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printout

Keystone MacCentral Macintosh Users Group ♦ <http://www.keystonemac.com>



We are on
summer break.
We'll be back
in September.

Meet us at
Bethany Village Retirement Center
Education Room
5225 Wilson Lane, Mechanicsburg, PA 17055

Tuesday, September 19th 2017 6:30 p.m.

Attendance is free and open to all interested persons.

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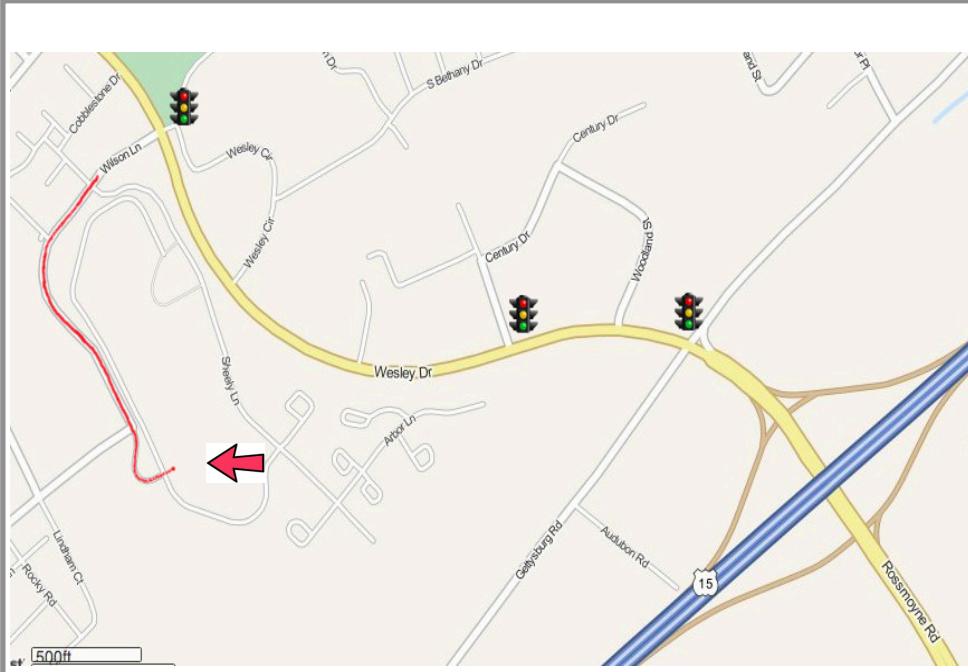
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Keystone MacCentral is a not-for-profit group of Macintosh enthusiasts who generally meet the third Tuesday of every month to exchange information, participate in question-and-answer sessions, view product demonstrations, and obtain resource materials that will help them get the most out of their computer systems. Meetings are free and open to the public. The *Keystone MacCentral printout* is the official newsletter of Keystone MacCentral and an independent publication not affiliated or otherwise associated with or sponsored or sanctioned by any for-profit organization, including Apple Inc. Copyright © 2017, Keystone MacCentral, 310 Somerset Drive, Shiresmanstown, PA 17011.

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by Julio Ojeda-Zapata

watchOS 4 Focuses on Fun and Fundamentals

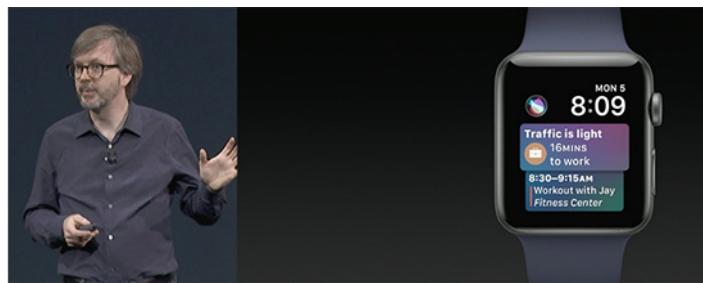
watchOS is in its infancy compared to Apple's more mature operating systems, which gives Apple more leeway to change even core behavior. At its Worldwide Developers Conference keynote, Apple announced a bunch of new features for watchOS 4, due this fall and slated to run on all models of the Apple Watch.

While none appeared revolutionary, the changes should nudge the Apple Watch forward in substantive and useful ways. These refinements include improvements to the Apple Watch as an information console, fitness tracker, music player, and payment maker. Plus, the Apple Watch will be more fun to wear and show off thanks to new faces and bands.

Information Flow — One knock against the Apple Watch is its awkwardness in delivering information users need in ways that are simple and convenient.

Apple is taking another swing at this issue with the new Siri watch face, which blends the company's intelligent assistant with its highly customizable watch interface.

With the raise of your wrist, you'll be fed information that is relevant based on time of day, regular activities, and data generated by the watch's various apps, such as Activity, Alarms, Calendar, Maps, Reminders, and Wallet.

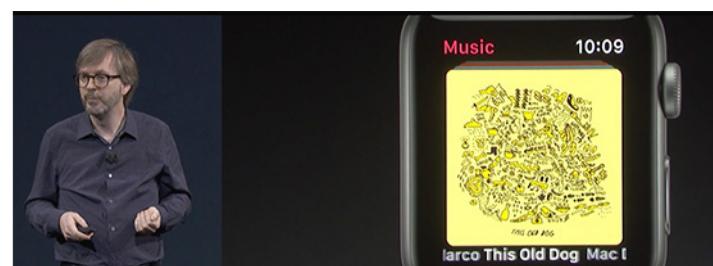


Similarly, the Apple Watch will regularly display news headlines from Apple News with an emphasis on your interests. You'll be able to tap any story for a summary, or to save the full article for later iPhone reading.

This approach bears a striking resemblance to Google Now, which feeds a similar information stream to iPhone and Android smartphone owners, as well as Android Wear smartwatch users. If the Siri watch face proves at least somewhat comparable to Google Now in how it unearths relevant, actionable information, Apple Watch users are in for a pleasant surprise.

Music Machine — As a music-control device, the Apple Watch has mostly been an awkward remote control for an iPhone. With watchOS 4, Apple is hoping to improve the experience a bit.

An updated Music app on the Apple Watch will sync over from the iPhone your most-listened music. If you subscribe to Apple Music, you'll also get your My Chill Mix, My New Music Mix, and My Favorites Mix. Apple hopes this will make it easier for Apple Watch owners to leave their iPhones behind — as when working out — and rely directly on AirPods for listening to music.



Intelligent Coach — Fitness tracking may be the Apple Watch's most popular feature, so it made sense for Apple to give its watchOS Activity app serious attention.

For instance, Apple wants to help you fill your activity rings with more consistency. To do this, it will now send morning notifications to suggest how you can match the previous day's activity levels, or pull off particular Achievements.

It will nudge you again in the evening as a reminder to close your circles, if you are tantalizingly close to doing so. You will receive monthly challenges that are unique to your exercise circumstances, as well. You'll even be rewarded with the digital equivalent of pinwheel fireworks when you nail your fitness goals.

The Workout app got some attention, too, and may be more interesting to athletes than in the past. Updates include an option for pool athletes to track sets and rests, pace for each set, and distance for each stroke type.

Apple also has added motion and heart-rate algorithms for those engaged in High Intensity Interval Training workouts.

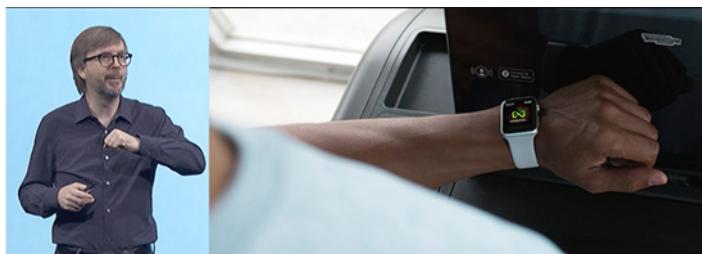


Similarly, those doing back-to-back workouts or training for triathlons can easily switch from one workout type to another, and then combine that data into one session to better analyze calorie and time measurements.

Workouts users also can designate a favorite workout type and later access it with just a tap. There's a Do Not Disturb option for distraction-free workouts, too.

Gym-equipment manufacturers are joining the Apple Watch party, as well. At properly equipped health clubs, Apple Watch users will be able to pair their watches to treadmills, ellipticals, indoor bikes, or stair steppers from vendors such as Cybex, Life Fitness, Matrix, Schwinn, StairMaster, Star Trac, and TechnoGym.

The point of this exercise: gym-equipment and Apple Watch workout data like calories, distance, speed, incline, pace, and floors climbed will be kept in sync. Apple claims that 80 percent of gym equipment already supports this capability, although we suspect that's overly optimistic given the cost of replacing gym machines.



Person-to-Person Payments — The Apple Watch has long served as means for making purchases at brick-and-mortar retail outlets via touch-to-pay terminals that support Apple Pay.

Now Apple is offering more Apple Pay options, including person-to-person payments within Messages or using Siri. If you get paid in this fashion, you can see that money added to your new Apple Pay Cash account. You can then use that moolah for Apple Pay retail purchases and person-to-person payments, or transfer it to a bank account.

