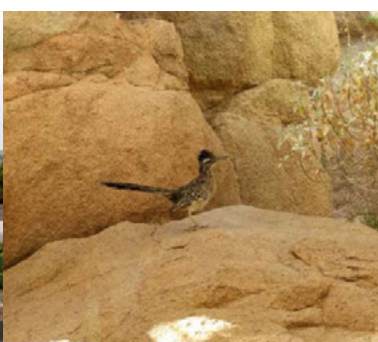


# Southwest



## Phoenix, AZ T-MOBILE

Stick with me here. Although T-Mobile and Verizon have very similar LTE performance in Phoenix—and thus very similar 4G speed scores—T-Mobile is our clear winner and thus a better choice for a fast network. The difference is T-Mobile's 3G HSPA network, which is ridiculously fast (for 3G) in Phoenix—it's faster than AT&T or Sprint's 4G networks. That means between T-Mobile's 4G and its backup, the magenta carrier is the best overall choice in Phoenix.





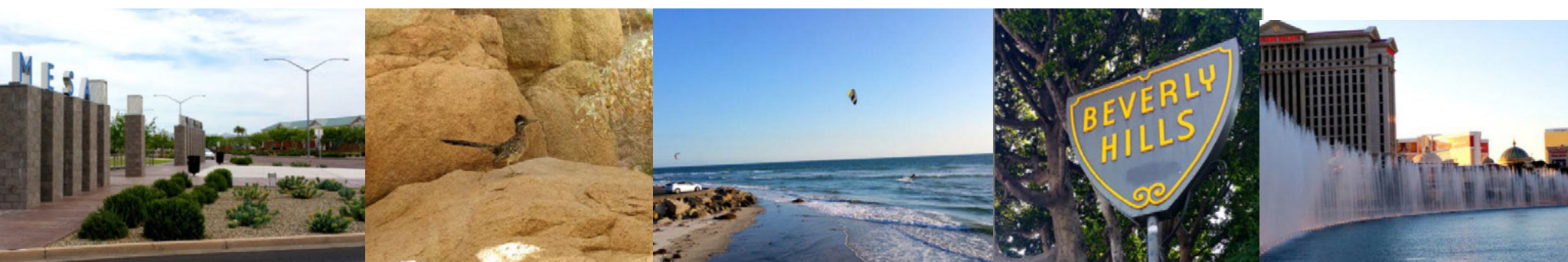
# Southwest



## **San Diego, CA** VERIZON WIRELESS & T-MOBILE (TIE)

Verizon should be your choice for a fast, reliable network across Southern California. The nation's number-one carrier delivered top performance throughout San Diego, Los Angeles, and everywhere in between, and cemented its win by even having a reliable LTE experience in the sparsely populated eastern parts of San Diego County.

T-Mobile's tie score came down to extremely fast, reliable results within the city of San Diego itself, as well as up the coast to Encinitas. In the most populated parts of town, T-Mobile was noticeably faster than Verizon. But head east of El Cajon, and T-Mobile's network drops out entirely.



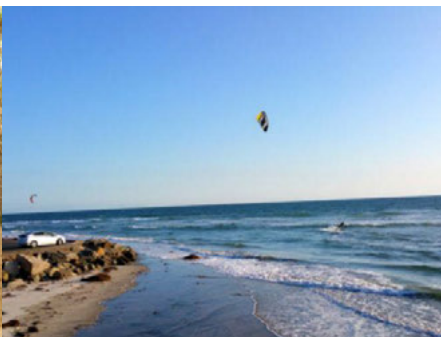
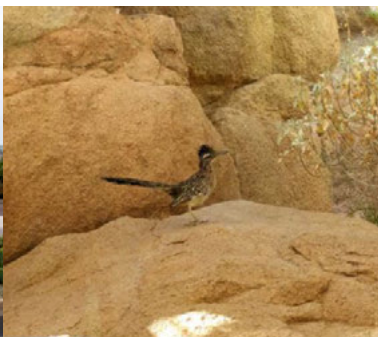


# Southwest



## Los Angeles, CA **VERIZON WIRELESS**

There's no question: Verizon is the carrier to use in L.A. It's not just about speeds, although Verizon offered the fastest download speeds by a large margin. Verizon was also measurably more reliable than any of its major competitors. On top of that, it performed the best of any carrier on our drives into and out of the city. Combined with its performance in San Diego, that makes it clear that Verizon is the best choice for a Southern California carrier.



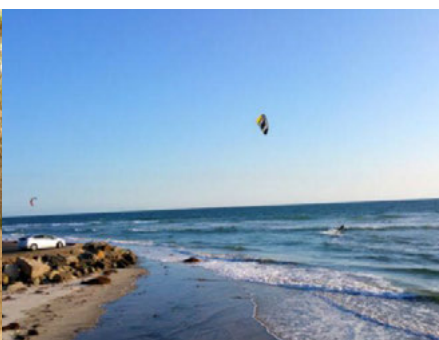
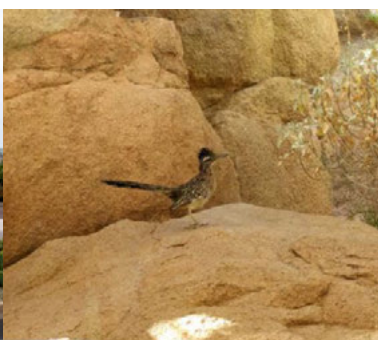


# Southwest



## Las Vegas, NV T-MOBILE

Las Vegas was one of T-Mobile's first LTE markets, and it's a very competitive place for wireless service. T-Mobile won in large part because of smashing the competition's upload speeds—important for a lot of Strip selfies—but the real news in Las Vegas is with Sprint, which went from averaging a pathetic 3.3Mbps down last year to a very respectable 14Mbps this year. Coverage isn't perfect—our phone dropped to 3G at the airport and stayed there for a while—but if you dismissed Sprint out of hand in Las Vegas before, it's time to take another look.





## Carrier and Networks

**AT&T's** new carrier aggregation technology brought together its slimmer slices of spectrum to vault speeds back up, closer to the award-winning heights we saw in 2013. It couldn't always beat Verizon and T-Mobile, but in cities including Atlanta, Chicago, and Houston, things were looking significantly better than last year. Speeds in St. Louis and Kansas City dropped, however.

AT&T's LTE network coverage is second only to Verizon's, and its HSPA+ backup network is much faster than Verizon's guttering CDMA system. This year, we saw AT&T fill in many of the LTE gaps it had on our Midwestern drive, as well as extending more LTE through the suburbs of Seattle and Portland. This year the carrier is adding another slice of spectrum—Band 29—to its mix, which will further shore up speeds.

**Sprint's** years of painful network upgrades are finally taking hold. Sprint is still the fourth-best carrier in terms of overall network quality, but for the first time, it's within striking distance. The carrier isn't focused on spectacular peak speeds—of 35,000 tests, we only saw 157 downloads over 50Mbps—but it nearly tripled its average download speeds in key markets like New York and Baltimore, and more than tripled them in Denver and Las Vegas.

Sprint's LTE network also now extends significantly into suburbs, rather than stopping at the city lines. If it continues to improve at this rate, Sprint finally has a network it can build a business on—and by next year, it'll be a threat to fast-growing T-Mobile.

**T-Mobile** gained more subscribers than any other carrier has this year, and it's spent the year focusing on coverage expansion through technologies like Band 2 and 12 LTE. That's resulted in major coverage improvements and mixed



speed results. Portland and Seattle improved dramatically, but St. Louis and Kansas City declined.

The real story is on the map. Last year we saw very little T-Mobile LTE in Missouri, Mississippi, and Georgia, for instance; this year there was much more. Last year, LTE cut out about 30 miles south of Atlanta and Memphis, and 40 miles south of Seattle. This year, T-Mobile's LTE continued much further down the Interstate from each city. That said, T-Mobile still has some weakness in the Mountain West, which the carrier says it's going to aggressively address later this year.

