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Galaxy Nexus: The ^ALMOST Perfect Smartphone

Galaxy Nexus HSPA+
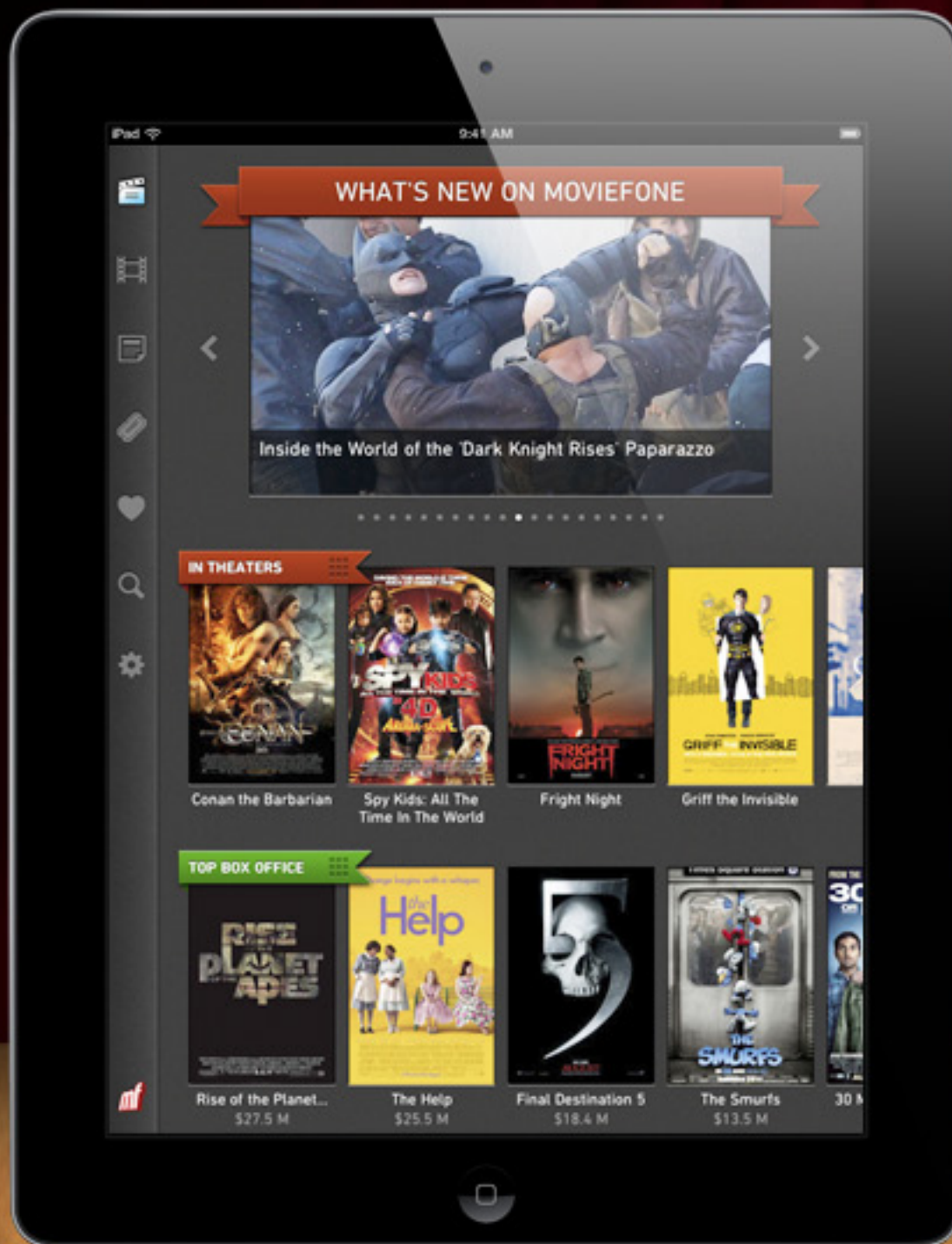
LeWeek of Lenovo and the Transformer Prime gets a date

Back to work, and back to a ridiculous flood of news for the Engadget crew to parse and process. Things got pretty hectic at times this week, but that's how we like it, and besides, it's just over a month until CES — the most absolutely insane week of the year. We're proud to announce that we've been chosen to be the Official Online News Source for CES 2012 and for the CEA as a whole. This is a big step up from our "Official Blog Partner" title that we've had for the past three years running. Rest assured that we won't sleep until we've brought you every scrap of interesting news from the show.

Getting back to the now, it was Lenovo leading the charge with announcements this week, with a whopping three phones, two tablets, one tabletphone and a TV. We'll start with the hybrid 5-inch LePad S2005 tabletphone, running Gingerbread on a 1.2GHz chip and trying desperately to be more successful than the Dell Streak that came before it — despite both having the same sized LCD at the same WVGA resolution. Let's just say we're not optimistic.

The LePhone S2 is, as its name so Gallicly implies, a proper

phone, a 3.8-inch unit with a single-core 1.4GHz Qualcomm processor, Gingerbread install and a WVGA resolution from its TFT LCD. Then there's the S760, fronted by a 3.7-inch AMOLED display and packing a 1GHz processor.

Next are the LePad S2007 and S2010, both running Honeycomb on a dual-core 1.5GHz chip and available in, predictably, 7- and 10-inch varieties. The biggest display of them all, though, is on the IdeaTV (or LeTV in China), a proper smart TV that will run apps of an unknown provenance and, we're told, tie in to Lenovo's own cloud storage. The cloud is, after all, where all modern gadgets must be able to stick their heads.

Honestly none of those did anything to get me particularly excited. Their specs are all decidedly mid-range and, despite being an unabashed ThinkPad fanboy, I can't say I'm in the market for a Lenovo TV. Still, there's one more phone that did pique my interest: the K2. It has a

4.3-inch IPS LCD and a dual-core 1.5GHz Qualcomm CPU with 1GB of RAM. It's still running Gingerbread but it is, at least, the one device of the lot that actually looks solidly relevant in the current market.

There is one device, however, that is undoubtedly competitive in the modern gadget world, and that's the ASUS Eee Pad Transformer Prime. We sadly got ours too late to include the review in this week's issue (you'll have to wait a week for that), but we will bring news of release: according to ASUS the Transformer is expected to ship to eager American gadgeteers the week of the 19th. It'll be priced at $500 for the 32GB version, $100 more for a 64GB flavor and you can get the battery-extending keyboard dock for $150 on top of that.

By the way, that tablet is the first to ship with NVIDIA's quad-core Tegra 3 system on a chip, but it won't be the last. Word on the street is that Acer and Lenovo are both working on their own tablets featuring the same hardware, but they'll be running Ice Cream Sandwich when they ship in 2012. For its part, ASUS is promising the Prime will get an upgrade to ICS next year too.

Meanwhile, Samsung seems to be giving up on the netbook,

Samsung seems to be giving up on the netbook, the sort of tiny laptops that once dominated our posts and our hearts.

the sort of tiny laptops that once dominated our posts and our hearts — and which cramped our fingers with their tiny keyboards. The little lappys will go away as part of a "new strategy" from the company focusing on ultraportables and Ultrabooks — not to mention tablets and phones in every shape and size imaginable.

The Kindle Fire got its first taste of a custom ROM, running the Gingerbread-based CM7. Things are far from pristine — the tablet is processing touch inputs that are 90 degrees off from where they should be, among other issues — but it's a promising step in the continuing process of cracking open a tablet that many of us want to see split wide.

The PlayStation Vita will likely not be so easily hacked — at least not if Sony has anything to say about it — and

sadly it also won't easily run PSOne Classics and other so-called "archive games." Those are the sort of older titles that get players of a certain age (like myself) unreasonably excited and cause younger gamers to, well, yearn for more *Modern Warfare.*

In this week's Distro our premiere piece is our review of the Galaxy Nexus, Samsung's wunderphone in its globetrotting HSPA+ flavor. If you're an Android fan, this is the one you've been waiting for. We'll also look at Fanatec's latest high-end wheel and pedal setup, designed for virtual racing in Forza 4, and then we'll take you racing for real with Audi Sport Team Joest as we look at the tech that keeps their team in the race. Our Don Melanson weighs in on the frustrations and failures of product naming, Ross Rubin talks about the lack of appification of the Apple TV and we'll yet again give you a glimpse of the gadgets that keep us ticking IRL. As ever it's a lot to process, so get comfortable and get informed.

TIM STEVENS
EDITOR-IN-CHIEF,
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This Way In...

