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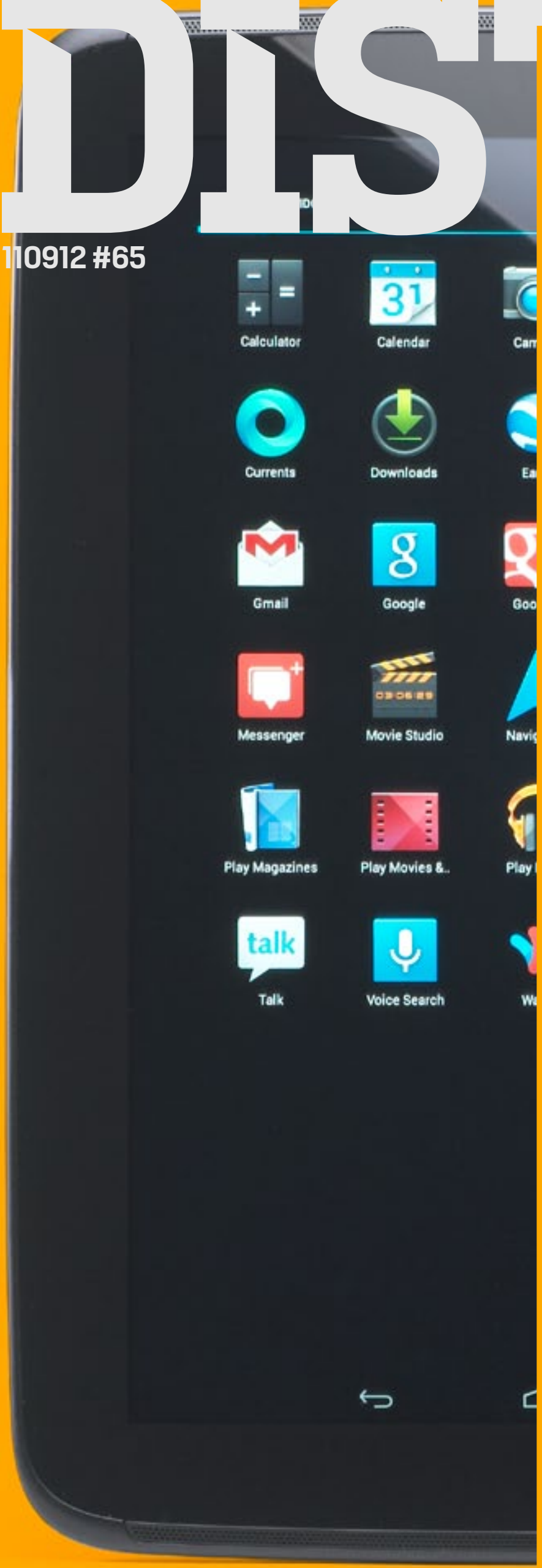
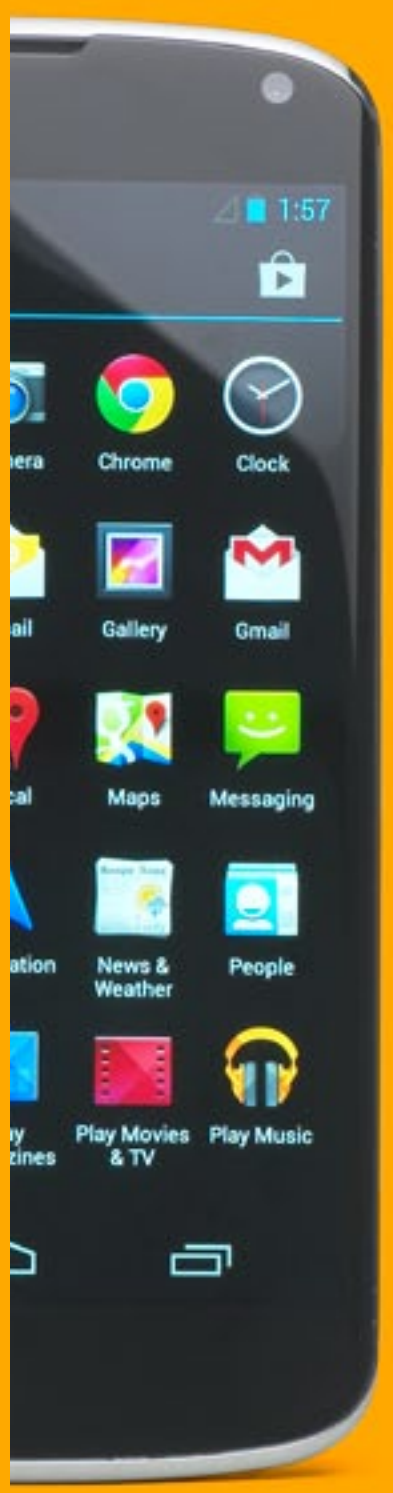


◀ Nexus 10

▼ Nexus 4



The Next Phase of Nexus

THESE ANDROID ADVOCATES PACK THE LATEST JELLY BEAN BUILD BEHIND STELLAR DISPLAYS, BUT CAN THEY LIVE UP TO THE FAMILY NAME?

LUMIA 920:

IS NOKIA SETTING THE PACE FOR WP8?

Lockheed Gives New Life to Aging Tech

INSIDE:

ROVER'S SELF-MADE SNAPSHOT

ISSUE 65

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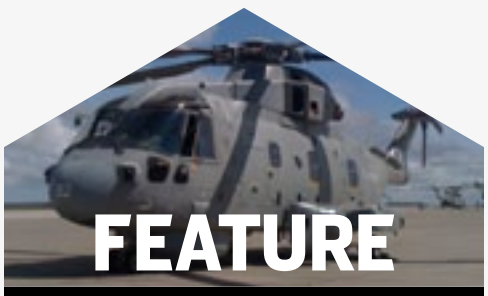

ESC

On the Cover:
Photograph
By Will Lipman for Distro

WINDOWS PHONE STAYS BUDGET-FRIENDLY

EDITOR'S LETTER

At the launches of Windows Phone 8's premier handsets, the Nokia Lumia 920 and HTC's Windows Phone 8X, just about every journalist in attendance was left thinking the same thing: those sure look nice, but how much will they cost in the US? Even when we completed our review of Nokia's option (which you'll read in this very issue) we were still in the dark but finally, *finally* AT&T and Microsoft and Nokia and HTC have managed to make all their respective accountants happy and delivered unto us a price.

And what a price! Just $99 for either the Lumia 920 or the 8X, continuing the Windows Phone trend of thoroughly undercutting the competition — a trend that we'd hoped would extend over to the Surface, too. Alas, that didn't come to pass, but if you've had your eye on Microsoft's re-reinvention of the smartphone space, you no longer have to worry about cost as a consideration.

Why so cheap, and if you're going to put such a fantastically low price why not shout it from the hills at the product launch, when it would have had the biggest impact? I have to imagine that's simply because, at the time, they didn't know what they were going to charge for the things, that the companies involved were waiting to see how the devices fared in the hands of reviewers. That the value-packed, sub-$100 level was chosen for both might just be a sign that some folks somewhere in the corporate hierarchy are still uncomfortable with the ability of those handsets, and their ecosystem, to stand toe to toe with devices like Apple's iPhone 5 and Samsung's Galaxy S III.

So, they're cheap. For $99.99 you get a 32GB Lumia 920 in your choice of colors and even a free wireless charging plate. Even off-contract, the price on the 920 is very fair at $450 and, should you desire something a bit simpler — and smaller — the 820 is available on-contract for $50. The 8X, meanwhile, isn't quite as good a deal with just 8GB of storage and only available in blue or yellow. Those wanting additional colors and more storage will need to pay $200 for the 16GB.

But that's not all HTC has to offer. The company has invited us to an NYC launch of a new device, in partnership

EDITOR'S LETTER

with Verizon. Nobody's talking about exactly what that device will be, but we have a sneaking suspicion it's the new DNA, an Android-powered device that, like the Note, straddles the line between phone and tablet. Doesn't look like there's room for a stylus, but we think it will be a 1.5GHz quad-core device with a 5-inch LCD packing an amazing 1080p resolution.

Meanwhile, Samsung's Galaxy S III is well and truly out there in the market and doing very, very well. We knew that already but a recent report from Strategy Analytics shows it's doing better than many would have expected — better even than the iPhone 4S. The GS III was the top-selling smartphone worldwide in Q3 of this year, trumping what was Apple's strongest device. Of course, everyone knew there was a new iPhone on the way and so surely those numbers were affected by folks waiting. Indeed, we fully expect the tables to turn once again as soon as we get the Q4 sales results.

We don't have sales figures comparing Amazon's Kindle Fire tablets to Barnes & Noble's Nook offerings, but if we had to guess, we'd say flames trump corners in this contest. Both companies just refreshed their lineups with HD models, but B&N seems to be struggling to clean out its warehouses of the older Nook Tablet and Nook Color. So, another price drop — with the 8GB Tablet going to $159 and the Color going to just $139. Very fair prices for some very hackable slates.

Finally, Nintendo's Wii U is just a little over a week away from release, believe it or not, and while the relative lack of fanfare as we get closer to its launch is troubling, a sign perhaps that Nintendo's latest isn't all it needs to be, we were still quite excited to get our review unit this week. Naturally there's plenty of testing ahead of us before we'll file our full opinion on the thing, but I for one am a bit disappointed to see the removal of the GameCube controller ports. The WaveBird is still my preferred weapon in *Super Smash Bros.*

In this week's Distro, we have our comprehensive review of the Lumia 920, in which we find its camera is great — but perhaps not quite as great as we'd hoped. We also have my review of Google's next reference tablet, the Nexus 10, and Brad Molen's take on their next reference phone, the Nexus 4. If you're not into reviews, Dan Cooper has an amazing piece on how Lockheed is bringing tomorrow's tech to today's tanks and aircraft. We also have a new IRL, a high-res self-portrait of Curiosity and a Q&A session with M.C. Schmidt, half of the electronic duo Matmos. It is indeed a plethora of amazing content, and it's just a few taps away. D

TIM STEVENS
EDITOR-IN-CHIEF,
ENGADGET

MINI DECISIONS, WP8 FLAVORS AND MOBILE COUPLING

Touch article names to read full threads

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11.09.12

INBOX

IPAD MINI
ISSUE 64,
NOVEMBER 2ND, 2012

"The iPad Mini at the end of the day is a good device. At the same time the Nexus 7 is a great device too. For those always talking specs, has Apple ever been about the hard specs? No, they focus on the core user experience and that's what most people want. I'm not a fan; I was one of those people who never believed it'd actually exist till it was announced. And yes the price is high, but the truth is, Apple products are usually known to be "premium" and you'll always pay more for them. Certain people will, others won't. It's all up to the person and if they feel it's worth it. Its all a mater of opinion at the end."

—SCARBOY6693

PADFONE 2
ISSUE 64,
NOVEMBER 2ND, 2012

"Good quality pictures/ video and near stock Android. Please release in US."

—KTRONICS_

"Having a smartphone and a separate tablet, I can definitely see where having it all in one would be a big advantage. Just leave the pad (let's just call it a dock for the phone) at home, and when you get home just plug the phone in and now have a bigger screen and speakers for your phone! This would be great for my games that I only play on my tablet because saves aren't synced between devices."

—CHARLESXAVIER

"I really like this form factor idea merging the phone with the tablet. I would really love to hear a rumor that ASUS or Nokia were doing this for Windows. I wouldn't even mind if ASUS did it, but I'd prefer Nokia do it. Or Microsoft Surface phone… with a Surface tablet dock that has a kickstand and keyboard cover… that would be sick. I'm pretty sure that's why they are making RT for the future Windows Phones. Who knows…"

—RJMLIVE

HTC 8X
ISSUE 64,
NOVEMBER 2ND, 2012

"Top camera, best looking smartphone, top notch screen... I really want this over the 920, but the 16GB memory is just too small.
Give me 32 and I'm sold. Otherwise I guess it's the 920 with its worse camera (maybe only temporary but there are no guarantees the software update will make it better than this)."

—TOPOK

"I can actually see the 8X being more popular in the US than the Lumia 920. I like its design and compactness, and the colors are bolder and deeper.
I'll still be grabbing the 920 because of the advancements in tech, but the price point of the 8X mixed with the design and colors will appeal more to the average consumer
I think."

—TIMOTIM19

WINDOWS 8
ISSUE 64,
NOVEMBER 2ND, 2012

"I upgraded on day one, and so far love it.

There are a few small items I'd like to see improved in the future (more Metro app details/options, easier Metro multi-apps on a single screen support, charm customization, etc.), but so far good improvements in all areas.

There really isn't much of a learning curve to W8, you'll be surprised how easy it is to work with."

—ENZOMATRIX

"No Start button, no buy!!"

—DANTRUON

"When Apple brings out a new feature, everyone loves it because Apple users love new stuff. When Microsoft brings out something genuinely new and innovative, everyone gets cross because it's not what they're used to. Different markets. I hope it works out for them."

—SUPERLUMINARY

ENTER

EYES-ON

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11.09.12

LANGLY CAMERA BAGS

Tap for detail

DUAL THREAT

UNIFORM ORGANIZATION

LAPTOP STOWAGE

WWII-STYLE RUCKSACKS FOR THE DAYTRIPPER

New backpacks arrive on the regular, but few offer up the attention to detail and vintage design elements that are tucked into Langly camera bags. Created by a photographer, this pair is meant to store everything one would need for a shoot — camera gear, clothes and a laptop — without being overly bulky or cumbersome.

THE DAMAGE: $200

PHOTOGRAPHS BY WILL LIPMAN

NIKON D5200

The trusty D5100 and D7000 have held sway over Nikon's low-to-mid DSLR range for around 18 months now, but come December there'll be a new option driving a wedge right between them. The D5200 will still fulfill the role of a lightweight "advanced beginner" model and physically it's the spitting image of the D5100, but at the same time it brings some fundamental and distinctly D7000-like photographic improvements to try to excuse its £720 (body only) recommended retail price. This equates to around $1,150, but Nikon tells us that there's no official US pricing or arrival date at this time.

The D5200 offers a 39-point AF system for smarter focusing and tracking of moving subjects (compared to the 11-point module on the D5100), a 2,016-pixel RGB metering sensor (whereas the D5100 judged exposure based on just 420 pixels), and a new Expeed 3 processor that permits up to five shots per second (versus the older camera's 4 fps). There's also a brand new main image sensor: a DX-format chip that is the same size as the D5100's and yet somehow squeezes in 8 million more pixels, bringing the effective resolution to 24.1 megapixels. Need more convincing? The camera also has a slightly simpler-looking UI, a stereo internal mic, more choice of H.264 frame rates up to 60 frames per second (in 1080i), and compatibility with Nikon's admittedly flaky WU-1a wireless adapter.

Click on product names to read full stories

PRICE:
£720 / €899 (BODY ONLY)

AVAILABILITY:
DECEMBER 2012

THE BREAKDOWN:
NIKON'S NEW SHOOTER BRIDGES THE DIVIDE BETWEEN THE D5100 AND D7000, ALBEIT WITH A HEFTY PRICE TAG.

Click on product names to read full stories

TIMBUK2 POWER COMMUTE

If you're like us, every one of your mobile devices could use a performance boost in one crucial area: battery life. Timbuk2 saw the exigency to keep phones, tablets, PMPs and cameras juiced up, and aims to meet that need with the Power Commute messenger bag announced earlier this year. The Power Commute sports a form factor that's familiar to any Timbuk2 fan, as it's essentially a Commute Laptop TSA-Friendly messenger bag with myriad internal options for the wares you find yourself lugging around on the daily.

Of course, the main appeal of the Power Commute lies in its waterproof Joey T1 power supply, which Timbuk2 claims can recharge most phones twice. You can use your phone's charger to juice up the unit via micro-USB. The Joey outputs electricity through a standard USB 2.0 port, and charging starts when you plug in any device — the Joey's onboard circuitry handles the rest. In our brief testing, we found that the Joey's 13Wh cell could only recharge our Galaxy Nexus a bit more than one and a half times. That's less than promised, but more than enough to get us through a day at even the most hectic trade show. Because it's a 5V unit pushing a single amp of power, it's not the speediest of charging methods, but it'll keep you powered on until you can find an outlet.

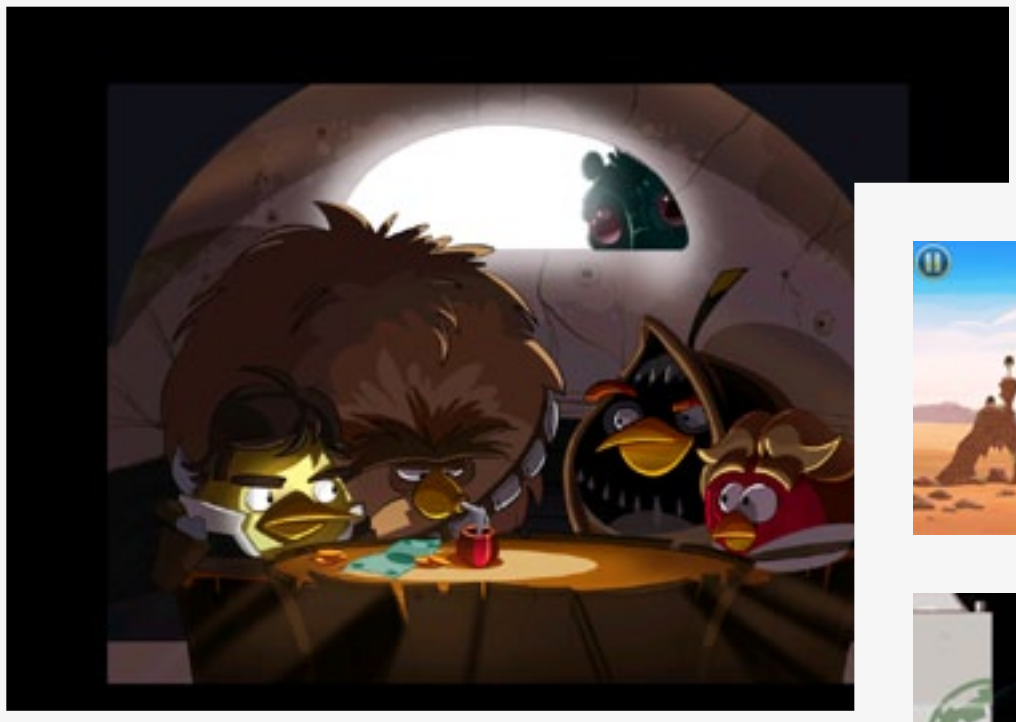
PRICE: $199

AVAILABILITY:
NOW AVAILABLE

THE BREAKDOWN:
IT'LL TAKE A FEW MINUTES TO CHARGE YOUR GADGETS, BUT THE POWER COMMUTE KEEPS THOSE BATTERIES OUT OF THE RED.

Click on product names to read full stories

ANGRY BIRDS STAR WARS



Finland's biggest game studio is heading back into the coop, pulling out its *Angry Birds* franchise for yet another go on a whole mess of platforms — this time, even Windows 8 and its mobile counterpart get some attention. Moreover, Rovio's teamed with the folks at LucasArts (now part of the Disney family) to craft an entirely thematic experience: enter *Angry Birds Star Wars*. But fret not — just because *Angry Birds Star Wars* seems like a shameless tie-in doesn't mean it's a bad game (it is, however, a shameless tie-in, no matter which way you cut it). In fact, it's quite good, melding pieces of *Angry Birds Space* — arguably the best and most creative entry in the Angry Birds franchise — with new gameplay elements. Rather than birds which explode or other such modifiers post-fling, *Angry Birds Star Wars* equips each of several themed birds with one weapon apiece. An Obi-Wan Kenobi-themed bird uses The Force to push enemies or blocks, while a Han Solo-themed bird fires three blasts from a space pistol, just to name a few.