**Verizon Wireless** wins for the second year in a row by maintaining the consistent performance and broad coverage we saw last year with its XLTE network. Almost all phones sold by Verizon in the past year have XLTE, which is the carrier's brand name for Band 4 spectrum support. If you have an older model, it's definitely time to upgrade.

Verizon isn't impregnable. Back in 2012, it suffered from capacity issues. But its network management and coverage since then have been spot-on, keeping it the best bet for those who want top network performance.

U.S. Cellular does not participate in Fastest Mobile Networks because it doesn't cover enough of our test cities. Our readers do rate U.S. Cellular in our Readers' Choice Awards, however.

Many other companies that appear to be wireless carriers just borrow the networks of the Big Four. Consumer Cellular and Cricket are AT&T. MetroPCS is T-Mobile. Boost, Republic, and Virgin are Sprint. Straight Talk uses a mix of AT&T and T-Mobile, and TracFone uses all four networks. Better customer service and features like Wi-Fi calling may lead you to choose one of these over the four major carriers. You can use Fastest Mobile Networks to check the performance of the host carrier.





## **GET ORGANIZED**

**11 Ways to Increase  
Your Productivity**

## **CONNECTED TRAVELER**

**Four Seasons Hotels Add  
Uber for Room Service**

## **GAMING**

**The Best Free-to-Play  
PC Games**

# Digital

# Life

# 11 Ways to Increase Your Productivity

BY JILL DUFFY



**W**anting to get the most out of your time is normal. We live in a productivity-obsessed culture, and it's hard to fault anyone for dreaming of a life that's more efficient. Some people want to get their work done quickly so they can leave it all behind when they go home. Others want to master the art of productivity so they can earn enough money to pay the bills while saving some time and energy to pursue their passions.

Being more productive is all about getting the most out of the time you have.

"There are 168 hours in a week. If you work 50, and sleep 8 per night (56 hours per week in total), that leaves 62 hours for other things," writes time management expert and author Laura Vanderkam in her latest book.

The time is there. It's all in how you use it. These 11 tips will help you increase your productivity in both the short and long term.



## 1. TRACK YOUR TIME

Do you know how you spend your time? If not, how do you expect to get more out of it?

Track your time for a week. Your record doesn't have to be accurate to the minute, but note when you arrive at and leave work, breaks, mealtimes, family time, activities, leisure time, and so forth. Install RescueTime ([rescuetime.com](http://rescuetime.com)) if you want more detail on how you spend your computer time. It tracks which programs you use and which sites you visit, as well as how much time you spend away from the computer.

When you review your log, look for hours that you're using "poorly" (however you define it). Once you realize how you spend your hours, you can increase how much you get out of them.



**Do you know how you spend your time? If not, how do you expect to get more out of it?**



## 2. REVIEW YOUR CALENDAR AND TO-DOS FIRST THING

It's a productivity nightmare to have your whole day hijacked by a meeting you completely forgot was on the calendar. Don't let that happen. Look over your calendar and to-do list first thing every morning. It takes less than a minute, and you won't be thrown off course later. The task-management app Any.do has a setting that reminds you every morning to review your plans for the day.

**RESCUE YOUR PC TIME**  
If you have a habit of wasting time by visiting websites, RescueTime will show you a detailed breakdown of your activities so you can better adjust your online hours.

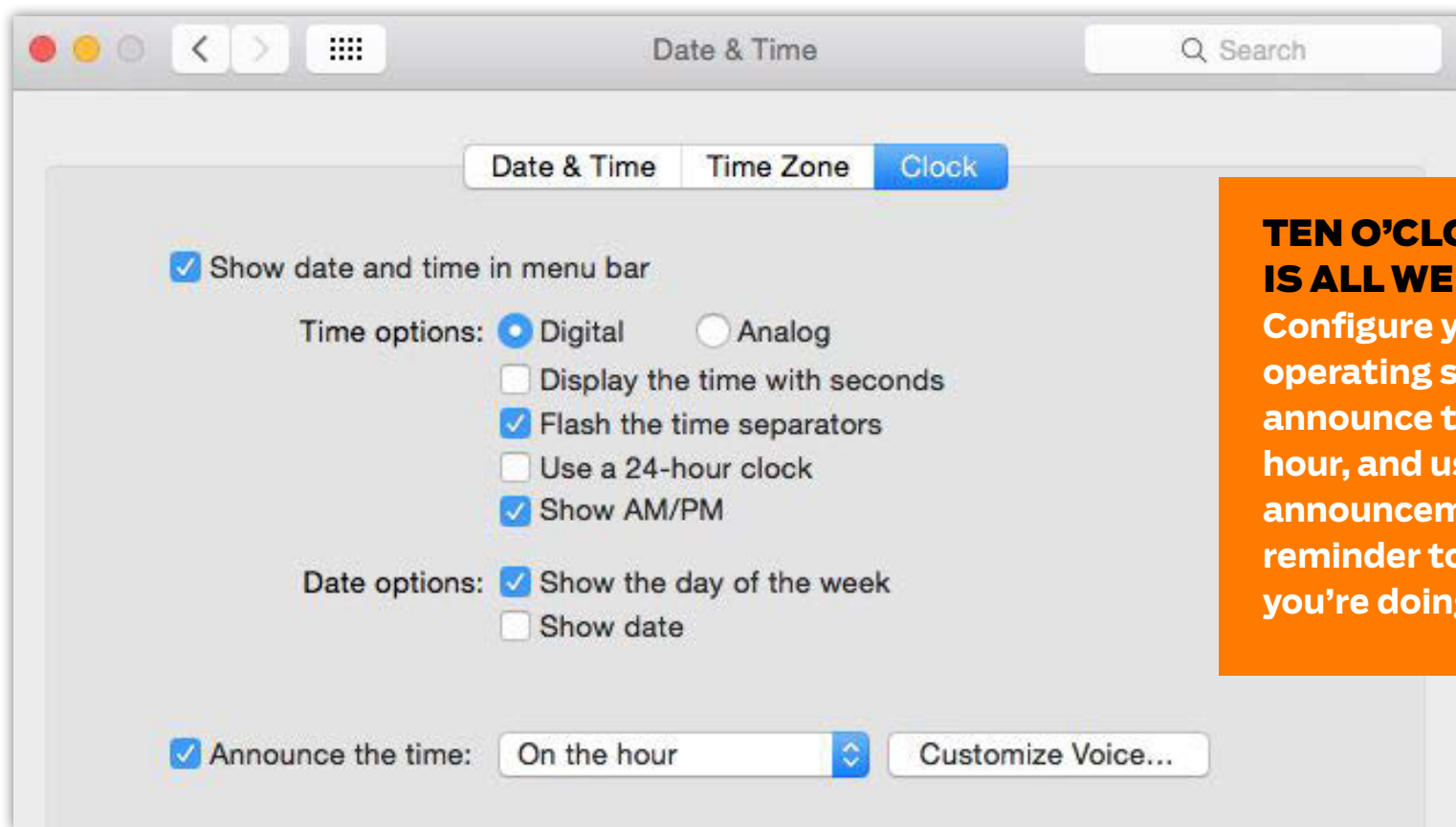
### 3. PROTECT YOUR MOST PRODUCTIVE HOURS

Ask any successful creative person how they manage to find time to write movie scripts, paint portraits, play music, or whatever endeavor they accomplish, and they'll most likely tell you the butt-in-the-chair rule: Start by putting your butt in the chair.