Cover Illustration: Jerry Business

TOP 5
U.S. TABLET BRANDS
(EXCLUDING APPLE)

Retail sales Jan-Oct 2011
Total number of non-iPad tablets sold:
1.2 million

ASUS
10%

Motorola
9%

Acer
9%

Others
27%

Hewlett
Packard
17%

Samsung
16%

HP nabs spot as number two tablet maker…
for the moment

You hear that Samsung? HP's number two. For now at least. The PC maker, which snuffed out its line of webOS devices not all that long ago, managed to grab the number two spot in the tablet race between January and October, according to analyst group, NPD. The news comes thanks in part, no doubt, to the bargain-basement pricing on its discontinued TouchPad. According to NPD, the time frame saw the sale of more than 1.2 million non-iPad tablets. Apparently 76 percent of those who bought such devices didn't even consider picking up Apple's industry leading slate.— *Brian Heater*

The Weekly Stat
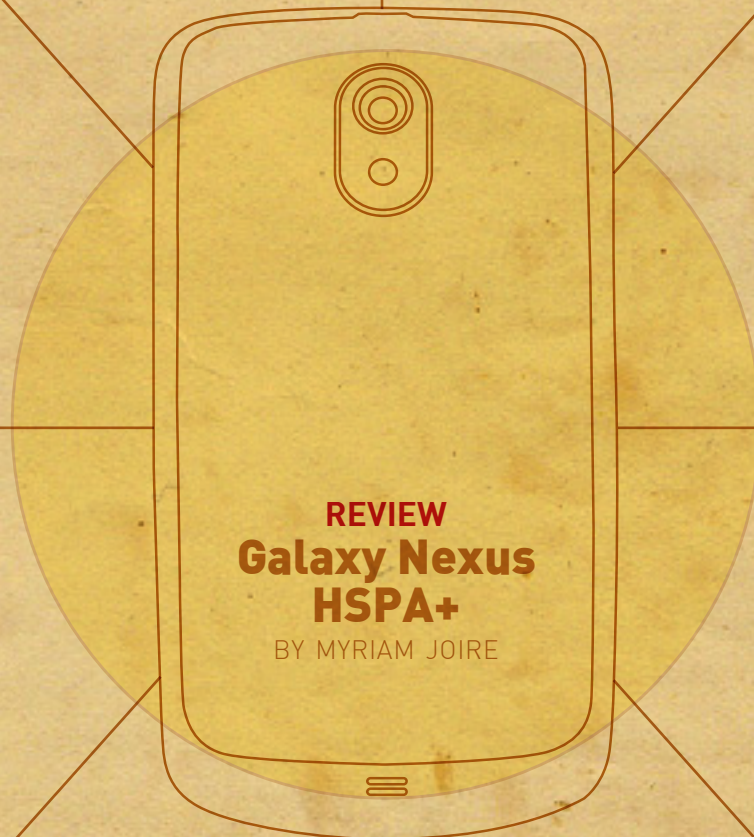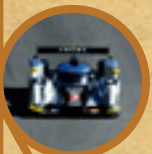
KEEPING THE 'APP' OUT OF APPLE'S TV

Switched On

BY ROSS RUBIN

Ross Rubin (@rossrubin) is executive director and principal analyst of the NPD Connected Intelligence service at The NPD Group. Views expressed in Switched On are his own.

Rumors continue to heat up that Apple will enter the television market next year, stepping up its Apple TV "hobby" into a greater revenue-generating vocation. The company would clearly like to repeat the kind of rousing success it has seen in smartphones. There, it entered a market at least as crowded and competitive as that for televisions whereas most of its Windows rivals have barely been able to eke out a few models with nominal share. ¶ Indeed, the challenge is not as much about competition as commoditization. At first glance, this would be a curious time for Apple to enter the TV space. The HD and flat-panel transitions on which premium manufacturer brands and retailers once feasted has long passed. "Flat-panel TV" and "HDTV" are now just "TV." And prices for smaller sets are settling into a range familiar to those who remember what they cost back in the heyday of CRTs. ¶ What's different, though, is that the state of the smart TV market looks strikingly like the smartphone market did before Apple's entrance. The market essentially has "feature TVs" that present a few popular canned services (YouTube, Netflix, Hulu, Pandora, etc.) and "smart TVs" that are a fractured mixture of homegrown offerings (from companies such as Panasonic, Samsung, LG and Toshiba) and an experience-challenged licensed OS (Android from Sony and Vizio).

This doesn't mean, though, that Apple would necessarily see its television as a way to extend the iOS developer base any more than it has opened up the Mac to such apps, at least at launch. Switched On has previously discussed the challenges that TV-based apps face. If putting such apps on a TV was Apple's plan, why

The smart TV market looks strikingly like the smartphone market did before Apple's entrance.

wouldn't it get it started via support on today's Apple TV box? Even if Apple exceeds its wildest dreams for success with an Apple-branded television, there will be a much, much larger base of Apple TV-accessible HDTVs from other brands available for the foreseeable future

The company has clung to the idea of TV as a passive experience. Indeed, enabling iPhone-like apps on a TV would likely require some Magic Trackpad-like remote, which is not, in the words of Steve Jobs, "the simplest user interface you could imagine." So, what is Apple's opportunity then? There are at least two paths it can take to creating a compelling, differentiated TV experience. They are:

Aggregation: Switched On has also previously discussed the promise of an iTunes-based subscription alternative to cable. Alas, it has been difficult for any company to coax content owners to abandon their lucrative cable compensation deals. And while Apple may have the cash to do so, it doesn't seem like the sort of spendy deal in Apple's character. Of course, user interface and input would play a huge role. Siri or some Siri-like agent could pluck shows from across services such as Netflix and Hulu if Apple can't pull together an integrated subscription service of its own and repeat the disruption it originally made with the iTunes Music Store.

Integration: The cliche "if you can't beat 'em, join 'em" hasn't worked in the world of broadband television. As difficult as it has been to assemble a competitive show lineup to facilities-based incumbent TV service providers, it hasn't been much easier to integrate the richness of that platform. Most have tried either the kludgey (IR emit-

Apple has been one ring away from Netflix on cable company dartboards.

ters used by early TiVo boxes and the Logitech Revue) to the obscure (Cable-CARD, used by modern TiVo boxes, which is hardly universal in the U.S. much less Apple's other global markets).

If Apple were to find some way to remix the content that most consumers were already paying for, it would have a huge advantage versus other TV makers. But Comcast and TimeWarner have been slow to provide the keys to the content kingdom to even current high-volume TV companies such as Samsung and Sony. Historically, Apple has been one ring away from Netflix on cable company dartboards, although many of them can't seem to rush enough video to the iPad today. Perhaps Apple could use the iPad as a leverage point. After all, a simple cable or AirPlay support is all that separates its display from a television today.

Over the next few years, Internet connectivity will become a common feature in TV sets. It is already becoming so in 40"+ models. Apple seems to be under no pressure to enter the market. With its current Apple TV, it can send a wide range video content up to a television with ease, and future versions of Wi-Fi will easily support the ability to do so in the best quality available. It's almost certain that an Apple-branded television would (and would have to) differentiate on user experience well beyond an engagement level that Apple TV delivers today. Beyond that, optimizing the selection and presentation of the content consumers want is the critical task for any company that would seek to reinvent the TV.

Switched On

THE PROBLEM WITH BAD PRODUCT NAMES AND WHAT WE CAN LEARN FROM IT

Editorial

BY DONALD MELANSON

Don Melanson is a Senior Associate Editor at Engadget, a denizen of Canada's east coast, and generally curious.

Product names generally fall into one of four different categories: good, safe, meaningless and bad. There may be better categories to group them in, but we'll use these for the purpose of this editorial. In the first category I'd put something like Kindle, arguably one of the best new product names of the last ten years. iPhone and iPad, and their subsequent suffixed versions, are in the safe category. They're perfectly fine names for a cellphone and a tablet, but they're not as original or distinct as iMac or iPod were, which I'd consider good (iPod nano, shuffle and touch, on the other hand, are all safe names). ¶ In the meaningless category are things like the MSI GT683DXR or ASUS XU6280, one of which I just made up. Some meaningless names can also be good in their simplicity — like the Nokia N9 or Nikon D3S — but they are still basically nothing more than differentiators. This is an acceptable option. ¶ In the bad category are the majority of smartphones released in the past few years. Rezound. Rhyme. Vivid. Epic. Sensation. Thrill. Skyrocket. Conquer. Triumph. Enlighten. Infuse. Prevail. Arrive. Can you name the company behind each phone? And those are just a few examples from this year. The names aren't just bad — they're noise. Some names might fall into a fifth, slightly murkier okay category, but there are certainly more phones (and, increasingly, tablets) in the bad category than any other, and I'd argue that's a sign of a larger problem.

A product's name is part of its identity. If you tell someone you have an iPhone 4, most people will know what it is, and they'll know it's made by Apple. That's

largely due to the phone's success, of course, and Apple's effective marketing, but the name is not an insignificant factor. Apple has made five different phones now, and each successive one has helped to build up the iPhone brand. If each phone had used a different name — or if Apple had made far more than five different phones by this point— I'd suspect that people would have a less clear idea of what an Apple smartphone is.

I don't think Apple will keep up its current numbering scheme for much longer — it starts to get a bit ridiculous at iPhone 6 or 7 — but I doubt it will get rid of 'iPhone' until it's truly ready to start over with something new.

But iPhone is a safe name. Kindle is a great one — like Macintosh or Think-Pad. It's not going anywhere anytime soon, but it also poses some challenges. If Amazon only made one device, it could keep calling each new version "the Kindle" forever and be fine. But now it's making a bunch. Its current lineup includes the Kindle, the Kindle Touch, the Kindle Keyboard, the Kin-

… A good product naming strategy isn't all that far removed from a good product strategy.

dle DX and the Kindle Fire (not counting 3G variations). Some of those are on their way out and others will certainly be added, each running the risk of diminishing the Kindle brand (and, consequently, Amazon's).

The Kindle Fire, I think, is an example of doing it right. It sounds good, or at least good enough, and people can basically grasp what it is and what it isn't. They know that it's a Kindle — and hence, for reading books — but the name is sufficiently different from something like Kindle Touch so as not be confused for another e-reader. I think that also makes it a "good" name in its own right. As opposed to Apple's various iPods, "Fire" doesn't simply describe a feature or characteristic as iPod nano, iPod shuffle and iPod touch do. It's a Kindle that does more than books, which is something that's easy for Amazon to market, and a significant advantage over other Android tablets (a term, incidentally, you won't see Amazon using very much).

If full-featured tablets wind up being Amazon's focus, a future Kindle Fire may well eventually become "the Kindle," and its basic e-readers could take

"These names aren't just bad —
they're noise."

on a suffix instead. Or, if the Kindle Fire becomes a huge success, Amazon could simply call a future tablet "the Fire," and its e-book reader could remain "the Kindle." It has options that are built on a solid foundation.

There might be a Kindle Fire 2, a Kindle Fire DX or a Kindle Flame before that happens, but the further Amazon dilutes the Kindle name without creating something new, the closer it comes to confusing consumers and hurting its brand. It's far from a hard and fast rule, but if you're starting to run out of decent product names to use at any given time, you might just have too many products.