Person-to-person payments will be available only in the United States, at first, and will work on iOS devices as old as the iPad Air 2 and the iPad mini 3.

More Faces, New Bands — In addition to the highly utilitarian Siri face, Apple is providing more whimsical faces. Pixar characters Woody, Jessie, and Buzz Lightyear

are joining veteran Mickey Mouse and recent arrival Minnie Mouse.



A different watch face dubbed Kaleidoscope is exactly that – an endless series of static images transformed into mesmerizing patterns.



Lovers of complications get some goodies, as well. New options include Now Playing and Apple News.

Apple also (big surprise) has a batch of new bands. These include Sports Bands in new colors, a bright yellow Classic Buckle, and Nike Sport Band options that color-coordinate with the company's athletic footwear. And, "as a celebration of diversity and inclusion," Apple is now making publicly available a rainbow-colored Pride Edition Woven Nylon band that used to be an option only for Apple employees.

The bands are [available in Apple's online store now](#), and in brick-and-mortar outlets by next week.

Core Bluetooth — Last, but certainly not uninteresting, was Apple's announcement that watchOS 4 would support Core Bluetooth. That means that you'll be able to connect more Bluetooth devices directly to the Apple Watch without having to go through the iPhone.

Apple suggested that this might be useful for continuous glucose monitoring, analyzing your tennis swing via a sensor on a tennis racket, or recording wave height and calorie burn via a sensor on your surfboard. Yeah, I don't have a sensor-enabled surfboard either.

Incremental but Solid — The announced updates to watchOS 4 are only half of the story. New Apple Watch models, possibly due within just a few months, could prove more dramatic than this week's incremental announcements. Even so, Apple Watch users wanting evidence that their beloved gizmos will see regular improvement via software updates have reason to cheer. ☺

2017 iMac Configuration Quirks: Don't Get Burned!

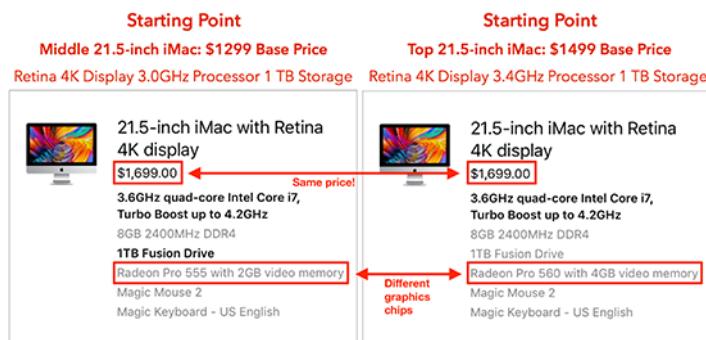
Thinking about buying one of Apple's just-updated iMacs? You'll want to pay close attention while configuring them because you could end up with a worse configuration for the same price depending on how you start, or you might pay more for the same configuration. Alert reader Yasuhiro Sugawara of Sugarwater Brothers deserves the credit for identifying these quirks in Apple's online store.

21.5-inch iMac's Radeon Pro 555 versus 560 —

First, imagine that you want to buy a 21.5-inch iMac with the fastest processor and a 1 TB Fusion Drive. Apple's online store provides three configurations, the lowest of which we'll ignore because it lacks the 4K Retina display and can't be configured with a faster processor.

If you start with a middle-level 21.5-inch iMac with 4K Retina display, choose the faster 3.6 GHz quad-core Intel Core i7 processor, and select a 1 TB Fusion Drive in place of the 1 TB hard drive, you end up with a price of \$1699. If you instead start with the top-level 21.5-inch iMac, you can create the same configuration for the same price merely by selecting the faster processor, since it already comes with a 1 TB Fusion Drive.

Here's the thing though. As Yasuhiro Sugawara noticed, everything is the same, including the price, except for the Radeon Pro graphics processor. The middle-level iMac comes with the Radeon Pro 555 with 2 GB of video memory, whereas the top-level iMac includes the Radeon Pro 560 with 4 GB of video memory. To reiterate, that's for the exact same \$1699.



How much of a difference does the higher-numbered Radeon Pro graphics chip with twice as much video memory make? It's impossible to say without formal benchmarking. **AMD says** that the Radeon Pro 555 has 12 compute units and can hit 1.3 teraflops, whereas the 560 has 16 compute

units and can reach up to 1.9 teraflops. On the [Tech Report Web site](#), there's a discussion of these graphics chips that suggests there might be a slight performance improvement by getting the 560 over the 555.

Radeon™ Pro 560	Radeon™ Pro 555
1.9 TFLOPS	1.3 TFLOPS
PEAK PERFORMANCE (UP TO)	PEAK PERFORMANCE
16 (1024) COMPUTE UNITS (STREAM PROCESSORS)	12 (768) COMPUTE UNITS (STREAM PROCESSORS)
81 GB/S MEMORY BANDWIDTH	81 GB/S MEMORY BANDWIDTH

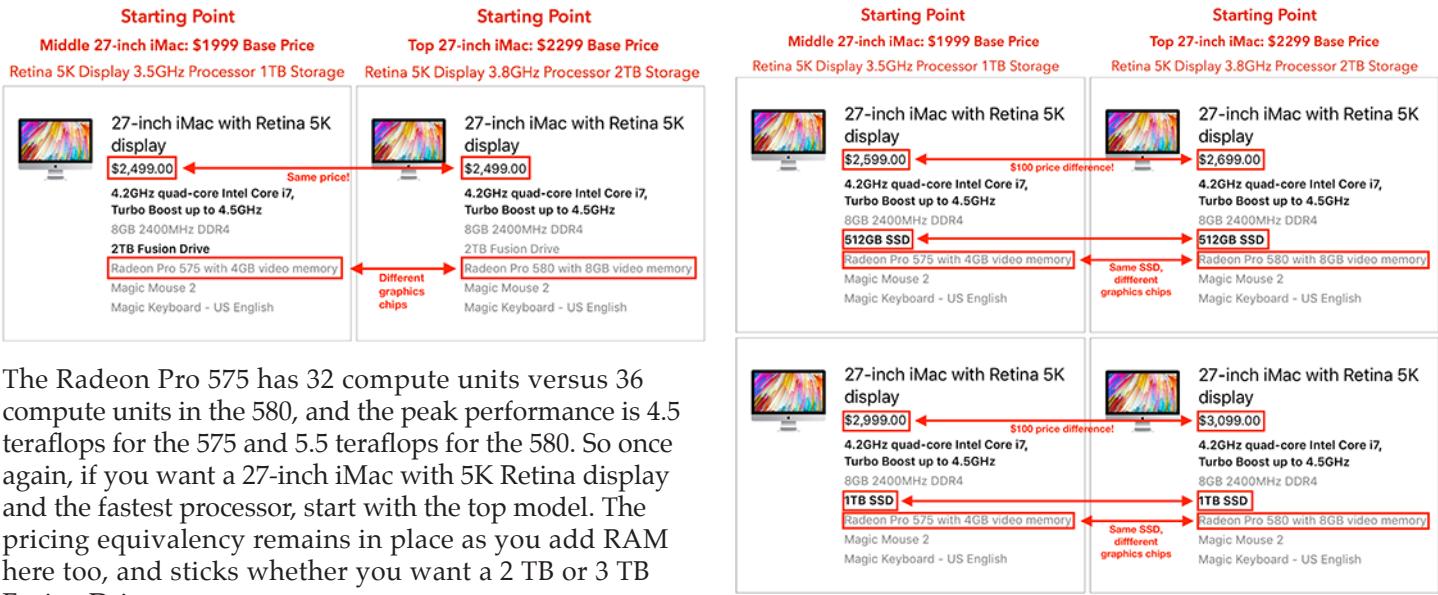
Whether or not you'll notice the difference between the 555 and the 560, I can't see any reason you wouldn't want the faster 560 with more video memory for no extra money. It will be at least theoretically better and may increase the resale value of the iMac. Regardless, if you want a 21.5-inch iMac with the fastest processor and at least a 1 TB Fusion Drive, start with the top model, not the middle model.

The price equivalency stays in place as you add RAM or storage, though the top model can also take up to 32 GB of RAM, whereas the middle model tops out at 16 GB. As with the previous 21.5-inch iMac models, you cannot upgrade the RAM yourself, as you can with the 27-inch iMac, so make sure to order with the right amount to start.

Yasuhiro Sugawara's discovery piqued my curiosity, so I investigated other Macs. With the 15-inch MacBook Pro, I couldn't create a similar situation, because the middle configuration offers a \$100 option of stepping up from the Radeon Pro 555 with 2 GB of video memory to the top model's Radeon Pro 560 with 4 GB of video memory. Clearly, Apple considers that jump to be worth \$100, at least when it comes to the MacBook Pro.

27-inch iMac's Radeon Pro 575 versus 580 —

However, when I worked through the 27-inch iMac configurations, I found the same issue as with the 21.5-inch models. To see this, configure the middle and top 27-inch iMacs with the 4.2 GHz quad-core Intel Core i7, and give the middle one a 2 TB Fusion Drive to match the top model. Although both configurations cost \$2499, the middle one has only the Radeon Pro 575 with 4 GB of video memory, whereas the top one has the Radeon Pro 580 with 8 GB of video memory.