Of course, it's not as simple as sitting down. The timing matters, too. For most people, the most productive part of the day is in the morning, not immediately after you wake up, but usually before lunchtime. Use those hours for the work that matters most. Don't schedule meetings then. Don't check email. Don't catch up on social media. If you're a night owl, protect your late hours just the same way. Then get your butt in the chair. Don't check email. Don't catch up on social media. If you're a night owl, protect your late hours just the same way. Then get your butt in the chair.

### 4. CHECK IN EVERY HOUR

If your computer supports the feature, set its date and time preferences to announce the time on the hour. Every time it happens, check in with yourself. Are you still on task? Should you be taking a break?



#### TEN O'CLOCK: IS ALL WELL?

Configure your computer's operating system to announce the time every hour, and use the announcement as a reminder to evaluate what you're doing (or not doing).

### 5. KEEP A TO-DO LIST

Create a to-do list. Make each entry concrete and actionable. Only write down things that will be done on a specific day, not tasks that take several days to complete. When your list looks too ambitious for the current day, keep the most

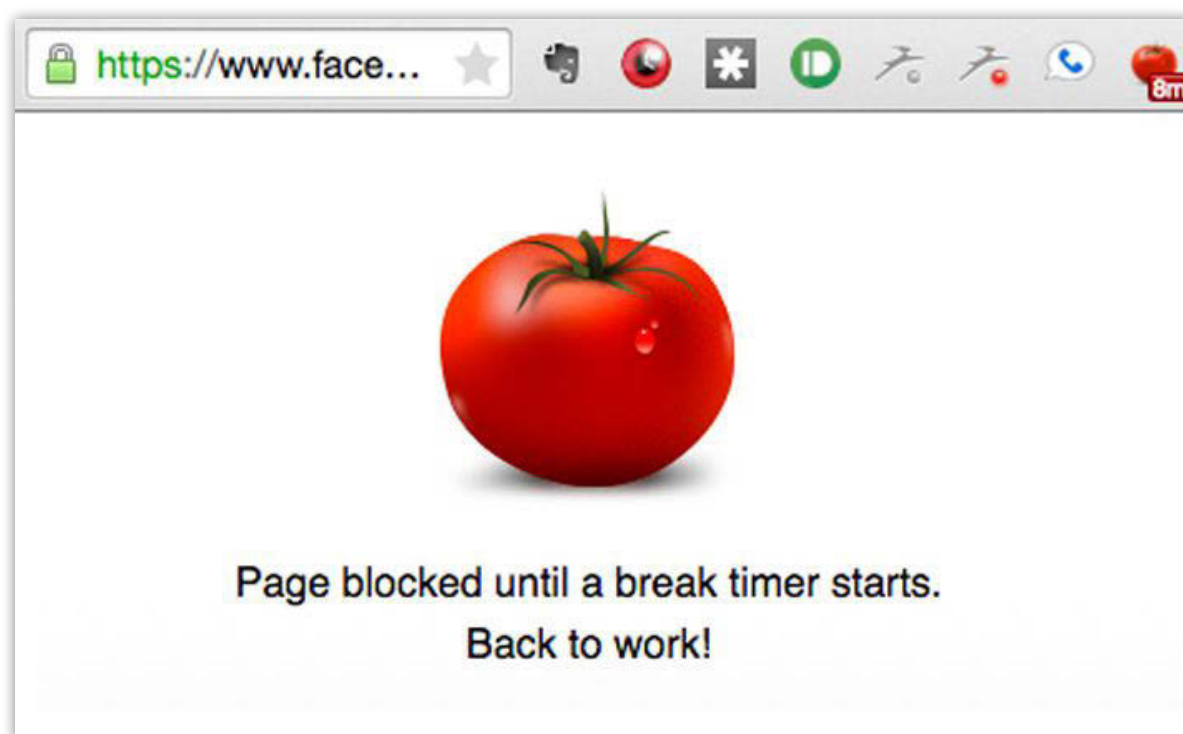


important tasks and push to other days the ones that can wait. Don't try to take on too much at once.

To-do apps are a dime a dozen, so pick one that you like. And don't be afraid to reject an app if you don't like the way it looks! Design matters. If you hate how your to-do list looks, you'll resent looking at it, and that's no good.

## 6. THINK IN TERMS OF TOMATOES

Do you remember the Pomodoro Technique? It's a productivity routine that has you work diligently and uninterrupted for about 25 minutes, then take a short break. The name comes from a kitchen timer, designed in the shape of a tomato. With this technique, you estimate how many 25-minute sessions, or "tomatoes," you need to complete a task, and then you aim to get it done with short breaks in between them.



In Chrome, Strict Workflow is the best tomato timer extension I've seen.

You can adjust the length of the work sessions and breaks. A tomato icon in the corner of your browser turns red or green depending if you're in work or break mode, and shows the remaining minutes for the current leg. Strict Workflow can also lock you out of certain distracting sites during your work phases.



**If you hate how your to-do list looks, you'll resent looking at it, and that's no good.**



### **YOU SAY TOMATO, I SAY GET TO WORK**

Apps and extensions that promote the Pomodoro Technique, like Strict Workflow (for Chrome), encourage you to supercharge your productivity by working diligently for 25 minutes and then taking a break.

## 7. LOCK YOURSELF OUT OF DISTRACTING WEBSITES

Another Chrome extension called StayFocusd prevents you from visiting distracting websites when you should be working. Unlike Strict Workflow, StayFocusd will lock you out during any times you set, such as from 9:00 a.m. to 5:00 p.m. every weekday. It can keep you from trolling Facebook or getting sucked into BuzzFeed when you need to work or study, or it can limit your Twitter usage to 30 minutes per day—whatever you want. Just tell it the domains that tempt you most, and set your schedule.

## 8. FORCE YOURSELF TO TAKE BREAKS

Never underestimate the importance of breaks. All truly productivity people know breaks are necessary to staying efficient (and optometrists certainly recommend screen breaks, too). Time Out is a free Mac app that I love. It locks you out of your entire computer at intervals you set. Windows and Linux users can try the free Workrave ([workrave.org](http://workrave.org)). A Web-based break app that emphasizes eye breaks, called PYV (for “protect your vision”), is also free.

## 9. MOVE!

Some breaks should be short so you can get back into the groove of working quickly. But at least one break a day should involve getting out of your chair and walking for a while. Researchers at Stanford University have shown that walking promotes creativity. It’s good for your health and your brain, and thus your productivity. Get in the habit of taking a long walk at lunch, or whenever it best fits into your day. Some activity trackers have move reminders that cause the band to vibrate if you’ve been idle too long. The Garmin Vivoactive and Apple Watch have this feature, as do many other trackers.



### YOU GOTTA MOVE

Activity trackers, like the Garmin Vivoactive, remind you to stand up and walk around once in a while—another important way to get more done.





## 10. REWARD YOURSELF FOR COMPLETING TASKS

Let's say you finish a task half an hour earlier than expected. The most productive thing to do would be to move quickly onto the next job, right?

Wrong. When you finish on time or early, reward yourself. Buy a coffee. Tweet your success. Doodle. Call your friend. Or just savor the moment. You have an opportunity to create a habit here of rewarding good behavior. That's positive reinforcement. You'll see better results in the long term if you reward yourself for a job well done rather than punish yourself with new work.

