HOW TO PLAY RETRO GAMES ON A MAC

THE WORLD'S BEST-SELLING APPLE MAGAZINE

Macworld

FEBRUARY 2018 IDG

FROM IDG

iMac Pro:

Apple's slimline powerhouse heralds new era for the Mac

Meltdown and Spectre:

Everything you need to know

Apple in 2018:

What we expect, what we want

CONTENTS

NEWS

NEWS ANALYSIS

REVIEW

FEATURES

Keep updated with all the latest Macworld news, by following us on Twitter and Facebook

CONTENTS

FEATURES

ROUND-UP

HOW TO

OPINION

NEWS

Apple responds to claims it slows down old iPhones

Apple answers its critics. **Roman Loyola** reports

Apple has released a statement to TechCrunch to address accusations on the Internet that the company purposely throttles the performance of older iPhones in order to boost new iPhone sales. Here is the statement to TechCrunch:

"Our goal is to deliver the best experience for customers, which includes overall performance

and prolonging the life of their devices. Lithium-ion batteries become less capable of supplying peak current demands when in cold conditions, have a low battery charge or as they age over time, which can result in the device unexpectedly shutting down to protect its electronic components.

"Last year we released a feature for iPhone 6, iPhone 6s and iPhone SE to smooth out the instantaneous peaks only when needed to prevent the device from unexpectedly shutting down during these conditions. We've now extended that feature to iPhone 7 with iOS 11.2, and plan to add support for other products in the future."

The batteries in iPhones, iPads, and other portable devices degrade over time, thanks to heat and age. This means an older battery becomes less suited to meet the demands of a device's processing peak. With an iPhone, this could cause the device to shut down.

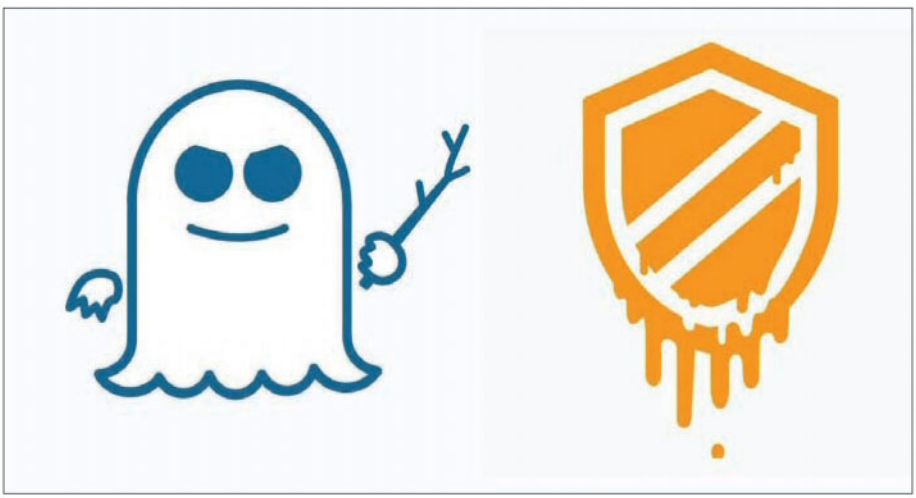
To address this, Apple last year updated iOS with power management features so that processing peaks were smoothed out by putting a cap on the power draw from the battery, or by distributing power requests over multiple cycles.

As TechCrunch points out, this is a problem with lithium-ion batteries, and Apple's power management is an attempt to prolong the life of your device, not to shorten it. If Apple were truly trying to hamper performance to force sales of new devices, the company would be basically asking for legal and governmental problems.

NEWS ANALYSIS

Meltdown and Spectre FAQ

Brad Chacos and **Michael Simon** reveal what you need to know



Massive security vulnerabilities in modern CPUs are forcing a redesign of the kernel software at the heart of all major operating systems. Since the issues – dubbed Meltdown and Spectre – exist in the CPU hardware itself, Windows, Linux, Android, Macs, Chromebooks, and other operating systems all need to protect against it. And worse, it appears that plugging the hole will negatively affect your PC's performance.

Everyday home users shouldn't panic too much, though. Just apply the latest operating system updates and keep your antivirus software vigilant, as ever.

Here's a look at what you need to know about Meltdown and Spectre, in plain language. If you want a deep-dive into the technical details, be sure to read Google's post on the CPU vulnerabilities. We've updated this article repeatedly as new information becomes available.