Compare that to something like the Motorola Xoom. "Xoom" isn't a particularly good name to start with, and you can't really call the product a success, but Motorola's now not only back with a Xoom 2, but a Xoom 2 Media Edition and a Xoom Family Edition (but not a Xoom 2 Family Edition). You still have to explain what a Xoom is to most people, and you now also have to explain what the difference is between the three models. In contrast, Motorola and Verizon had a winner with Droid, but even it has seen things like the HTC Droid Incredible muddy the waters, and many of Motorola's non-Droid phones have names that are largely interchangeable with each other and with other companies' phones. And if Droid is now wholly a Verizon name, what does it mean to be a Droid phone?

Again, this is far from scientific, but my suspicion is that the companies who are regularly in the good and safe categories tend to have a better handle on their products in general than those that find themselves in the meaningless and bad categories more often than not. There are few companies that thrive on nothing but good product names, but I think the smart ones are able to realize when they're pushing things—so they settle into the safe category, and occasionally put out a new product with a good, or even great name to restart the cycle.

Yes, there are plenty of exceptions to the rule. Some companies like Leica or BMW have iconic names in their own right, and their "meaningless" names have been around long enough to develop their own legacy (or at least some semblance of a standard formula). Those exceptions also tend to make great products. Nokia was once in this camp as well, but it eventually faltered and has now decided to effectively start over with Windows Phone — and Lumia is a pretty good start. There are also, of course, plenty of lousy products with good names. The name itself is only part of the equation.

On the whole, however, a good product naming strategy isn't all that far removed from a good product strategy. You have to know when to take a risk with something new and when to play it safe. You can't just keep throwing things against a wall and hope that one sticks, or keep echoing the same chorus of hyperbole that drowns out everything and resonates with no one.

Fanatec Forza Motorsport CSR wheel and Elite pedals

BY JOE POLLICINO

It's amazing to realize that about two years ago Fanatec's first Xbox 360 racing wheel, the Forza 3 Porsche 911 Turbo Wheel, hit the scene. Although it turned out to be a mixed bag, Fanatec pleasantly surprised us with its Porsche GT2 and ClubSport Pedals in January of this year—despite a roaring fan and shaky shifter mounts. Now, we're saying hello to a new trio of racing sim-related goods intended for Forza Motorsport 4 on Xbox 360: the $249.95 Forza Motorsport CSR Wheel, $59.95 shifter set, and $149.95 CSR Elite Pedals.

If you'll recall, it was back in March that we checked some of this kit out, and now with Forza 4 here, we hooked this mashup of gear up with our Playseat Evolution for a massive amount of virtual spins. So, did this combination help speed past the checkers with

a respectable feel? Shift in to overdrive and find out in our full review.

Hardware

Admittedly, you may find yourself procuring only a portion of the items featured here—after all, Fanatec is no stranger to catering to folks who love piecemeal. But for what's at hand, all together it weighs in at over 30 pounds—we'd like to apologize to the UPS worker tasked with carrying it all to our door. Inside of each box we found a variety of cables, screws and each unit itself, but needed to supply our own hex wrenches (and a drill) for installation. Essentially, you should anticipate having at least a semi-permanent setup for this rig.

From the rear, the CSR wheel appears strikingly similar to Fanatec's GT2, and that's because they're more or less built from the same foundation. The CSR wheel is said to have "updated internals," but like its older brother, it's packing a belt-driven Mabuchi 550 force feedback motor along with two other motors that handle vibration. What

has definitely changed, however, is the overall theme—namely, all of the Forza inspired tweaks like its red and black color scheme. Along the right side, you'll find a duo of PS/2 ports for connecting the shifter pedals, as well as a power jack and an on / off button. Meanwhile, on the left, there's an Xbox Live headset jack, a USB standard-B port (for PC / PS3 hookup) and another shifter connector if you'd prefer it there or want to hookup a handbrake. Notably, you'll be able to connect many of Fanatec's other shifters / pedals, and with an optional adapter, even Logitech's G25 / 27 gear. Lastly, positioned on the wheel's dash is the familiar Xbox guide button.

The wheel's inner rim is fashioned from a slab of brushed-aluminum and features the Forza logo dead center with Xbox buttons laid out in a cluster on the right, a three-number preset LCD planted top-center (more on this later), four red buttons around it and a new 5-way d-pad on the left. All of the buttons are easily within thumbs'
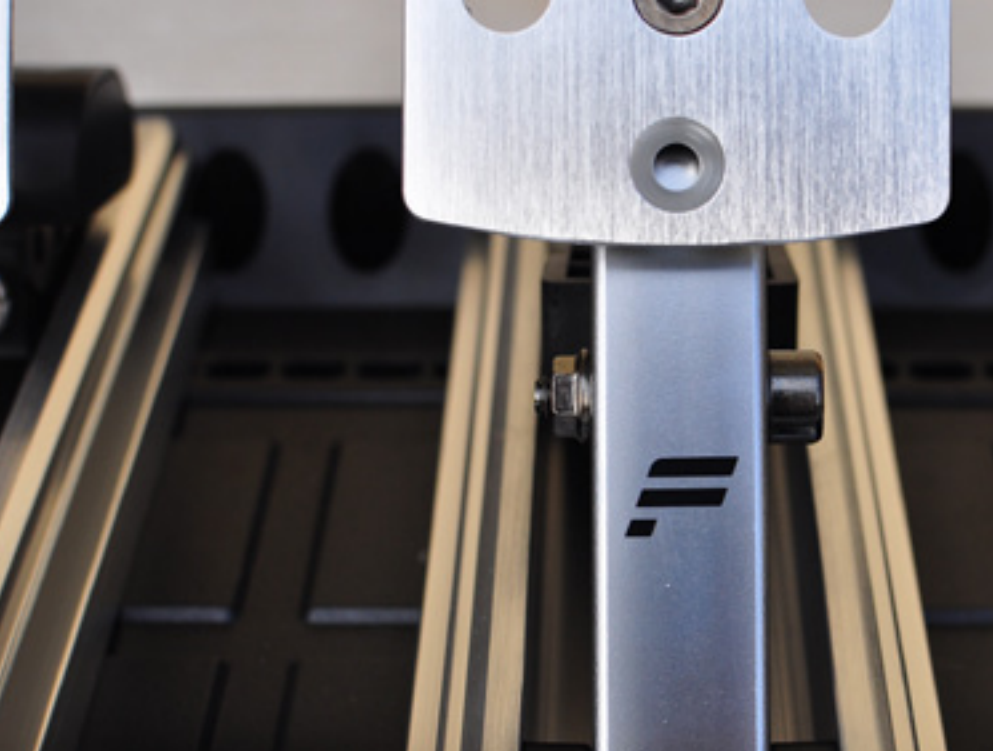
reach, and best of all, on back you'll find sizeable metal paddle shifters that move with the wheel. The most obvious change, though, is the racing-styled wheel grip.

At the CSR's nine and three o'clock positions are comfortable contours fashioned with smooth rubber and Alcantara for extra tack, ensuring our sweaty hands never slipped or cramped. The rest of the wheel however (excluding the bit of rubber on its underside), is made of slick and glossy black plastic. Although we normally positioned our hands on two of the three aforementioned sections, full rotations had us yearning for an all around soft-touch feel. (Not to mention that the GT2 spoiled us with its full Alcantara covering.)

If you're not fond of paddles, that's where the optional shifter set comes in—and just like the GT2, you'll get a rail-mountable sequential, and 6-1 H-pattern shifter. Both have a similar base with the same glossy plastic as the wheel, while the handgrips are fashioned completely from metal. They're noticeably larger than those made for the GT2, and feel superb in

palm. Oddly, though, the PS/2 port for hookup is loaded on the bottom of each unit, which caused them to sometimes become loose from hitting our knees.

Completing this trio are the CSR Elite pedals, which are a step up from the plasticky entry-level CSR pedals, but still a slightly cheaper answer to Fanatec's ClubSport pedals. Like their CSR counterpart, the Elite pedals come pre-assembled on a huge plastic and metal base with adjustable and removable aluminum pedals. This Elite version, however, opts for less plastic, using width-adjustable metal rails for each pedal assembly, pedals (with adjustable plates) and tension-adjustable pedal posts.

The whole system is certainly an option for custom setups, and once more, a pedal inversion kit is available for extra realism. Notably, the Elite Pedals feature an adjustable load cell (pressure sensitive) brake like the ClubSports, but forgo any built-in ABS vibration (good riddance), instead leaving it to the CSR wheel. The clutch and gas are also like the ClubSports, packing distance-sensing potentiometers.

Installation and setup

As you'd expect with serious gear like this there are mounting options aplenty, and it's laid out exactly like the GT2. For those not familiar, the underside of the CSR wheel is loaded with a removable desk clamp, and smattering of rubber pads and screw-holes on its base for permanent placement.

To be blunt, the desk clamp is rather mediocre. We annoyingly needed a surface that was about an inch thick to start, and after twisting its hand screw to a secure fit we were still getting slight wheel wobble. While it's not uncommon for many wheels—and mostly adequate for quick setup and teardown—we can't help to note that our $150 Logitech Driving Force GT mounts better to a variety of surfaces. It's not some-

thing of concern during races, but we're surprised Fanatec hasn't reworked this fitting. With that said, it'll ideally be screwed into a racing rig like Fanatec's $150 Rennsport wheel stand—as we've noted in the past, these racing setups can thin-wallets with a single card swipe depending on your wants.

Although the stand was sent to aid our testing, we opted to hook up to our Playseat Evolution sim-racing cockpit. As we mentioned in a recent IRL piece, this is an extremely solid offering that allows for a permanent yet movable setup, and a proper racing seat feel. To start, we used a downloadable drill template to create two new holes on our Playseat's wheel bracket, and then bolted the CSR wheel in with its included hex screws. Interestingly, the wheel has a few more

sections for screws, but just the two gave us a tight fit that was free of any give.