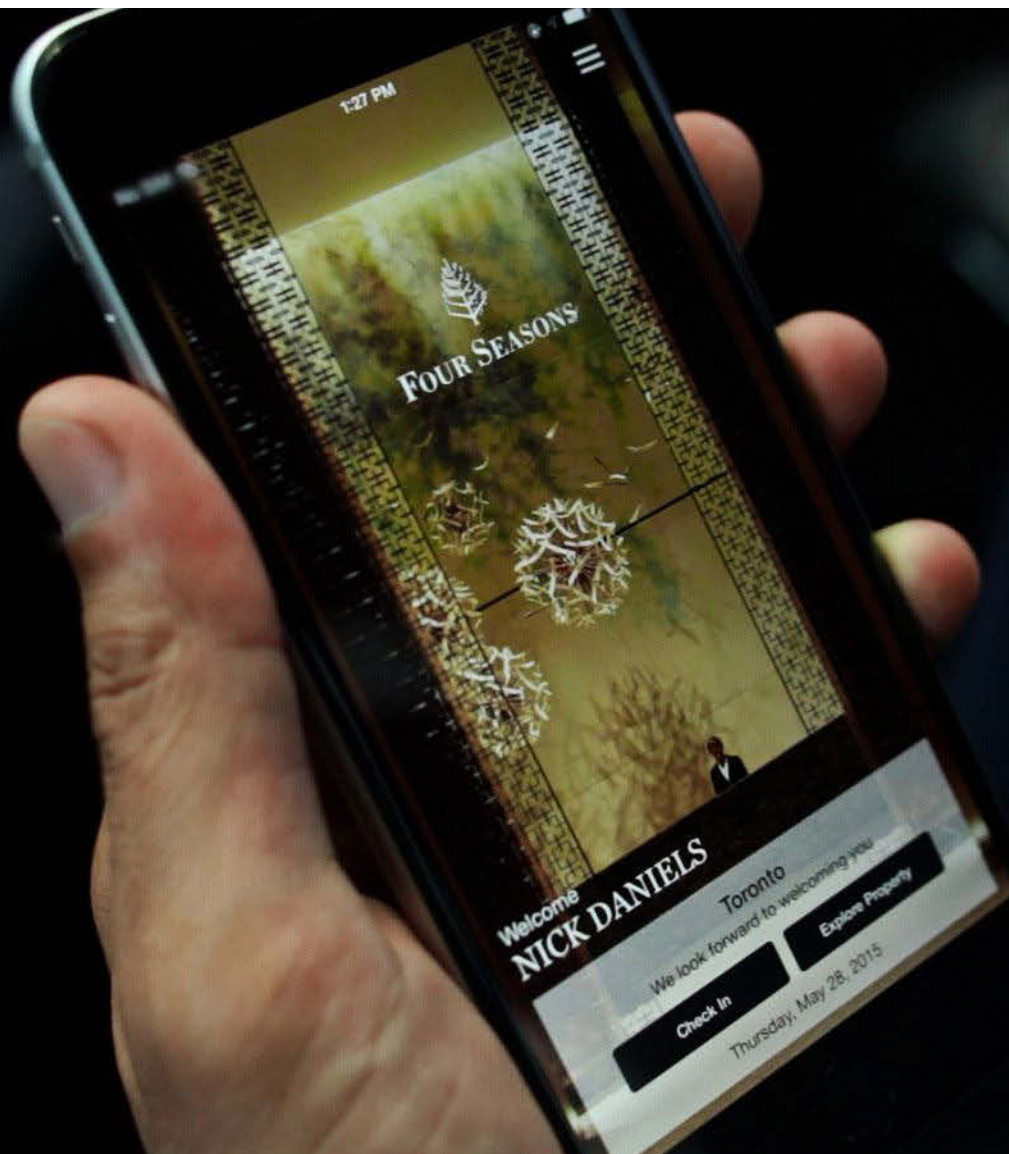
## 11. LEAVE TIME FOR SLEEPING AND SLACKING

Sleep. Sleep well. Sleep enough. No one is at their most productive or efficient when sleep-deprived.

Additionally, don't book up every moment of every day. Research (much of it explained in Sendhil Mullainathan and Eldar Shafir's book *Scarcity*) shows that when resources are depleted, your mental bandwidth takes a hit. It's true when those resources are time, money, or something else altogether. When we experience scarcity, we cease to operate at our best, and our decisions and actions suffer. So build in some slack. Give your schedule plenty of wiggle room, and leave yourself some unscheduled time to just be.

# Four Seasons Hotels Add Uber for Room Service

BY SASCHA SEGAN



**T**he Four Seasons is known for old-world service and a highly involved staff. But it's 2015. So the chain has just introduced an app that lets you order room service and make housekeeping requests without picking up that old room phone—at any of its 94 hotels worldwide. On a recent trip, I got a tour of the new app from Halla Rafati, the director of PR for Four Seasons Toronto.

The app's home screen shows your existing bookings. If you drill down to an individual hotel, you'll get shopping and entertainment tips from the concierge and staff. You can check in remotely, and if you give the app your flight details, it will keep the hotel informed if you'll be delayed. If you're checked in, you'll get



the option to order room service, ask for housekeeping or maintenance, or order amenities like extra robes and toothbrushes.

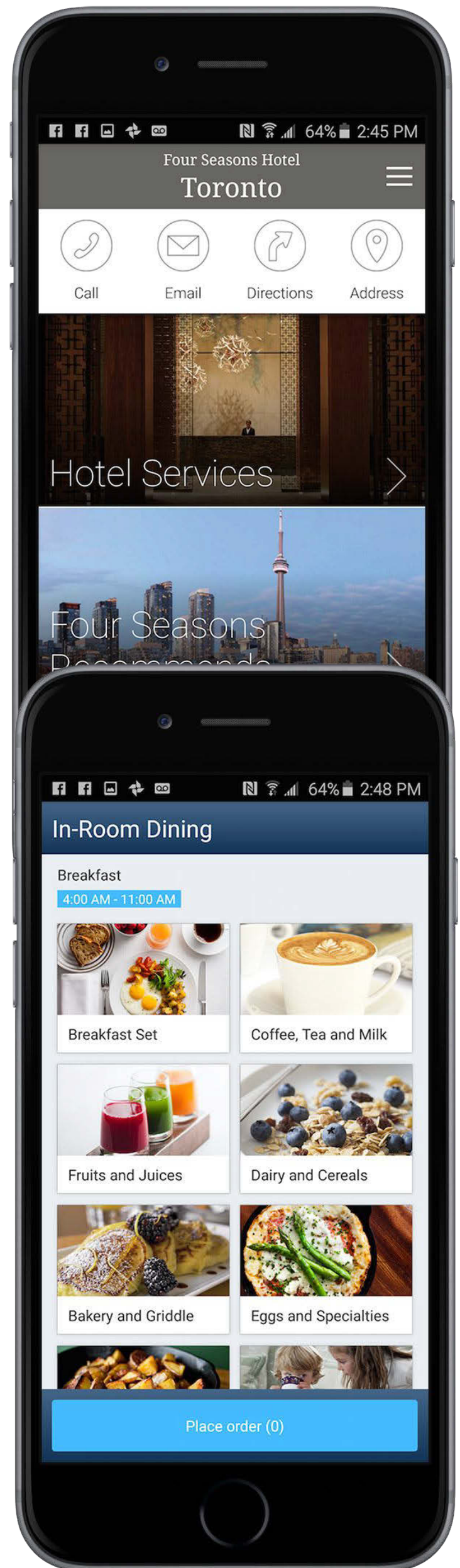
Hotel technology companies have been demoing these kinds of apps for years, but they're difficult to implement because they require a lot of changes to back-end systems, especially in older properties, Rafati said.