The Radeon Pro 575 has 32 compute units versus 36 for the 580, and the peak performance is 4.5 teraflops for the 575 and 5.5 teraflops for the 580. So once again, if you want a 27-inch iMac with 5K Retina display and the fastest processor, start with the top model. The pricing equivalency remains in place as you add RAM here too, and sticks whether you want a 2 TB or 3 TB Fusion Drive.

Radeon™ Pro 580		
5.5 TFLOPS PEAK PERFORMANCE	36 (2304) COMPUTE UNITS (STREAM PROCESSORS)	217 GB/S MEMORY BANDWIDTH
<hr/>		
Radeon™ Pro 575		
4.5 TFLOPS PEAK PERFORMANCE	32 (2048) COMPUTE UNITS (STREAM PROCESSORS)	217 GB/S MEMORY BANDWIDTH

(Speaking of adding RAM, you can upgrade the RAM yourself in all three 27-inch iMac models. [The Mac Observer notes](#) that even the low-end model can take up to 64 GB of RAM, contrary to Apple's [Tech Specs page](#), although you'll need to buy it from an independent supplier.)

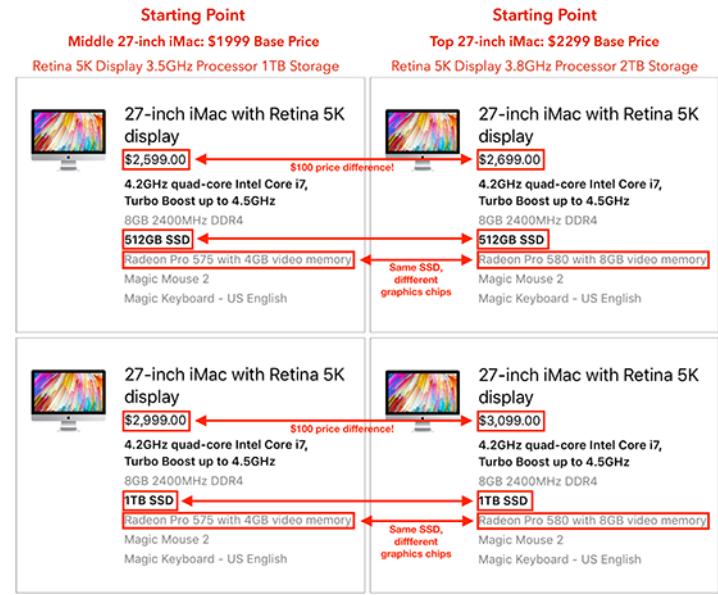
27-inch iMac's SSD Pricing — There is one area in which this unusual pricing equivalency does not remain in place for the 27-inch iMac, and that's if you want to swap the Fusion Drive for an SSD.

When you configure the middle 27-inch iMac with a 512 GB or 1 TB SSD, it will be \$100 cheaper than the identically configured top model. With a 512 GB SSD, the middle model runs \$2599 and the top model \$2699. Go up to a 1 TB SSD and the middle model is only \$2999, whereas the top model costs \$3099.

by Mike Matthews

Can Your iPhone Replace Your Wallet?

Fans of the TV show "Seinfeld" might remember George Costanza's [overstuffed wallet](#), which he described as "an organizer, a secretary, and a friend," complete with notes, receipts, hard candy, Sweet'N Low



I see three possible explanations for this discrepancy at the moment. In order:

- This pricing is exactly how things should be, with the top 27-inch iMac model being \$100 more expensive due to having the faster Radeon Pro with twice as much video memory. It's possible that Apple would prefer to charge more for the faster graphics chip in general but couldn't figure out how to work that in without bringing SSDs into the mix. But why wouldn't Apple carry this \$100 surcharge over to the 21.5-inch models?
- It's a simple mistake, though there's no telling whether the actual prices should be higher or lower. If this is the case, we may see Apple adjust the prices soon.
- The more expensive SSDs in the top 27-inch iMac models are actually faster or better in some other way. [Apple's Tech Specs page](#) for the iMac doesn't call out any difference.

I have contacted Apple about this situation, but haven't heard back yet.

In the meantime, the moral of the story is to pay careful attention when you start configuring an iMac to make sure you're getting the best possible set of options for your money. ☺

packets, and possibly even cash. Back in the 1990s, unless you carried a purse, or as Jerry Seinfeld called it, a "European carryall," your wallet was often the repository for all



The Exploding Wallet

Thanks to the iPhone, you no longer need a wallet so large that you have to stuff napkins in the opposite pocket to level out your posterior. Your iPhone can store notes, photos, and receipts. And with Apple Pay, Apple has even bigger ambitions.

When Apple VP Jennifer Bailey, who leads Apple Pay, said at a Recode Code Commerce Series event in 2016, “[Everything in your wallet, we’re thinking about](#),” she probably didn’t have Sweet’N Low packets in mind. But while I’m not using my wallet to squirrel away artificial sweeteners, I am looking forward to when I don’t have to carry around a wallet full of random cards that I might need sometime.

But how close are we, really, to that day?

Even before the debut of Apple’s Wallet app (when it appeared in iOS 6 as Passbook; see “[Passbook’s Best Is \(Probably\) Yet to Come](#),” 20 September 2012), I had stopped trying to carry everything in my wallet. Begone, hotel membership cards. Away with ye, frequent flyer cards.

Back then, I replaced many such cards with a single, laminated card that held numbers for my hotel and airline accounts. That was helpful, but plenty remained.

What remains in my wallet now that I’m carrying an iPhone everywhere I go? My laminated card is gone, having been replaced by a password manager and iPhone apps for hotels and airlines (see “[Comparing Five iOS Travel Management Apps](#),” 11 April 2017).

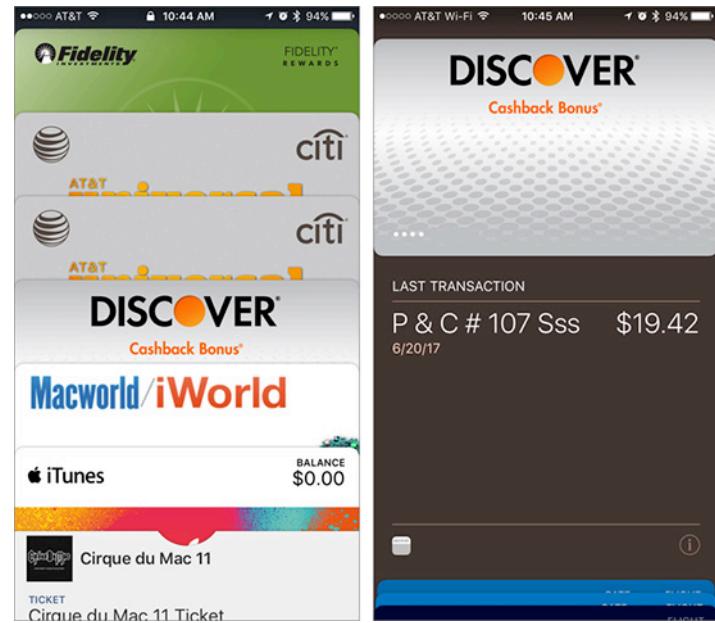
Still, there’s a lot left, and the collection probably looks a lot like yours. Let’s take a look at each category and see what the likelihood is that you’ll eventually be able to offload it to an iPhone app.

Cash — While it seems that Apple is printing money these days, that’s only in a metaphoric sense. But if you wanted to walk around with almost no cash and pay for nearly everything with some virtual payment scheme, you might be able to get away with it.

Apps such as PayPal, Circle, Square Cash, and Venmo allow people to pay for things or send cash to each other — Glenn Fleishman wrote about that last year in “[Circle, Square, and Venmo: Payment Apps Let You Pay via iMessage](#)” (3 October 2016).

The latest news, announced at WWDC, is that Apple itself will be getting into the payment game, adding person-to-person payments as a function of Apple Pay. The process will be initiated through an iMessage app and will use a virtual Apple Pay cash card when iOS 11 ships in a few months (see “[iOS 11 Gets Smarter in Small Ways](#),” 5 June 2017). This change will be big, maybe bigger than George’s wallet. Never underestimate the stickiness of an app that’s native to the device.

Credit Cards — If your credit card issuer is on board and you shop mostly at large chains, Apple Pay has the potential to let you leave credit cards at home. Plus, some stores let you pay via their own apps (like Walmart Pay — see “[Walmart Pay Is Better Than You Might Expect](#),” 18 July 2016).



As a bonus, Apple Pay and similar apps can help you avoid paper receipts that fill your wallet, either storing them in the app or sending them to you via email.

Unfortunately, too many retailers still lack payment terminals that accept Apple Pay, so credit cards will have to stay in the wallet for now. But I have noticed that the silver paint on their raised numbers isn’t rubbing off quite so fast since credit cards come out of my wallet much less often.