Next up, was mounting the shifter rails. They slide in through the side of the wheel's base, and then get locked by twisting using two coin screws. Past that, any of the two shifters can be hooked into place—it does take a bit of force, however, and it's hard to gauge when the screws are twisted tight. The trickiest part of setup was figuring out how to secure the CSR Elite pedals' wide base onto the Playseat's smaller pedal plate. The base (like the wheel) can also be bolted down, but for our needs a combination of Velcro loops and locking zip-ties kept it free from budging loose (sometimes, you gotta do, what you gotta do). It's worth noting that its nearly 10-pound weight and size keeps it from shifting on hard floors.

The last step was wiring it all it all together... the shifter plugs into the wheel, which connects with the pedals and its power adapter. That's it. Overall, the initial setup does take quite of bit time, but it's no worse than what we've experienced with similar kits. The CSR is technically "wireless" like an Xbox controller, and getting it to sync with our Xbox was just as simple. Oddly though, it doesn't function correctly unless the console is turned on first— at best it's a minor annoyance. Upon powering up, the CSR wheel's fans kick in; followed by the wheel itself doing some quick calibration spins. Notably, the wheel works for PS3 and PC as well, requiring all but a USB connection.

We can't believe we're saying this again, but its fan is annoyingly whizzy, similar to our experience with the GT2. Amazingly, it managed to worsen once synced with the Xbox, as a shrill eeeEeeeEeee sound got added into the fray. Now, before you say, "but surely some moderate volume eases that pain away"—not a chance, even with a gaming headset on. Fanatec thankfully offers some consolation for the problem this time around with a button combo that'll have the fans remain off until the wheel determines it needs cooling. Still, the high-pitched whine always remains as an ever-present reminder that you're behind the wheel of a virtual sports car.

In use

So, was the somewhat arduous setup process worth it? In couple of words: oh yes. The CSR wheel provides an impressive amount of force feedback, which let us clearly feel whether we were slipping or gripping the asphalt. Steering movements are fluid and responsive, being swift to react in turns with nary a bit of lag when spinning through its 900 degrees of rotation. The internal motor is also extremely smooth and not too noisy, even when fighting for control after taking a corner too tight. With certain games like Forza, you'll also get the added benefit of shock vibration, letting you feel bumps, scrapes and even engine revs, but just like the Forza 3 911 wheel, it's much too tame for our taste—even when cranked up. While it certainly makes the game feel

more immersive, you'll still need to rely on your on-screen RPMs for those perfect shifts.

One of the major highlights of this wheel is how customizable it is. Remember that LCD display we mentioned? It's your own personal tune-up shop within the wheel itself and can be accessed by simply hitting small button to the right of the display. The LCD lights up, letting you save up to five custom presets including adjustments for: Sensitivity (from 90 to 900 degrees of total spin), Force Feedback, Shock Vibration, five Drift Modes (which actually uses the motor to help you turn the wheel faster), ABS Vibration (how soon the wheel vibrates to simulate brake lockup), Linearity (how much actual wheel spin is required for it to translate to 900 degrees of rotation) and its center Dead Zone. (Console users also benefit from Spring and Damper settings.)

All of these options allowed us to quickly create a variety of helpful tunings, but it should be noted that it can also make the wheel act in a less than realistic manner—like how we set the drift mode to allow for super-human speed while turning through chicanes. Even so, with the right tweaks the CSR wheel has the potential to feel extremely personalized, offering a better feel for how your virtual car is reacting to your inputs. Of course, any decent steering rig will offer an advantage over your average controller, but having an array of constantly tweakable parameters on a smoothly performing wheel is really something of a joy.

Speaking of shifting, all three options (paddles, sequential and H-pattern sticks), for the most part, worked admirably. The paddles were easy to press with a finger and met with a reassuring click, while the sequential shifter offered the same in an arcade-style stick layout. Our weapon of choice, however, was the six-speed H-pattern unit. Each gear slot is tightly lined and the stick itself has an awesome amount of tension to it. Every shift feels very mechanical, save for the slight click you get in each position. Despite their plastic foundations, both sticks and the paddles held their own even if we chose to be heavy-handed when quickly downshifting. Our only real gripe is that, again like the GT2, we couldn't manage to get the rails totally secure and it allowed the shifters to sway a bit more than we'd have preferred while in use.

We were also pleased by the performance of the pedals. For our use, we adjusted the spring tension for a slightly looser brake (setting the dial to 7 for compensation) and a tighter throttle so we could attain a more selective grip through its range. Notably, we needed our own hex screw to do so, but the process took no more than a few minutes.

The clutch also acted as we expected with a long and smooth throw that functioned precisely in tune with our shifts. There is one bothersome issue we came across, though. Despite the various tweaks that can be made to the peds, disappointingly, the rake attack of each one is fixed—essentially, cockpit users will need their own tiltable pedal plate if they'd prefer a custom angle. Pulling off the plastic screw spacers between the posts and the pedals gave us a bit of extra rearward tilt, but it was still far from ideal given the permanent angle of our Playseat. Overall, it's exciting to have this level of foot control in something slightly less wallet-thinning than the ClubSports.

Wrap-up

So, let's break it all down. For better or worse, the CSR wheel and shifter set function very much like a racing-styled rebadge of the Porsche GT2, offering a familiar interface and basically the same performance we enjoyed last time around, albeit with a new set of grips and re-aligned buttons. That being the case, it's hard to be okay with finding similar issues we brought up with past wheels cropping up again—like the noisy fan and finicky shifter rails, for instance. The CSR wheel itself isn't a terribly exciting addition to Fanatec's lineup aside from looks, but that doesn't make it any less excellent of a Forza 4 companion. If you weren't sold on the GT2's looks or shape, but wanted the functionality it offered, then the CSR wheel may be for you. Of course, for those who'd consider themselves among the most serious Forza drivers you may want to go for the recently released extra-serious $500 dollar CSR Elite. We also can't neglect to mention that this is an Xbox 360 wheel at its core, and while it will work with PS3s and PCs, the experience is a bit less streamlined.

When it comes to the CSR Elite pedals, we'd easily recommend them at their $150 price point. You're getting highly adjustable, fluid feeling pedals and an extra realistic movement on the brake itself—not to mention the build quality is top notch. Overall, we'd have no qualms using them in place of the slightly spendier ClubSports, whose built-in vibration was passable at best. It is worth noting that Fanatec does

offer a non-Elite version of the pedals with fewer features priced at $80, if Elites are a bit to rich.

As a package, the CSR wheel, Elite pedals and shifter set are an amazing complement to Forza 4 and any titles that can benefit from what it has to offer. Furthermore, while the pieces are modular within Fanatec's (and some of Logitech's) other racing gear, it always leaves the option for changing out parts down the line or upgrading a section of your current setup. At $460 dol-lars combined, this setup is certainly reserved for only those ready to throw countless hours of playing time in, but it certainly isn't a compelling upgrade if you're already rocking a GT2 with Club-Sports. Overall, if you're ready to pay the premium, Fanatec's latest creations will do an admirable job of helping you out on the virtual track. 🆔

Joe's functionally useless without his glasses—a fact you really shouldn't disclose to any enemies.

BOTTOMLINE

Fanatec Forza Motorsport CSR wheel

$250

PROS
- Programmable presets and 900 degrees of rotation
- Ergonomic grips
- Good build quality and button layout
- Semi-wireless with Xbox 360

CONS
- Fans are noisy / unit is whiny with Xbox 360
- Engine and ABS force feedback is passable

The CSR wheel is worth a look if you skipped the GT2, but want something similar for Forza 4.

BOTTOMLINE

Fanatec CSR Elite pedals

$150

PROS
- Load-cell brake adds realism
- Modular system that's near-fully adjustable
- Smooth pedal throw
- Compatible with Logitech wheels
- Impressive build quality

CONS
- Fixed pedal angle

The CSR Elite pedals are an awe-some complement to any Fanatec or Logitech driving simulation rig.

Galaxy Nexus HSPA+

The Galaxy Nexus is definitely the best Android phone available today — it's possibly even the best phone available today, period.

BY MYRIAM JOIRE

Each year, several dozen smartphones land on our collective desks. They come in different shapes and sizes, boast different features and sell at different price points. We take each of them for a spin and review most of them, but only a handful really stand out. This is especially true with Android handsets, where incremental updates appear to be the *modus operandi*. Every now and then a device comes along that we really look forward to getting our hands on. Google's line of Nexus smartphones falls into this category, setting the new standard for Android each year.

In early 2010, the Nexus One became the yardstick for all future Android handsets and, later that year, the launch vehicle for FroYo. A year ago, the Nexus S introduced us to Gingerbread on the popular Galaxy S platform. Now, a few weeks after being unveiled with much

fanfare, we're finally able to sink our teeth into Ice Cream Sandwich with the Galaxy Nexus, arguably the latest addition to Samsung's critically acclaimed Galaxy S II family. So, does this highly anticipated device live up to our expectations? Is the Galaxy Nexus the smartphone to beat? Most importantly, is Ice Cream Sandwich ready to take Android to the next level? In a word, yes. Read on for our full review.

Hardware

There's absolutely no doubt that the Galaxy Nexus is a big phone. Sure, it's not Galaxy Note *large*, but it's a smidgen taller (and narrower) than the HTC Titan. As such it dwarfs its predecessor, the Nexus S. While this could

be an issue for some folks, we didn't have any trouble fitting the handset in our pockets. Despite its size, the Galaxy Nexus manages to be quite thin (8.94mm / 0.35in) and light (135g / 4.76oz). As a result, it feels wonderful in hand. Design-wise, the Galaxy Nexus looks like what we imagine would happen if we stacked a Nexus S and a Galaxy S II and flattened them with a rolling pin. Last year's shiny black lacquer gives way to a satiny gunmetal gray finish that manages to be at once more refined and more understated. Build quality is typical Samsung — the plastic construction is durable but looks and feels cheap for such a flagship device.