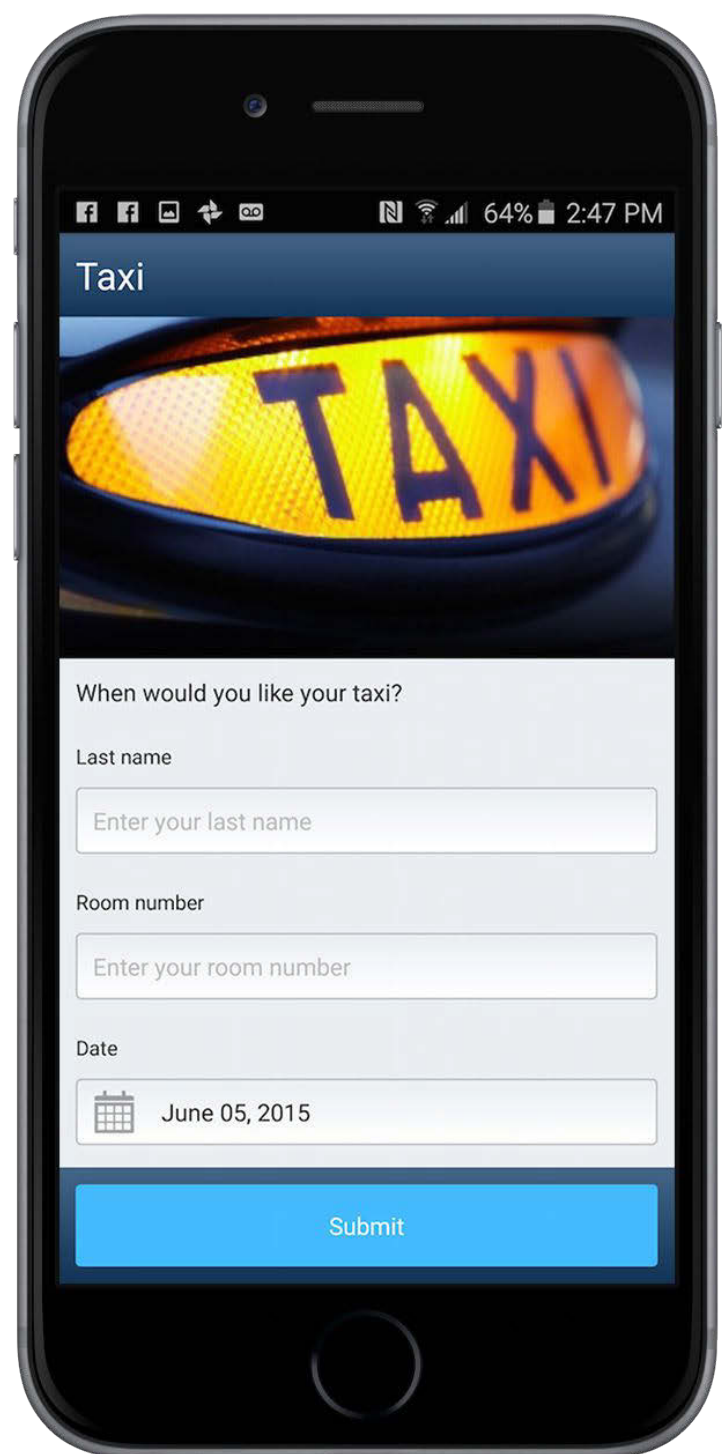
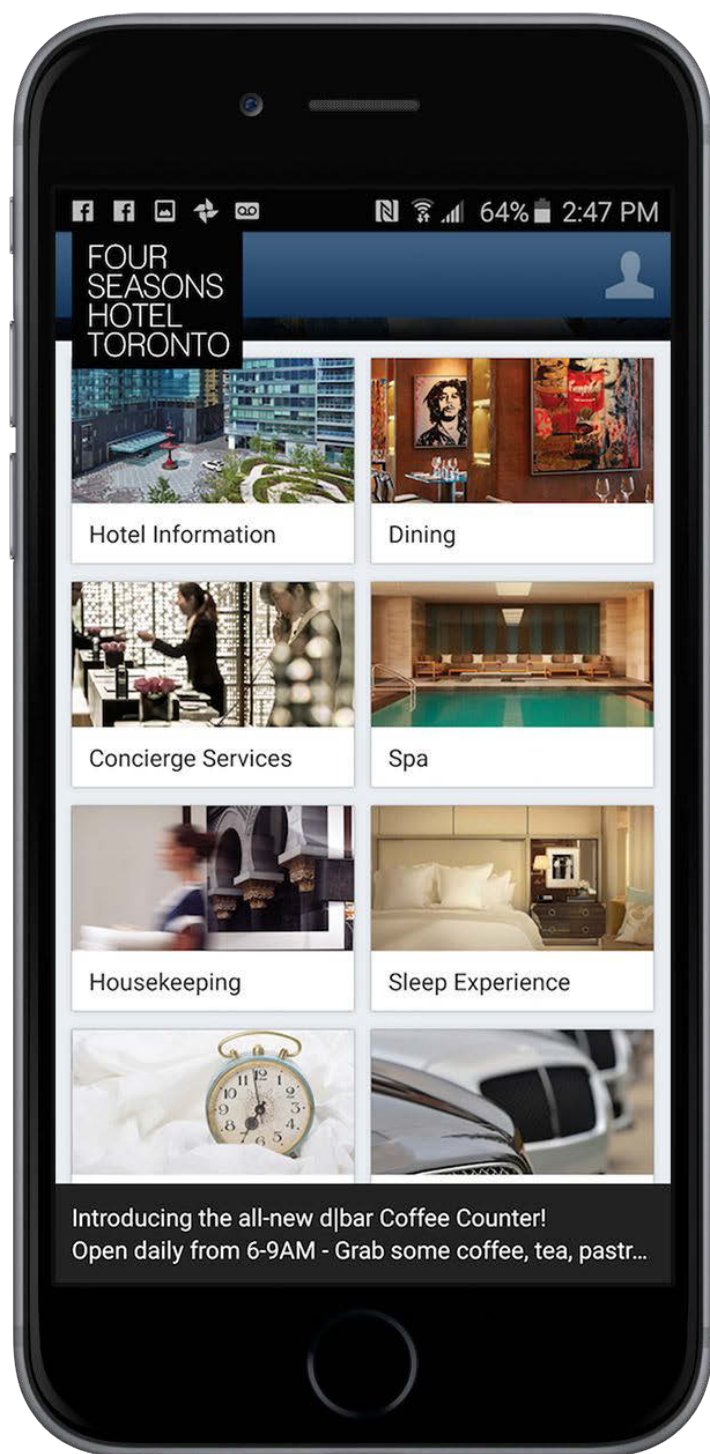
Room service, for example, is a real bear. Ordering room service from an app means the app (ideally) needs to be connected to the system that prints tickets in the kitchen and tracks whether food has been prepared and delivered. It also needs to be hooked into the hotel's billing system, so the food can be charged to your room. Many large hotel brands have IT setups that are agglomerations of different systems purchased over time, and linking them can be tricky.

Four Seasons has managed to find systems that work at all of its properties, although sometimes staff members, rather than automated systems, are doing work behind the scenes, said Four Seasons Global Senior Vice President Elizabeth Pizzinato.

It's especially impressive that Four Seasons is doing this because, as a high-end brand, its room service revenues are under less threat than those in the three-star hotels of the world. GrubHub and Seamless have been cutting into midrange room service by offering a broader range of food at lower prices, but the Four Seasons customer is less price sensitive.

About that customer: Four Seasons is treating technology a little gingerly, Rafati says, because of its unusual guest profile.





Four Seasons tends to attract an older, conservative crowd, the type of people who don't want a lot of things to change—they want to be able to get room service by picking up the hotel phone and to order pay-per-view movies from the TV.

But it's also starting to bring in the next generation of luxury travelers. Waiting for Rafati in the lobby, I overheard two bearded impresarios vigorously discuss the music festival they were organizing for later in the summer. So Four Seasons technology needs to add options for the tech-savvy without taking away any of the high-touch amenities its core clientele demands.

Four Seasons isn't the first chain to debut an app with these kinds of features, but it's the widest available: There are iOS, Google Play, and Amazon Android versions. W Hotels' similar app is only for iPhones. Conrad Hotels has a similar app, but only 28 properties. Virgin Hotels has a powerful app, but only has one hotel, in Chicago.