As an aside, the rise of digital wallet technologies like Apple Pay also effectively killed off the nascent market for a single multi-account card — such as those offered by moribund or defunct companies like [Coin](#), [Plastic](#), and [Swyp](#) — that could be used in place of credit cards, debit cards, gift cards, and other loyalty cards.

Debit/ATM Cards — Apple Pay supports many debit and ATM cards just like credit cards. Using Apple Pay to pay with a debit card works mostly like paying via Apple Pay with a credit card, though you have to enter a PIN at the sales terminal.

Getting cash out of an ATM is a slightly different story. Many banks have updated their ATMs to include contactless card readers that will accept an ATM or debit card that has been added to the Wallet app.

The side benefit of using Apple Pay at an ATM is greater security because card skimmers — which thieves commonly use to capture ATM card data — can't steal data from contactless card readers.

To use your debit/ ATM card with an ATM, first double-press the Home button to invoke Apple Pay (this is best done with a finger that Touch ID doesn't recognize). You can also open the Wallet app and tap your debit/ ATM card. Then hold the iPhone near the contactless reader symbol and activate Touch ID by placing a recognized finger on the Home button. If you have one, you can also use your Apple Watch — double-press the watch's side button to bring up Apple Pay. Finally, enter your PIN on the ATM's keypad.

Alas, not every ATM has a contactless card reader. Even for those that do, some types of transactions, such as deposits, may still require a physical card. Until the ATMs close all these particular loops, my ATM card will have to remain in my wallet.

Transit Passes — If you live in the right place, such as [New York City](#), [London](#), or [Japan](#), you can use Apple Pay to ride public transit (things have improved significantly since Steve McCabe wrote "[Around The World With Apple Pay](#)," 13 May 2015). Apple Pay support for transit payments helps riders save time, particularly when transferring from one service to another; can help speed passengers through fare gates; and could even save the transit authority some costs.

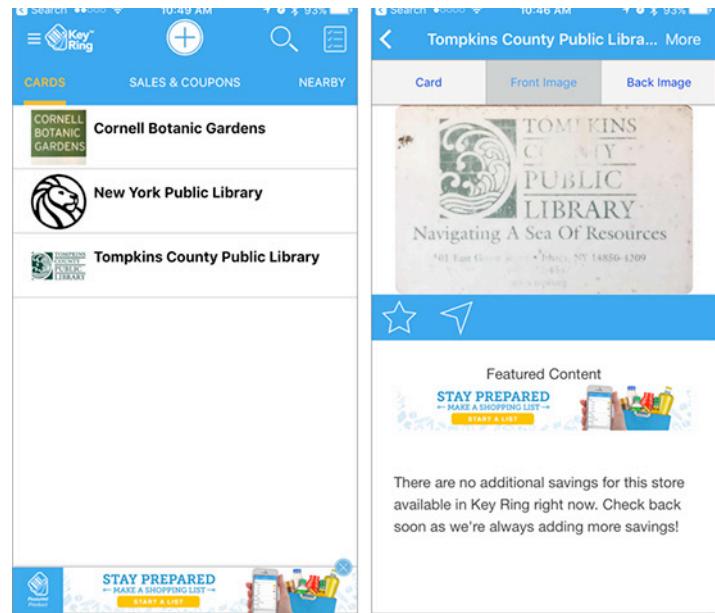
Sadly, far too few transit systems support Apple Pay yet. Even in Apple's home territory of the San Francisco Bay Area, for example, commuters can use a single Clipper Card to navigate over 20 separate transit agencies but can't use Apple Pay. It would be nice to replace that card with a virtual card in the Wallet app, but that hasn't happened yet.

Loyalty/Stored Value/Gift/Membership Cards

Department stores, drug stores, and restaurants are starting to see the value of having their loyalty programs appear in their apps or in Apple's Wallet. Some are placing special offer coupons right in the Wallet app, giving customers one less thing to forget when heading out for the day and increasing the odds of an impulse buy.

Apps like [Stocard](#) and [Key Ring](#) offer you the opportunity to put all your loyalty cards into one app and may also

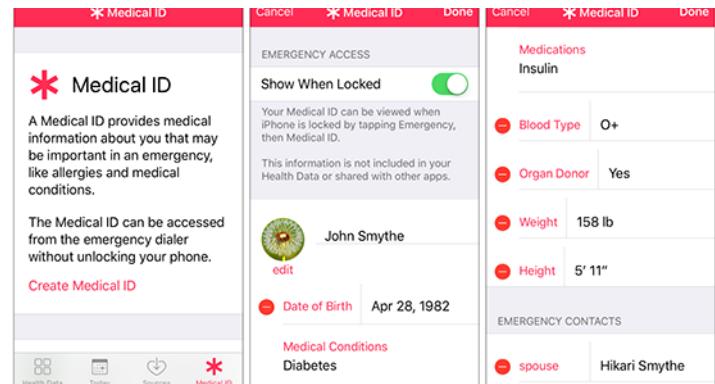
present information about ads and store sales. These apps may also be able to handle membership cards that have barcodes. For instance, TidBITS publisher Adam Engst was able to lighten his wallet load by adding his Tompkins County Public Library card and others to Key Ring.



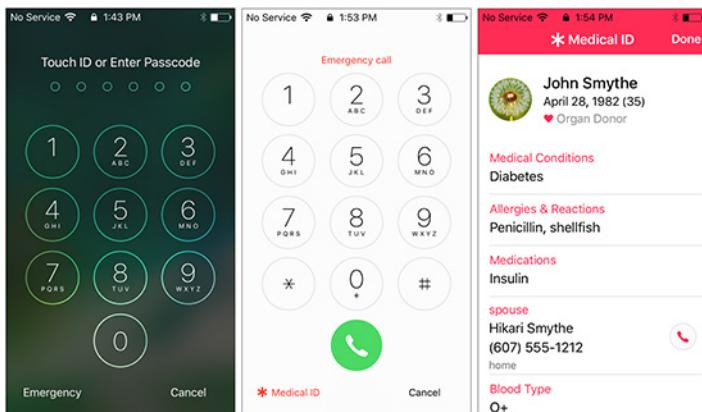
Health Insurance/Emergency ID — Everyone should carry this sort of information because you never know when a medical emergency (such as a bus) will strike. Ouch!

Fortunately, major health care providers offer apps that often include account details or even on-screen replicas of insurance membership cards. Search on your health insurance provider's Web site to see if they provide such an app.

In addition, Apple's Health app includes a Medical ID into which you can enter your age, blood type, height, weight, and organ donor status, along with people to contact in case of emergency.



If you're in an accident, emergency responders can access this information from the iPhone's Emergency screen (tap Emergency on the Passcode screen) or by pressing and holding the side button on the Apple Watch.



Be sure to tell your iPhone- and Apple Watch-using friends about the iPhone's Medical ID, since it will be useful only if it contains helpful information and people know to access it.

Government ID — While you could take a picture of your driver's license and store it on your iPhone, that's not going to get you very far if you have to present your actual ID card to get into a bar, past the TSA at the airport, or to a police officer who has just pulled you over.

That said, [Alabama](#) now offers a digital driver's license, and quite a few [other U.S. states – and other countries – are exploring the possibility](#).

by Glenn Fleishman

HEVC and HEIF Will Make Video and Photos More Efficient

If you haven't already experienced abbreviation overload, Apple has added two more to your plate: HEVC (High Efficiency Video Coding) and HEIF (High Efficiency Image File Format — yes, it's short one F). These two new formats will be used by iOS 11 and macOS 10.13 High Sierra when Apple releases them later this year.

While you may not have heard of HEVC or HEIF before, both are attempts to solve a set of problems related to video and still images. As people take photos and shoot video at increasingly higher resolutions and better quality, storage and bandwidth start to become limitations. Even in this day of ever-cheaper and ever-faster everything, consuming less storage space and requiring less bandwidth when syncing or streaming still has many benefits.

The Current Landscape — Those of us who have been around the block a few times have seen plenty of image formats come and go. Once, I thought the Kodak-backed [FlashPix](#) format might make inroads because of how it created a hierarchy of multiple sizes of images in a single file for faster retrieval. But it was not to be.

The idea of replacing passports and driver's licenses is rife with security and privacy concerns, however. Digital IDs may initially be offered as a complement to traditional plastic or paper forms of identification.

For instance, the Mobile Passport app is authorized by U.S. Customs and Border Protection. It doesn't replace the need for a passport; it merely permits U.S. and Canadian citizens to submit their passport control and customs declaration information via an iPhone or iPad (rather than fill out a paper form) and then bypass the regular line when entering the United States at selected airports and seaports.

We're still far from solving these larger tensions surrounding identity, privacy, and security, so we'll probably have to resign ourselves to carrying physical wallets for a bit longer.

Right now, if I could put all of these options to work, I might be able to downsize my current wallet to just a bit of cash, my driver's license, a credit card, an ATM card, and a transit fare card.

That would be pretty much everything I need. Except for some hard candy, of course. 🍬

Since the 1990s, only the [PNG \(Portable Network Graphics\) format](#), designed to avoid certain patents then extant, has joined the pantheon of widely supported, well-established image formats, alongside JPEG and GIF. (The long-established TIFF isn't used on the Web, but it remains important in publishing workflows.)