That *Angry Birds Space* component is little more than gravity effects, but it helps to mix up the often redundant level design — if you've played more than one *Angry Birds* game, you've seen most of what's on offer here. That isn't necessarily a bad thing, per se, but be forewarned if you're expecting the kind of innovation we saw from Rovio's last Angry Birds spinoff, *Bad Piggies*. *Angry Birds Star Wars* is now available on iOS ($0.99 / iPhone, $2.99 / iPad), Android (Free SD version, HD is $2.99), Amazon Kindle Fire, Mac ($4.99), PC, Windows Phone ($0.99), and Windows 8 ($4.99). D

PRICE: $0.99-$4.99

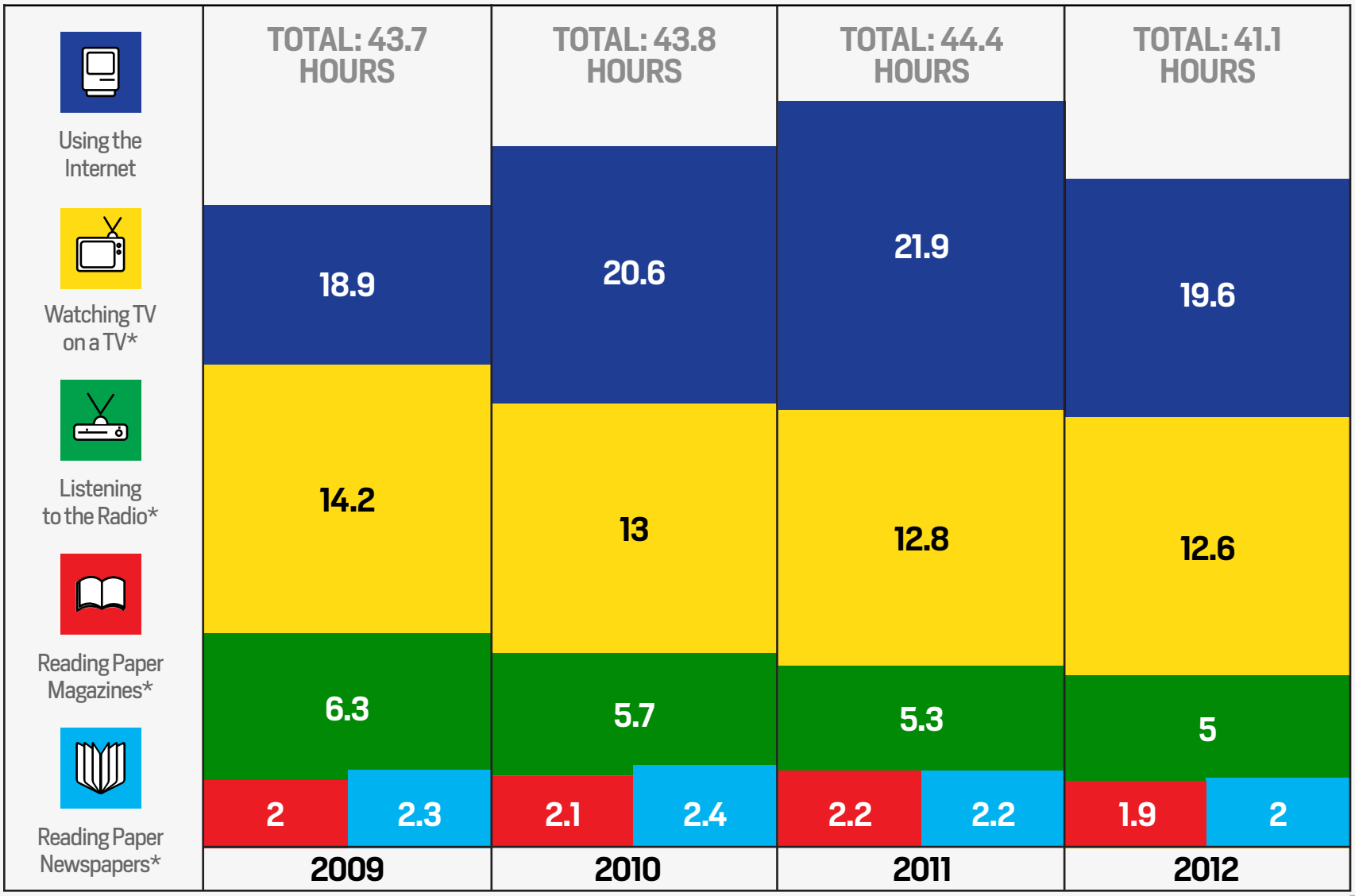
AVAILABILITY: NOW AVAILABLE

THE BREAKDOWN: THE LATEST TITLE FROM ROVIO COMBINES THE BEST PARTS OF *ANGRY BIRDS SPACE* WITH OBI-WAN AND THE FORCE.

Constantly Connected

A survey measuring people's internet habits used to be a fairly simple thing. If you dialed up and logged onto CompuServe or AOL, you were "online" until you disconnected. Even in more recent years, you were "online" for as long as you were looking at a web browser or a chat window. But things have gotten more complicated as we've grown more mobile and connected than ever. That's now resulted in the first-ever decline in people "using the internet" in Forrester's annual survey. As *AllThingsD* reports, this year's survey found that people spent an average of 19.6 hours per week using the internet, compared to 21.9 hours in 2011. According to Forrester's Gina Sverdlov, however, that's not due to a shift back towards watching television or other activities, but to a changing notion of what "being online" means to individuals. As she puts it, "given the various types of connected devices that US consumers own, many people are connected and logged on (automatically) at all times," and that "the internet has become such a normal part of their lives that consumers don't register that they are using the internet when they're on Facebook, for example." — *Don Melanson*

HOURS OF MEDIA INTERACTION IN A TYPICAL WEEK — U.S. ADULTS (18+)



SOURCE: "UNDERSTANDING THE CHANGING NEEDS OF US ONLINE CONSUMERS, 2012," FORRESTER RESEARCH, INC.

*Not Online

RECOMMENDED READING

PHOTOGRAPH COURTESY OF ERIC CARL – FLICKR

OMNI Magazine

The Internet Archive

The thing with magazines that are fondly remembered is that they're often just that: remembered more than they are read. You may be able to track down the odd issue on eBay or at a used bookstore, or find some articles republished online, but building a complete library is generally a pricey and time-consuming proposition. That's been changing, though, with the likes of Google Books and The Internet Archive making a number of magazine archives freely available online — and a few months ago, the latter added one particularly influential and well-remembered title. First published in 1978, *OMNI* blended science, technology and science fiction, attracting everyone from Harlan Ellison and William Gibson to Freeman Dyson and Ted Nelson as contributors or interview subjects. Some of the issues scans may leave a bit to be desired, but they're all certainly readable, and available in a variety of formats (including PDF, ePub, Kindle and plain text). Also included are the magazine's "Best of" issues, which are a great place to start whether you're familiar with the magazine or not. We'd recommend freeing some space up on your device before diving in.

Click on headlines to read full stories

Past is Prototype: The Evolution of the Computer Keyboard
By Caleb Garling
Computerworld
In some ways, the computer keyboard hasn't changed all that much over the past few decades — it still generally resembles a traditional typewriter, after all — but there have been some fairly big changes beneath the surface. Caleb Garling traces those in this piece for *Computerworld*, while also looking at some of the bigger changes that could be in store for the future.

Going Boldly: Behind the Scenes at NASA's Hallowed Mission Control Center
By Lee Hutchinson
Ars Technica
There's been no shortage of articles on NASA in light of the shuttle's retirement, but this piece from *Ars Technica* goes a step further back than that, taking an in-depth look at the mission control center that made the missions to the moon possible. It's also aided by a tour from retired flight controller Sy Liebergot who, among other things, helped guide Apollo 13 safely back to Earth.

Elon Musk's Mission to Mars
By Chris Anderson
Wired
From a milestone in space exploration's past to what is now, one big, clear component of its future: privately funded spaceflight. In this interview for *Wired*, Chris Anderson talks to SpaceX founder Elon Musk about his recent successes and challenges, and his even bigger plans for the future, including his ultimate goal of sending humans to Mars.

THE TIME IS RIGHT FOR XBOX SURFACE

DISTRO 11.09.12 | FORUM | SWITCHED ON

BY ROSS RUBIN

RUMORS HAVE SWIRLED that Microsoft is developing a high-powered 7-inch gaming tablet dubbed Xbox Surface, the Reese's Peanut Butter Cup of Microsoft's homegrown hardware brands. Such a move would change the landscape of Microsoft's Xbox and portable game initiatives. It would mark a reversal for the company, which has stayed out of the increasingly challenging handheld space in favor of promoting Windows Phone as part of its ecosystem battle. However, it would be in keeping with Steve Ballmer's promise (or is it OEM warning?) to expect more hardware from Microsoft. As the tablet was partly Apple's answer to the netbook, it could also be Microsoft's answer to the PlayStation Vita.

In terms of OEM conflict, there would be even less to ruffle the feathers of the likes of Acer as no Windows vendors have broached the 7-inch tablet market (with good reason given the current focus on a PC-like experience). If, as reports have indicated, the device is ARM-based, it would likely end up being a Windows RT tablet. Building the device on Windows RT would imbue the tablet with a strong technical foundation and set up distribution via the

> “Unlike the Nintendo 3DS and PlayStation Vita, the Xbox Surface would, like most tablets, straddle home and mobile use.”

Microsoft app store. This would continue the industry transition from physical product to digital distribution advanced by the imminent Nintendo Wii U.

It’s a subtle point, but while we tend to lump the smartphone gaming and tablet gaming phenomena together, in part because of Apple’s strong position in both markets, they are really different beasts and increasingly will be used in different ways. This will remain true even if we see a strong behavioral uptick in consumers sending smartphone games up to their televisions via technologies such as MHL or AirPlay (which the Xbox Surface, like the first Surface, will no doubt be able to do). Tablet games, as the heir to PC games, are more graphically impressive and immersive; they will come to walk the fine line between casual and hardcore games that even the home consoles must navigate these days.

Unlike the Nintendo 3DS and PlayStation Vita, which must compete for pocket space with ever more powerful and larger smartphones, the Xbox Surface would, like most tablets, straddle home and mobile use. The looming question is whether it would expand the portable gaming category or sell to a subset of Xbox users. In addition to all the technology assets and game business experience Microsoft would bring to an Xbox Surface tablet, it has earned a flag-bearer position in button-free gaming in the console world (albeit with dramatically different mechanics) with Kinect and has a growing app library to make a handheld gaming tablet a robust competitor against the Kindle Fires and iPad minis. In fact, in pushing average prices of small tablets up with its iPad mini, Apple would be doing Microsoft a favor in establishing a benchmark for premium smaller tablets.

It’s not about graphics, which are rapidly improving across all tablets as CPUs and GPUs and hybrids of the two continue their relentless improvements in power and efficiency. If Microsoft can strike the right balance between engagement and complexity with Xbox Surface, it has a real opportunity to establish a step-up device that appeals to mobile gamers that want a console-quality experience with established franchises in any room of the house as well as thousands of miles away from it. D

REVIEW

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Nokia
Lumia 920

Google
Nexus 4

Google
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REVIEW

NOKIA LUMIA 920

Nokia's flagship Windows Phone 8 handset packs some innovative technology, but is the Lumia 920 setting the pace or just headed in the right direction?

By Mat Smith

It's been almost a year day since we reviewed Nokia's first Windows Phone and now we're staring at its second-generation flagship, the Lumia 920. Since the Lumia 800, Nokia's taken a pretty big role in improving Windows Phone's standing in a crowded (but lucrative) smartphone battlefield. While it may be sharing the spotlight with the new HTC 8X, this slab of hewn polycarbonate has garnered plenty of admirers. No doubt, a large chunk of those would-be phone buyers are, for better and worse, lusting after the phone's PureView imaging tech

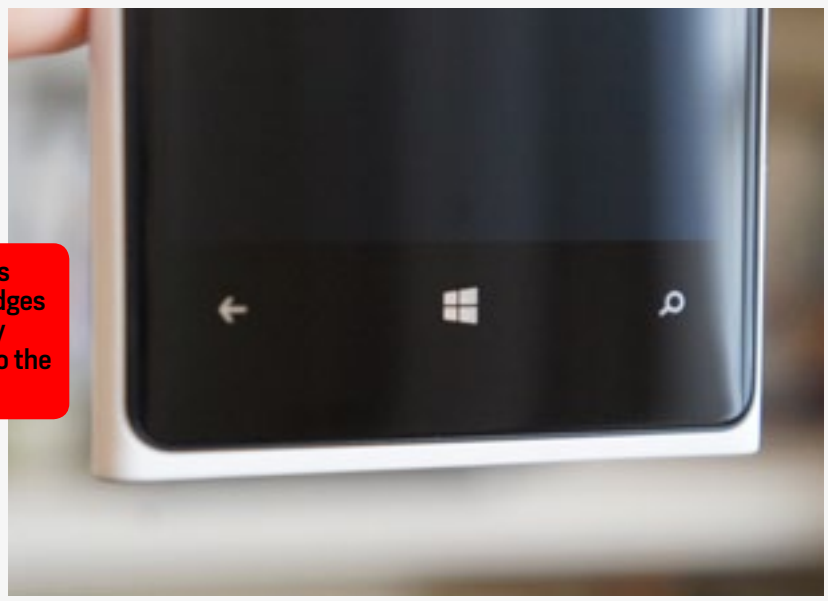
— and after our early tests, it looks like it could be just as impressive as the lossless optical zoom seen on the PureView 808.

The Lumia 920 dominated Nokia's presentation at Microsoft's Windows Phone 8 press event a few months ago, with the smaller Lumia 820 barely getting a look-in. It's got a "better-than-HD" 1,280 x 768, 4.5-inch high-contrast IPS display, built-in contactless charging, solid build quality and more of Nokia's exclusive software additions. This time, at least on hardware specifications, the company aims to put its flagship on equal footing with the likes of the Galaxy S III and the iPhone 5. Can Nokia's biggest and (literally) brightest smartphone maintain its place at top of the Windows Phone pile? How does that camera fare with extended use? And will the Lumia 920 offer enough to pull you away from Android or iOS for your next phone?

HARDWARE

We'll be frank: Nokia has crafted one substantial smartphone. After experiencing the curves and lightness of HTC's Windows Phone 8X (4.5 ounces), the Lumia 920 makes the scales tremble at 6.5 ounces. While other phone makers are pushing the limits of lightweight materials and structures, this beast is noticeably heavier and *feels* bigger in comparison to almost every other recent phone. Granted, Nokia's Windows Phone flagship has a larger 4.5-inch screen, but that incremental difference (HTC's display is 4.3 inches wide) doesn't completely explain how different the two Windows Phones feel in-hand. Measuring the pair, the Lumia 920 is 0.42 inch thick to the 8X's 0.4 inch. Their footprints are also comparable. But the 8X's tapered edges felt more at home in our hands than this new Lumia. That said, our hands were able to reach the outer edges of that PureMotion HD+ screen. What's more, despite that larger screen size, one-handed navigation is quite possible, though it might be a stretch for smaller hands.

Thankfully, Nokia has carried across several design licks from the Lumia 800 and avoids one of the hardware design complaints we had with its bigger brother. Yep, this particular phone's screen curves *into* the frame and doesn't awkwardly protrude like the one found on the Lumia 900. Our white model — unfortunately those eye-catching yellow and red models weren't available for review just yet — has a



The 920's screen edges smoothly taper into the frame.

Micro-drilled speaker holes round out the finely crafted design.

glossy (but fingerprint- and smudge-prone) coating, but if you're looking for another matte-finish smartphone, thankfully the black AT&T LTE version has a matte finish.

However, it's nonetheless another beautifully crafted smartphone from the Nokia design team, with tiny details like micro-drilled holes in the base for the pair of loudspeakers reminding you that this is a company that knows how to make desirable hardware — even if the final product is a bit weighty. The rounded sides and that slightly curved back make this phone easier to grip than its predecessors. This time around, there's also a darker finish on both the rear camera unit and the physical buttons lined up on the right edge (these are actually ceramic and according to Nokia, will be less prone to scratches), while the flash is the only other detail on the otherwise smoothly curved back. Along the flat top edge, you'll find the pin-accessible micro-SIM slot (no nano-SIM just yet), some tiny perforations that connect to the secondary mic and headphone socket, while the lower edge offers immediate access to the micro-USB port and those two speakers.

Around front, the 920's 4.5-inch screen is underlined with a slightly thick bezel that houses the capacitive Windows button trio. These all light up and, as we'll also cover in the display section, they all work through your winter gloves or freshly manicured nails. Along the top of the screen, Nokia branding has this time been ushered to the right corner, with the earpiece housed above the center of the screen. Both the ambient light sensor and a front-facing 1.2-megapixel camera take their place between the two. Underneath the screen, Nokia has installed Qi contactless charging for the phone's 2,000mAh battery. Our review model arrived with a contactless charging pad to test it out with, and it works exactly how it should, resting the majority of the phone on top of the pad will start it charging immediately, if slowly. The non-removable battery is tasked with powering a dual-core Snapdragon S4, alongside 1GB of RAM and a generous 32GB of storage. Microsoft's also throwing in 7GB of cloud storage for any new SkyDrive accounts and though it's quite possible you're already grandfathered into 25GB, there's no microSD slot for expanding the physical memory.

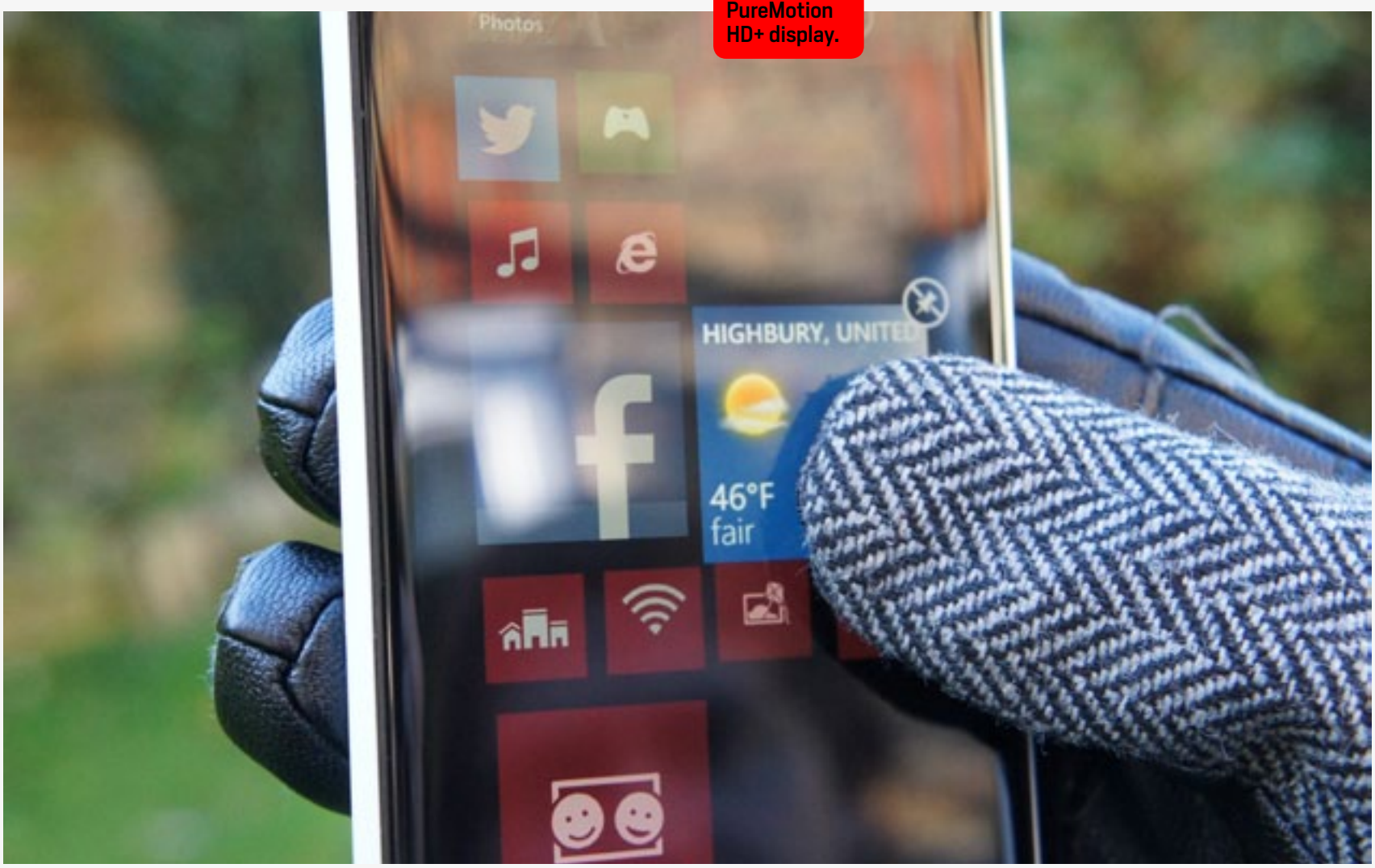
As is to be expected, our global model crams in quad-band radios with GSM

/ GPRS / EDGE (850 / 900 / 1800 / 1900MHz), UMTS / HSPA+ (850 / 900 / 1900 / 2100MHz) and LTE (800 / 900 / 1800 / 2100 / 2600MHz) bands, while the device will launch exclusively on AT&T in the US, and only on (for now) EE in the UK — the country's first 4G network. And if there's no 4G near you yet? Well DC-HSPA+ (42Mbps) is also crammed inside that polycarbonate shell.