# The Best Free-to-Play PC Games

BY GRANT BRUNNER



**F**ree PC games used to be the realm of quirky Flash titles or weird indie projects, but the free-to-play phenomenon has really taken off in the last couple of years. Now, the \$60 AAA games that once ruled the roost are getting some real competition from titles that offer hundreds of hours of gameplay at no cost. This large selection means that there is something to fit just about any taste, though the signal-to-noise ratio is truly atrocious. As long as you select your games carefully and spend wisely, your free-to-play experience can be rosy from tip to tail. Here are the games we've found that we think you're most likely to love.





## Dota 2

Based on the popular Warcraft III mod called Defense of the Ancients (DotA), Valve's Dota 2 is a model free-to-play game. Without spending one cent, you get access to the entire gameplay experience. Of course, Valve makes a tidy profit from selling cosmetic and ancillary items. The Bellevue company is well versed in the realm of free-to-play games, so don't be surprised if you find yourself buying new loot for this "free" game once you're hooked.





## League of Legends

Like Dota 2, League of Legends is a MOBA (multiplayer online battle arena) and it's even derived from the same Warcraft III mod. But the folks at Riot Games have a very different pricing model than Valve's. You can play a select number of characters for free, but access to additional characters is going to cost you. Regardless of the value proposition compared with other MOBAs, League of Legends remains insanely popular across the globe.

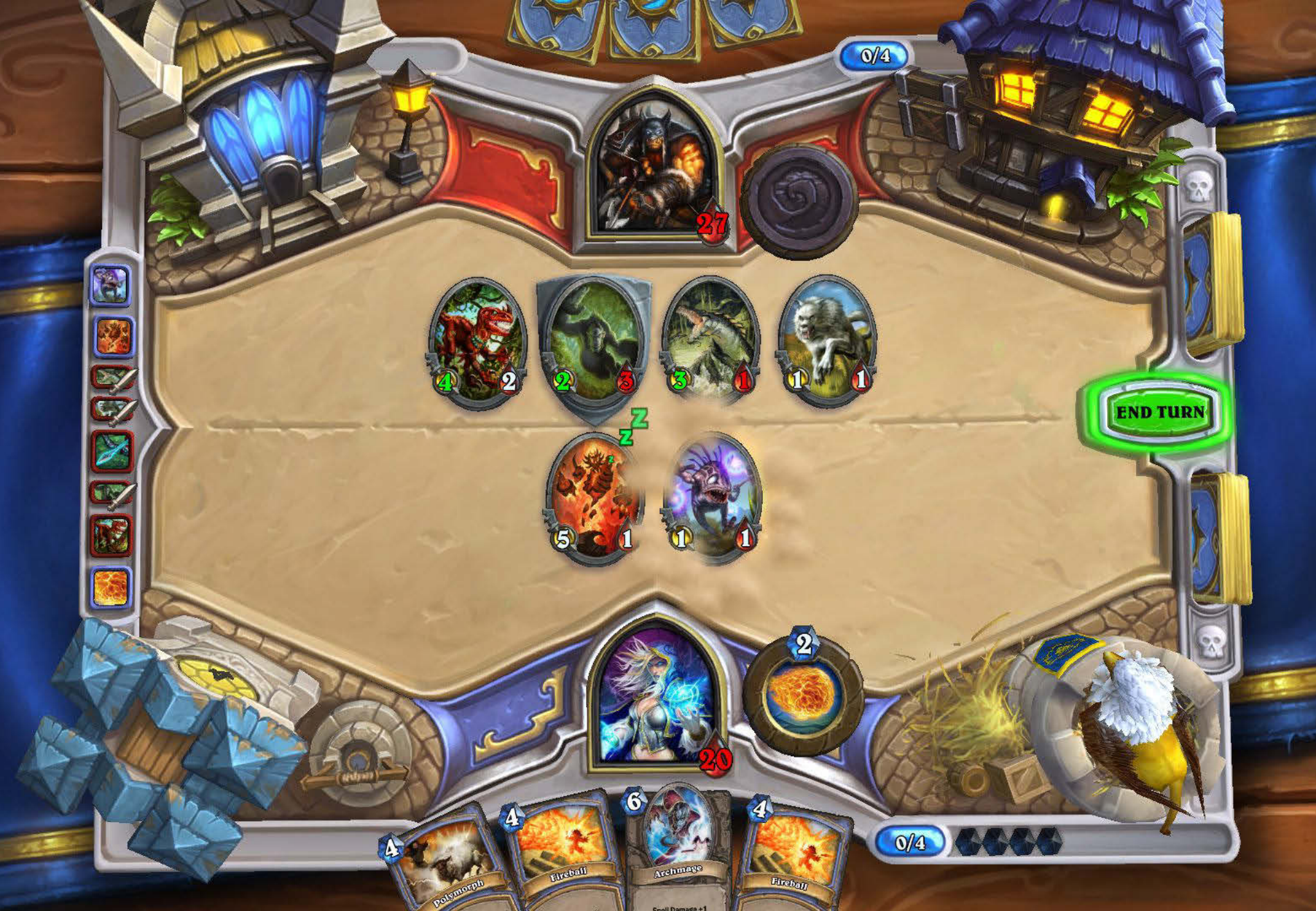




## Heroes of the Storm

As if there wasn't enough competition in the MOBA space, Blizzard has now gotten in on the action, too. Heroes of the Storm takes elements from all of Blizzard's various franchises and melds them into a single DotA-like game. This particular iteration of the MOBA concept has been lauded as more approachable than others in the genre, but because it just launched at the beginning of June, it's not quite as well fleshed out as other games of this type. If you want to pay for new heroes and skins, purchases range between \$4 and \$20.





## Hearthstone: Heroes of Warcraft

Based on the artwork and setting of Blizzard's incredibly popular Warcraft franchise, Hearthstone is a phenomenon in and of itself. This turn-based collectable card game (CCG) is hugely successful on the PC and mobile platforms, and the low barrier to entry is the reason why: All you need to join in on the fun is a free Battle.net account. As it stands, there are numerous single-player campaigns that cost \$25 each, and you can spend anywhere from \$3 to \$70 a shot on booster packs. But don't worry: If you just buckle down and play the game on a regular basis, you'll soon earn enough good cards that you won't really need to buy more to stay competitive.





## Star Wars: The Old Republic

Is all the hype surrounding *The Force Awakens* kick-starting your interest in *Star Wars*? If so, check out BioWare's *Star Wars: The Old Republic* MMORPG. All of the core story content is free-to-play, but if you're interested in even more gameplay, you can pay for expansions (\$20) and a higher tier of service (\$15 per month) that will net you more currency and more perks. This game isn't as popular as *World of Warcraft*, but it offers a lot more content before the paywall kicks in.





## Team Fortress 2

Dota 2 isn't Valve's first free-to-play game—the house that Gordon built cut its F2P teeth on Team Fortress 2. Originally released as part of a bundle called The Orange Box (which also introduced Portal), Valve made Team Fortress 2 free-to-play nearly four years after its original 2007 release. This class-based shooter is now infamous for its item-based economy, and maintains a surprisingly large user base. Give it a go, but don't let the virtual hat mafia get ahold of your Steam account.





## Path of Exile

If you liked the Diablo series, then Path of Exile will be right up your alley. At its core, this is an action RPG mashed together with a free-to-play business model. You walk around destroying everything in your wake with blades, bows, and magic—paying only for aesthetic changes and convenience upgrades as you go.





## Warframe

This sci-fi third-person shooter from Digital Extremes has a lot to offer thrifty players. You can spend dozens of hours shooting and slashing away with other players online, and you don't have to invest anything other than your time. Of course, you can spend real money on in-game currency and items, but it's definitely not necessary to have a good time. Even better, Warframe works surprisingly well on older systems, so almost anyone with a discrete video card can join in.