In front, the Galaxy Nexus is almost identical to the Nexus S, with a sheet of

> **The Galaxy Nexus looks like what we imagine would happen if we stacked a Nexus S and a Galaxy S II and flattened them with a rolling pin.**

"reinforced" curved glass hiding sensors and a 1.3 megapixel front-facing camera to the right of the earpiece. Notably absent are the familiar capacitive buttons, which have been replaced with three softkeys in Ice Cream Sandwich. There's also a notification light just below the display, something we'd like to see on all phones. The back blends the curves from the Nexus S with a textured battery cover and oval camera pod reminiscent of the Epic 4G Touch. While the battery door uses the same snap-on design as most Galaxy S II variants, we found it harder to snap shut. The camera pod is home to a five megapixel autofocus shooter and single LED flash. A microphone is cleverly hidden in the seam of the battery cover, above and to the right of the camera pod, and the speaker is located on the signature chin at the bottom of the device. Google and Samsung's logos are stenciled on the battery door.

All the controls and ports follow the exact same layout as on the Nexus S. You'll find the headphone jack, micro-USB connector and main microphone along the bottom edge of the handset, the volume rocker on the left side, the power / lock key up along the right side and nothing on the top edge. There's a series of three gold contacts below the power / lock button, presumably for an optional charging dock — something that Nexus One owners will be familiar with. Under the battery cover, this unlocked HSPA+ version is home to a 1,750mAh NFC-enabled battery and a standard SIM slot nestled to the right of the camera pod. Sadly, there's no removable storage on the Galaxy Nexus.

With its clean and rather plain design, the Galaxy Nexus doesn't exactly stand out in a crowd (except, perhaps, for its size), but this all changes the instant you see the screen. The 4.65-inch HD Super AMOLED display (1280 x 720 pixels) is simply beyond par. Gorgeous doesn't even begin to describe this screen — try amazing, jaw-dropping, mind-boggling. As we mentioned in our first impressions, fonts are crisp, colors are vibrant, blacks are deep and viewing angles are exceptional. Yes, the panel is similar to that of the Galaxy Note, which means it's PenTile, and yes, the HTC Rezound features a beautiful 4.3-inch 720p TFT display with a proper RGB matrix, but the writing's on the wall: Super AMOLED is brilliant, and it's only getting better.

Considering most Galaxy S II variants are powered by Samsung's in-

Ice Cream Sandwich is what happens when Android hits the gym and becomes lean and mean.

house Exynos SoC, with some models using Qualcomm's Snapdragon S3 and NVIDIA's Tegra 2, we were surprised to discover that the Galaxy Nexus eschew all of these in favor of TI's OMAP 4460, a dual-core 1.2GHz Cortex A9 CPU with a PowerVR SGX540 GPU, paired here with 1GB of RAM. Our unlocked HSPA+ review unit boasts 16GB of built-in storage (the LTE version comes with 32GB). Unfortunately — and unlike Gingerbread — Ice Cream Sandwich only supports USB Mass Storage on removable media, leaving MTP and

PTP as the only options to transfer content to / from the phone via USB.

In terms of radios, you'll find WiFi a/b/g/n, Bluetooth 3.0, GPS / AGPS and NFC. Moreover, the Galaxy Nexus is the first Android device with a pentaband 21Mbps HSPA+ radio (that's 2100, 1700 / AWS, 1900, 900, and 850MHz bands), meaning it's compatible with both T-Mobile and AT&T's 3G / "4G" networks in the US. A quadband EDGE radio provides legacy support. Rounding up the spec list is the usual bevy of sensors — accelerometer, compass, gyroscope, light and proximity — along with the new kid on the block, known as a barometer. Speaking of sensors, we experienced problems with the auto-brightness setting, which would dim the screen too much in low light, while behaving normally in daylight. Hopefully, this will be fixed in a future software update.

Performance and battery life

The Galaxy Nexus is definitely one of the fastest Android handsets we've ever played with. Everything feels snappy, everything looks fluid — Ice Cream Sandwich isn't just a new version of Google's mobile OS, it's what happens when Android hits the gym and becomes lean and mean. That being said, the Galaxy Note, with its dual-

BENCHMARK	SAMSUNG GALAXY NEXUS	SAMSUNG GALAXY NOTE	MOTOROLA DROID RAZR	HTC REZOUND
Quadrant[1]	2,032	**3,998**	2,798	2,347
Linpack Single-thread[1] (MFLOPS)	42.85	**64.30**	50.0	52.0
Linpack Multi-thread[1] (MFLOPS)	69.37	**95.66**	**95.66**	60.3
Nenamark1[1] (fps)	53.03	**56.67**	50.34	53.5
Nenamark2[1] (fps)	24.26	N/A	27.54	**35.8**
Neocore[1] (fps)	Would not run	51.77	**59.98**	59.8
SunSpider 9.1[2] (ms)	**1,985**	2,902	2,140	2,961

[1]Higher the score the better.
[2]Lower the score the better.

core 1.4GHz Exynos processor and optimized build of Samsung's Touch-Wiz 4.0 UI, still wins in terms of perceived speed. Getting the most performance from Android 4.0 requires a few tweaks. Not all the live wallpapers are fully optimized (for example, Phase Beam is, but Water isn't). Developers have to add a single line of code to their apps to take advantage of 2D hardware acceleration — you're able to enable this as the default for all apps by checking "Force GPU rendering" in the Developer Options.

Looking at our benchmark results, it's clear the Galaxy Nexus is no slouch. We're not going to read too much into the Quadrant score, since we're not even sure the app works properly in Ice Cream Sandwich, but it's close to what we observed on the HTC Rezound. The results for most of the other tests match those from the Motorola Droid RAZR (similarly powered by TI's OMAP 4430 chip), except for Neocore, which would crash each time we tried running it. Most impressive is the Sun-Spider score, which is the lowest we've ever recorded on any phone. In fact, the entire web browser is blazingly fast — gone is the signature lag that's familiar to anyone who's ever browsed the web on Android.

We didn't experience any issues with network performance. Calls sounded loud and clear on both ends (thanks in part, no doubt, to the dual microphone setup), and data speeds on T-Mobile

and AT&T matched our expectations for this type of radio, with results as high as 8Mbps down and 1.7Mbps up. Some European owners have documented erratic volume problems when connected to 900MHz GSM networks — something we were unable to reproduce here in the US for lack of compatible bands — but Google's already promised a fix. Audio quality is fine when listening to music. The Galaxy Nexus is able to drive a variety of headphones and earbuds without trouble, and the speaker is surprisingly decent.

Battery life is excellent. While we only managed to squeeze about five hours and 15 minutes from our battery rundown test (where we play a looped video starting from a full charge), it matches what we saw with the Droid RAZR, which features a similar battery and processor. Note that we switched video players since our usual app misbehaves in Ice Cream Sandwich. The 1,750mAh battery fared significantly better in our battery usage test (where we use the device normally until it shuts down), lasting an impressive 28 hours. Other than watching videos, it's unlikely most people will have to worry about running out of juice with the Galaxy Nexus.

Camera

We're just going to come right out and say it. The five megapixel autofocus camera on the Galaxy Nexus is underwhelming, and to be clear, we're not referring to the specs, but to the actual pictures. In the year since the introduc-

tion of the Nexus S, we've witnessed significant improvements in camera performance, first with Samsung's Galaxy S II, then with HTC's myTouch 4G Slide, and more recently, with Apple's iPhone 4S. Each of these handsets combines an eight megapixel backside-illuminated sensor with a fast wide-angle autofocus lens, and takes wonderful shots. It's not clear why Google passed on using Sam-

> ## While the Galaxy Nexus shooter is extremely fast, it provides little improvement in picture quality over the Nexus S.

sung's flagship camera module, but it's a real shame. While the Galaxy Nexus shooter is extremely fast and introduces plenty of new features, it provides little (if any) improvement in picture quality over the Nexus S.

The new camera app is incredibly quick and borrows a lot of functionality from existing third-party Android shooters, such as touch-to-focus, continuous autofocus, face tracking, zero shutter lag and panorama. It's easy to take several shots per second by repeatedly tapping the on-screen shutter key. Google

clearly put a lot of effort into revamping the camera app. It's simple and intuitive, with three primary modes of operation — video, stills, and panorama. Video recording now supports 1080p capture (720p using the front-facing sensor), real-time effects (think Photo Booth with face tracking) and time lapse (a feature we're particularly fond of). While there's no dedicated two-stage camera button, holding the on-screen shutter key locks focus and exposure, and releasing it snaps the picture. Sadly, the volume rocker doesn't double as a zoom control, but there's an on-screen slider.
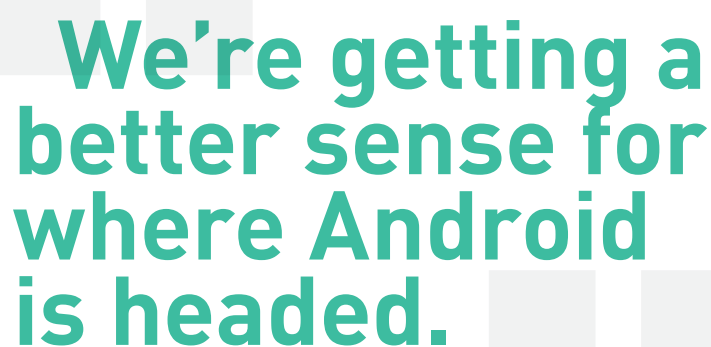
Most of the time, it's possible to coax the Galaxy Nexus camera into taking reasonably nice shots. Color balance is quite good, but exposure is sometimes off due to the sensor's narrow dynamic range. We also noticed that bright images exhibit some haze. Pictures snapped in low light suffer from significant noise and loss of detail. The Galaxy Nexus captures 1080p video with mono audio (despite the dual microphone setup). While the frame rate maxes out at 24fps, the camera supports continuous autofocus. Ice Cream Sandwich features a comprehensive photo editor within the Gallery app (complete with Instagram-like filters) and a dedicated video editor called Movie Studio.