DISPLAY

The Lumia 920's screen packs so much new stuff from Nokia that they even wrote their own white paper on what's going on behind that sliver of curved glass. The 4.5-inch, 1,280 x 768 enhanced IPS screen is titled PureMotion HD+, and while the 332ppi means Windows Phone 8 looks crisp and images are superbly showcased, new technology here also improves the screen's transition response. While typical IPS LCDs have an average pixel transition time of 23ms, the Lumia 920 apparently trounces it with an average of 9ms. Can you tell the difference in real life? Well, barely — we noticed reduced blur as we poked around the UI and swung the camera around. It's unlikely to be immediately noticeable to new smartphone users, but we can't fault Nokia for trying to push the envelope.

Conversely, the Lumia 920's outdoor performance is a true selling point. While the Lumia 900 was no slouch in outdoor performance, the Windows Phone 8 se-



The sleek 4.5-inch, 1,280 x 768 PureMotion HD+ display.

quel boosts contrast, brightness and color composition, meaning photos and websites are noticeably clearer — and games and apps are easier to pilot under bright lights. Nokia has also improved its ambient light sensor, and we found the screen not only adjusted faster to lighting changes, but noticeably cranked up both color and contrast settings to improve viewing depending on whatever environment we were in. While November isn't the best time to test a phone's screen against full sunlight, we had no problems with the screen outdoors or under harsh show floor spotlights. These winter months, however, did prove ideal for steering the Synaptics-powered capacitive screen while wearing gloves, and the phone performed just as well as it did when it was first unveiled. The surface even picks up nails and some pens — something we had no fear of testing ourselves thanks to the protection offered by a coating of Gorilla Glass.

CAMERA

Where to start? Reading down the Lumia 920's spec sheet, there's plenty to get us excited: an 8-megapixel backside-illuminated sensor paired with an f/2.0 autofocus Carl Zeiss lens, the return of Nokia's PureView branding, the promise of superb low-light performance, 1080p video capture, and (on both stills and video) optical image stabilization — the first floating lens and sensor in a phone that will ignore minor trembles while letting in more light. So after all that build up, does the Lumia 920 live up to that PureView appellation? Well, that's a little harder to say.

Firstly, Nokia seems to be a bit limited as to how much it can bring to Windows Phone 8's camera UI. Load up the camera app (or hold the physical camera button) and you'll be greeted with a familiar camera interface — it's simple, but a little sparse. Sure, compared to all the tweaks and options available to 808 PureView users, this might disappoint, but given that we were supremely impressed by that Symbian device's shots on *auto*, we weren't all that worried. Nokia's tried to amend this to some extent by adding its extra functionality through Windows Phone 8's Lens system. Both from the Windows Phone marketplace (and from Nokia's own collection) you can install panorama functions, burst shot and even a GIF maker; these apps can be accessed both from the phone's program list and the arrow icon inside the camera UI.

We got to work shooting samples and seeing how the Lumia 920 stacked up against both its PureView predecessor and current smartphone heavyweights. Throughout the course of our testing, we put Nokia's new Windows Phone against a number of other capable cameraphones, including the 808 PureView, the HTC One X+, Apple iPhone 5, Samsung Galaxy S II and Galaxy Note II and the LG Optimus G. We came in to these testing scenarios with exceedingly high expectations, and in

The camera packs an 8-megapixel sensor and f/2.0 lens.

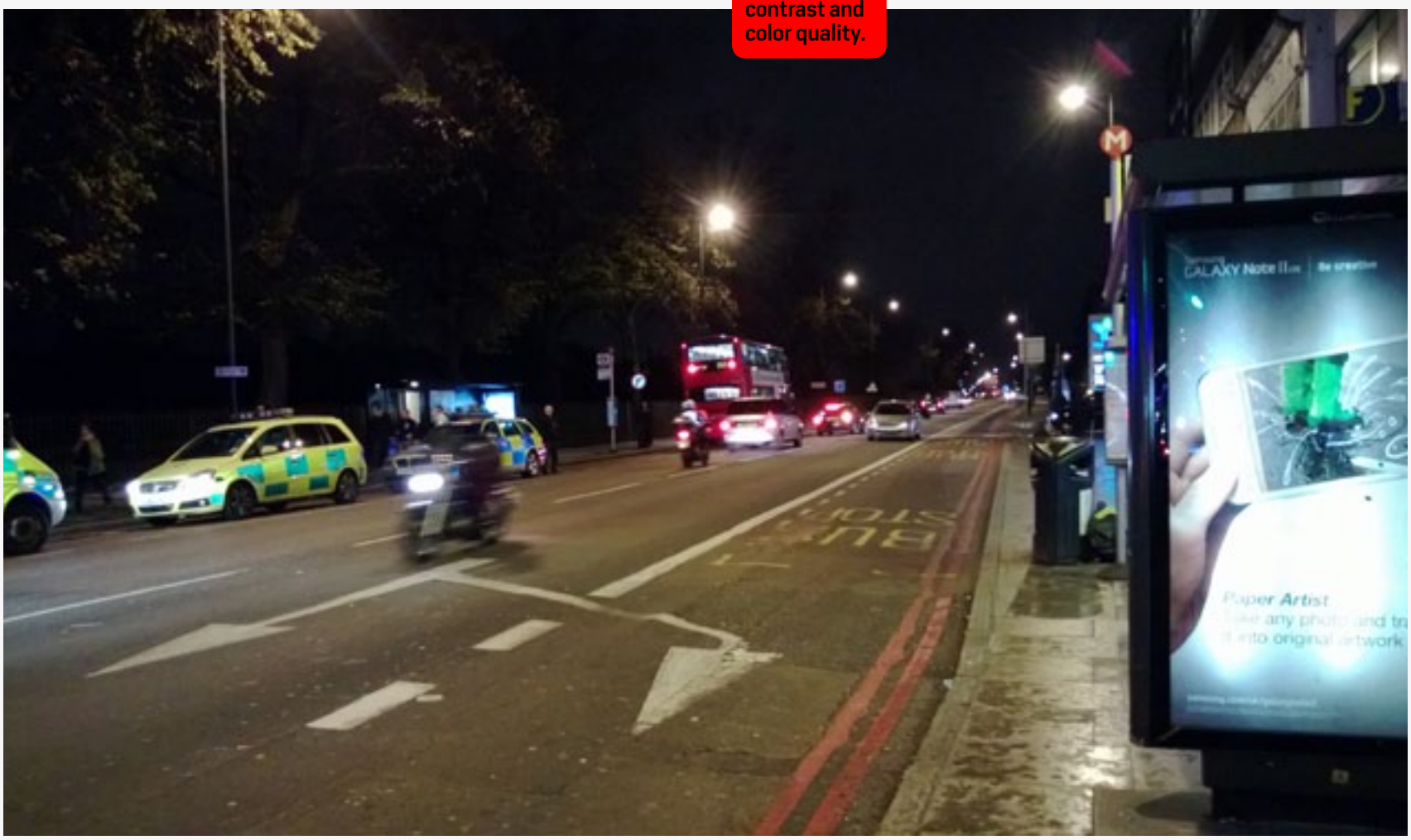
the extremely low-light situations, where most phones fall flat on their face, the Lumia 920 indeed hit its stride. Yes, there was often some ISO noise to be seen and the results weren't always spectacular, but the 920's low-light shots were *always* the best of the bunch. Images were blur-free and reasonably clear, a definite improvement from the frequent messy quality induced by longer shutter times in the other cameras. Everything from contrast to color reproduction in low-light imagery was truly superior in the 920 to any other shooter we sampled it against, living up to Nokia's claims on that front.

Unfortunately, the same can't be said for daytime photography. Here the tables were often turned, with the 920 frequently producing shots that were subtly soft. Different situations showed the problem more than others, but it was consistent across all shot types, whether macro or focusing on subjects farther away. We made doubly sure the lens was smudge-free and tested on four separate 920s to be sure, but on each we saw the same symptoms. It's as if the lens mechanism isn't quite focusing correctly. We spoke with Nokia at length about this and were told it's at least in part thanks to some pending software tweaks to increase sharpness — but that doesn't explain why we didn't see any such aberrations when we visited Finland to test a 920 last month. This softness often resulted in some excess fuzziness in low-light too, but we found we could compensate by lowering the exposure settings to -1/3 or -2/3.

That's not to say the daytime images looked bad, necessarily — in fact they generally looked reasonably good. But in this case, the Lumia 920 failed to consistently deliver images that beat the rest. In fact, it was often the 920 that ranked mid-pack compared to the heavy-hitters we listed earlier. Another minor complaint was the white balance, often off in cloudy conditions outdoors (the 808 PureView had similar issues with fluorescents indoors), and leaving some of our shots with a yellowish tinge — the manual settings did remedy this, however.

We look forward to testing the revised software on the device to see if it improves things, and we genuinely hope it does, but for now 920 shoppers may be forced to choose whether high-quality photography in the dark is truly enough to make up for occasionally middling performance when the sun is out. It's worth reiterating that the smartphone's image stabilization is a marvel, rescuing some shots we thought would be a blurry mess. It's another example of genuine innovation coming from Nokia — but it's not quite there yet.

We also found that the Lumia had difficulty metering the scenes we presented. We often had to decide between capturing a detailed skyline or a well-lit subject. An HDR mode certainly wouldn't go amiss. Admittedly, the low-light performance, as we'd already teased, beat everything else outright, but that performance has somehow cost your well-lit images a degree of detail you might not want to give up. Noise artifacts are low (again, especially in low light) and file



Low-light shots have superior contrast and color quality.

sizes suggest that Nokia hasn't compressed much away. But we can't fight our disappointment with these results; after all that fanfare, the all-around imaging performance still leaves something to be desired.

In better news, video capture is crisp and amazingly stable — thanks to that OIS. Walking with the phone introduces minimal stutter — especially compared to what we're used to on other smartphones, while autofocus is able to latch on to points of interest quickly. You'll make the prettiest video clips you've ever seen on a smartphone, all lacking any motion sickness-inducing shuttering. In our testing the phone often produced some slightly muted colors in our videos — though we reckon this was still an accurate representation of the scene. Similarly, sometimes the auto-white balance would change in the middle of filming, meaning our videos would occasionally jump from warm yellows to cool blues and greens; something that would certainly benefit from some software adjustments.

SOFTWARE

We'll leave the finer details of Windows Phone 8 to our in-depth review, but it's worth touching on how WP8 fares on the new Lumia. The slightly more customizable Live Tiles give you something to mess around with as soon as you switch it on — and they still feel fresh, if only incrementally different from what we became accustomed to with Windows Phone 7. Covering some familiar software highlights; Nokia Maps is a superb app and free turn-by-turn navigation is hard to sniff at. Also, Internet Explorer 10 is swift, and looks sharp on the Lumia 920's high-response PureMotion display.

The Live Tiles are a common-sense setup and are easy to understand and adjust, while everything is largely organized in a sensible way. However, plenty of issues still remain; the lengthy refresh time for social apps like Twitter and Facebook, lightweight Google integration (which is admittedly better than what Microsoft's mobile OS offered in the past), and the jarring gap in app selection. While Microsoft was quick to claim it's catching up, the new iteration (at the time of this review) oddly lacks

The familiar yet customizable grid of WP8's Live Tiles.

Spotify, already out on Windows Phone 7, while the likes of Dropbox, Instagram and Flipboard still remain absent.

The gaming selection, despite the Xbox Live connection, seems littered with titles of yesteryear and doesn't give mobile gamers enough to pull them away from the rich delights of both iOS and Android. Xbox SmartGlass replaces the My Xbox Live app, handing you another way to interact with your console. The full version requires an Xbox Live subscription (and a capable broadband connection), and throws up some touchscreen controls that map to controller buttons along with a content browser. SmartGlass-compatible content is signposted with its own icon, although unfortunately not all of it (notably Xbox Video) has been switched live just yet.

We were able to connect to Netflix, but again, this requires a subscription. The contents don't appear to be fully fleshed-out yet — presumably more contents will go live when the devices hit stores and while a keyboard is available when you browse through the phone, some parts of the Xbox UI still require typing through the UI — and controller. We'd love to see further (possibly in-game) integration using Windows Phone as Microsoft continues to flesh out the feature — because at the moment, there's not much here for us to do. We'll stick with the controller.

While our ecosystem complaints remain, Nokia has continued to offer its own "hero" apps, and even improved some of them in the process. Nokia Music continues to expand its music offering, despite obvious competition. The app itself now

The 920 comes with the Xbox SmartGlass application.

supports Dolby sound and has its own built-in seven-channel equalizer, while the gig finder feature now taps into location data for search results. The app will even spin out navigation results and the ability to buy tickets for your show of choice — as long as they're still available. While anyone who's already signed up to Spotify, (or Pandora) will likely ignore the function, Mix radio still offers a raft of free (mainstream and not) music to stream and download, with the ability to take several playlists offline for use anywhere.

Unsurprisingly, Nokia's included plenty of additional camera and imaging apps, ranging from the reality-augmenting City Lens, which was more than capable of leading us to the nearest cafe or pub across London, to the GIF-crafting skills of Cinegraphics. However, that last one feels like it isn't quite ready for public use just yet. After recording a brief clip, you can then select areas of the image to keep animated, while pausing the rest. This file can then be shared as a GIF file — well, at least through a convoluted upload to SkyDrive.

We were unable to get our animated pictures to send through email, Twitter or Facebook without the files being automatically converted to JPEG. In the end, the SkyDrive option does give you the animation, and even the chance to embed into your own blog, but it's a convoluted workflow for what could be a fun little extra. You'll also need a SkyDrive account just to see your uploaded pictures. Yep, Microsoft's cloud storage, while stitched into the very seams of WP8 is often rather unintuitive, especially when it comes to transferring pre-existing images to our phone. We just wanted to make the most of those photo tiles, but we found both the web and mobile side to the cloud storage system unclear and frustrating.

PERFORMANCE AND BATTERY LIFE

Alongside that newer software comes fresher hardware — and the arrival of dual cores on Windows Phone. The Lumia 920 packs a 1.5GHz Snapdragon S4 processor, meaning it's more than capable of breezing through transitions, content-dense websites and the current crop of available games. We've tested the phone on WPBench and AnTuTu, both Windows Phone 7 benchmarking apps that aren't calibrated for the latest version just yet. However, results line up with the HTC 8X and yet another impressive SunSpider score that's been borne out in our real-life experience with the handset; the device is more than capable of rendering the desktop versions of sites — something that the big screen is also well-suited to.

It's also worth considering that the Lumia 920 has both a larger and slightly higher-resolution display than HTC's device, meaning the internals are being taxed a little more. Its battery, at least, is more substantial, at 2,000mAh, and in WPBench's CPU-taxing battery test (which is based on Windows Phone 7), we reached 2:36, incrementally more than the 8X. In typical use, the phone

BENCHMARK	NOKIA LUMIA 920	HTC WINDOWS PHONE 8X	NOKIA LUMIA 900	NOKIA LUMIA 800
WPBENCH	**227**	221	92	86
BATTERY RUNDOWN	2:36	2:30	**4:29**	2:40
SUNSPIDER 0.9.1 (MS)	**914**	**914**	6,902	7,200
ANTUTU (*GFX TEST OFF)	10,957*	**11,775**	2,596	2,398

SUNSPIDER: LOWER SCORES ARE BETTER

was more than able to keep up with a day's regular use, although we found that increased outdoor use (and thus a brighter screen) did make noticeable dents in the battery life. Using the Lumia 920's contactless charger was a bit slower than simply plugging it in, but that's what you pay for convenience. We're just glad to see the charging function arrive without a clunky case ruining a phone's design.

WRAP-UP

Nokia arguably offered up the best hardware for the last iteration of Windows Phone. Does it repeat that success here? Yes, but it ties with the HTC 8X for that honor. The Lumia 920 feels substantially

Innovative and elegant, the 920 proves to be a solid device.

chunkier, despite having similar by-the-number dimensions, but it remains another glorious piece of hardware from Nokia. That large shell has afforded more space for the latest PureView camera, which delivers superb low-light performance and effective optical stabilization across stills and video. While these features worked as well as we'd hoped, well-lit shots lacked the clarity and detail we saw during earlier test sessions. Overall, results were a little too smoothed out (and many smartphones have a tendency to over-sharpen), and fell short of our expectations for Nokia's latest PureView phone.

All your incredible shots of that great night out will also be tinged by SkyDrive frustrations and limited ways to share them — something that Microsoft's mobile OS is going to have to deal with if they really want to become the third choice in smartphone operating systems. Meanwhile, alongside its imaging advances, Nokia has pushed forward on its screen hardware, besting the outdoor visibility of the Lumia 900 and adding color and contrast tweaks from a new ambient light sensor — this is all on a capacitive touchscreen you can now handle with gloves on. Nokia may crown it the most innovative smartphone, and alongside embedded wireless charging, there's plenty here to demonstrate that. But, for all that Windows Phone 8 does right (superb maps, zippy browser, simplicity), those holes in the app selection remain something that needs to be plugged. D

Myriam Joire and Tim Stevens contributed to this report.

Mat is an Associate European Editor who lives in the UK. He's a Liverpool supporter who enjoys obscure Japanese game shows.

BOTTOMLINE

NOKIA LUMIA 920

£445

PROS

- Rich display
- Smooth video capture
- Best-in-class low-light camera performance

CONS

- Some softness in photos
- Device feels unwieldy
- App selection still lacking
- Sluggish refresh on social networks

BOTTOMLINE

It's Nokia's greatest Windows Phone yet. The Lumia 920 packs a superb screen with great visibility and sensitivity, but the camera gives a mixed performance.

REVIEW

GOOGLE NEXUS 4

It's an affordable and tasty bit of tech, but does Google's new Nexus 4 have the speed and power to take a top spot?

By Brad Molen

Movie sequels often don't live up to the hype of the original blockbuster, but the same isn't always true of smartphones — on the contrary, they typically get even better. The Nexus lineup, initially thought of as a "playground" for Android developers to test their apps on, has continually gotten better at its craft (and popularity). Not only that, it's picking up momentum: in less than five months, Google has crafted two Nexus tablets as well as its latest and greatest smartphone known as the Nexus 4, and the attractively priced devices are now facing more

interest than they ever have before.

The Nexus 4 is a veritable dreamboat when it comes to looks and specs. It's a smooth, elegant-looking device that comes with a large, 4.7-inch, HD display, a 1.5GHz quad-core Snapdragon S4 Pro processor and plenty of other appealing components. It exhibits a lot of commonalities to LG's current flagship, the Optimus G. And for a starting price of $299 unlocked, it's sure to attract a whole new demographic that until recently had never even heard of a Nexus. But is this a flagship smartphone that everyone will want to buy, or should the fourth-generation offering just be another target of developers' envy? Stay tuned to find out.

HARDWARE

The Nexus line has always been a solid indicator of the state of the smartphone industry. While these phones aren't guaranteed to have the absolute best components available, they're still highly competitive and, in recent times, have offered some of the best value, dollar for dollar. This leaves us even more impressed, then, that the LG-made Nexus 4 has been endowed with state-of-the-art silicon and is backed up by some of the best components on the market.

Once it's available, Google's newest Android smartphone flagship will be one of the most exquisite devices you can buy. In many respects, it's the love-child of a Samsung Galaxy Nexus and an LG Optimus G: it features the sleek curves of its predecessor along the edges, along with a unibody back cover and scratch-resistant glass. At 4.9 ounces (139g) and 0.36 inch (9.1mm), it's slightly lighter and thicker than the Optimus G (5.2 ounces and 0.33 inch, respectively), but the difference in these two areas doesn't make it any more or less comfortable — what *does* help your hand-holding experience, however, is the tapered edge that adds an extra place for your fingers to naturally rest.

You may be wondering why we've talked so much about the Optimus G already, and it's because it shares many commonalities with the Nexus 4; both use a 1.5GHz quad-core Snapdragon S4 Pro chipset, 2GB RAM and sport the same 4.7-inch True HD IPS PLUS with 1,280 x 768 resolution. They even pack the same 2,100mAh battery. Indeed, a close look at the two devices side by side should be enough to convince someone that the two are blood brothers, perhaps even fraternal twins. If it weren't for the Nexus 4's gentle curves, we'd wager they were born of the same chassis. Keep in mind that this isn't a harsh comparison: we were quite fond of the build quality and materials used

The Nexus 4 is one of the most elegant devices we've played with.

The Nexus 4 and Optimus G share many similar core specs.

in LG's top-of-the-line smartphone, and having a similarly specced device with comparable build *and* a vanilla version of Android 4.2 sounds like a killer combination.

Gracing the front of the phone is the IPS PLUS display mentioned earlier, dressed with a full slab of Gorilla Glass 2. The glass itself curves down a bit as it meets the left and right edges, which certainly adds to the feeling of elegance. The idea here is actually to add more of a natural feel when swiping back and forth on the screen. (HTC did something similar with the One X.) Our only complaint with this is that it's easy for dust and other tiny particles to get stuck between it and the chrome lining the edge. Continuing on, there's a 1.3-megapixel front-facing video cam on the top right and sensors on the top left. Below the screen sits the pulse notification light, which brought back memories of what's found on the Galaxy Nexus, and there are no capacitive buttons since LG added virtual navigation keys to the screen.