## Marvel Heroes

Marvel characters and loot gathering: a match made in Valhalla. Pick from a handful of free characters, and start clicking away on the hundreds of baddies that stand between you and that sweet, sweet loot. If none of the free characters strikes your fancy, you can lay down some cash for the character of your choosing (\$10 to \$50), and pick out the costume that best fits your style.





## TrackMania Nations Forever

TrackMania is a racing game designed around besting your friends on the leaderboards, and making the craziest tracks imaginable. You can play the entirety of the stadium environment for free by downloading TrackMania Nations Forever. If you enjoy yourself, you can spend \$30 to upgrade to TrackMania United Forever, which includes an additional six environments. And if you just can't get enough, you can always move on to TrackMania 2.





## Blacklight: Retribution

If you just want a good, old-fashioned multiplayer shooter, Blacklight is the game for you. Team up with friends or match up with random players for some team death match, capture the flag, or king of the hill. It's simple and fun, and you don't need the items behind the paywall (\$15 to \$40) to have a good time. The fast pace, small learning curve, and lack of an up-front cost makes this title compelling competition for the Call of Dutys of the world.





## Neverwinter

Want to get nerdy? Check out this free-to-play MMORPG based on the world of Dungeons & Dragons. Without spending a single dollar, you can play through this fantasy world with your friends and soak in the decades of lore built up around the Forgotten Realms. You need to be careful of what you buy, however, because you can easily drop \$200 on a single pack of in-game content. Still, the more reasonable \$20 packs are nothing to turn your nose up at if you're having a good time.





## Pinball Arcade

Classic arcade tables never looked so good. If you download the client for the Pinball Arcade on Steam, you get full access to the Tales of the Arabian Nights table for free. You can also try out any of the other tables at no additional cost, but you won't be able to play past the first high score. Each additional table can be purchased à la carte, or you can invest \$30 at once into an entire pack of classic tables. Whether you're a casual playing or a pinball fanatic, this freemium title is an amazing value.

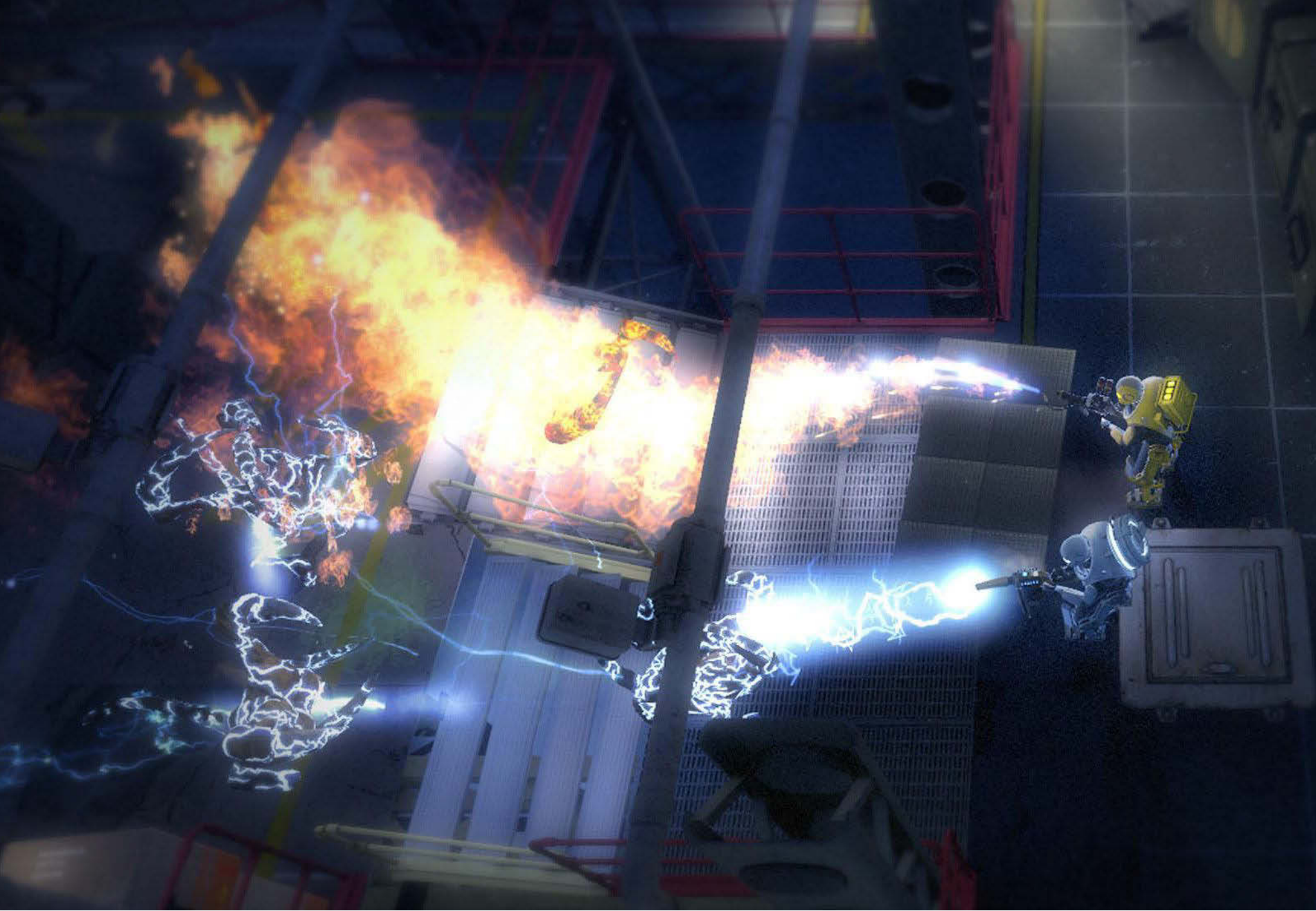




## War Thunder

War Thunder is a massively multiplayer online game set during World War II and the Korean War. Both air and ground vehicles are available for you to control, and you can fight head-to-head with players on Windows, Linux, OS X, and the PS4. Of course you can play for free, but the cash shop lets you buy vehicle packs (\$5 to \$80) and in-game currency as you see fit. If you're a history buff, this game is the perfect way to get a little taste of classic combat machines from the safety of your own desk.





## Alien Swarm

This top-down shooter developed by Valve is completely free—just download the entire game and the SDK through Steam, and play to your heart's content. Join up with three of your friends to destroy alien monsters, or crack open the game editor to make your very own environments. With four classes, eight characters, and persistent unlocks, this game will keep you busy for months. Even better, it's really free. No micropayments in sight.





## Windows 10, Looks 3

---

**Y**ears ago, there was an episode of *The Simpsons* in which Homer reunited with his long-lost half-brother, who turned out to be a billionaire magnate running a General Motors–like operation. The brother decided to let Homer design a car that would become the mainstay of the company. What did Homer come up with? A huge, ugly, gas-guzzling behemoth with fins and a sky-high price tag. It bankrupted the company.

This is what Microsoft thinks of public input regarding its products, and who can blame them? The way Microsoft executives see it, they are the experts, they have the research, and they have the testing. Outsiders and their lame ideas are not at all welcome.

This phenomenon is not new and has traditionally been referred to as the NIH syndrome: Not Invented Here. Of course, Microsoft will commonly take ideas from Apple or even Google, but generally not from the public, the critics, or even the open source community distributing through SourceForge or elsewhere. That would be admitting defeat.

Although Microsoft will deny this NIH problem, examples abound.

Most recently, Classic Shell points this out. This is a product that reintroduced the Start button and menu to Windows 8.1 and thus made the OS much more useful. Classic Shell, in fact, provides a variety of styles for the user to choose from. This sort of versatility, which Microsoft used to relish, has been frowned upon as the company has

reverted to a “we know what’s best” mentality similar to the one Apple employs.