The main split between image format types is whether they're lossless or lossy. Lossless formats retain pixel-for-pixel details and tones exactly, at the expense of a larger file size. Compression in lossless formats reduces the storage required for redundant information without discarding detail. Lossy formats rely on algorithms to approximate detail and tones across regions of an image, allowing for typically much smaller file sizes.

None of the popular formats fit all needs. JPEG is lossy, so it's great for photos but less useful for screenshots, and it doesn't support an alpha channel for transparency, like GIF and PNG. GIF is lossless, but relies on limited color palettes, making it great for certain kinds of artwork, but poor at reproducing photos. (Reduced color palettes were more important when color displays had shallow color depth

and bandwidth was more constrained). GIF also supports animation, unlike JPEG and PNG's most common implementation. PNG, either lossy or lossless, works particularly well for screenshots and was designed around the patent encumbrances that once restricted GIF usage. **PNG and JPEG are both used on about 74 percent of Web sites**, but GIFs still appear on 36 percent of sites. PNG didn't succeed in killing GIF, but it made huge inroads.

HEIF tries to combine all the best aspects of PNG, JPEG, and GIF, while dramatically improving compression and adding new features like the capability to store bursts of photographs.

Video formats have suffered from a more fraught path, because many were caught up in newer patents that hampered widespread adoption. Image formats had to deal with patents, too, but either they were near the end of their lives when the Web was young, as with **LZW compression**, or the makers of various tools to create and display images — from Photoshop to Internet Explorer — had already licensed all the necessary bits and pieces.

These video patents complicated things for Web sites. Questions arose as to whether sites would have to pay royalties for every view, free software groups debated the use of encumbered standards, and Flash took off as a cross-platform delivery package for video, because Adobe took care of all the back-end licensing and display issues.

Ultimately, the MP4 family of standards and its H.264 codec (encoder / decoder) won the day, with the vast majority of video available on the Web now using that format. (The group that pooled patents for H.264 said it **wouldn't collect royalties** for free Internet-delivered video. Hardware-accelerated encoding and decoding followed. That took the wind out of competitors' sails.)

What will be the real-world benefits of these new formats? Let's start with HEVC and move on to HEIF.

HEVC: Encompassing the Future While Shrinking the Past — Video streaming gobbles up over **70 percent of evening Internet traffic**, and network-management firm Sandvine estimates it's on track to hit 80 percent in 3 years. Thus, streaming video companies, ISPs, and viewers who have monthly caps or overage fees have a huge incentive to get more from less, and HEVC is the solution. Apart from Google's 4K-capable **VP9** codec, HEVC is the only reasonable path for most streaming services to affordably and practically feed out 4K Ultra-High Definition (UHD) video for mobile devices. (VP9 is built into Android starting with version 5.0 Lollipop.)

HEVC is another name for the H.265 standard, and it's being promoted as taking 50 percent less data to produce streams or downloads of the same quality as H.264 when the resolution is 1080p or less. Netflix, which accounts for about half of the aforementioned primetime data usage in the United States, found that it did **indeed achieve 50 percent savings**. (Google's VP9 hit the same 50 percent

mark.) **Netflix suggests 5 Mbps for HD video** now, which would consume about 340 GB for 150 hours of content.

When it comes to 4K UHD video, HEVC uses about 40 percent less data. But that's still tremendously more efficient. Netflix streams only 4K to televisions released starting in 2014 that had an earlier version of the HEVC hardware decoder. The streaming company currently advises a constant 25 Mbps or higher rate to stream its 4K content, which is about 1.7 TB for 150 hours of viewing. It would be over 40 Mbps at H.264 compression rates.

How can HEVC achieve such a notable improvement in compression without sacrificing quality? As with the jump from MPEG2 to H.264, it involves hardware acceleration on the encoding side. With chips that can perform specialized calculations, algorithms that perform more intensive analysis of video to find places to compress become more viable. HEVC can require up to 10 times more computation than H.264 to encode at the same bit rate!

But this is asymmetrical. In plain English, HEVC works because it's relatively cheap to buy super-powerful computers with specialized chips to encode the video in production, but even tiny mobile devices can decode those highly compressed streams or downloads quickly and easily. Producers crunch the files; viewers reap the bandwidth benefit.

Both H.264 and HEVC break down every frame in a video into a series of rectangles (mostly squares) based on the image's tonal values, with the goal of grouping similar tones for more compression. A frame that has a large area of blue sky and small figures walking across a desert could obviously be compressed better if the blue sky and desert regions were broken out from the people walking across it. HEVC can encode larger areas at once, which results in higher compression for less-differentiated detail.

HEVC is also much better at "predicting" how elements in a frame will change from frame to frame and in which direction those elements will move. The full explanation is eye-glazing, but the summary is that increased compression efficiency both within a frame and between frames lets HEVC gain that extra 40 to 50 percent reduction.

Smaller files and fewer bits-per-second required for streaming are great when you're Netflix, but why should you care as an individual user or even a company using video from iPhones as part of your workflow? Because every bit saved is a bit you don't transmit and a bit you don't store.

For starters, if a video occupies only half the space for the same quality, your iPhone's precious storage goes twice as far before you have to sync or offload video.

At the average user level, if you're an iCloud storage subscriber above the free 5 GB tier, when you cross 200 GB with your current media needs, you suddenly leap from \$2.99 a month for 200 GB to \$9.99 a month for 2 TB. Halve your storage and you save that difference in cost. For even

relatively modest video production houses storing massive amounts of video, the same scenario applies to local SSD or RAID storage and remote cloud storage, and could result in savings of tens of thousands of dollars per year.

Similarly, if you send or receive video via cellular data, you might be able to drop to a cheaper data plan without being throttled or charged for overages. And for commercial users, being able to transfer less data to cloud storage or stream at lower bit rates could reduce costs significantly. Amazon S3 and Google Cloud may offer cheap storage and transfer, but it still adds up. Half of anything is half as much!

As viewers, we should get better and more consistent quality television and movie streaming on our iOS devices and Macs, as well as on the fourth-generation Apple TV, which is slated to receive HEVC decoding in tvOS 11 (see "[What's Coming in tvOS 11](#)," 15 June 2017). People with lower broadband throughput rates will potentially use the same amount of data and see a much crisper picture. Those with higher bandwidth connections will consume half as much data for the same results.

The central question about HEVC is how easy or hard it will be to capture, edit, and play back on various devices. Apple hasn't named compatible devices, but in a developer presentation, it provided a [clear rundown of the hardware and software support](#) (go to 22:00 in the video to listen and see).

In short, all Macs and iOS devices that run the upcoming releases will be able to decode HEVC at least in software. But for hardware decoding, you'll need an iOS device with an A9 or later and a Mac with an Intel Skylake or Kaby Lake processor (6th and 7th generation Intel Core). On the iOS side, that means an iPhone SE, iPhone 6s or later, any iPad Pro, and the fifth-generation iPad. The 2016 MacBook Pro models have Skylake processors, and the 2017 iMac and MacBook Pros sport Kaby Lake chips.

Depending on the size of files and other parameters, HEVC software decoding might be erratic or consume much more battery life than H.264. Smart Web sites may check a device's vintage and iOS apps can use new developer queries about supported video formats, and then feed out H.264 if HEVC might suffer from software decoding hiccups. Of course, that means older hardware that's technically capable of HEVC might not get the full bandwidth advantage, but owners will probably then appreciate H.264's battery savings, reduced fan noise, and smoother video.

If you want to edit and encode with HEVC, you'll have the same issues as decoding, and it probably won't be practical without a newer Mac.

(A technical aside for those who care about deep color. Both H.264 and HEVC allow for 10-bit color, which provides richer differentiation of tones than 8-bit color: a billion different shades instead of just over 16 million. 4K and 5K iMacs and the Mac Pro support 10-bit color, as do the 2016 and later MacBook Pros, and external monitors on some

other 2015 and later Macs. 2016 MacBook Pros with Skylake chips include only 8-bit HEVC hardware encoding; Kaby Lake models handle 10-bit.)

Because not every device will display HEVC video, exporting will produce compatible formats for social media and other sharing, as you can do with Photos, iMovie, and other apps today.

With video out of the way, HEIF will seem vastly simpler by comparison.

A Container for Images, Rather Than a Simple File Format

Even though it's billed as an image format, HEIF is in fact a container that rethinks what an image format needs to do in today's complex world. An HEIF file will be able to hold text, audio, video, still images, and sequences of frames for bursts and animations, and software will be able to extract and present the relevant information depending on what we're trying to do.

HEIF is built on an ISO standard — hurray! — developed into a full spec by the Moving Picture Experts Group (MPEG). Apple has based its implementation on a second, more fully realized version that the company said at WWDC will soon be released. Also, Apple says HEIF is pronounced "heef," rhyming with "beef." (An Apple developer [presentation offers a good amount of detail](#), if you want the not-too-gory bits.)