The left side houses a volume rocker, while a secondary mic and headphone jack sit up top. Moving over to the right, you'll see the power button just

You'll probably want to avoid concrete at all costs.

barely above where your index finger naturally rests — this is nice because you won't accidentally bump it every other second, but it's still within easy reach. The bottom is where you'll find the micro-USB / Slimport socket.

Let's talk a little about that last one: Slimport. It appears that Google and LG have chosen to use Slimport for tethered display sharing, rather than standard MHL. Neither company has shared the reasoning behind this decision, but whatever it is, you'll need to buy a special adapter if you want to take advantage of this capability. It's not the only way to mirror your phone's display on your TV — Android 4.2 has now added native support for Miracast's wireless display standard — but if you don't have equipment compatible with Miracast, Analogix's $30 Slimport adapter is a cheaper alternative to purchasing Miracast-certified gear.

Moving on to the back, we already mentioned briefly that it's covered by scratch-resistant glass. It's not a removable cover, which means you won't be getting access to your battery unless you're willing to be adventurous and start removing screws. On the top left you'll see the 8-megapixel rear camera and LED flash aligned vertically, with the famous Nexus logo sitting just below. LG added its own stamp to the bottom of the back, right next to a speaker grille on the right side. But the most interesting part of the whole thing is its checkerboard-like decor that looks like a cross between *The Matrix* and the iconic tile-like live wallpaper made famous by the Nexus One. When we first saw the device in leaked photos, we worried that it might look too tacky — on the contrary, it not only adds to the subtle aesthetics, but it helps the Nexus 4 stand apart from all those other bland, rectangular phones.

With all of our praise about the phone's design and build, there is one potential hazard: that glass-laden back. We haven't had any terrible luck in that department yet, but it's worth noting that this part of your phone — while sleek and gorgeous — should probably avoid the concrete at all costs.

Now, onto the portion of the review that you'll either love or hate, depending on where you live and what network you use. The Nexus 4, like the Galaxy Nexus before it, is a penta-band (850/900/1700/1900/2100) HSPA+ device capable of 42 Mbps speeds. It's also quad-band (850/900/1800/1900) GSM / EDGE, which means this phone will work with virtually every GSM and HSPA carrier in the world. Unfortunately, the one thing truly missing from the Nexus is LTE compatibility. In many parts of the world, this won't be an issue; people using a carrier with LTE service may feel frustrated, however.

SPECIFICATIONS	NEXUS 4	LG OPTIMUS G (KOREAN VERSION)	SAMSUNG GALAXY NEXUS (HSPA+ VERSION)
DIMENSIONS	5.27 X 2.7 X 0.36 INCHES (133.9 X 68.7 X 9.1MM)	5.19 X 2.71 X 0.33 INCHES (131.9 X 68.9 X 8.5MM)	5.33 X 2.67 X 0.35 INCHES (135.5 X 67.9 X 8.9MM)
WEIGHT	4.9 OZ. (139G)	5.11 OZ. (145G)	4.76 OZ. (135G)
SCREEN SIZE	4.7 INCHES	4.7 INCHES	4.65 INCHES
SCREEN RESOLUTION	1,280 X 768 PIXELS (320PPI)	1,280 X 768 PIXELS (320PPI)	1,280 X 720 PIXELS (316PPI)
SCREEN TYPE	TRUE HD IPS PLUS	TRUE HD IPS PLUS	SUPER AMOLED HD (PENTILE)
BATTERY	2,100MAH	2,100MAH	1,750MAH
INTERNAL STORAGE	8 OR 16GB	32GB	16GB
EXTERNAL STORAGE	NO MICROSD SLOT	NO MICROSD SLOT	NO MICROSD SLOT
REAR CAMERA	8MP, AF, LED FLASH	13MP, AF, LED FLASH	5MP, AF, LED FLASH
FRONT-FACING CAM	1.3MP	1.3MP	1.3MP
VIDEO CAPTURE	1080P	1080P	1080P
NFC	YES	YES	YES
RADIOS	HSPA+ 42 / UMTS: 850 / 900 / 1700 / 1900 / 2100; GSM / EDGE: 850 / 900 / 1800 / 1900	GSM / GPRS 850 / 900 / 1800 / 1900; UMTS / HSPA+ 900 / 2100; LTE BAND 3	HSPA+ 21 / UMTS: 850 / 900 / 1700 / 1900 / 2100; GSM / EDGE 850 / 900 / 1800 / 1900
BLUETOOTH	V4.0	V4.0	V3.0
SOC	QUALCOMM APQ8064 SNAPDRAGON S4 PRO	QUALCOMM APQ8064 SNAPDRAGON S4 PRO	TI OMAP 4460
CPU	1.5GHZ QUAD-CORE	1.5GHZ QUAD-CORE	1.2GHZ DUAL-CORE
GPU	ADRENO 320	ADRENO 320	POWERVR SGX540
RAM	2GB	2GB	1GB
HDMI OPTIONS	SLIMPORT (WIRED) / MIRACAST (WIRELESS)	MHL (WIRED) / MIRACAST (WIRELESS)	MHL
WIFI	802.11 B/G/N DUAL-BAND	802.11 A/B/G/N	802.11 A/B/G/N DUAL-BAND
OPERATING SYSTEM	ANDROID 4.2 JELLY BEAN	ANDROID 4.0.4 ICS	ANDROID 4.1 JELLY BEAN

We'd love to see a special edition come out down the road, but we're not going to hold our breath for it.

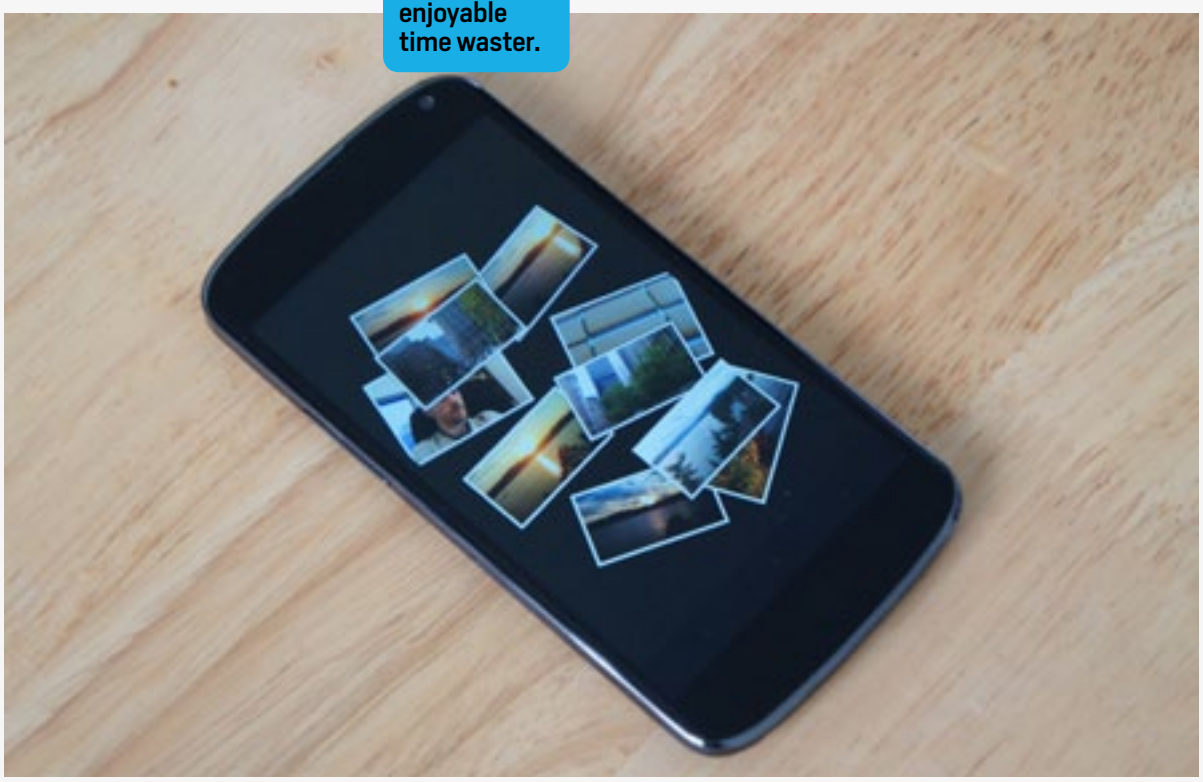
Finally, the Nexus 4 also fully supports the Qi wireless charging standard, which means you can use any Qi-capable charging pad to refill your battery — we even took it for a spin on the Fatboy recharging pillow sold by Nokia, and it worked like a charm.

DISPLAY

A quick review of the spec list should indicate that the display is essentially identical to the one used on the recently released LG Optimus G, the Nexus 4's close sibling. Looking backward, it's also better than the HD panel the Galaxy Nexus bears. What we're looking at (literally) is a 4.7-inch, 1,280 x 768 True HD IPS PLUS display, with a sheet of Gorilla Glass 2 covering it. With the Nexus 4, however, the Corning-furnished glass plays a much more critical role than it does on other smartphones. LG has developed a technology that integrates the display's touch sensor into the outer layer of the glass. This not only makes for a thinner phone, it brings the pixels closer to the display itself. (If this sounds familiar, it's because Apple has done something similar to this with the iPhone 5 and Microsoft has too, with the Surface for Windows RT.)

The display is among the best that you can currently find on a smartphone.

Additionally, its WXGA resolution translates into a pixel density of 320ppi, but its RGB subpixel arrangement means it actually packs more of a visual punch than the PenTile Super AMOLED HD screen on last year's Nexus. There's less pixelation — if that's even possible — and the viewing angles are fantastic, providing us better opportunities to read articles and watch movies than most other devices we've used. Also, it's one of the nicest displays we've ever viewed in the midday sun. We could



The new Daydream feature is an enjoyable time waster.

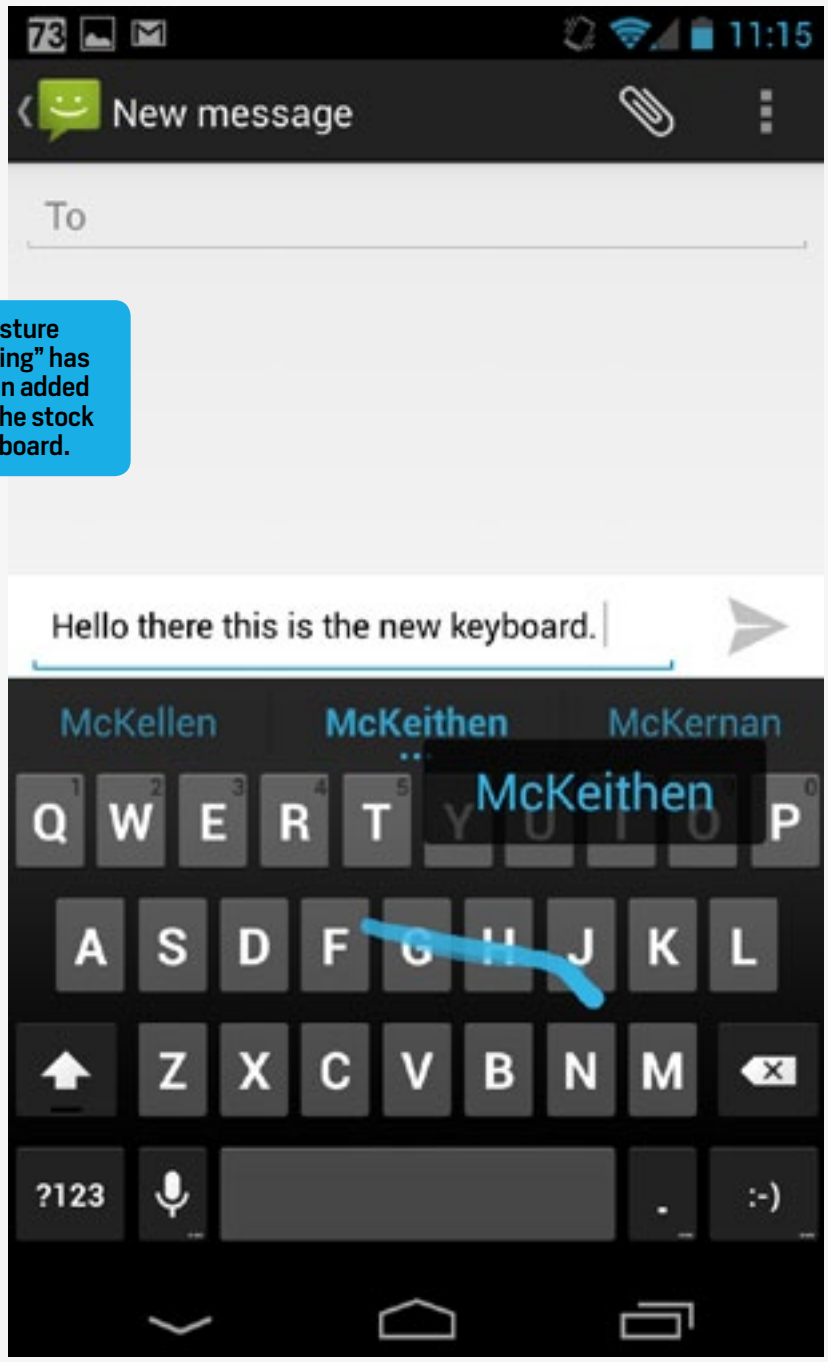
see everything clearly at right around 50 percent brightness, and it was still at least relatively easy to read with the settings down to about 30 percent.

This panel is one of the best you can get right now, and is on par with the 720p displays we've played with on the One X and Samsung Galaxy S III. It ranks in between those two competitors when it comes to color saturation. The darks are as dark as you'll see on the One X (but less than the GS3), and the whites are brighter than on either rival phone. We also noticed that the Nexus shows off the darkest reds and magentas, as well as the lightest greens and yellows. As a result, your viewing experience may differ slightly from other 720p displays, but we've been very pleased with what we've seen on the Nexus 4.

ANDROID 4.2

Aside from the inaugural Nexus (the HTC-made Nexus One), each subsequent version of the Nexus has ushered in a new era of Android firmware along with it — Gingerbread for the Nexus S, Honeycomb for the Motorola Xoom, ICS on the Galaxy Nexus and Jelly Bean on the Nexus 7. And as we've come to expect from this precedent, the Nexus 4 comes loaded with Android 4.2. But there's something drastically different this time around: despite the new version number, this upgrade is still considered Jelly Bean. This is the first time we've seen such a move since Eclair was bumped up from 2.0 to 2.1.

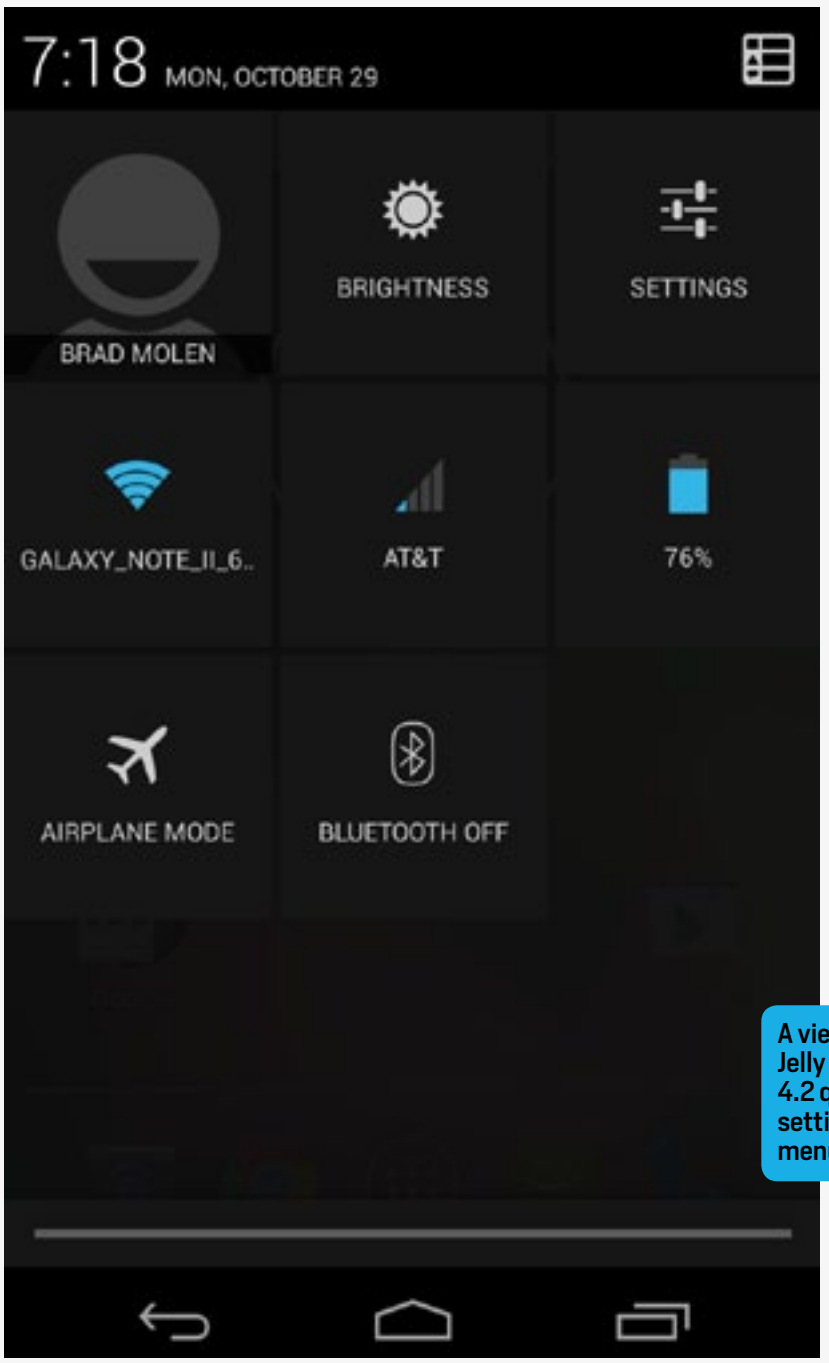
An incremental ".X" update without a new dessert-themed codename typically indicates a small refresh with just a few enhancements. We think there's enough of a change to justify jumping up to a treat that begins with "K," but most of the significant design shifts have to do with the tablet experience; in contrast, there have been few drastic changes on the phone side. We wonder if many of the features added to the Nexus 4 and Nexus 10 were already on the drawing board alongside the rest of Jelly Bean and just weren't ready in



"Gesture Typing" has been added to the stock keyboard.

time, but none of that really matters. What's important is that we have some new things to enjoy at the present time. Here's what you can expect to see in Jelly Bean, part deux.

First, we mentioned briefly that you'll see a larger difference on the tablet side than on the phone. This is because the Nexus 10 sheds both the settings box in the lower-right corner and app menu access in the top right. Instead, it offers two pull-down menus on the top: the left side acts as your standard notifications menu, while the right side features the new quick settings menu (more on that shortly). It also uses the standard set of three virtual navigation buttons that you'll find on the Nexus 7 and Galaxy Nexus.