Despite the public and the pundits carping, Microsoft ignored all the complaints, suffered the predictable backlash, and then promised to bring back the Start button in Windows 10. Then Microsoft revealed that its idea of the classic Start button was to have it open a miniature version of the Start screen, thereby missing the point of the whole thing.

It looks like Windows 10 will be a genuine upgrade to the half-baked Windows 8.1, but it will still incorporate an underlying belief that the desktop is dead as can be and we will all be using laptops, tablets, and phones for all our computing needs. (I’m probably more old-fashioned than most in this regard, and out of touch with reality, as I’m thinking about moving to four 27-inch monitors running off of my custom desktop rig in an over-and-under layout.)

Microsoft’s hype machine is pumping Windows 10 as if it’s radically different than, and solves the “problems” of, Windows 8.1. But the company has made the wise choice of shooting its publicity cannons at the mainstream media rather than the tech press, knowing the latter still has a few wizened eye-rollers who have heard it all before and aren’t afraid to say so.

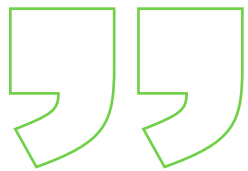
Some of this has resulted in hilarious material to mock. The good news is that the emphasis given to certain features points up the exact things that Microsoft will be pushing as important, giving us insight into what the company is thinking.

The winner in this game to date is found on CNN’s website in its tech coverage promoted under the umbrella headline “The secret behind why Windows 10 is so good,” and with a sub-feature called “10 things you will love about





**You have an entire year to upgrade to Windows 10 from Windows 7 or Windows 8.1, and it might be a good idea to wait a while—say 11 months or so.**



Windows 10.” But from the Start menu, Windows 8–derived visuals, and mildly revamped multitasking to the Edge browser, Cortana, and Continuum (basically an auto-screen-resize feature for tablets or convertibles), nothing mentioned is really new, let alone innovative.

Who knows how much of it will even work the way it’s supposed to? OneDrive doesn’t—the company still hasn’t fixed the 20,000-file limit that’s sold as either a terabyte or “unlimited” space for users of Office 365. Plus, according to Microsoft watchdogs, you may not be able to zip your files up into one archive unless they’re stored in the cloud and mirrored on your Windows 10 machine.

You have an entire year to upgrade to Windows 10 from Windows 7 or Windows 8.1, and it might be a good idea to wait a while—say, 11 months or so—for Microsoft to shake the flaws out of the OS and make it as good as it can be.

Even that probably won’t matter. After what happened with Windows 8, who can blame Microsoft for not wanting to take too many chances? They don’t want to end up with a car like the one Homer Simpson designed.

[john\\_dvorak@pcmag.com](mailto:john_dvorak@pcmag.com)

**EDITOR-IN-CHIEF, PC MAGAZINE NETWORK** Dan Costa

**CREATIVE DIRECTOR, ZIFF DAVIS** Cynthia Passanante

**MANAGING EDITOR, DIGITAL EDITIONS** Matthew Murray

**SENIOR DESIGNER** Jackie Smith

**SENIOR PRODUCER** Mark Lamorgese

## NEWS & FEATURES

**EXECUTIVE EDITOR** Chloe Albanesius

**FEATURES EDITORS** Evan Dashevsky, Eric Griffith

**SENIOR FEATURES WRITER** Chandra Steele

**REPORTERS** Stephanie Mlot, Angela Moscaritolo

## PC LABS

**EXECUTIVE EDITOR, REVIEWS** Wendy Sheehan Donnell

**MANAGING EDITORS** Sean Carroll (software, security, Internet, business, networking), Alex Colon (consumer electronics, mobile), Laarni Almendrala Ragaza (hardware)

**LEAD ANALYSTS** Michael Muchmore (software), Neil J. Rubenking (security), Joel Santo Domingo (desktops, laptops), Sascha Segan (mobile), M. David Stone (printers, scanners)

**SENIOR ANALYSTS** Jim Fisher (digital cameras), Will Greenwald (consumer electronics), Fahmida Y. Rashid (business), Jeffrey L. Wilson (software, Internet, networking)

**ANALYSTS** Max Eddy (software, Internet, networking), Tony Hoffman (printers, scanners), Eugene Kim (mobile), Brian Westover (hardware)

**JUNIOR ANALYSTS** Jordan Minor (software, Internet, networking), Timothy Torres (consumer electronics)

**INVENTORY CONTROL COORDINATOR** KT Tandler

**INTERNS** Samuel Feinburg, James L'Heureux Jr.

## ART, MEDIA & PRODUCTION

**DIRECTOR OF PRODUCT DEVELOPMENT** Sal Cangeloso

**PRODUCERS** Gina Latessa, Whitney Reynolds

**COMMERCE PRODUCER** Arielle Rochette

**DESIGNER** James Jacobsen

**PRODUCTION DESIGNER** José Ruiz

**PHOTOGRAPHER** Paul Maljak

**SENIOR VIDEO PRODUCER** Weston Almond

**INTERN** Tatiana Flowers

## CONTRIBUTING EDITORS

Tim Bajarin, John R. Delaney, Jill Duffy, John C. Dvorak, William Fenton, Tim Gideon, Bill Howard, Edward Mendelson





## ZIFF DAVIS INC.

**CHIEF EXECUTIVE OFFICER** Vivek Shah

**CHIEF OPERATING OFFICER** Steven Horowitz

**CHIEF FINANCIAL OFFICER** Brian Stewart

**CHIEF TECHNOLOGY OFFICER** Joey Fortuna

**CHIEF STRATEGY OFFICER** James Yaffe

**SENIOR VICE PRESIDENT, SALES AND MARKETING** Eric Koepele

**SENIOR VICE PRESIDENT, BUSINESS DEVELOPMENT** Anurag Harsh

**SENIOR VICE PRESIDENT AND GENERAL MANAGER, DATA SOLUTIONS** Bennett Zucker

**SENIOR VICE PRESIDENT AND GENERAL MANAGER, ACCOUNTING** Fredrick Rolff

**SENIOR VICE PRESIDENT, CONTENT** Dan Costa

**GENERAL COUNSEL** Stephen Hicks

**VICE PRESIDENTS** Frank Bilich (media sales), Lucas Deryckx (engineering), Michael Kane (product experience), James L'Heureux (ad and revenue operations), Diane Malanowski (human resources), Michael Pantoliano (business intelligence), Jennifer Riccio (FP&A), Archie Rosenblum (technology), Jason Steele (commerce), James Steven (operations), Marc Von Holzen (software development), Nathaniel Wilkins (marketing and product)

---

**THE INDEPENDENT GUIDE** *PC Magazine* is the Independent Guide to Technology. Our mission is to test and review computer- and Internet-related products and services and report fairly and objectively on the results. Our editors do not invest in firms whose products or services we review, nor do we accept travel tickets or other gifts of value from such firms. Except where noted, *PC Magazine* reviews are of products and services that are currently available. Our reviews are written without regard to advertising or business relationships with any vendor.

**HOW TO CONTACT EDITORS** We welcome comments from readers. Send your comments to [pcmag@pcmag.com](mailto:pcmag@pcmag.com) or to *PC Magazine*, 28 E. 28th St., New York, NY 10016-7940. Please include a daytime telephone number. *PC Magazine's* general number is 212-503-3500. We cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone.

**PERMISSIONS, REPRINTS, CONTENT, AND TRADEMARK RIGHTS** For permission to reuse material in this publication or to use our logo, contact us at [Brand\\_Licensing@ziffdavis.com](mailto:Brand_Licensing@ziffdavis.com), or by phone at 212-503-5263/5264. Material in this publication may not be reproduced in any form without written permission. Copyright © 2015, Ziff Davis Inc. All rights reserved. Reproduction in whole or in part without permission is prohibited.