Once again, compression is perhaps HEIF's most significant benefit. To make things simpler, HEIF can use HEVC compression. That's both because HEVC compression is more efficient than JPEG, but also because Apple can use HEIF to store bursts of images and animations (think Live Photos), both of which benefit from HEVC's inter-frame compression.

Less obvious benefits include better support for alpha channels, which are used for transparency and masking of images, and for deeper color, something Apple has been pushing into its hardware for a few years. HEIF can also break an image into rectangular regions so editing and display software quickly retrieve just the necessary adjacent pieces without loading the entire file. And it can store both an original image and images derived from the original, much like apps like Lightroom store a base image and then record a series of transformations.

Although HEIF can be used to store bracketed images — photos of the same scene taken in quick succession with different exposures — to let software produce high dynamic range (HDR) output, Apple instead generates HDR images directly in the image signal processor in iOS devices. Third-party software could opt to bypass Apple's hardware and use HEIF for this purposes. [ProCamera](#), for instance, has its own HDR mode.

But with two-camera iPhones, currently including just the iPhone 7 Plus, Apple will store the depth map that it derives for its Portrait-mode photographs in the HEIF file. The depth map identifies a series of planes at a range of

distances from the foreground. This lets Apple separate out figures in the front and aesthetically blur the background to achieve the “bokeh” effect (see “[Behind the iPhone 7 Plus’s Portrait Mode](#),” 24 September 2016). But it can also be used for a host of interesting effects by developers, who will be able to access the depth map in iOS 11 both as the camera is in operation and from stored HEIF images. Apple showed examples like a foreground figure being in full color, while the background was in black and white. It will also make it easy to composite foreground elements against artificial backdrops.

I won’t reiterate the advantages for storage, since they apply just as much to photos as to video. As someone with dozens of gigabytes of video and hundreds of gigabytes of photos, I’ll likely find more savings from HEIF than HEVC video.

Just like HEVC, HEIF relies on newer hardware for hardware decoding: iOS devices need an A9 or later processor, and for Macs, the same Skylake and Kaby Lake models noted above. All other iOS devices and Macs that can run iOS 11 and High Sierra rely on software decoding.

Because HEIF is a container format, it gives individual implementors like Apple a lot of flexibility about what ends up inside. I hope that doesn’t create compatibility issues when moving HEIF files between other platforms that eventually support it as a native file type. At the moment, HEIF files can be read only by Apple beta software. Conceivably, we’ll see Adobe Photoshop and other software gain support.

Web browsers won’t support HEIF initially, and it’s not inherently suited for the Web because any given HEIF file could include all sorts of excess data. I expect that Apple and others will define kinds of HEIF that will be appropriate for Web usage, such as a substitute for animated GIFs and for better compression than JPEG provides. Web servers can already supply different kinds of image and video types based on browser versions, so HEIF would just extend that capability. But Apple hasn’t said anything along those lines yet.

by Josh Centers

iOS 11 Gets Smarter in Small Ways

If you were hoping for massive changes to iOS, such as a redesigned Home screen, [iOS 11](#) will disappoint you, at least on the iPhone. While the iPad will receive many terrific (and much-needed) big-screen features (see “[iPad Pro Gets More Professional](#),” 5 June 2017), the rest of iOS 11 focuses on UI refinement, artificial intelligence, and developer capabilities. Regardless, some big changes are coming when iOS 11 is released this fall.

Apple has created developer tools that let apps assess what format an image has to be in to share or display, and export and serve that up as needed. iOS, macOS, Apple’s apps, and independent apps will perform a lot of conversions or offer export options, while retaining and passing HEIF for intra-ecosystem use.

Are HEVC and HEIF Like USB-C for Media? — People still have issues with the USB-C connector used for USB 3.1 and Thunderbolt 3 because it requires adapters, raises compatibility issues among identical connectors, and generates anxiety about what will work with what. (I’m a big fan of USB-C — as evidenced by my owning a 12-inch MacBook and a 2017 iMac — but I understand the complaints.)

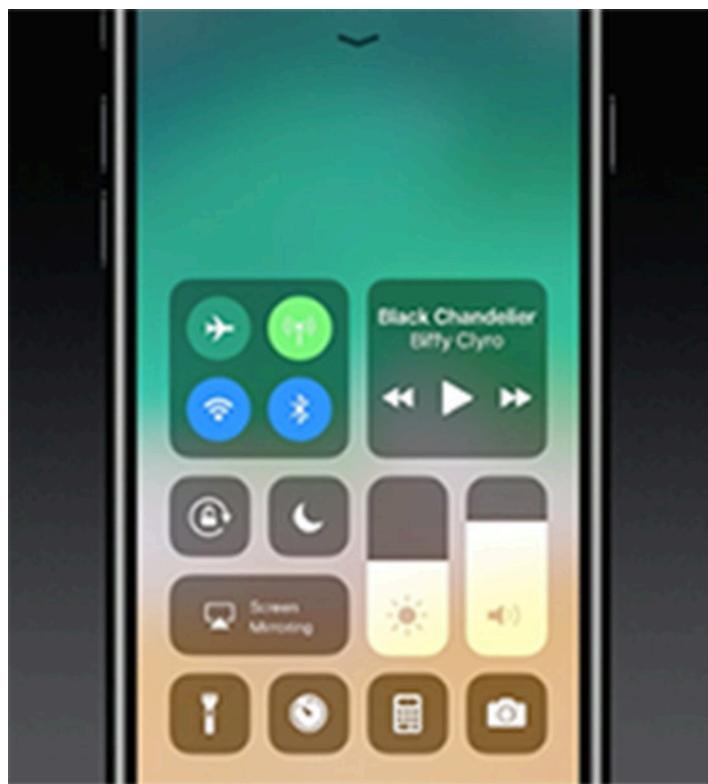
HEVC and HEIF shouldn’t suffer from the kind of confusion that plagues USB-C, however, because Apple has built its support around the notion that only devices within Apple’s ecosystem will support the formats natively. Moving outside Apple’s ecosystem will typically — at least initially — require transcoding and export, and those conversions will almost certainly happen without you even realizing. Apple is encouraging developers to keep this approach in mind, too.

The one sore spot you might hit is if you don’t upgrade all your devices to iOS 11 and High Sierra at the same time, or if you own older hardware that can’t be upgraded. For instance, if you use the same iCloud account with iCloud Photo Library across both new and old devices, I’m not clear on how pre-HEIF/HEVC platforms will deal with those images. Apple hasn’t provided guidance about that yet.

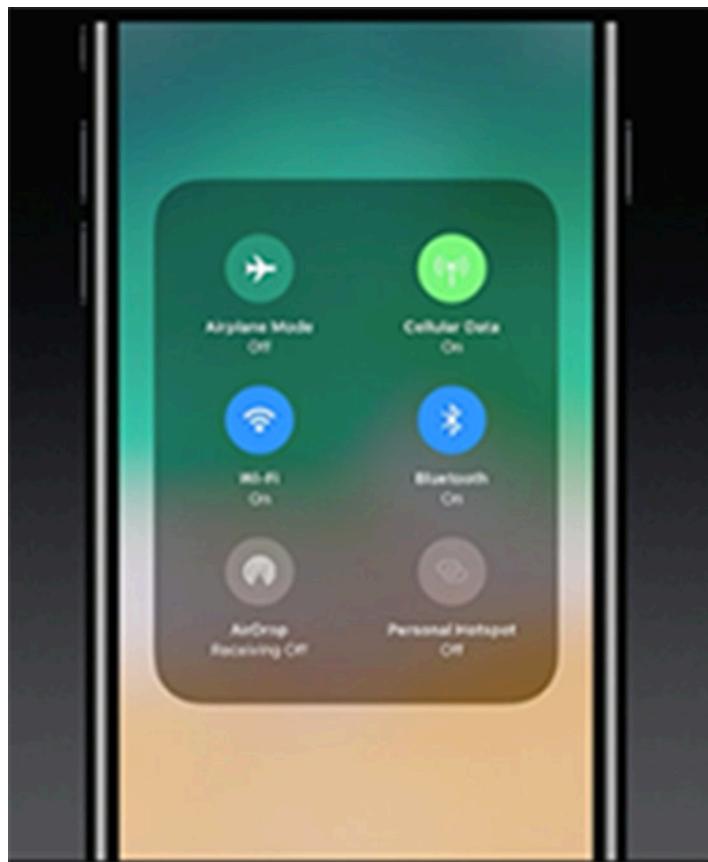
Another question that Apple has yet to answer is how your existing JPEG photos and H.264 video will be treated when you update to High Sierra. Will Photos automatically convert your entire library? What about files outside of Photos?

Nevertheless, the advantages for HEVC and HEIF are clear, and the transition shouldn’t be rocky if you move forward all at once. But hey, keep good backups, just in case. ☕

Control Center and Lock Screen — Whenever you install iOS 11, the first big thing you’ll likely notice immediately is the new Control Center, which had ballooned to up to three pages in iOS 10. For iOS 11, Apple has compressed it back down to one page, in a grid that takes up more of the screen.