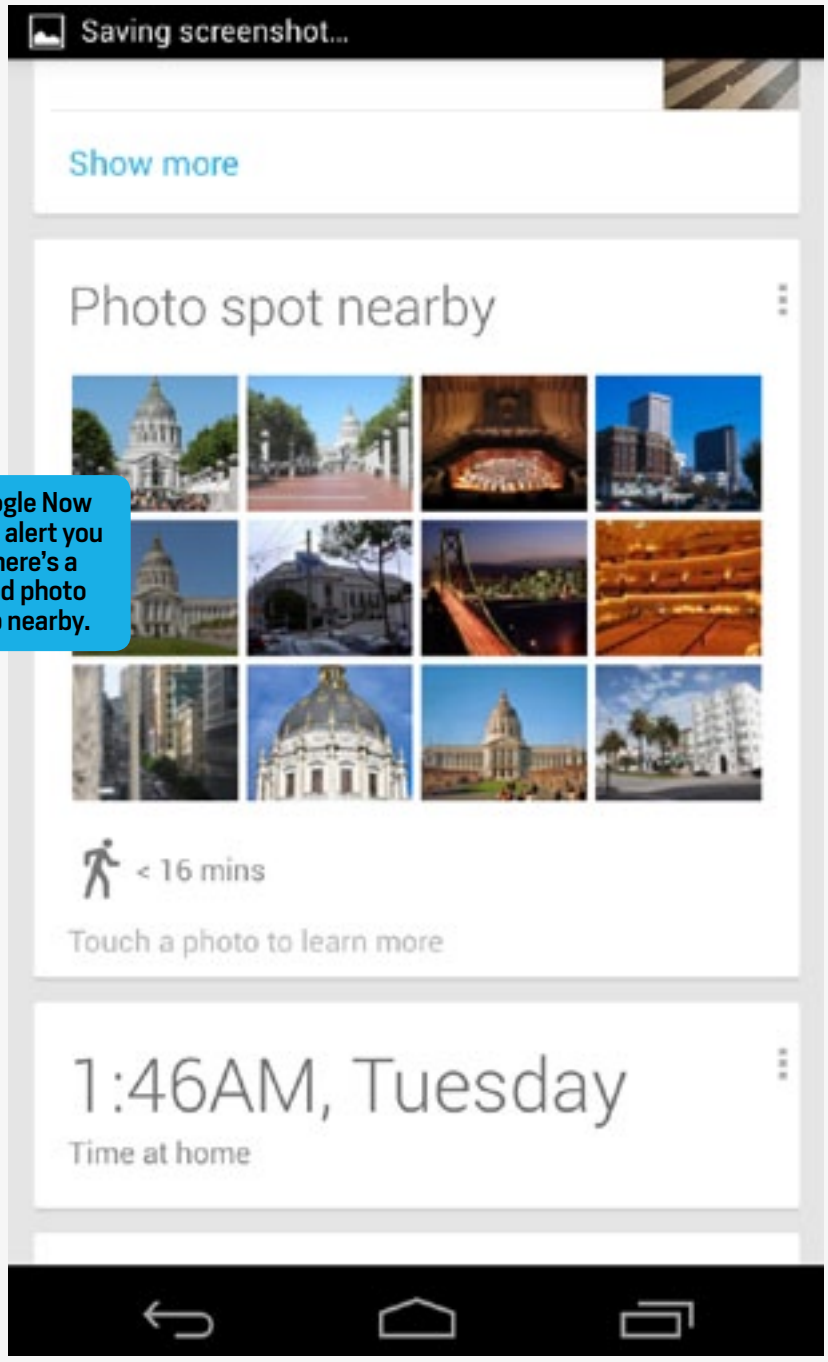
A view of the Jelly Bean 4.2 quick settings menu.

Lastly, Android 4.2 also brings multi-user capabilities to the tablet, in which different members of the family can have their own private set of apps, settings and files — in other words, the same experience you can have on a standard PC or Mac. Unfortunately, this isn't available for smartphones, so the Nexus 4 doesn't get to take advantage of this. (We have a hunch this feature may be added to phones at some point, but we have no inside information to confirm this.)

Let's dive into the improvements that you *can* take advantage of on the Nexus 4. The quick settings menu is exactly what it sounds like — a panel full of access points such as brightness, WiFi, battery life, airplane mode, Bluetooth and data usage. It also includes a direct link into the settings menu. The concept is incredibly similar to what you would find on a TouchWiz or LG device (amongst other custom skins), but it uses up its very own space rather than co-habitating on the same menu as the notifications. Fortunately, it's just as easy to get to: pull down from the status bar with two fingers instead of one, and presto — you're in. It can be accessed from the Lock Screen and the notifications menu as well. Sound fa-

miliar? If so, it's likely because you can find a very similar concept in Motorola's latest series of devices, such as the RAZR M and RAZR HD. Given Moto's new role, it sure seems like a very interesting coincidence, doesn't it?

The new and improved Jelly Bean also features native widget support on the Lock Screen and even offers multiple panels for additional widgets. Our units didn't come with the feature, as it likely won't be available until the Nexus devices start shipping out, but this may very well be one of our favorite additions to Android. We love the idea of being able to view emails, calendar appointments and other notifications without entering the home panel — it may sound like we're too lazy to take an extra step and unlock the screen to see our widgets, but the ability to quickly glance at crucial information without entering your phone should not be underestimated.



Google Now will alert you if there's a good photo opp nearby.

You can expect to see more cards popping up in Google Now. The service has been given more powers, such as the ability to find local events and concerts, nearby attractions and photo spots (places for photo opps). The card for photo spots shows a grid of thumbnails, each of which can be clicked for a larger picture, details and directions. There's a whole new series of cards that digs into your Gmail inbox and finds relevant information: when you get a flight or hotel confirmation email, Now will automatically pick it up and remind you about it. The same goes for packages, event bookings and restaurants.

Voice search, which we used with mixed results in 4.1, has been bestowed with an improved set of queries. You're now able to schedule meetings, check to see your next appointment and launch apps ("open app [name of app]" will do the trick). Google also says that when you ask questions that may not have a definitive answer, the service will do a comprehensive search for your inquiry, see what the general consensus is and provide you with an answer based on

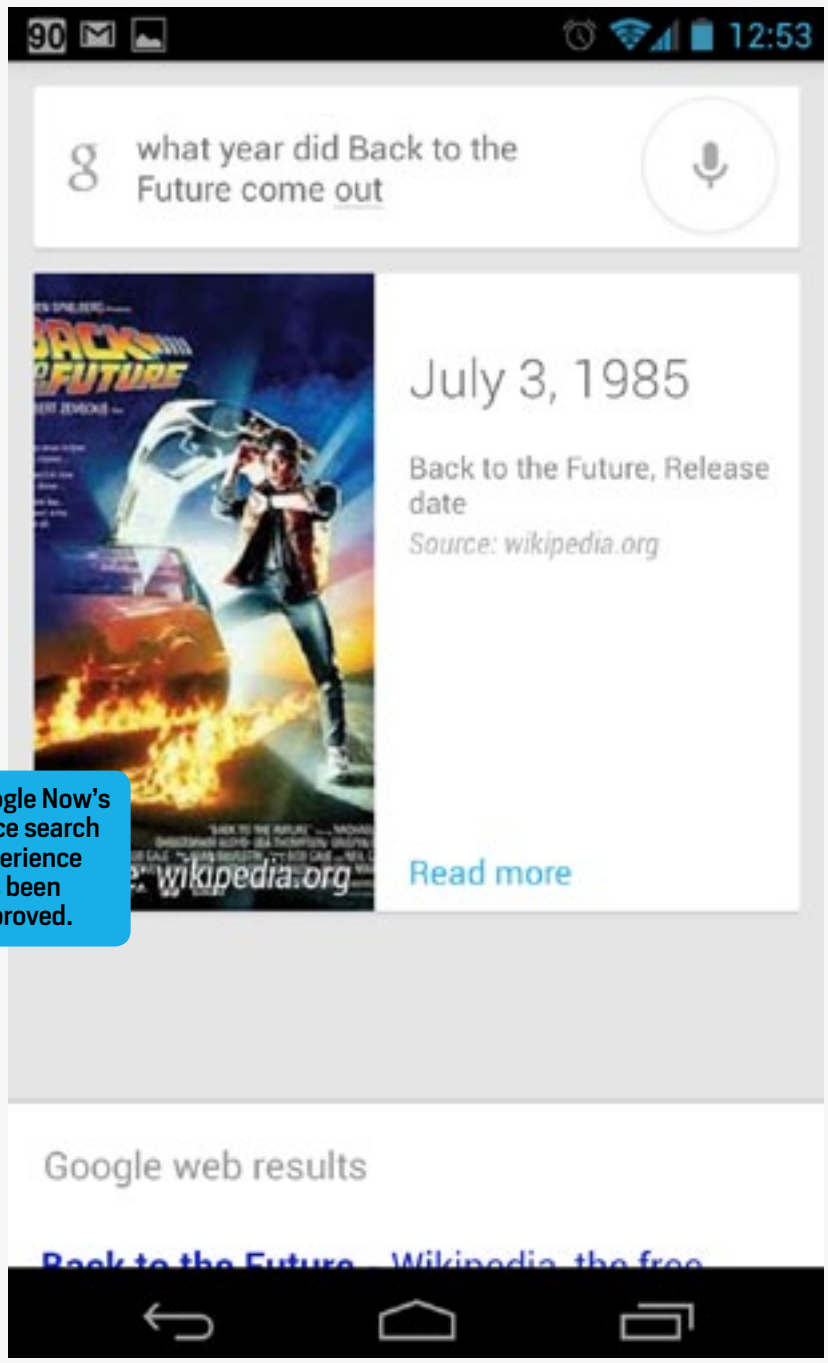
what it found. Additionally, we found that it was able to pull up more information than before. For instance, we asked what year *Back to the Future* came out, and were given the specific release date as well as a card with information about the movie. Indeed, Google's made a decent amount of effort to make the voice search experience more of a natural interaction, rather than let it feel like a machine dictating search results.

By the way, Jelly Bean users don't have to wait for the Android 4.2 update to come out to enjoy a lot of the same things — most of these new features in Now are now available for Android 4.1 users, thanks to an update to the Google Search app in the Play Store.

Google has also thrown in "Gesture Typing" to the stock keyboard which makes it much easier — and appealing — to use. Taking a page out of Swype's book (and, perhaps, some of the wind out of its sails), 4.2 now lets you swipe from one letter to another, rather than using the traditional hunt-and-peck method of typing. It's incredibly accurate, too, as the keyboard rarely had a hard time understanding what we were trying to type. It's even capable of predicting which word you're attempting to type via the swipe gesture. As you start spelling your word, a box will appear next to your finger with a word prediction. If you lift your hand off the screen, that predicted word will pop right into place and you can continue with the rest of your message. The experience is now much more intuitive and enjoyable to use.

Gmail also received a small facelift, now boasting pinch-to-zoom and automatic formatting so the entire message can fit on the screen. You can also swipe left or right on a message in your inbox to quickly archive it.

Next, you can magnify whatever is on the screen by triple-tapping it. From there you can pan around by using two fingers or even pinch-to-zoom



Google Now's voice search experience has been improved.

to adjust the amount of magnification viewed on the display.

The Daydreams feature is also new to the stock Android experience. This is the smartphone equivalent of screen savers. It displays content on your screen when the phone is docked or charging. You can view a selection of images as they float around, check out the latest feeds coming through Currents or even burn time by flicking around jelly beans. (Unfortunately you won't find any flying toasters. Yet.) It adds very little in the way of functionality, but it's a clever trick if you aren't using your handset and want to have something to peek at while it sits on the coffee table.

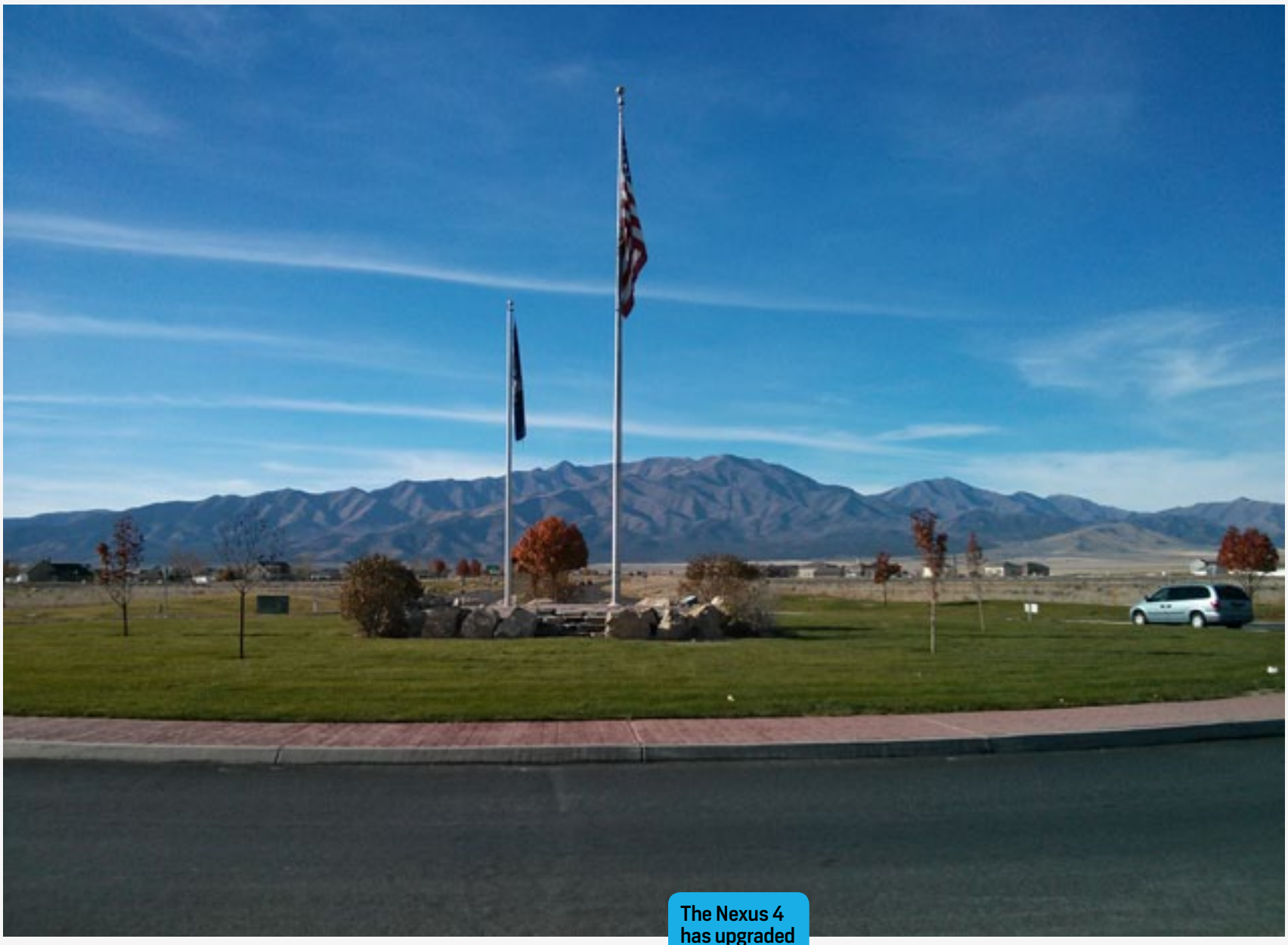
We briefly mentioned earlier that Miracast is now natively supported in Android 4.2, which means you'll now be able to wirelessly stream movies and music from your phone to the TV or other Miracast-certified device. Here comes the tricky part: if your TV or monitor isn't certified for the standard, you'll need to make sure you grab a Miracast adapter, which isn't super cheap — a brief Amazon search brings up one result that costs $70. Still, if you can find one or if you already have equipment capable of picking it up, you'll at least have one more solid reason to pick up a Nexus 4.

CAMERA

We'll admit that we always hold Nexus devices up to the highest of expectations — each one carries the burden of being the latest Android flagship, and they're held up by Google as an example for other Android manufacturers. That's why we were extremely disappointed in Samsung's decision last year to include a paltry 5-megapixel sensor in the Galaxy Nexus. A year later, LG made sure to stick an 8-megapixel camera into the Nexus 4. On the spec sheet, it's not the best in the market — but remember, megapixel count never tells the full story.

Before we get too far ahead of ourselves, though, let's discuss the user interface in the camera app. Even if you've used Android devices in the past, the Nexus 4's UI might throw you for a loop at first. It's very basic at first glance, consisting only of a viewfinder and a sidebar with a shutter button, settings button and a toggle for camera modes. When you choose settings (which can also be selected by long-pressing the viewfinder), you'll be shown a large circle with various choices lining its outside. Just drag your finger up to each one and you'll be shown more options; you can also pinch-to-zoom up to 4x on the viewfinder. You may also be thrown by the lack of a gallery thumbnail, but don't panic — just swipe to the left and your gallery will show up, a gesture similar to iOS or Windows Phone, which allows you to swipe to the right for the same result. Exposure and focus lock are also available by tapping and holding the screen.

We wish we could say the Nexus 4's



The Nexus 4 has upgraded to an 8-megapixel shooter.

camera was decked out with all of the trimmings (think of the list of settings you get on a Galaxy S III), but the selection is pretty limited here: HDR is now natively supported, and you can also adjust white balance, select one of four scene modes and change the resolution and flash setting. Panorama mode makes a return appearance as well. Yep, that's about it. If you crave any other clever filters for your Nexus, you'll want to start checking out what options are available in the Play Store — fortunately, there are plenty to choose from.

There is one other neat camera mode you can take advantage of with Android 4.2, and that's Photo Sphere. You could call it a type of "Panoramic Mode 2.0" — instead of simply snapping images horizontally, you can add another dimension by going vertically as well. Then, after a minute or two of stitching, your picture is ready for viewing and it shows up with a natural sphere-like curvature; when looking at the finished product, you get a sense that you're actually looking from left to right as if you're really there — often, you'll need to scroll around the entire image in order to see the whole thing, which adds a stunning amount of depth to our

pictures of scenic vistas. And, for an even nicer touch, the phone is capable of doing the scrolling for you so you can just sit back and enjoy the scenery. There's only one concern: we noticed that the phone had some problems stitching photos together. In one shot, the right half of a window was noticeably higher (and had more reasonable exposure) than the left half, a picture frame looked as if it had been sawed in half and one side of the bookshelf had far more exposure than the other. This issue is more with the firmware itself, most likely, as we noticed similar problems on the Samsung-crafted Nexus 10. We hope to see this resolved in a future 4.2.x update.

Now let's turn our attention away from the software and dig into the performance of the camera itself. As we mentioned before, the last Nexus wasn't exactly what we would call a stunner in the imagery department, so would this year's model be any different? The quick answer is yes — and in a good way.

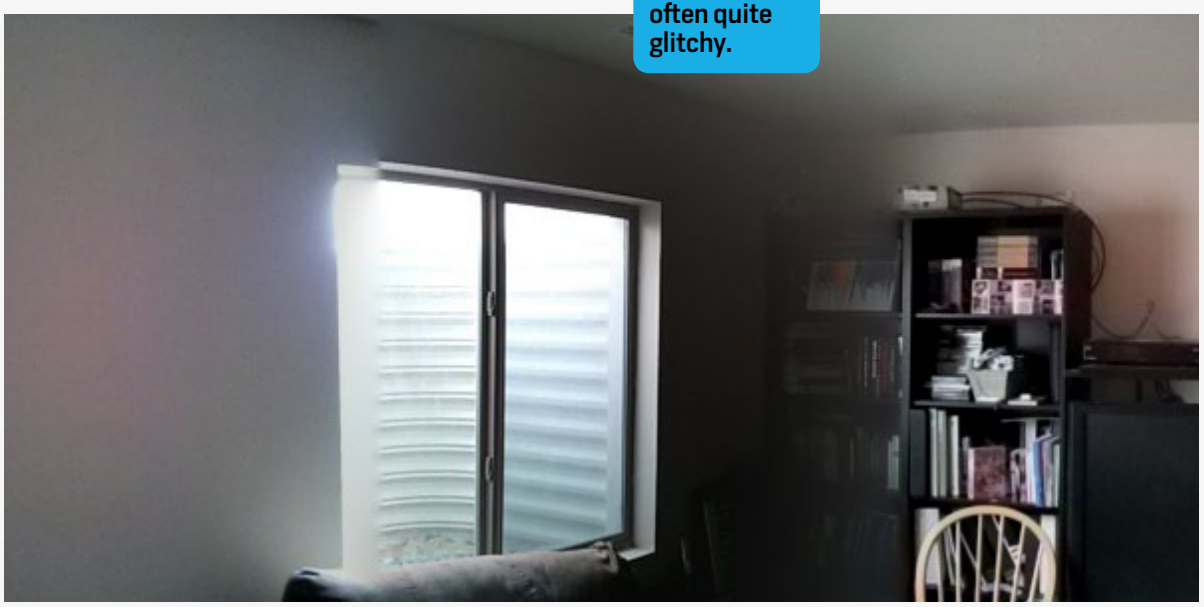


Photo Sphere's stitching is often quite glitchy.

We did some comparison tests with the Nexus 4 and the Galaxy S III, one of the best 8-megapixel mobile cameras we've had the pleasure of using. There are a few areas in which the Nexus 4 bests the GS3, and others in which it's still very good, but loses to its Samsung competitor. The Nexus appears to be slightly better in close-ups and when zooming in at full strength. We also prefer HDR on the Nexus. Colors, however, seem to be more naturally saturated on the GS3 and the sky shows a more realistic blue hue.

The LED flash on the Nexus 4 is bright — in fact, it's almost *too* bright. This is a rare problem to have on a smartphone, no doubt, but many of our shots taken with the flash on end up washing some of the color out. The GS3's flash, by comparison, is softer, but at least we were able to see all of the colors the way they're supposed to look. In general, low-light performance was acceptable on the Nexus, but we noticed more noise and less light than on the GS3.