Software

Sure, the Galaxy Nexus is a beautiful and powerful piece of hardware, but that's only part of the story. More significantly, it's the launch device for Google's highly anticipated new version of Android — Ice Cream Sandwich — the company's most significant mobile OS update yet, with a laundry list of improvements. As such, we approached the new software with lofty expectations, and while we weren't disappointed, we were surprised by the extent of the changes, to the point where we found ourselves having to undo years of old Android habits.

There's a definite learning curve to Ice Cream Sandwich that's ultimately rewarded with a more attractive design and a more coherent user experience. Gingerbread's lime green-on-black color

> **We're getting a better sense for where Android is headed.**

scheme gives way to a more subtle light blue-on-gray motif, and for the first time, we're getting a better sense for where Android is headed — a clearer identity, which is fantastic news. That being said, we're not convinced that Android 4.0 will be more intuitive for first-time users — it still feels geared towards people like us: the nerdy, tech-savvy, geeky and power-hungry set. Let's dive into the details.

After turning the Nexus on for the first time, you're greeted with the familiar Android setup process. New accounts
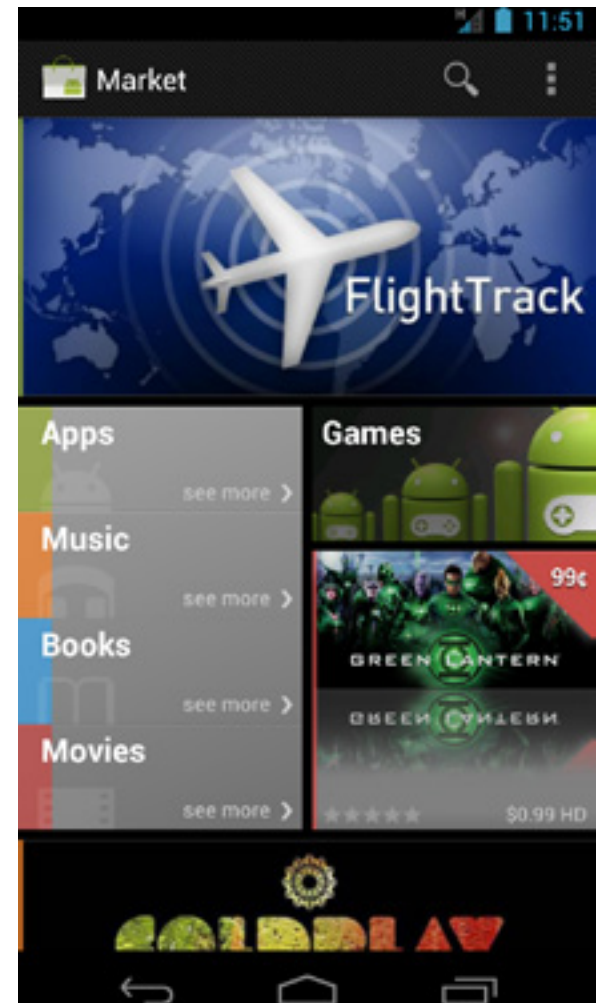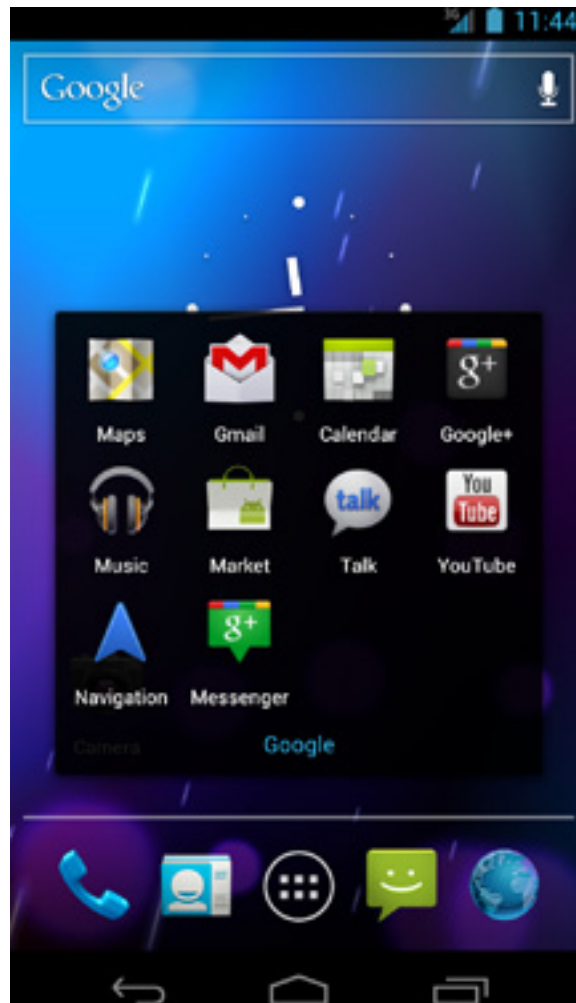
are invited to join Google+ and Google Wallet. There's also a slick tutorial that's sure to lower the learning curve for first-time users and seasoned aficionados alike — something we initially skipped, but would have eased our transition to Ice Cream Sandwich. We were also pleased to see our settings restored and all of our apps downloaded and installed after logging into our Google account, something that never appears to work properly on the myriad Android devices we regularly get our hands on.

The first change you're likely to notice is the new lock screen, which shows the time and date using Android's lovely new font, Roboto, and displays album art and audio controls during music playback. Slide the padlock icon to the right and it unlocks the handset, slide it to the left and you're dropped into the camera app (a clear nod to HTC's Sense 3.0 UI). It's now possible to access notifications directly from the lock screen by pulling down the notification tray. Another interesting — if perhaps somewhat gimmicky — new feature is face unlock, which unlocks the Galaxy Nexus upon recognizing your face (or a picture of your face, as it turns out). Convenience and novelty are the name of the game here, not security.

More differences come to light when looking at the five home screens. As we already mentioned, the Nexus lacks hardware buttons, which have been replaced with three softkeys at the bottom of the screen — back, home and recent apps. The latter lists recently accessed apps using thumbnails con-

taining a snapshot of each app. Tapping on an app's thumbnail switches to it, and flicking apps to the side removes them from the list. Unlike a real task manager, there's no proper way of closing apps. Just like in Honeycomb, a virtual menu button (represented here by three vertically stacked dots) appears to the right of the main row of softkeys when running legacy apps. While this usually works, Facebook fails to display this virtual menu button for some reason, forcing us to live with the annoying default notification settings.

Ice Cream Sandwich includes additional persistent items across all five home screens — the favorites tray just above the softkeys and the search bar just below the notification area. You're able to customize the favorites tray with four apps of your liking, two on either side of the app tray button — something that's likely familiar to anyone who's used a third party launcher before. For better or for worse, the search bar now takes up a tiny sliver of real estate at the top of each home screen. Strangely, the search bar also lives on as an optional widget.

Speaking of which, the app tray now includes two tabs — one for apps, and one for widgets, along with a button to access the Android Market. Gone is the ability to add widgets and shortcuts by long-pressing anywhere on the home screens, but just like in Honeycomb, many of the stock widgets are now resizable. The app tray no longer scrolls vertically, but consists of multiple pages that are accessed by swiping left or right — complete with a nifty animation. A welcome feature is the ability to drag an app from the app tray on top of an existing app in the home screens to create app folders. While there's no way to create app folders within the app tray itself, it's now possible to uninstall apps without leaving the app tray.

The notification tray is more polished in Ice Cream Sandwich. It enables quick access to the settings menu (since there's no more hardware menu button) and allows the user to dismiss individual notifications by flicking them to the side. Audio controls have also been added to the notification tray, and only appear while listening to music. The settings menu also benefits from a welcome overhaul, with the controls grouped in three sections
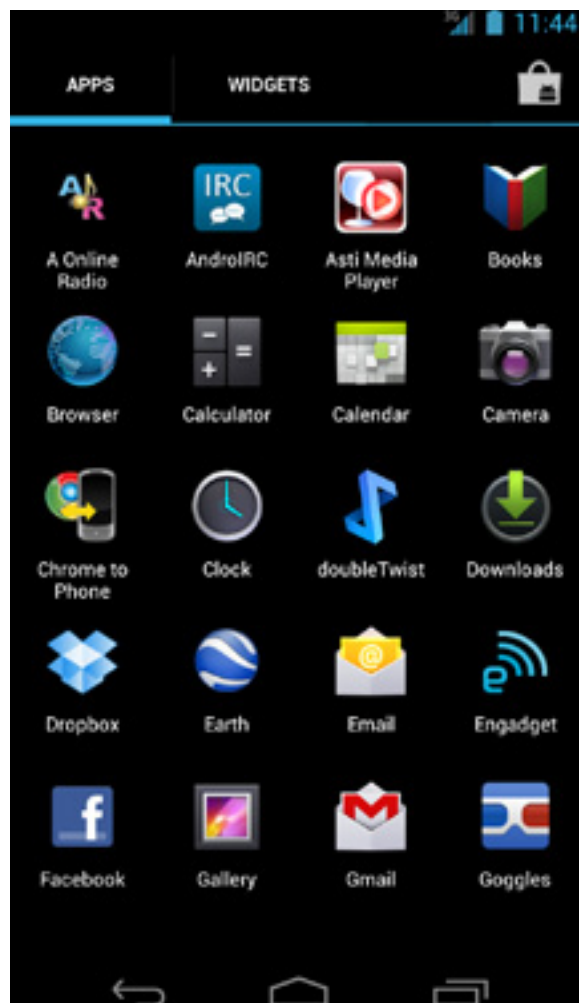
— the oft-used wireless settings at the top, the device settings in the middle and the system settings at the bottom. Screenshots are now finally an integral part of Android — just press the power / lock key and the volume down button simultaneously and observe the magic.

We're happy to report that Android 4.0 provides much improved text input and a consistent, system-wide clipboard. The keyboard is now significantly more accurate, with better word prediction and a spell checker that underlines mistyped words in red — just touch any mistyped word to see a list of suggestions. Continuous voice input is now supported in any input field and displays spoken text in near-real-time. Long-pressing any text selects the current word, and brings up the selection carets along with a clipboard bar with buttons for select all, cut, copy and paste.