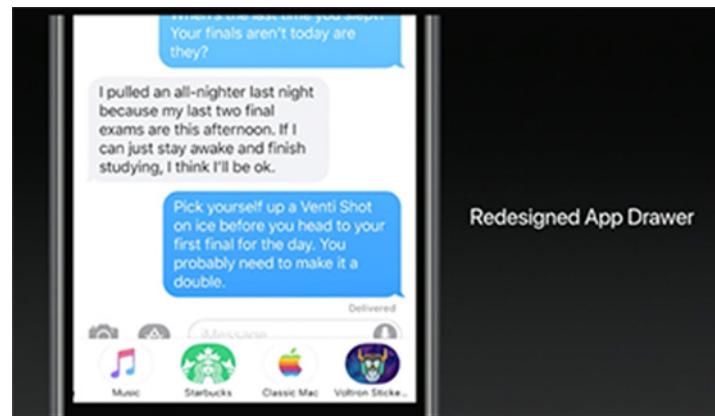
Despite being squeezed into a single page, Control Center will offer more options than before. You'll be able to 3D Touch a Control Center "platter," as Apple called them, or presumably long-press it on devices that don't support 3D Touch, to pop open a panel with more options.



The other big front-facing change is that Notification Center is going away in iOS 11. Instead, you'll be able to scroll through all of your notifications on the Lock screen. It wasn't quite clear how you'd be able to see your older notifications without locking the device.

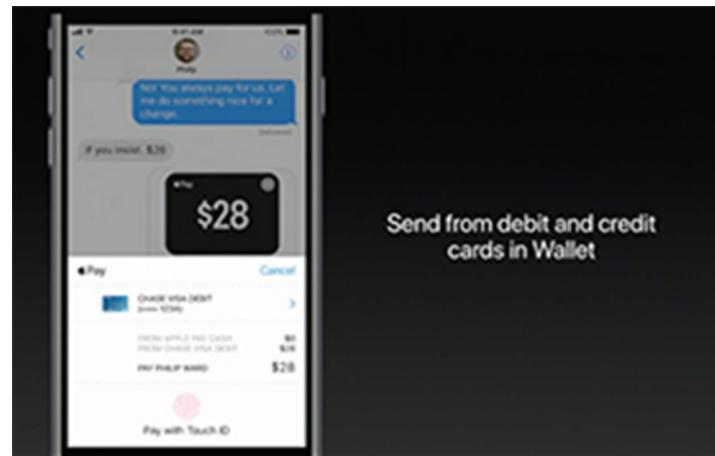
Messages — In iOS 11, Apple is finally fixing Messages with Messages in iCloud. Your messages will be synced across devices via iCloud, so you won't have unsynced or jumbled messages. If you delete a message on one device, it disappears on all devices. Also, your older messages will be stored in iCloud so they won't hog precious storage space on your devices. Of course, your messages will still be end-to-end encrypted to ensure your privacy.

Apple is also redesigning the Message app drawer for iOS 11. The company introduced Message apps in iOS 10, but they've been underwhelming so far. A better-designed app drawer may make these mini-apps more accessible. That will also be key for a new feature coming to Apple Pay...



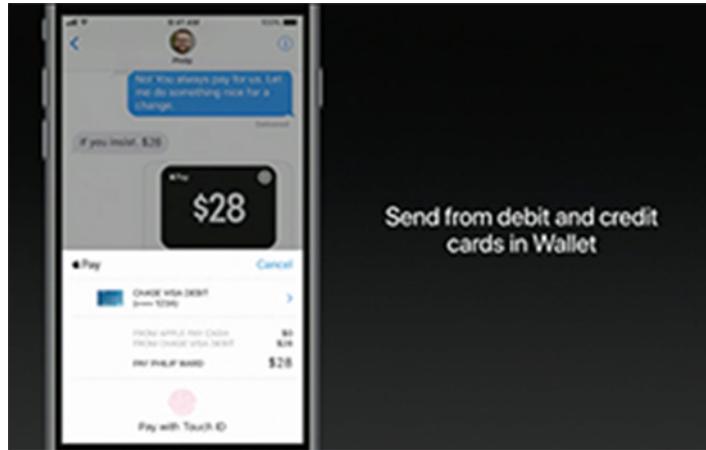
Apple Pay — Apple is becoming a financial services company of sorts, since Apple Pay will support person-to-person payments in iOS 11. To store the money you receive, you'll have an Apple Cash Card in Wallet, and you can transfer money from it to your bank.

Apple was a bit skimpy on details, but it seems that the primary way of making person-to-person transactions will be with a Message app that can send money via iMessage.



Siri — Siri will receive some major enhancements in iOS 11. In addition to new, more natural voices and a new look, Siri will now sync the data it knows about you between devices to better help personalize your queries.

Siri is also getting smarter. Thanks to what Apple calls Siri Intelligence, Siri will better understand your interests and the contexts in which you are speaking. For instance, if you search for Iceland in Safari, Apple News will recommend articles about Iceland, and the keyboard will intelligently suggest related terms.



Apple has spread this intelligence throughout iOS 11. For instance, Calendar can now extract events from Safari. This is one of those features that's difficult to demo or describe, so we're anxious to get our hands on it to see how it works in reality.

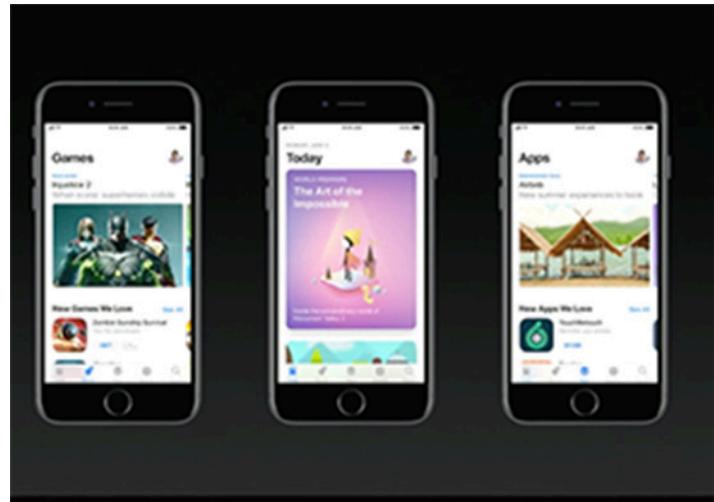
Unhappy with the results Siri usually gives you? In iOS 11, Siri will offer alternative answers that you can choose by tapping the screen. Presumably, Apple will use this to tailor its recommendations.

Perhaps the coolest new feature coming to Siri is translation. You'll be able to say something like "How do you say what the most popular dishes in your restaurant in Chinese," and Siri will speak what you said in Chinese. Apple emphasized that this is a beta feature, so we don't quite have the Babel fish from "Hitchhiker's Guide to the Galaxy" yet.



Finally, the SiriKit API for developers is gaining some new features, such as photo search, car controls, task management, and banking. That should mean that we'll be able to use Siri to control many more apps than in iOS 10.

App Store — Apple is totally revamping the App Store in iOS 11. The old top charts seem to be gone. Instead, there are tabs for daily featured apps, games, and apps.



Apple seems to be moving toward curating the App Store more. Apps featured in the Today tab will include short articles and how-to videos. Likewise, the other new tabs will feature highlighted apps every day. The idea seems to be to get users to check in with the App Store every day to see what's new. That may be great for developers, but we're horrified that Apple seems to think you should waste vast amounts of time browsing the App Store for new apps daily.

Developers will appreciate the App Store's new "phased releases," which roll out a new or updated app slowly instead of all at once. That'll be especially welcome for developers whose apps require a lot of server resources.

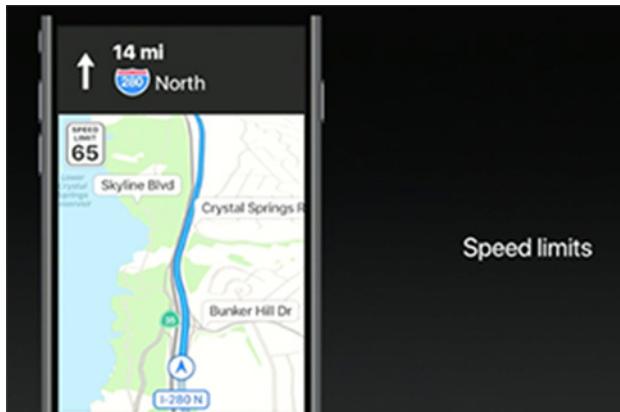
Camera — Have you noticed that the file sizes for photos are growing with each new iPhone model? Apple is tackling that with two new technologies: HEVC H.265 video compression and a new image format called HEIF. Apple claims that HEVC compression can cut the size of videos by half. HEIF, or High Efficiency Image File Format, is a new file format standard that will replace JPEG for iOS photos. Apple claims that images in HEIF will be easy to share with others, but we're waiting to see how well that pans out.

Portrait Mode for the iPhone 7 Plus is also getting some much-needed enhancements: improved image quality, better low-light performance, and optical image stabilization.