Lastly, the shutter speed seems to vary, depending on if it needs to focus before the shot is taken, but it still comes in under less than two seconds most of the time. There were a few occasions in which our subjects

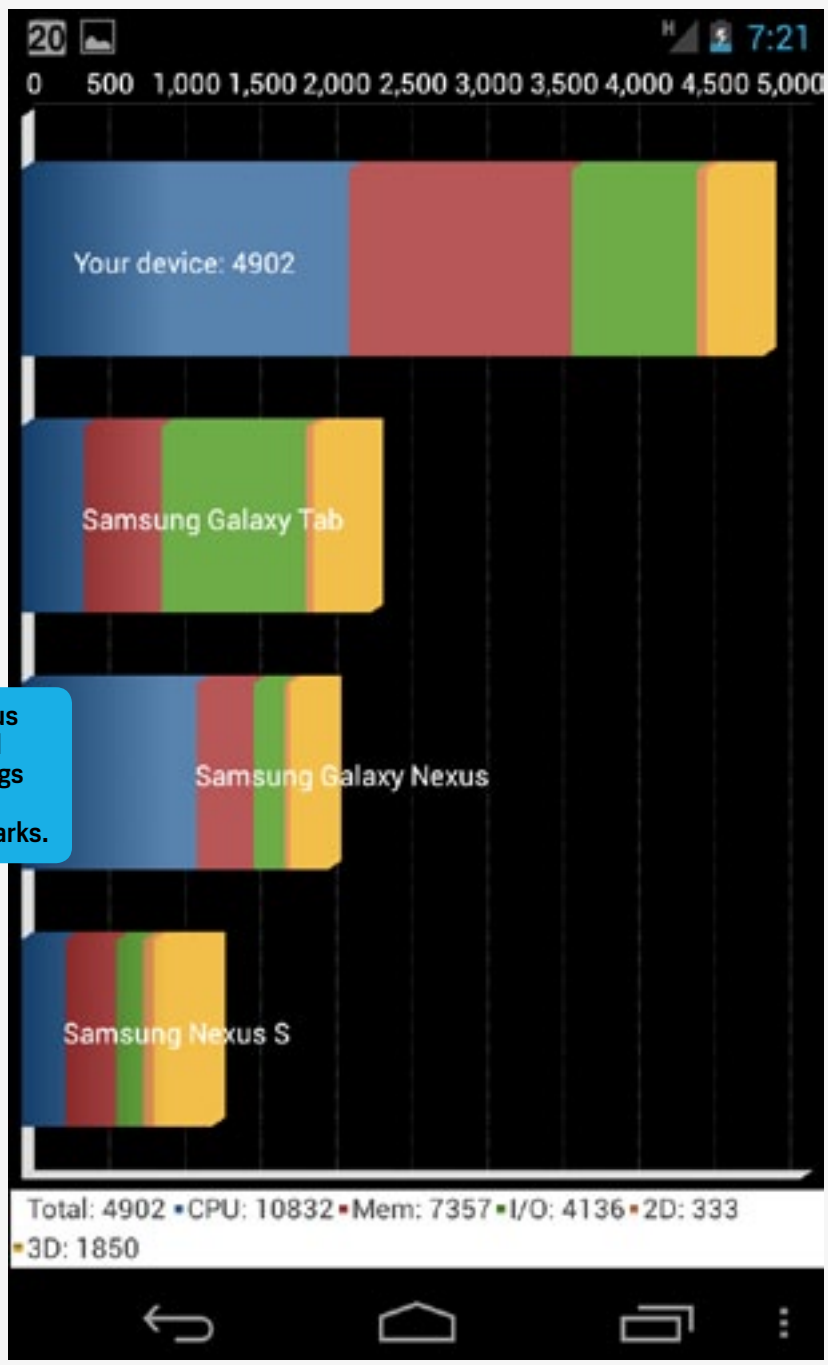
came out blurry because they moved before we could finish taking the shot.

Overall, it may not be the best performer among its peers, but the camera is still an asset to the Nexus 4, whereas it was a detriment to the phone's predecessor. And that's exactly what we were hoping to see. While we always prefer to have the best possible performance — we're just picky that way — it's nice to at least see more love and attention being paid to this aspect of the Nexus lineup.

The camcorder is capable of taking 1080p movies in MPEG-4 format, and records footage at an average of 22 fps with a 9 Mbps bit rate. This resulted in noisy, slightly choppy videos that didn't really convince us that what we were watching was of true HD quality. One positive takeaway is that you're still able to take images at the same time you record video, much like you could on the Galaxy Nexus.

PERFORMANCE AND BATTERY LIFE

The performance of the Nexus 4 is a curious thing. The phone has a complete beast of a chipset running things behind the scenes: it's the same 1.5GHz quad-core Snapdragon S4 Pro (APQ8064) as we saw in the LG Optimus G, paired with an Adreno 320 GPU and 2GB of RAM. In our initial tests between the aforementioned LG flagship and the Samsung Galaxy Note II (which sports a 1.6GHz quad-core Exynos chip), the S4 Pro comes out on top. And in our real-world use tests, we were overall satisfied with the zippiness of the Nexus. For the most part, it was responsive and fast, multitasking was smooth and we only rarely had any lag. In side-by-side use, it does feel slightly slower than the Optimus G; most of the time this difference is rather infinitesimal, but there are a few times that it stuck out like a sore thumb. For instance, we noticed that when dialing a phone number — a rather trivial task in the OS — we'd have to wait for the



The Nexus 4 topped its siblings in most benchmarks.

BENCHMARK	GOOGLE NEXUS 4	LG OPTIMUS G	SAMSUNG GALAXY NOTE II
QUADRANT (V2)	4,902	**7,628**	6,819
VELLAMO (V2.0 HTML5)	1,236	1,710	**2,482**
ANTUTU	10,122	11,284	**13,539**
SUNSPIDER 0.9.1 (MS)	1,975	1,283	**1,023**
GLBENCHMARK 2.5 EGYPT 1080P OFFSCREEN (FPS)	30	**31**	17
CF-BENCH	13,835	14,398	**15,267**

SUNSPIDER: LOWER SCORES ARE BETTER

numbers to catch up with us, whereas the Optimus G passed this simple test with flying colors. We did find that the phone dialer issue is much more noticeable when the triple-tap magnification feature is turned on. This can be disabled in accessibility settings.

There are two strange things at play here. First, we fully expected the phone to be even faster than the Optimus G, mainly because LG and Google have had the opportunity to make sure Android 4.2 is fully optimized with the manufacturer's hardware, and the lack of custom skin should theoretically keep everything running efficiently. The second concern is in the benchmarks we ran.

Before we dive in, we'll get one thing out of the way: benchmarks don't always tell the full story, and we understand that they often don't replicate real-world usage. But this is one of those cases in which it's helpful to have a quantitative measurement after running the same kinds of tests. Since the Nexus 4 and the Optimus G are so similar in their chipsets and other components, the two's metrics should be easily comparable — or at least in the same neighborhood as each other. But as you can see in the table, some of the numbers are the complete opposite of what we expected. In fact, some of these results (most notably, Quadrant and Vellamo) are even lower than what we typically get out of dual-core Snapdragon S4 processors. To be fair, CF-Bench and GLBench didn't veer as far away from our expectations, and were quite respectable.

We would be tempted to shrug it off and choose not to give this concern much thought, but we also ran into the same exact problem with another Nexus 4 review unit and multiple Nexus 10 devices as well. It's also easy to blame the benchmarks for not being optimized on Android 4.2, but we've never seen

these tests exhibit this same problem with other versions of the mobile OS when they were brand new. That said, our units may very well have been loaded with a non-final firmware build that could be contributing to our dilemma somewhat. We'll receive a final pre-launch update that will enable lock screen widgets, so we're keeping our fingers crossed that a few more optimizations are included. Still, you're going to get a pretty nice bang for your buck, and we doubt most power users will come away disappointed.

We ran *Riptide* through its paces and it didn't skip a beat; the graphics were fantastic and we didn't have any problem. When we played *Need for Speed: Most Wanted*, an even more graphically intensive game, we saw a few frame skips and stutters throughout each level we played. These issues didn't interrupt the flow of the game, but they were still noticeable. Aside from these hiccups everything worked well, as the quad-core processor did a good job rendering all of the details, such as the reflections cast onto the car and the fine quality in the surrounding buildings and other landmarks within the game.

Battery life is yet another segment of the performance that's confused us. Since the Nexus 4 uses the same 2,100mAh battery (and power-friendly Krait chip) as the Optimus G, we expected to record essentially the same runtime. Much to our surprise, however, it was considerably worse in both our tests and our real-life use. Our standard video rundown test, which consists of looping a movie at 50 percent brightness with WiFi on (but not connected) and normal pull notifications for email and social media, lasted for five hours and 18 minutes before the battery died. Our anecdotal tests — in which we do a moderate amount of email, social media, messaging, web surfing, take a few pictures and make some phone calls — almost got us a full day of use, but your overall result will definitely depend on how bright you set that display. Regardless, our experience is still a stark contrast to the Optimus G, which lasted over eight hours in the video rundown test and 20 hours with moderate use.

We loved making calls on the Nexus, as our friends came through loud and clear. It was static-free and neither side of the conversation had any difficulty hearing each other.

It's at this point that the plot continues to thicken. While we were satisfied with how loud and crisp our calls were, the external speaker was a completely different story. With both voice calls and music playback, it was substantially softer than on most comparable phones we've tested recently, and on several occasions we found ourselves double-checking the settings to make sure we had it as loud as it could possibly go. We also tested the Nexus 4 with Klipsch Image S4A in-ear reference headphones and found the volume to

be adequate, but it's definitely not the loudest we've heard. On the flip side, we didn't have any concerns with its clarity or being able to hear the highs, mids and lows. Speaking of multimedia, we should also mention that the display and chipset contributed to a flawless movie-watching experience.

PRICING AND AVAILABILITY

The LG-made Nexus 4 will be available as an unlocked device in the Play Store beginning November 13, and it will come in two flavors: 8GB for $299 and 16GB for $349. We're not looking to sound like Crazy Eddie when we say this, but it's hard to dispute. This is an incredible price for a brand new quad-core HD device, especially when the least expensive phone on the market with similar specs will be the Huawei Ascend D1 Quad XL at $450 (and that's not even available in most major markets). It'll be on sale in the US, UK, Canada, Germany, France, Spain and Australia to start off with, but because it's penta-band, you'll easily be able to stick in a micro-SIM card from virtually any GSM carrier in the world and roam at your leisure.

The rear panel of the Nexus 4 is covered in Gorilla Glass.

Stateside Nexus fans will have one other option: buy the 16GB model for $199 on T-Mobile with a two-year contract, starting November 14th. (It's also offered at the same price on the company's Value Plan.) We have a difficult time recommending this particular route — you save $150 up front, but you're locked into a plan for two years and may likely pay more on a monthly basis as a result. There's no other differentiation between the two: no branding,

no bloatware or special apps. WiFi calling isn't supported, and both versions are confirmed to include DC-HSPA+ 42 Mbps speeds.

WRAP-UP

The idea that a Nexus quad-core smartphone is hitting the market with a starting price one dollar shy of $300 is simply stunning. Even more so is that it's available without any contract or carrier locks, which means you can use it virtually anywhere in the world. Adding yet another layer of amazement is the fact that this particular device will always be among the first (if not *the* first) to get the latest version of Android for the foreseeable future. What once was a smartphone series designed for developers has been decked out with top-notch features and priced so attractively that consumers will take notice of it; there's nothing comparable that comes close to it in that price range. This is a smartphone that we'd normally expect to be much more expensive unlocked, but Google set a precedent by lowering the cost of the Galaxy Nexus, keeping the Nexus 7 at $200 and is now continuing the trend with the Nexus 4. The price of freedom has never been more reasonable.

Sure, the Nexus 4 is not without its hiccups, but none of its predecessors have been perfect, either. And given the boost in real-world performance, the better camera and various other new features, it's even more tempting than all those previous devices whose shoes it's trying to fill. In a case like this... you have our permission not to resist. D

Brad is a mobile editor at Engadget, an outdoorsy guy, and a lover of eccentric New Wave and electro. Singer and beatboxer.

BOTTOMLINE

GOOGLE (LG) NEXUS 4

$299-349

PROS

- Beautiful and vibrant 720p display
- Very affordable price
- Pentaband HSPA+
- Android 4.2 delivers new features

CONS

- Poor battery life
- Doesn't support LTE

BOTTOMLINE

It may not be the best phone on the planet, but its high-end specs, elegant build and incredibly affordable price make it worth throwing your money at.

GOOGLE NEXUS 10

Its resolution and price may hit the sweet-spot, but is Google's Nexus 10 ready to take on the 10-inch tablet heavyweights?

By Tim Stevens

When Google unleashed the Nexus 7 upon us earlier this summer we were caught completely off-guard. A $200 tablet that was *legitimately good* in every regard? It was unheard of at the time, and even five months later it's still a really nice slate. Now it has a big brother, the Nexus 10, this time coming courtesy of Samsung. At $399 it arrives with less fanfare and a higher price, but it also comes with a very distinctive selling point: a stratospherically high resolution.

This 10.1-inch panel has an eye-watering 2,560 x 1,600 resolution — the very same as the 13-inch

MacBook Pro with Retina display but in a much smaller package. Is Google's second reference tablet the ultimate Android 10-incher at a bargain price, or is it simply another big tablet with a lot of pixels?

The back of the Nexus 10 (black) compared to the Nexus 7.

HARDWARE

The Nexus 7, with its rubberized back and chunky profile, always felt very good for a budget tablet — but mostly it just felt very good. The Nexus 10 feels like a completely different beast, which isn't entirely surprising since it's from a different manufacturer. ASUS got the nod to build the first reference tablet from Google, a development process that required a very close partnership with the manufacturer. Now it's Samsung's turn, continuing the tradition of Google spreading the Nexus love around.

The Nexus 7 felt very good for a budget tablet — but mostly it just felt very good. The Nexus 10 feels like a completely different beast, which isn't entirely surprising since it's from a different manufacturer.

It's a fair partnership, since Samsung has long been the biggest supporter of Android on the tablet front, and of course since Google has long had an affinity for the Galaxy Tab 10.1 —giving away 5,000 of the things at Google I/O a few years back. We've been wondering when Samsung would release a new stylus-free 10-incher, staying mostly quiet since the underwhelming Galaxy Tab 2 10.1. We're happy to say this one fares better. Mostly better.

It starts with a design that definitely looks like an evolution of the Gal Tab 2 10.1, itself very similar to the controversial Galaxy Tab 10.1N, whose most notable feature was a pair of front-

facing speakers. That bit of design language carries on here, grilles embedded into the left and right bezel and extended farther down than before, running through nearly the entire vertical extent of the tablet.

Those speakers are hard to distinguish, though, in what is a sea of very dark materials all blending together into an interestingly rounded shape. Yes, this is still largely a rectangular piece of glass with a mind-boggling number of transistors stuffed in behind it, but the corners have big, lazily rounded profiles. Even the sides are subtly curved, bowing outward to eliminate any straight lines. This makes for a tablet that is incredibly comfortable to hold in any angle or orientation, but it also makes for a tablet that looks even bigger than it is.

It's slightly larger than Galaxy Tab 2 10.1, measuring 10.39 x 6.99 inches across (263.9 x 177.6mm) compared to that tablet's 10.11 x 6.9. But, it's well thinner, just 0.35 inch (8.9mm) vs. 0.38 (9.7mm) for its predecessor. That does make it thicker than the ASUS Transformer Pad Infinity TF700 (which is 0.33 inch thick). Meanwhile, for those keeping score across ecosystems, that makes for a tablet that's slightly taller (0.8 inch), narrower (0.4 inch) and thinner (0.6mm) than the latest generation iPad. It's lighter, too, at just 1.33 pounds (603 grams) compared to 1.44 (632 grams).

> We wish Google would start mandating such covers to hide garish carrier branding on Android handsets.

That relative lightness is likely due to the difference in materials, a plastic back dominating the flip-side of this device. It's covered with a soft-touch coating that

The 10 has a distinctly curved and comfortable frame.

feels unusually tacky, almost to the point of being sticky. It's nowhere near as nice feeling as the spun aluminum on the TF700 and a definite, and unfortunate, change from the dimpled cover on the back of the Nexus 7 that both looks and feels good. Mind you, a trace of that lineage remains here, a rubberized strip across the top of the back that has the same sort of perforated leather pattern — just with a slightly tighter dispersal.

That strip is punctuated by the 5-megapixel camera (capable of 1080p recording), which is inset next to its friend the LED flash. If you'd like to see more of these two you can actually remove that plastic strip altogether, which also reveals the tablet's FCC designation and all sorts of other internationally mandated brandings that are printed here, cunningly and tidily hidden away, leaving the back nearly blemish-free. We wish Google would start mandating such covers to hide garish carrier branding on Android handsets.

On the top edge of the slate you'll find the only two physical controls, a volume rocker and a power / lock button. Travel around the corner to the left and you'll find a micro-USB port and 3.5mm headphone jack. On the bottom there's a six-pot pogo pin connector and, on the right, a very welcomed micro-HDMI port for streaming all your legitimately acquired video content to a bigger display. There is, contrary to our expectations, no way to wirelessly stream that video from this tablet, but more on that later in the review.

Go crazy and Beam yourself in either direction. This tablet won't miss a beat.

On the face of the device, again it's those big, beautiful stereo speakers. Inside the upper bezel of the display is a 1.9-megapixel camera (capable of 720p video recording) and, in the bottom bezel, an RGB notification LED. Your proclivity toward such blinkenlights probably directly correlates to the volume of email you receive, but still we're glad to see one here.

And then, of course, there are the juicy bits on the inside. Powering this slate is a 1.7GHz chip of the A15 Eagle variety. That processor architecture is capable of quad-core duties but this particular processor sits in a dual-core configuration. Sitting next to that is a Mali T604 GPU and 2GB of RAM matched with either 16 or 32GB of storage, depending on whether you paid $399 or $499. Neither is expandable.

There are no cellular models just yet, so WiFi will be your only link to the world. As such this slate is reasonably equipped with dual-band and MIMO and HT40 support over b/g/n. (Sorry, 802.11a hold-outs.) You also have GPS, Bluetooth 4.0 and NFC on both the front and the rear. So c'mon, go crazy and Beam yourself in either direction.

This tablet won't miss a beat.

DISPLAY AND SOUND

We'll type it again just because it's kind of neat: 2,560 x 1,600. That's an awful, awful lot of pixels in just a 10.1-inch PLS LCD panel — *way* more than a 1080p HDTV contains. That it's in something that comfortably can be carried around, and that can be acquired for under $400, is quite a marvelous feat. It's good to live in the future.

And, indeed, things look fantastically sharp here. Text is rendered incredibly crisply and the UI looks better than ever. The first-party icons are all crisp and clean, though many third-party app icons do look like they could use a new, higher-resolution rendering. Thankfully, the apps themselves overwhelmingly look fine.

Remember when the new iPad shipped and everyone was scrambling to update their apps to support it? There's no need here. The way Android is structured, apps just natively support the higher resolution. We tried dozens of apps, including third-party browsers like Dolphin and lots of different random utilities and games, and we didn't spot a hint of blurry text.

We tried dozens of apps, including third-party browsers like Dolphin, and we didn't spot a hint of blurry text.

Of course, some feature graphics and assets that could use a higher degree of polish now that they're being consumed at such a preposterous resolution, and those with less than 20/20 vision may be squinting at some occasionally tiny text, but on average it's a big step above the blurry messes that many tablet apps were on the Retina iPad when it first launched. (A state that, we're happy to say, has long since passed thanks to the quick work of all those devs.)

The brightness of the display is fair,

This 10-inch slate features front-facing speakers.

though not quite as searingly bright as the 600 nits the Infinity can pump out. Colors are well-rendered and viewing angles are very good, but we were a bit disappointed by the contrast. Blacks were a bit on the murky side, sometimes appearing more purplish, and we couldn't help but notice some distracting light leakage around the lower corners of the display, something we verified on a second Nexus 10.

And we'd also like to point out that this display is protected beneath a sheet of Corning's Gorilla Glass 2. This is a nice change over the Nexus 7, which sheathed in some other type of cover that we've found to be quite prone to easy scratching.

We have some misgivings about the speakers too, but we're happy to say they're among the best we've ever heard on a slate. Where so many other tablet makers relegate the speakers on the back or, at best, the sides facing outward, here they're exactly where they should be: to the left and right of the display and pointing front and center. Their sound is reasonably warm, too, packing a lot of punch for a tablet. But, the most important part of that sentence is "for a tablet." Sound is adequate at best, and you'll want to augment more serious viewing experiences with a set of headphones or external speakers.

PERFORMANCE AND BATTERY LIFE

Again we're talking about a dual-core 1.7GHz A15 processor paired with 2GB of RAM and a Mali T604 GPU. The quantity of RAM is certainly healthy but, when compared to the quad-core 1.7GHz Transformer Pad Infinity TF700 or with Samsung's recent Galaxy Note 10.1, on paper it sounds like no contest.