Google also fitted Ice Cream Sandwich with a comprehensive and intuitive set of tools to manage data usage. You're able to monitor total data usage and per-app data usage with separate counters for mobile networks and for WiFi. Better yet, it's possible to set a warning threshold as well as a hard limit beyond which the phone will stop using data over mobile networks altogether — something sure to come in handy for anyone with one of those pesky tiered data plans. There's also a way to turn off background data for individual apps, forcing them to use WiFi instead.

Most of Android's core apps have been

revamped as well, and feature a more intuitive layout. The Gmail app gains multiple text sizes, the calendar adds a neat pinch-to-zoom feature, and — as we mentioned above — the Web browser is much improved, especially in terms of performance. Expect a full-blown review of every intricate Ice Cream Sandwich detail in the days ahead.

Wrap-up

Let's not beat around the bush. The Galaxy Nexus is definitely the best Android phone available today — it's possibly even the best phone available today, *period*. Sure, it's not perfect — we're disappointed that the camera doesn't deliver the same wow factor as the rest of the handset. It's an alright shooter, but it's just no match for the state-of-the-art. There's also room for improvement in terms of build and materials quality. Still, there's no denying the satisfying look and feel, the stunning dis-

play, the impressive performance, the excellent battery life — the whole is far greater than the sum of its parts.

Ice Cream Sandwich is phenomenal — it represents a giant leap forward for Android and brings a whole new level of style and substance to Google's mobile OS. Still, while the design is more refined and the user experience more polished, we're not sure it's intuitive enough for first-time users. At the core, it's clear that Android remains targeted squarely at tech-savvy, power-hungry folks like us. No matter — the Galaxy Nexus is proof that we can have our Ice Cream Sandwich and eat it too. ⬚

Myriam was born wearing combat boots and holding a keyboard; moments later she picked up a soldering iron. She's senior mobile editor at Engadget and co-host of the Engadget Mobile podcast. Dana Wollman contributed to this report.

BOTTOMLINE

Galaxy Nexus HSPA+	$750+ *(no contract)*

PROS
- Satisfying look and feel
- Stunning display
- Impressive performance
- Excellent battery life

CONS
- Underwhelming camera
- Average build quality and materials

The Galaxy Nexus is definitely the best Android phone available today — it's possibly even the best phone available today, period.
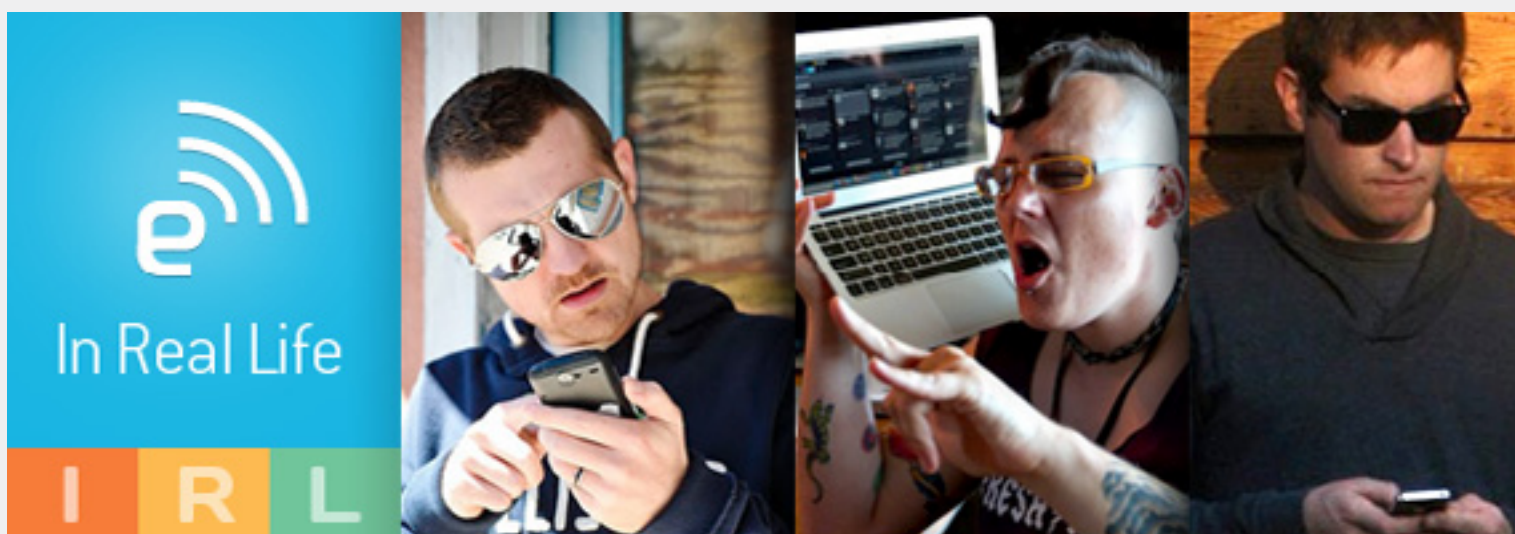
Google Voice, FastMac's U-Socket and returning the iPhone 4S

BY ENGADGET STAFF

Welcome to IRL, an ongoing feature where we talk about the gadgets, apps and toys we're using in real life and take a second look at products that already got the formal review treatment.

Hi there, folks. Happy post-four-day-weekend to you too. As you'd expect, we're not the types to waste an opportunity to tie IRL into a national eating orgy, so this week's edition is appropriately about giving thanks. Terrence appreciates Google Voice, even if it slips some incomprehensible one-liners into his transcriptions. Zach, meanwhile, is mighty happy about his U-Socket purchase (because wall-mounted USB ports are a beautiful, beautiful thing). And Joe — actually, he's none too grateful for the two iPhone 4S' he returned, though he *is* glad Google hurried up and released Ice Cream Sandwich. What's his problem, anyway? Read on to find out.

All power outlets should have USB

I have six USB ports permanently mounted in the walls of my apartment, and I can't imagine living without them — it's not uncommon for me to be using all of them at any given time. FastMac's U-Socket is the ultimate no-compromise solution for powering your smartphones, tablets and any other gadget that sources power from USB, adding

a pair of power-only USB ports to each wall mounted outlet. There's 12 watts of 2.4A power available to both ports, and I've had no issues charging up a tablet and a smartphone simultaneously.

At $25, the U-Socket is quite a bit pricier than a generic outlet, but considering it'll live forever in your wall, the initial expense is worthwhile. It's available in almond and ivory colors, with a variety of faceplates and two different plug styles: standard, which is a bit more rounded, and decor, which will likely be the best fit for modern homes. Both versions have a footprint similar to a standard outlet, but the U-Socket takes up significantly more space behind the wall, so it may not fit for everyone (mine did, but without a centimeter to spare).

If you use USB-powered devices and live in North America (international sockets aren't available), you can't go wrong tossing these into your wall. Just make sure you buy enough to keep everyone juiced up. — *Zach Honig*

The only number I give out

I signed up way back when it was still called GrandCentral, almost a year before Google snatched it up. During those early days it went largely unused. As interesting as the concept was, it simply lacked too many features, and things only got worse after the Mountain View acquisition. Then, somebody turned the lights back on in 2009. Google Voice was born and my life has never been the same.

Let's be honest: having a single repository of all your incoming and outgoing calls, text messages and voicemails available to you on any phone, tablet or computer is something out of a sci-fi movie. And knocking out texts from the comfort of a laptop makes me wonder how I ever survived the T9 days. But, as great as the basic features are, it's some of the more advanced tools that have really proven indispensable — especially considering my line of work. Now, when I do a phone interview, I no lon-

ger have to bother with speakerphone or convoluted recording devices; I simply press "4" and the audio of my call is saved online. Google will even transcribe the conversation, though it does an admittedly hit-or-miss job. When it comes time to review a handset, I don't give out the number to select people — I just connect it to my Voice account and treat it as my primary device for a few days. I can also set my home phone to ring when I don't go in to the office so I don't miss any important calls. Sure, there have been a few hiccups along the way and the occasional outage, but it's reliable enough that my Google Voice number is the only one I give out anymore. And at this point, I can't imagine it any other way. — *Terrence O'Brien*

Returning the iPhone 4S

If you've been following along, you may know that I have a love-hate relationship with Apple. That pretty well describes my brief time with the iPhone 4S, which I returned thanks to a few glaring issues. The forums have been abuzz with folks facing various problems, and you can count me as one of them, though somehow, I was spared any battery life woes. Upon receiving the unit, it was clear that the new screen had a yellower tint than the cold blue of my 3GS. While a warmer hue could have been good news, this seemed a bit too yellow, making for a sickly, washed-out look that I noticed every time I moved to my iPad 2 and 3GS (it's not as if you can calibrate these iDevice screens).

Strike two: those ever-so tiny pockets of light leaking through the top of the screen. Yes, this is a fairly minor gripe, but those slight blotches became a nuisance, particularly when I tried to read emails in landscape mode. I could also get into how tapping the bottom of the device made for a slight bounce-back (seemingly from its linear oscillating vibration motor) or how the camera element rattled like a pack of Tic Tacs whenever I set it down, but that would be nit-picking — even by my standards.