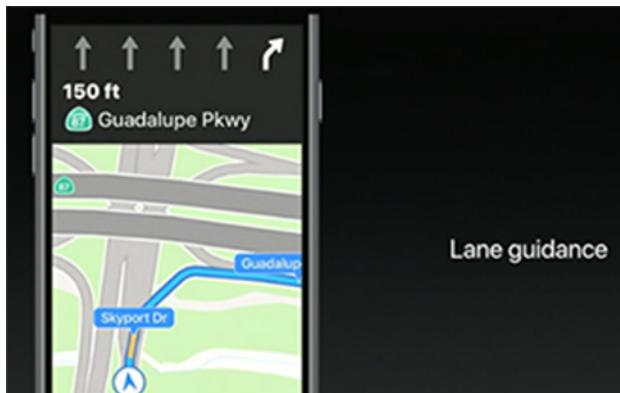
Photos — The Memories feature that Apple introduced in iOS 10 is getting smarter and better able to identify different objects and people, but the change you're most likely to notice is that Memories in iOS 11 will be able to switch from landscape to portrait orientation.

But the most impressive new stuff coming to Photos in iOS 11 is all the things you'll be able to do with Live Photos. You'll be able to trim and edit Live Photos, pick a different key photo, and create loops. You'll even be able to reverse the directions of loops if you want a bounce effect. But perhaps the coolest new feature with Live Photos is being able to combine all the frames together to form a long exposure shot.

Maps — As always, Apple's Maps is playing catchup. Maps in iOS 11 will inform you of speed limits and offer lane guidance — standard features on most standalone GPS units.

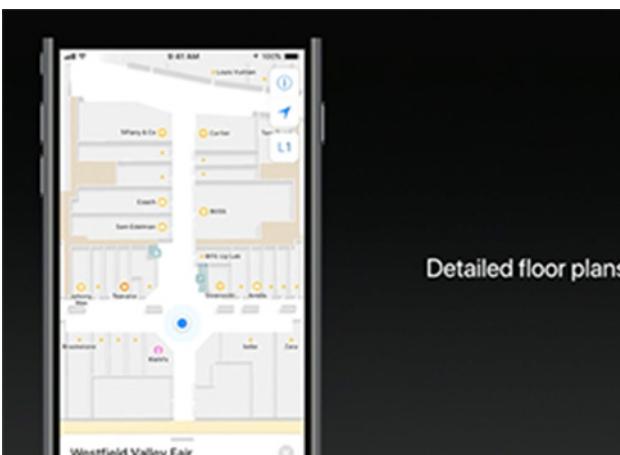


Speed limits



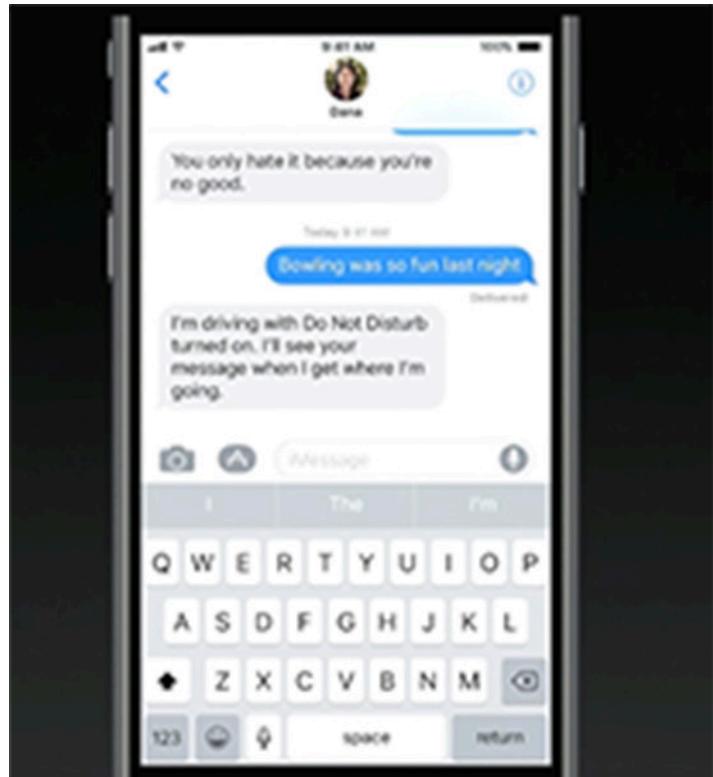
Lane guidance

However, more interesting is that Maps will begin offering indoor maps of large places like malls and airports. Support will be limited to a small number of major cities at first, but that will hopefully grow over time.



Detailed floor plans

CarPlay for the Rest of Us — Even Apple admits that CarPlay hasn't been widely adopted, so that's why the most interesting new automotive feature will be available to all iOS 11 devices: Do Not Disturb While Driving. When your iPhone detects, either via Bluetooth or the Wi-Fi Doppler effect, that you are in a car, it will shut off notifications to your phone. You'll be able to set an auto-reply text message in case anyone messages you, which the sender can break through by stating that the message is urgent. You can also turn off Do Not Disturb While Driving if you're riding in a car instead of driving. We strongly hope this feature will help cut down on the number of accidents caused by texting and inappropriate iPhone use while driving.



HomeKit – Apple’s home automation platform will gain some more capabilities, but the key thing Apple wanted to discuss is the new AirPlay 2 protocol and its integration with HomeKit. If you have multiple AirPlay 2 enhanced speakers, you’ll be able to use the Home app to broadcast music throughout your house. A number of manufacturers have signed on to produce AirPlay 2-compatible speakers, and we presume Apple’s own HomePod will do so as well. Apple TVs running tvOS will also be able to act as AirPlay 2 receivers.

I hope this musical HomeKit integration will let me do things like play a song in response to an event or even sync my lights to music.

Apple Music — Remember Ping? Or Apple Music Connect? Well, Apple just won't give up on the dream of a social music experience, so Apple Music in iOS 11 will let you see what your friends are listening to. We hope you can turn

that feature off; there's a reason each of Apple's previous attempts in this area has failed.

Apple is also offering developers an API for Apple Music, so developers of apps like Shazam can tie into Apple Music. It will be interesting to see what developers do with that.

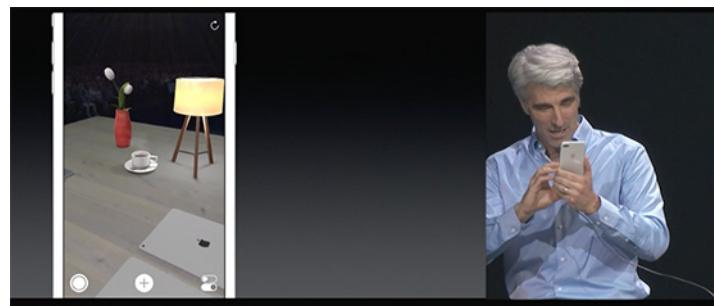
Behind the Curtain — WWDC being a developer conference, Apple announced some new technologies that could lead to new, exciting apps. The two most interesting ones for end users are Core ML and ARKit.

Core ML is a developer framework to make machine learning readily available to developers. Developers can use it to handle things like face detection and tracking, text detection, object tracking, palm rejection, and barcode scanning. Apple claims that with Core ML, iOS image recognition will be six times faster than with Google's Pixel phone.

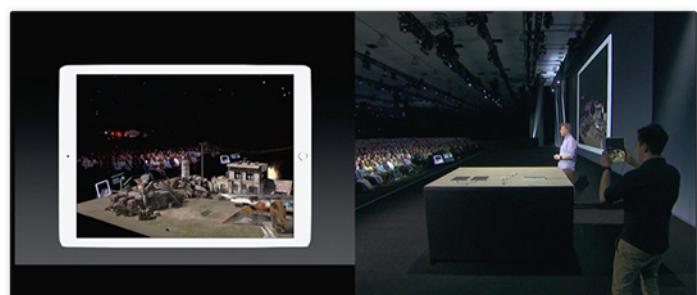


ARKit is a framework to help develop apps using augmented reality, which mixes the real and virtual worlds. The example most people are probably familiar with is Pokémon Go, which lets players capture and battle with pocket monsters around the world (see "[What the Heck Is Pokémon Go?](#)," 17 July 2016). Apple even demonstrated how ARKit will make Pokémon Go better by showing that a thrown pokéball will bounce around on a real-life sidewalk.

Apple senior vice president Craig Federighi also showed how an ARKit app lets him place virtual objects on a table.



And Alasdair Coull, head of director Peter Jackson's Wingnut AR studio, showed off an entire battle overlaid over the auditorium.



AR is an interesting technology, but it has yet to find a killer app. Pokémon Go seemed to be the app, but its luster has quickly faded. However, if Apple ever did develop a car, AR could be an essential technology.

Where is iOS Going? — iOS 11 has no marquee feature, but that's not really a problem. As with many recent iOS releases, iOS 11 instead provides a series of refinements, many of which should improve the user experience in real ways. We'll be poring over the beta releases in the next few months to find and share the most useful of these changes.

If there is one central thread, it's that of artificial intelligence, as Siri becomes more robust and better integrated throughout iOS and independent apps. It's clear that, for Apple, this is a year to establish the building blocks necessary for whatever comes next in technology. ☀