BENCHMARK	NEXUS 10 ($399)	ASUS TRANSFORMER PAD INFINITY TF700 ($499)	ASUS TRANSFORMER PRIME ($499)	SAMSUNG GALAXY NOTE 10.1
QUADRANT	4,551	4,685	4,137	**5,695**
VELLAMO	1,605	1,475	1,418	**2,395**
ANTUTU	8,731	**12,027**	10,269	11,962
SUNSPIDER 0.9.1 (MS)	1,371	2,012	1,861	**1,193**
GLBENCHMARK 2.5 EGYPT OFFSCREEN (FPS)	**33**	N/A (TEST RUN WITH 2.1)	N/A	N/A
CF-BENCH	9,772	7,874	11,861	**13,157**

SUNSPIDER: LOWER SCORES ARE BETTER

TABLET	BATTERY LIFE
NEXUS 10	7:26
APPLE IPAD MINI	12:43 (WIFI)
SAMSUNG GALAXY TAB 7.7	12:01
APPLE IPAD (LATE 2012)	11:08 (WIFI)
APPLE IPAD 2	10:26
ASUS EEE PAD TRANSFORMER PRIME	10:17
SAMSUNG GALAXY TAB 10.1	9:55
APPLE IPAD (2012)	9:52 (HSPA) / 9:37 (LTE)
GOOGLE NEXUS 7	9:49
MICROSOFT SURFACE FOR WINDOWS RT	9:36
APPLE IPAD	9:33
ASUS TRANSFORMER PRIME INFINITY TF700	9:25
PANTECH ELEMENT	9:00
MOTOROLA XOOM 2	8:57
HP TOUCHPAD	8:33
LENOVO IDEAPAD K1	8:20
MOTOROLA XOOM	8:20
T-MOBILE G-SLATE	8:18
ACER ICONIA TAB A200	8:16
SAMSUNG GALAXY TAB 7.0 PLUS	8:09
GALAXY NOTE 10.1	8:00
LENOVO THINKPAD TABLET	8:00
ARCHOS 101	7:20
ARCHOS 80 G9	7:06

As they say in motorsports, that's why they run the races, and in practice the Nexus 10 feels snappy and responsive. Apps load quickly and are quite responsive and web pages, too, pop into existence about as quickly as your data connection can suck them down.

Even in 3D gaming the Nexus 10 will hold its own, a result backed by an average GLBenchmark 2.5 score of 33. Unfortunately, we've not run the TF700 through the latest version of GLBenchmark, so we're unable to directly compare, but others online report scores of roughly 15 fps from the ASUS tablet. So, if you're looking to do a lot of intense 3D gaming, this could be a much better partner.

The TF700 also managed a higher battery life, nine hours and 25 minutes compared to a relatively paltry 7:26 here. That's on our standard run-down test in which we loop a video on the tablet endlessly while screen brightness is fixed. We figure the blame for this performance must lie largely in the hands of that display, as even the Galaxy Tab 2 10.1 did notably better, at 8:56.

CAMERA

Samsung certainly knows how to make a good imaging sensor — the Galaxy S II still shines — so we were cautiously optimistic coming in here despite knowing that the company's tablets have historically had miserable shooters. This one, we're sorry to say, follows in their footsteps. The 5-megapixel camera on the back failed in virtually every case to take

The 5-megapixel shooter failed to impress.

a compelling shot. Complex images were too soft and simpler images were often rendered with curious color temperatures that had little to do with reality.

That unfortunately dynamic color handling continues to the video shooting. The tablet is capable of recording at 1080p but it's over-active when it comes to choosing a color temperature, constantly cycling from cool to warm. Similarly, the camera exhibits some distracting focus hunting during filming.

Granted, we find photographing or filming anything on any tablet a chore, regardless of sensor quality, so the lack of a good quality shooter here isn't too much of a detraction. But, we figure if you're going to bother putting a camera sensor on a tablet, you might as well throw in a good one.

SOFTWARE

It's Android 4.2 here, a tenth higher than before but still called Jelly Bean. As such don't expect any life-altering improvements, but there are some nice additions.

Keyboard: There's a new keyboard here, but you probably wouldn't notice it if you didn't know better. You can now swipe your way from one letter to

the next to spell out words quickly. The experience isn't as polished or powerful as the third-party alternative, Swype, but it's a nice addition for those keen to keep the stock keyboard.

Additionally, there's a far more comprehensive predictive text mode here that does a better job of figuring out what you're going to say before you've had a chance to tap or swipe it in. It's no SwiftKey, but it makes for a nice addition.

Camera: The camera has received a lot of attention, including a fancy new UI that is very minimalist. The biggest new addition here, though, is a 360-degree photo capture mode called Photo Sphere. An incredibly slick interface guides you through capturing enough pictures to effectively surround yourself, generating floating blue dots that you must hit like targets while the software stitches all the pictures together. That's when everything falls apart.

The resulting spherical images look awful. We took many and not a single one was created that didn't have glaring seams. Even if they were blended perfectly, it'd still be easy to pick out the individual photos. The camera is constantly adjusting exposure for each individual picture, so when they're all blended together some shots are bright, some are murky — and some are simply a blurry mess. It's a very cool idea that, sadly, is poorly done here, but we're not sure whether to blame the camera or the implementation at this point.

The side-to-side panorama mode is a bit better, operating much like Apple's in that you just sweep the tablet from left to right and it does the rest for you. The stitching here is far better than in the Photo Sphere mode, about perfect as far as we can tell, but there's still that same exposure issue, with darker sections of the surroundings actually appearing brighter than those areas that should be light.

Miracast: Miracast is the Wi-Fi Alliance's standard for wireless streaming of video, and its addition to Jelly Bean made us very excited — Android finally has a response to AirPlay. Imagine our disappointment, then, upon learning that Miracast isn't supported in the Nexus 10, at least not yet. It is there in the Nexus 4, a perplexing state of affairs that Google wasn't able to give us much clarity on, but it does appear that this is not a hardware limitation, since all the communication takes place over WiFi. If Miracast isn't going to be software-enabled in every Android 4.2 device then we're struggling to see how it's actually part of the OS, and we're definitely feeling let down about its potential to improve the platform as a whole.

Other Tweaks: There's a new quick settings menu that appears should you drag down from the upper-right side of the bezel. It gives you access to the brightness and things like toggling WiFi, Bluetooth or Airplane Mode. There's also

The Nexus 7 would still be our tablet pick of the Nexus family.

a shortcut to the rest of the settings. If you want the notification bar, you swipe down from the left side of the bezel. It's intuitive enough once you've done it a few times, but there's no visual indicator at the top of the screen to help the newbies.

Jelly Bean 4.2 also brings support for multiple users — but that wasn't enabled yet. We're told it's coming on November 13th. In theory it could be a boon for corporate adoption of Android, and it could also make letting your kids use your tablet an awful lot safer. ("Who deleted all my email!") But, we're sadly unable to tell you just how useful that is at this moment.

THE COMPETITION

At under $400, the Nexus 10 is a compelling package, but despite that display it can't quite muster best-in-class performances across the charts. In fact, other than a relative lack of resolution (1,920 x 1,200 vs. this guy's 2,560 x 1,600) the Transformer Pad Infinity

The 10 has opted for a non-stippled soft-touch plastic back.

TF700 is, we think, an overall better package. It's thinner, lighter, faster, has a much better camera, offers better battery life (particularly if you opt for the keyboard dock) and, frankly, we'd take the brightness and contrast of that 600 nit, Super IPS+ panel over this one with its extra pixels.

What does ASUS's offering lack? Well, Android 4.2 for one thing, but as we've shown above you're just an aftermarket keyboard app away from getting the best that it has to offer right now.

And, the Nexus 10 does have a lower starting price of $399 for a 16GB model. The cheapest we were able to find the TF700 currently is $477 — but that's for 32GB, so it's actually $20 cheaper than the 32GB Nexus 10. Plus, the TF700 offers expandable storage.

There's also the Galaxy Tab 2 10.1, which right now is $349 for 16GB (again, user-expandable), so you're saving a little money, but it's bigger, heavier, has a 1,200 x 800 display, offers worse perfor-

mance and has a similarly poor camera. It does, though, manage better battery life.

And, of course, if you're thinking about crossing the aisle to the iOS side, there is the fourth-gen iPad. That tablet's 2,048 x 1,536 display is lacking a fair few pixels in both dimensions but it more than makes up for it in other regards (namely contrast and saturation), its battery life is far better (over 11 hours on our test) and it, of course, offers up access to the zillions of tablet-optimized apps in the App Store — for a starting price of $100 more.

WRAP-UP

The Nexus 7 impressed us on nearly every front. What few flaws there were we more than forgave thanks to its bargain-basement price. At $400 to $500, the Nexus 10 is actually on par with many other 10-inch Android competitors — even a little more expensive than some — and, with average performance in most areas and sub-par battery life, it's relying on that incredibly high resolution and fresh Android build to set it apart. Sadly, neither is enough to distance this tablet from the competition.

The resolution is indeed quite nice but in many ways, the Super IPS+ panel on the ASUS Transformer Pad Infinity TF700 is even nicer, and other than that new keyboard there's nothing much in Android 4.2 to get excited about right now. Of course, the true beauty of the Nexus line is that when 4.3 rolls around this slate will be the first to get it, and that is certainly worth something. But is it worth enough to make up for this tablet's other shortcomings? D

Tim Stevens is Editor-in-chief at Engadget, a lifelong gamer, a wannabe racer, and a born Vermonter.

BOTTOMLINE

GOOGLE (SAMSUNG) NEXUS 10

$399 - $499

PROS

- Incredibly high-res display
- Front-facing stereo speakers
- Latest and greatest Android build
- Great gaming performance

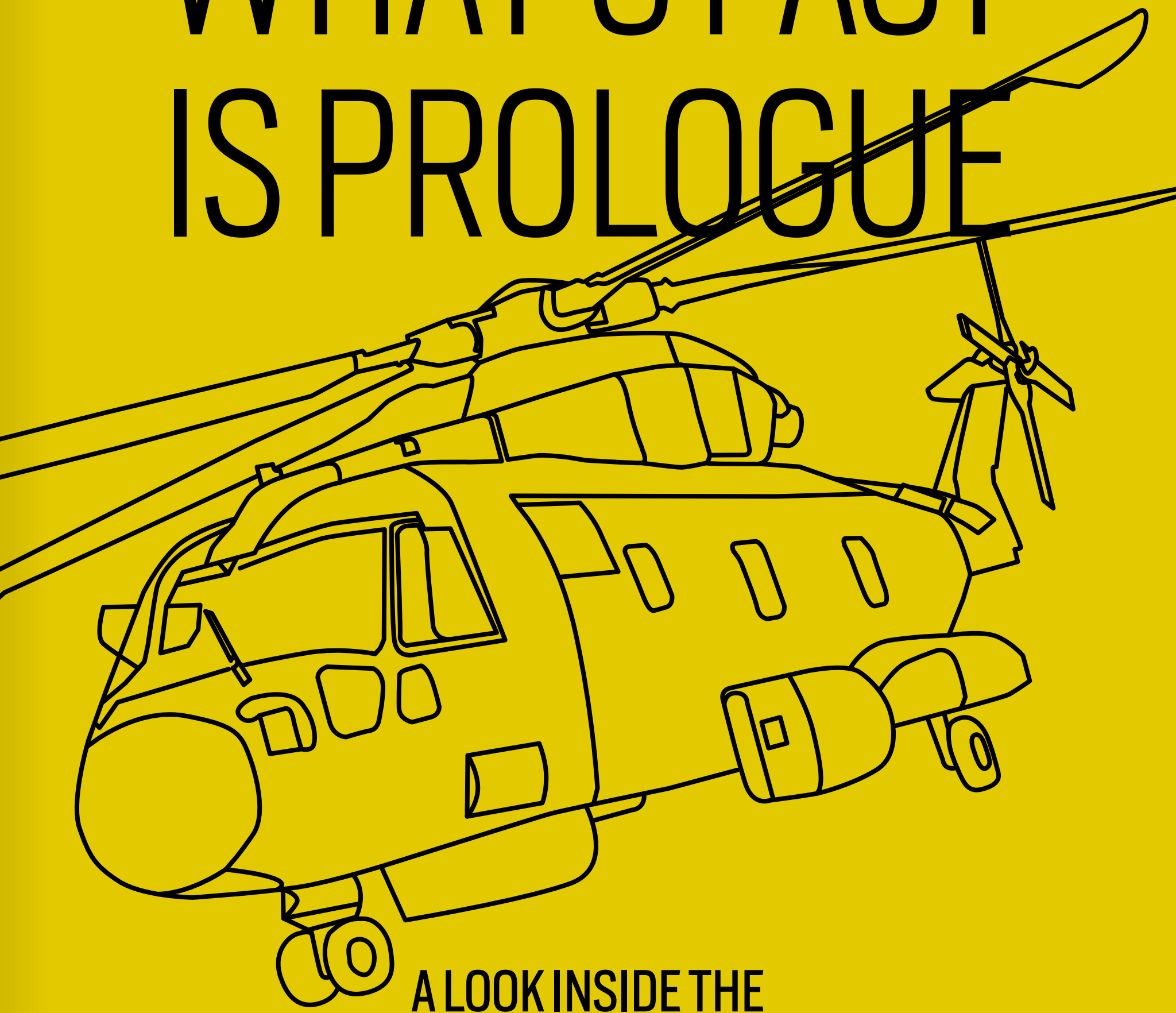
CONS

- Middling overall speed and battery life
- Display lacks contrast

BOTTOMLINE

Google's latest reference tablet packs an amazing resolution but ultimately fails to distance itself from the competition.

WHAT'S PAST IS PROLOGUE



A LOOK INSIDE THE FUTURE OF **LOCKHEED MARTIN**

BY DANIEL COOPER

I receive a terse invite from Lockheed Martin that asks me to take a "glimpse into the future," but doesn't mention whose future it is. I could write about what I know of the American defense contractor on the back of a postage stamp, but a cursory Google search fills in some of the blanks. The company reportedly receives around 7 percent of the US military budget on its own — and with

that, my imagination runs rampant about what I'm likely to see. Dreaming of playing with laser pistols, intelligent cyborgs and giant robots, I tell them I'm coming.

A few days later, I turn up at the Honourable Artillery Company in London's glitzy financial district, a miniature castle that's dwarfed by the gleaming skyscrapers that surround it. In a way, the landscape is telling, since the occupants of those buildings can shoulder some of

The Merlin's refit means it can do its current job and replace the Sea King helicopters, which are to be phased out.

the blame for the current financial crisis — while across the street, the defense industry is preparing its response. Walking past regiments of unflinching soldiers in the heavy (no, monsoon-esque) autumnal rain, I edge past the parade grounds trying not to disturb their duties.

Two hulking vehicles guard the entrance of a small courtyard, and through a window I see a plush room full of red velvet and leather, stuffed with computers and pensive, well-dressed operators. I wonder if I'm being vetted as I amble inside, my now-sodden socks and matted hair marking me out as unthreatening. As I'm ushered inside and the tour begins, I'm expecting to see jetpacks and robots, but the reality

PHOTOGRAPHS COURTESY OF LOCKHEED MARTIN

is much different. Not even this industry is immune to the world's financial problems, and my tour would reveal that its future lies decidedly in the past.

BUILD WHATEVER YOU WANT

The tour guide for the night is the affable Dr. Paul Townsend, Lockheed's head of technology in the UK. At first blush, he makes for an unlikely geek, resembling a pro athlete rather than the professorial stereotype. As he walks over to the first demonstration table, it's clear that this is a project that he's proud of. While it was conceived as a way to save a small fortune in material costs, it could have potential to change the way the company makes things in the future.

Manufacturing the highly specialized components the company uses requires ingots of raw materials (say, titanium) to be machined down to the correct shape. That process is enormously wasteful, and the company needs to reduce its resource-spending where it can. With that in mind, it's been investigating whether or not it's cheaper to employ 3D printing, which only uses what it needs, limiting waste.

Not even this industry is immune to the world's financial problems, and my tour would reveal that its future lies decidedly in the past.

Wire and Arc Additive Manufacturing (WAMM) is, in short, 3D printing with metals. While that technology isn't new, the current process is difficult and inflexible, requiring a static, vertical welding head that drops globules of hot metal down to create a shape. However, as the head can't move, it can only build the most basic of rigid structures, and would have difficulty dealing with anything as complex as a curved wall.

WAMM, which was developed in partnership with Cranfield University, uses a thin wire of titanium that is threaded through a movable arm. Melted at the tip, it can then create objects of any shape as long as they are not bigger than the reach of the mechanism. While it's currently a lot slower than traditional manufacturing, very little

of the hugely expensive metal is wasted on the engineering room floor. Thanks to its flexibility, it's also capable of producing significantly more complex shapes than can currently be achieved with 3D printing.

Holding the objects, they have an almost alien quality thanks to the piecemeal nature of their construction. They feel more like rocks or calcium formations than something that's emerged from a foundry, given the thousands of droplets of metal that it took to put them together. However, if the company needs a component to be smooth, the pieces can be sanded down to be indistinguishable from a traditionally manufactured piece of hardware. While it currently only exists within the confines of a university laboratory, it could potentially herald a staggering revolution in manufacturing — not to mention the environmental and financial benefits that accompany it. However, this demonstration was something of an outlier during the tour, with many of the other projects on show having been cooked up in response to a more pressing threat — the dwindling size of procurement budgets.

THE iPOD TANK

A break in the rain means we can now go outside to meet an unnamed soldier who is standing in front of a Warrior Tank. The Warrior Tracked Armored Vehicle (to give it its proper title) is the British army's frontline tank, and has been the primary transport for combat troops since the '80s. Why then, is hardware invented before my parents' marriage (let alone my own birth) being heralded as the future?

In response to the worsening financial crisis, the government began reorganizing the army to make it smaller, more flexible and, crucially, cheaper. The program was eventually named "Future Force 2020," and as part of it, spending on heavy weaponry was cut while emphasis was placed on upgrading current hardware. As such, the aging fleet of tanks, now into its third decade of service, is in dire need of a refit, and Lockheed won the £642 million ($1 billion) contract to ensure it's battle-ready all the way through 2040.

Lockheed's testing manager, Steve Timms, described the challenge as trying to reinvent the traditional tank hardware to behave "much more like an iPod." The company has developed a new series of modular systems that can be swapped in and out to change its functionality over time. In his mind, this functionality is analogous to "downloading apps to make your iPod do different things." As such, depending on the need (or threat), different technologies like an anti-IED (improvised explosive device) or electronic warfare platform can be added and removed in a matter of hours.

On the nuts-and-bolts side, the Warrior is gaining an improved forward cannon, which, for the first time,

With Lockheed's improvements, these vehicles will be able to keep going until 2040, nearly 60 years after they were first introduced.

Why then, is hardware invented before my parents' marriage (let alone my own birth) being heralded as the future?

can fire multiple types of shells for "hard" and "soft" targets. To balance out such power, it's getting a new stability system that negates the recoil traditional tanks suffer from. It's at this point that our anonymous soldier chips in, pragmatically explaining that a current tank battle between moving targets is "about as accurate as a drive-by shooting." However, with the addition of a new computer targeting system, it can calculate the tank's own movement, terrain, the enemy unit's travel and the recoil factor to vastly improve its accuracy.

In an effort to provide crews with as much situational data as possible, the refreshed tanks are now lined with cameras and sensors. That way, transported soldiers (up to five per vehicle) know what they're about to encounter — whereas, previously, they leapt into the unknown. The crew stations inside the vehicle are now networked, allowing commanders and turret-gunners to share information and offer a level of redundancy should a system fail.

THE LOYAL ROBOTIC MULE

Our nameless soldier now steps forward to explain a project he's clearly more excited about — a smaller vehicle that's stationed beside the Warrior. The soldier, who is clearly speaking from experience, tells us modern troops need to carry a huge amount of gear on their backs, but that means they're far less effective during attacks. If they come under fire in the field, they're meant to gymnastically leap to cover and return fire — however, the sheer weight on their shoulders means soldiers could do little beyond "dropping to the floor where they stood." Naturally, that's not a useful combat tactic, since it's unlikely they'll be given the time to free themselves from their burdens — all the while presenting an easy target for their opponents. The solution? The SMSS, a diesel-

powered pack mule that's capable of carrying troops' gear like a robotic Sancho Panza.

The six-wheeled truck carries up to 544kg (around 1,200 pounds) of gear over 200km (124 miles) on a single tank of fuel. Unlike other transports, the SMSS straddles the line between autonomous car and self-aware robot, thanks to the bank of sensors and cameras that cover its face and let it self-navigate, make decisions and even find its way home. In ordinary circumstances, it can be directed with an Xbox 360 controller, sent on missions with an Android tablet or even lock onto a single soldier and follow them wherever they go, like a terrifyingly loyal dog.