Of all things, the deal-breaker was the phone 4S's (supposedly improved) antenna, which gave me interference during voice calls. While someone was talking, a faint, but audible zzZzzZ emanated from the top antenna, creeping up near the earpiece. Upon further investigation, I confirmed that placing a finger on the top antenna would kill the noise. Odd. I contacted Apple Care for a new unit, but alas, the issue reared its head during my first call on this "re-serialized replacement device" (fancy-talk for refurbished). Worse yet, the earpiece on this unit had terribly low volume, even when cranked all the way up. Look, the iPhone 4S has a lot going for it in many ways, but suffice it to say, a handset that can't properly handle a voice call isn't the device for me. So, I'm back to my 3GS and am happy to wait for a Galaxy Nexus-branded Ice Cream Sandwich — just don't get me started on the hellish return process and SIM swap AT&T put me through. — *Joe Pollicino*

DISTRO EXCLUSIVE READ IT HERE FIRST

Keeping the wheels on a Le Mans-winning Audi R18 prototype

BY TIM STEVENS

The silver car hums down the pit lane, engine surging against the mandatory speed limiter. It's eager to go faster. The thing is low and wide, silver but streaked with oil and filth after spending most of the day pounding around a 2.54-mile track with 58 other cars. The light is getting dim and many of those fellow machines — Ferraris, Porsches, Fords, Aston Martins — have crashed out or suffered mechanical failures. This one's been hunting them down for

nearly an hour without a break, just one stint of many in this 10-hour endurance event, but now it needs gas, tires and a

refreshed driver behind the wheel.

The Audi R18, which bears a more than passing resemblance to a chromed out Cylon Raider, is almost silent, its turbocharged engine too efficiently tuned to give off waste energy as noise. It murmurs into a pit stall where a swarm of red and black-clad mechanics wait to envelop it. First, though, the fuel: 21 gallons worth of syrupy diesel injected through a port on the side while driver Tom Kristensen scampers out of the enclosed cockpit. He squeezes through a tiny portal, usually covered by a flimsy, flip-up door. He's aided by a mechanic, who then helps strap in his replacement, former Formula One driver Allan McNish. Kristensen, meanwhile, hops over the pit wall, slowly extracts himself from a red and white helmet, then finds a seat at the back of the busy pits to catch his breath before beginning a verbal download to his team about how the car is performing.

Fuel finished, the hose comes out and the car goes into the air on pneumatic jacks built into the floor. In a very carefully orchestrated dance, mechanics hurriedly pull the spent rubber from each corner — never more than two bodies working on the car at once (due to race regulations). Filthy wheels caked with brake dust are pulled off and clean ones fly on with mechanical precision. Computer-controlled airguns ensure the central lug securing each wheel is perfectly tightened. As the car drops off its jack and surges back onto the track, torque

figures from each gun are displayed on an LCD sitting behind the pit wall. With a glance, the team can be sure that none of those wheels will go flying off again.

It's just one of dozens of technical systems Audi Sport Team Joest has developed over the years, part of a huge influx of technology that resides not in the car itself, but behind the pit wall. Where once concrete stalls were the denizens of spanners and the grease monkeys who turned them, often with cigarettes hanging from parched lips, now you'll find more laptops than wrenches, clusters of LCDs seemingly covering every square foot of vertical space the team has — and there's definitely no smoking.

The computerized, torque-reporting airguns were introduced after a 2007 incident where the car driven by Allan McNish, Tom Kristensen and Dindo Capello suffered what Le Mans-winning race engineer Lena Gade demurely called a "problem" — a wheel coming off at the high-speed Indianapolis corner, sending the car immediately into the wall. This system, cre-

ated especially for Audi, should ensure that never happens again.

But there's far more data being fed back to the pits, much of it in real-time as the car races about. The car uses a secure, wireless system to feed a constant stream of data to engineers in the pits. Sadly we couldn't get anyone at Audi to tell us much about the technical details of the transmission or compression, race secrets and all that, but dozens of points of data are constantly being fed back, things like tire pressures at each corner, suspension compression and movement, selected gear, throttle position, RPM, engine oil and coolant temperatures... a complete, real-time view at the health of the car — even when it's hurtling through the night at 200MPH or more.

It's enough data to make a stat-junkie swoon, and so Audi brings a dozen or more to the track for any given race weekend. We attended the 2011 Petite Le Mans at Road Atlanta, where we were given the chance to tour Audi's facilities, see a pit stop from behind the wall and chat with engineer Lena Gade about how it all comes together. The Petite is part of the globe-trotting Le Mans Series, highlighted by the world's most famous endurance race: the 24 Hours of Le Mans. (Not to be confused with the same-sounding but rather different 24 Hours of LeMons.)

In the grand scheme of things, The Petite is not as important as the big show in France, and so Audi brought fewer engineers to Braselton, GA. Lena

indicated there were about six to eight engineers per car here, their main duty to eye that stream of data and look for anomalies. At Le Mans? "A *lot* more," said Lena. "Otherwise we're bringing along 120 people for no reason."

There is of course a hierarchy there. Each of the two cars brought to Atlanta (at Le Mans Audi typically runs three) has a lead engineer who drives the team and has the final say on race strategy. He or she is helped by an assistant race engineer to keep an eye on things like tire pressures and suspension loads. A data engineer makes sure all those sensors are feeding back accurate data, while another pair of engineers is there just to watch the engine read-outs and yet another keeps his eye on the E-Shift gearbox.

Others keep an eye on suspension, fuel consumption, just about anything you can think of, all of them doing their best to ignore the frenetic racing on the track and instead keep staring at simple bar graphs and virtual gauges on LCDs. The software Audi uses is provided by Bosch, taking the stream of data from the car and presenting it in a way that even the tired eyes of an engineer who hasn't slept in 22 hours can easily parse.

During the race, this data helps the team to look for problems — overheating brakes or engine, a broken or poor-performing suspension damper — but, equally importantly, it helps them know the best moment to bring the car in to pit. Endurance races typically take between 10 and 24 hours to complete, and knowing exactly when to stop for fuel can save many minutes over the course of a race. The team tries to burn every last drop of gas before coming in, obviously without leaving the driver stranded on-track with a dry tank. Lena gives us an example:

"You basically want to have as much left so that you can *just* go over into the next lap. So, you might be able to get 11.8 laps [on a tank], and you want to get into the 12th lap. You'd use the data to see your consumption and see whether that's realistic, or whether you should just burn it all."

The real-world results of that data are fed back into servers that sit in and
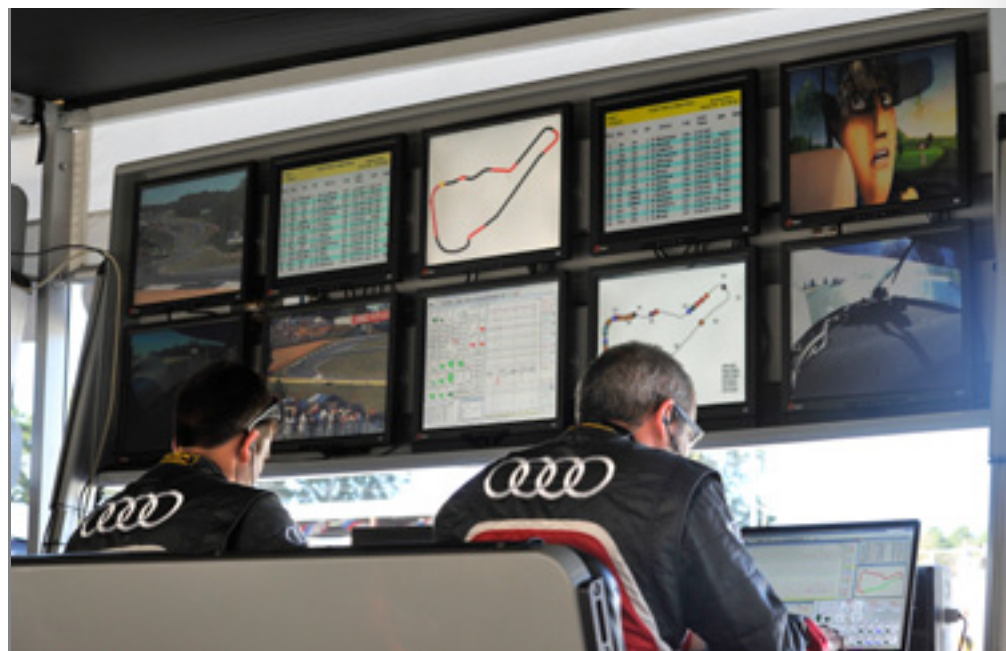
about the many support trucks that Audi brings to any race, and is also beamed back to the race headquarters. There it's integrated back into the team's simulators — not the type where drivers strap in, but simulators designed just to evaluate how well the car itself will perform over a given race distance and pace. (Lena wouldn't confirm whether Audi has a sophisticated, interactive driving simulator to help the racers train, but we'd be shocked if Team Joest didn't have some ridiculous setup buried in a basement somewhere.)

The team also stores digital copies of all manuals, so engineers can quickly look up information about components and their replacement. But, that's not at the expense of paper copies — Lena says the team needs to be able to work even when generators and network connectivity fails, and we imagine the mechanics might sometimes prefer a simple printed manual anyway.

Additionally, each part is assigned a unique code, called a LAKON number. Whenever that part goes on the car it's tracked, systems monitoring how many hours under pressure each widget has survived and when it needs to be replaced. This nut-and-bolt lifting of parts goes a long way toward helping a team like Audi cover the hundreds or thousands of miles in a typical race successfully.

Of course, all the statistics and telem-

etry in the world won't help you when your car winds up in the wall and, sadly for Audi, that's what ended the team's chances of winning The Petite this year. Driver Romain Dumas was chasing down bitter rivals Peugeot, with driver Franck Montagny behind the wheel of the 908 prototype. These two teams duke it out for Le Mans overall victories each year, with Lena Gade's Audi coming in first this year — followed by four Peugeot 908s.

At Petite, Romain came up behind a slower car quickly, pulled around to pass it and managed to just clip the silver and blue lion he was following closely. A blink of an eye later he was in the concrete barrier and it was game over.

There is, then, still a very human element in racing, something Lena reminds you must never forget:

"It's very easy to become very reliant on the data, and there are times when it stops working — just like anything. So, the data really is a backup tool, and something to verify what you can see, and what you know is going on. And, also, what the drivers are telling you, because that's your best data analysis tool. They don't feel something just for the hell of it. They know what's going on, and a lot of the time it's very easy to say 'Oh I didn't see it on the data, so it must not be there.'"

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