Its autonomy stretches as far as being able to find its own way past obstacles it cannot traverse. That way, if the soldier it's following hops over a chasm or through a narrow passage, it'll dash off to find the easiest route around. Thanks to its hefty hydraulic drives, up to two wheels on either side can be destroyed and it will still function. It can also be pressed into service as a medical transport, conveying two stretcher-bound patients (and a medic) to safety. It's currently being actively deployed in combat situations as a nighttime ferry. Thanks to its quiet engine and night vision, it can also carry supplies to forward positions from a main base without an escort.

SAVING MONEY IN THE SIMULATOR

Back inside, it's time to look at the company's simulators, which are designed to save money by reducing the amount of time (and fuel) troops have to log on real hardware. While the simulated tank battle may resemble something out of the halcyon days of DOS games, the software behind it is extraordinarily complex — modeling every element of the action, from the behavior of enemy tanks to the movement of the flora and fauna. Then it's time to take a look inside the claustrophobic vehicle simulator itself, a white box surrounded with cameras on the outside, its tiny cabin packed with screens and controls. While the company declined to go into specifics as to the hardware power both were using, I

It may look like a game from here, but generating the data to drive this display requires truckloads of radar gear.

could spot a few brand names on our travels.

In fact, Lockheed Martin uses a surprisingly large amount of consumer hardware in its everyday activities, where you'd expect to see over-engineered, custom gear. During the tour, I spot Dell desktops and servers, Panasonic Toughbooks and a table of 24-inch Wacom Cintiqs being set up for another exhibit. The primary joystick in the simulator is remarkably similar to the Logitech 942, and Townsend spoke openly of "human factors" that enable users to pick up skills faster because we've grown up with this technology — explaining the use of Xbox and PlayStation controllers. As such, many of the newest recruits have logged hundreds (if not thousands) of hours on their consoles, and so training reflects this. It's also beneficial from a cost perspective, since such tools have been designed by Microsoft and Sony to withstand the violent excesses of jam-smeared children and are so cheap (in military terms) that they're essentially disposable.

EYES IN THE SKY

Our next stop on the tour is to meet David Stanton, representing the company's (reported) £1.15 billion ($1.9 billion) contract to upgrade the British navy and air force's Merlin helicopters. In the same way that the Warriors are being refitted to avoid splashing out on new tanks, these vehicles are being tweaked to save £500 million ($805 million) replacing the soon-to-be mothballed fleet of Sea King choppers.

In my mind, this seems a little odd, purely because you'd have thought he'd be pushing to deliver a new vehicle rather than get involved in the messy process of dealing with another company's (Westland at the time) hardware. When I ask him, he seems a little resigned to the answer, saying that Lockheed operates "in the shadow of the global financial crisis" and that it's been forced to make concessions. So, rather than building new craft, it's doing its best to package new technology in a way that nations across the globe can afford.

The company's challenge is to turn the Merlin, an anti-submarine and search-and-rescue vehicle, into a craft that can also take over the Sea King's airborne surveillance and control duties without breaking the bank. As such, Lockheed is adding capacity for modular systems that can "roll on and roll off" (RORO) the craft depending on the mission's need. It's here that the company is demonstrating Vigilance, the first system to accompany the platform. It's a new radar setup that turns the helicopter into an all-seeing eye, capable of surveying the 360-degree space around it in order to direct fighter planes in combat.

It uses a pair of radar arrays, each with a 120-degree field of view, from Lockheed's competitor and occasional partner, Northrop Grumman. The array itself is a steel hoop around 20 inches in diameter, the surface of its aperture teeming with rectangular rods. The hardware is put into a fiberglass pod, which hangs on either side of the chopper's fuselage, on a gimbal, that lets it turn to cover the extra 60 degrees (for a total of 180 degrees of coverage each). The range of the equipment is classified for military reasons, but a demonstration showed that a helicopter, so equipped, could hang back and be the eyes and ears of fighter planes battling ground or aerial targets around it.

While it's being tested and implemented over the next year as part of this program, Vigilance can be fitted to any vehicle that can accommodate the two control consoles and supply the necessary power. The hardware, which ships on a pallet, includes 4-foot-high steel boxes with a built-in desk that sports a rubberized keyboard and roller-

ball mouse. Operators can watch a 24-inch primary monitor above their heads and two 10-inch displays mounted at eye level. The left of the two smaller screens is touch-enabled, offering customized controls, and the right is a secondary display that lets you see detailed information not visible above.

Once the program has been completed, these helicopters will become the airborne equivalent of a socket wrench — capable of undertaking a number of previously impossible tasks. Stanton has said that while the timescale will vary depending on the specific make and model of each craft, the company is confident it can upgrade a Merlin in less than two weeks, and after that the RORO systems can be changed in "around two hours."

THE REAL, REAL-TIME SIMULATION

The final stop on our tour is a pair of software projects that, uncharacteristically, aren't concerned with saving money as much as providing information. The Land Environment Air Picture Provision (LEAPP) is a £100 million ($160 million) system that uses ground-based radar stations to give mission commanders a view of their environment. Development began in 2008, and the first systems are being delivered to the army at some point this year. The trucks carrying the stations are the size of a shipping container and can either move around under their own steam or be airlifted by a Chinook helicopter. They provide mission commanders with real-time data, enabling intelligence staff to mark friendly and hostile craft, coordinate assets and see the whole landscape as if it was cooked up inside a computer. In effect, all of that hardware has one purpose: to create an isometric view of the battlefield as if it was a real-time simulation.

When I comment on the similarity between this and a game like *Command & Conquer*, the firm points out that operators are deeply aware this isn't a game. However, Lockheed's Systems Engineering Manager, Michael Harper, does concede that game design has heavily influenced the software's development. In his mind, "since people

come from a world of Google Maps," it's faster and cheaper to embrace the user interface Google developed — because to do otherwise would require jarring retraining.

Harper then directs us to the other end of his exhibit, where he is demonstrating Automated Sense and Warn (AS&W), a system that has been active since 2008. It's a defensive system that uses a series of radar scanners around the perimeter of military bases (like Camp Bastion, the British military base in Afghanistan that was recently attacked by Taliban forces) to watch for incoming threats. If it detects a mortar shell or rocket on approach, it sounds an alarm in the area where it's expected to land. While it can only give four or five seconds of notice before impact, it's already proven its worth in the field — with Harper saying that at one (unnamed) base, it's increased survival rates by 80 percent.

Some may be surprised to learn that the operating system that enables both of these vital programs is actually Windows XP. Unsurprisingly, Lockheed's insistence on using off-the-shelf components is both a benefit and a burden in situations like this. While it can rely upon its deep, highly secretive partnerships with companies in the industry, it's also a victim to those product's flaws. It has to contend with the lifecycle of the software — giving the company an extra headache as it tries to maintain support for the OS when Microsoft turns off the lights in 2014.

THE SHAPE OF THINGS TO COME

As I leave, the heavens open once again, and as I dash back to the tube, I'm left wondering what the company is trying to show me. It's certainly interesting to note just how much the likes of RTS games and Google Maps influences its software decisions — as if the worlds of consumer and military tech are somehow merging. Given that these are just the secrets the company feels comfortable showing off to journalists, it's clear that the really juicy projects remain hidden behind closed doors — I just hope that they're not as fixated on their past as some of these have been. D

ESC

DISTRO
11.09.12

VISUALIZED

PLANETARY SELF-PORTRAIT

No, this photo of NASA's Curiosity wasn't taken by alien paparazzi, it was shot by the rover itself. The image is actually the result of 55 self-referential pictures taken with the Mars Hand Lens Imager (MAHLI), which when stitched together, present an unobstructed view of the rover without its own camera-wielding arm in sight. The MAHLI is one of 17 onboard camer-as that can help mission engineers keep an eye on Curiosity's physical wear-and-tear as it makes its way around the Red Planet.

PHOTOGRAPH COURTESY OF NASA/JPL-CALTECH/
MALIN SPACE SCIENCE SYSTEMS

M.C. SCHMIDT

Schmidt (right) with his other half, Dr. Drew Daniel

One half of the electro duo MATMOS opens up about finding humor in car names and wisdom in his smartphone.

What gadget do you depend on most?
My Gaggia Baby espresso machine, which was foolish, as it just broke! Perhaps my Beyerdynamic M88 microphone? Certainly more dependable!

Which do you look back upon most fondly?
Apple Computer used to make a hell of a laser printer. In my hobby as a visual artist I am fond of printing on strange materials ... you could practically put a cat through that thing!

Which company does the most to push the industry?
Well, embarrassingly, I guess I have to say the obvious, Apple Computer.

PHOTOGRAPH BY JAMES THOMAS MARSH

What is your operating system of choice?
Well, choice doesn't always play the largest role in that, does it!? We use an old Mac OS something-or-other on our main studio computer, because we are very comfortable with the version of Digital Performer we use. The upgrading of systems is not necessarily the best thing for artistic endeavors, because art demands a sort of consistent fluency with one's tools. I'm not sure we would have the greatest, say, paintings of the past if people had DEMANDED that Vermeer change the shape of his brush handle and kind of paint and canvas every year and a half!

What are your favorite gadget names?
We love stupid car names. "Elantra" and "Aztek," "Escalade," etc. Hilarious.

What are your least favorite?
The ridiculous trend of combining words into new words was sort of despicable: "Taligent, Agilent, Accenture ..."

Which app do you depend on most?
Well, it's boring to say the boring ones. So, I'll say that I'm very fond of Urbanspoon, finding decent food and coffee on tour is now a beautiful possibility thanks to things like this.

What traits do you most deplore in a smartphone?
It infuriates me that I can't make my own ringtone for my iPhone. I loved my older flip phones that actually had a little synthesizer sequencer on them for that! Of course, the business of having a conversation with someone and then looking at them and realizing that they have "checked out" and are in phoneworld and not with you anymore is a social tragedy with implications that are hard to fathom, oh, excuse me ... I ... (checks phone).

Which do you most admire?
Its ability to function as a magical oracle. Very fond of the app, My I-Ching.

What is your idea of the perfect device?
The Roland SH-101 synthesizer.

What is your earliest gadget memory?
Ooo! Probably my Panasonic RQ-309AS tape recorder. Best known as "black plastic cassette machine," with built in "condenser microphone!" Go ahead, Google image search it, they are still well-loved.

What technological advancement do you most admire?
Off the top of my head, the Global Positioning System is pretty rad.

“We love stupid car names. ‘Elantra’ and ‘Aztek,’ ‘Escalade,’ etc. Hilarious.”

Which do you most despise?
Oh, I hate weapons development a lot. The really smart people who give their lives to companies that do that while thinking they have no responsibility for the results of what they do are … um, well let’s just say, wrong.

What fault are you most tolerant of in a gadget?
If a gadget / instrument with bad UI or inconsistent behavior manages to produce something that sounds great then it’s worth keeping around. I think the Flame Talking Synth falls under this category.

Which are you most intolerant of?
Having to page through menus in an instrument / gadget designed for live performance.

When has your smartphone been of the most help?
Staying in touch / coordinating while on tour.

What device do you covet most?
EMS Synthi AKS w/Cricklewood keyboard, or perhaps the all-electric Ford Transit XLT … are these gadgets? Is something that costs more than $20,000 a gadget?! Haaaaa ha ha ha! (Trails into crazy laughter.)

If you could change one thing about your phone what would it be?
Well, that thing I mentioned about the sounds I could make myself, easily, or perhaps longer battery life.

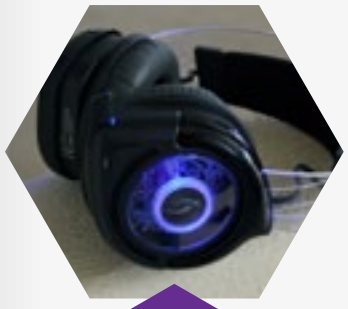
What does being connected mean to you?
Eye contact.

When are you least likely to reply to an email?
Oh, gosh. When it’s most important that I reply to it, it seems!

When did you last disconnect?
Drew and I took a vacation to Hawaii a while ago where we promised ourselves, “no computers!” We were bored silly in two days. Our favorite vacation (vacation together is a rare commodity when every “free” time can mean “tour” time) ever was one of the most connected cities ever — Berlin … wow, you can really connect a lot of ways there!

IN REAL LIFE is an ongoing feature where we talk about the gadgets, apps and toys we're using in real life.

iPHONETRIP

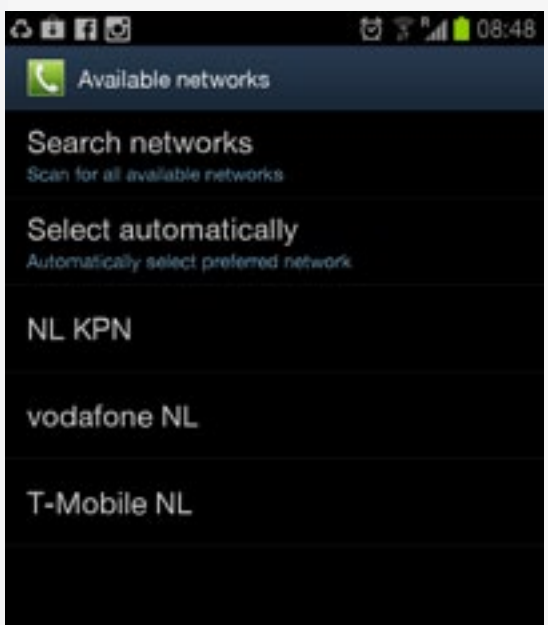


PDP Afterglow Universal Wireless Headset

Western Digital My Net Wi-Fi Range Extender

Have you ever crossed a border without swapping out your SIM? It's a rookie mistake or, for the deep-pocketed, a convenient solution. Tracking down a local data plan can be time-consuming and sometimes even impossible, leaving travelers to surf the web using a foreign SIM card, at astronomical rates. Sure, roaming is an option, but it's far from the best. There *is* a way to get the best of both worlds, though.

A new service called iPhoneTrip brings the convenience of roaming with tolerable pricing tiers. Packages start at $8 (100MB of data in a single country) and range all the way up to $17 per day (unlimited data in more than 200 countries). There are discounts on offer for longer trips as well. Those daily rates net you a standard or micro-SIM for any unlocked device — despite the company name, compatibility goes far beyond iPhones. If you opt for the World package, you can hop from country to country without skipping a beat — your handset will switch to a new network as soon as you cross a border, or you can manually select from any of the available carriers, just as if you were roaming with a SIM from AT&T.



I used a free trial of iPhoneTrip's service during my trip to IFA in Berlin and IBC in Amsterdam. The included SIM was programmed for "unlimited" use (500MB limits may apply), so I often used it for laptop tethering or sharing data with other smartphones over WiFi. It worked flawlessly — I was even able to hop onto AT&T before and after the trip, and an unscheduled stop in Belgium didn't trip up the SIM, even though I hadn't listed it. The service I tried would have run $17 per day — compared to about $40 monthly for a local SIM with plenty of data. For short trips, it's definitely a cost-effective solution, but if you're planning to be in one country for a week or longer, buying a prepaid SIM once you arrive is likely the better bet. Still, considering what you'd spend for regular roaming service, it's a bargain. iPhoneTrip has surely earned a spot as my default global data service — when I can afford it.

— *Zach Honig*

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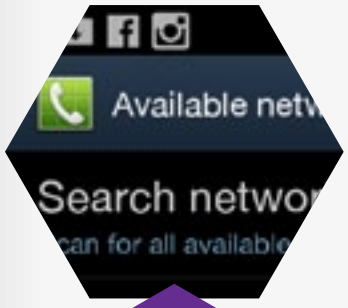
PDP AFTERGLOW UNIVERSAL WIRELESS HEADSET



iPhoneTrip

Western Digital My Net Wi-Fi Range Extender

Sometimes, people confuse value with cheapness, and to someone with $200-plus gaming headsets by Astro Gaming and Turtle Beach, the Afterglow Universal Wireless Headset by PDP's $90 price tag seemed relatively affordable. So, to be honest, I wasn't really expecting much. Then I put it on: this thing sounds way better than its price tag would suggest.

Featuring 50mm drivers and a honking set of earpieces, the Afterglow delivers crisp sound across all ranges with clean bass, even when using the Afterglow as a wireless headset. Despite lacking Dolby support, its Immersive Audio mode still does a decent job of conveying surround sound. It also has Pure Audio and Bass Boost modes to help round out your audio choices. To connect to a console, the Afterglow uses a USB transmitter dongle and a pair of analog RCA cables, which PDP says is necessary to lower costs. On the plus side, you can use the headset and mic functions on the PS3, Xbox 360, Wii and even a computer, and battery life is over 10 hours. The wireless range proved to be farther than my other headsets, though you do get signal degradation on your mic if you walk too far away.

As far as fit goes, the Afterglow uses a snug strap-based mechanism, which might be too tight for some folks, and while its plastic band is pretty sturdy it is laughably large and can make you look like an alien from an old B-movie. Folks who don't like its light effects can simply turn them off. Despite its faults, the Afterglow arguably provides the best bang for your buck among gaming headsets. If you're looking for a sub-$100 headset that works with all major consoles, then the Afterglow is worth a look.
— Jason Hidalgo

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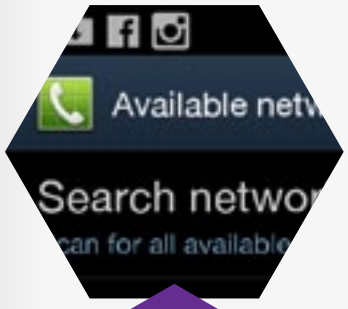
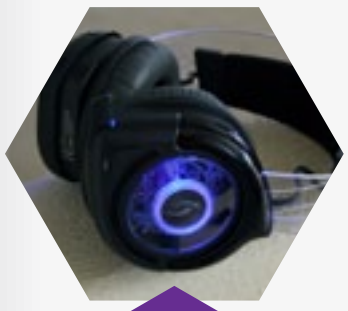
WESTERN DIGITAL MY NET WI-FI RANGE EXTENDER



iPhoneTrip



PDP Afterglow Universal Wireless Headset

For those holed up in studio apartments, the notion of needing a range extender is a silly one, but even smaller homes with thick walls — not to mention complex office buildings — frequently need a boost when it comes to distributing WiFi.

That's where WD's My Net Wi-Fi Range Extender comes in. The unit itself looks pretty much exactly like a router — it's got your typical "black box networking equipment" kind of vibe. Thankfully, it's pretty easy to hide, and setup is shockingly simple. I tested the unit in a home with a conventional Westell DSL modem-and-router combo. It's a pretty cheap box with no WPS support to speak of. All I did was plug the Range Extender in some 100 feet away, and the Dashboard process walked me through everything. I connected the extender to the router, punched in its WPA password, and then reconnected to the router's SSID. Once the setup is complete, you'll never know it's there... save for all that extra range you'll enjoy.

In my testing, it added another 150-some-odd feet of range, and that's through two walls and up a flight of stairs. Oddly, WD hasn't published an expected range boost, but I'm guessing that's because each home / office will see varying results based on the layout. Even with only one set out of three boost LEDs lit, I was able to take that relatively weak signal and enjoy the same download rates as I could being right next to the aforesaid Westell router — despite being two rooms away. For $80 or so, it's a reasonably priced way to boost your signal without forcing devices to latch onto a new access point.

— Darren Murph

The week that was in 140 characters or less.

Cue the Ferrari, Fix the Apology and Put the CEO to Work

DISTRO 11.09.12 | ESC | REHASHED

@Tim_Stevens
Ferrari has some amazing technology in its traction and stability control systems. In infotainment? Not so much. Maybe Eddy Cue can help.

@edbott

British court pulls full Monty Python, tells Apple, "Right, that's not an apology. Do it over, stop acting like twits."

@shutter_simon

This is the future – have the CEO do the unboxing video. Yes Iwata-san, it is a bit stiff.

@cartwheelit
Do you remember the Verizon App Store? No one does, which is why it's closing.

@DJDarren
So MS are finally offering Office on iOS, but it's a subscription model? Sod that.

THE STRIP | BY SHANNON WHEELER

THORENS EXCELDA

The concept of the PMP has been around far longer than the Walkman or iPod. As far back as 1931, a Swiss music box manufacturer named Thorens began offering one of the very first portable playback machines: the Excelda. This on-the-go gramophone finally gave people the freedom to take their music on the road, and it didn't even need batteries. When fully wound, its clockwork motor could easily play one full side of a 10-inch record. When not in use, this "pocket-sized" player could be packed away inside its own tin container, earning it the nickname of "cameraphone," since it resembled foldable cameras of the time.

MODERN EQUIVALENT:
iPod

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