The basics

Again, the CPU exploits in play here are extremely technical, but in a nutshell, the exploit allows access to your operating system's sacrosanct kernel memory because of how the processors handle 'speculative execution', which modern chips perform to increase performance. An attacker can exploit these CPU vulnerabilities to expose sensitive data in your protected kernel memory, including passwords, cryptographic keys, personal photos, emails, or any other data on your PC.

Meltdown is the more serious exploit, and the one that operating systems are rushing to fix. It "breaks the most fundamental isolation between user applications and the operating system," according to Google. This flaw most strongly affects Intel processors because of the aggressive way they handle speculative execution, though a few ARM cores are also susceptible.

Spectre affects AMD and ARM processors as well as Intel CPUs, which means mobile devices are at risk. It's "harder to exploit than Meltdown, but it is also harder to mitigate," Google says. There may be no hardware solution to Spectre, which "tricks other applications into accessing arbitrary

locations in their memory." Software needs to be hardened to guard against it.

What's a kernel?

The kernel inside your operating system is basically an invisible process that facilitates the way apps and functions work on your computer, talking directly to the hardware. It has complete access to your operating system, with the highest possible level of permissions. Standard software has much more limited access.

How do I know if my Mac is at risk?

Short answer: it is. Probably.

Google says "effectively every" Intel processor released since 1995 is vulnerable to Meltdown, regardless of the operating system you are running or whether you have a desktop or laptop. Chips from Intel, AMD, and ARM are susceptible to Spectre attacks, though AMD says its hardware has 'near zero' risk because of the way its chip architecture is designed.

Intel said recently, though, that the patches that it is issuing – via firmware and operating system patches – "render those systems immune from both exploits." That's a big claim from Intel, and has yet to be confirmed.

So if Meltdown's a chip problem, then Intel needs to fix it?

Yes and no. While Intel may address the fundamental hardware problem in future chips,

Intel's Core i7-8700K 'Coffee Lake' CPU

the fix for PCs in the wild needs to come from the operating system manufacturer, as a microcode update alone won't be able to properly repair it. Intel said on 4 January that it had been aware of both vulnerabilities since June 2017, which gives you an idea of how seriously the computing ecosystem has taken both Spectre and Meltdown.

Intel is also publishing firmware updates for its processors. You'll need to snag them from your PC, laptop, or motherboard maker (such as HP or Gigabyte) rather than Intel itself. Intel's support page for the flaw links to firmware updates and information from the PC manufacturers it works with. At the time of writing, Intel expects to have released firmware updates for 90 percent of processors released in the past five years by 12

January. The company hasn't announced its plans for older CPUs like the venerable Core i7-2600K or processors from last decade.

So, what can you do?

Not much besides updating your PC with Meltdown patches issued by operating system makers. Since the issue is such a deeply technical one there isn't anything users can do to mitigate the potential issue other than wait for a fix to arrive. Definitely make sure you're running security software in the meantime – advice that Intel also stresses.

Do you know when a fix will come?

It's already here. Apple quietly protected against Meltdown in macOS High Sierra 10.13.2, which released on 6 December, according to developer Alex Ionescu. Additional safeguards will be found in macOS 10.13.3, he says. Kernel patches are also available for Linux.

So once I download the patch I'm good?

Well, the operating system patches will plug the risk of Meltdown, but you might not like the side effects. While the fix will prevent the chip's kernel from leaking memory, it brings some unfortunate changes to the way the OS interacts with the processor. And that could lead to slowdowns.

How much slower will my Mac become?

It's complicated. Fortunately, a growing number of tests seem to support Intel's contention that

everyday Mac users won't see dramatic slowdowns, although there's one particular area of concern: drive read performance.

More recent Intel processors from the Haswell (4th-gen) era onward have a technology called PCID (Process-Context Identifiers) enabled and are said to suffer less of a performance hit. Plus, some applications – most notably virtualization tasks and data Centre/cloud workloads – are affected more than others. Intel confirmed that the performance loss will be dependent on workload, and should not be significant for average home computer users.

Will my games get slower?

Probably not. Phoronix also tested Dota 2, Counter-Strike: Global Offensive, Deus Ex: Mankind Divided, Dawn of War III, F1 2017, and The Talos Principle on a Linux 4.15-rc6 machine with a Core i7-8700K and

Intel processors have a severe kernel security flaw

Radeon Vega 64. None saw a frame rate change outside the margin of error range.

Are AMD processors affected?

Much, much less than Intel chips. All modern CPUs are vulnerable to Spectre attacks, but AMD says that its CPUs have 'near zero' risk to one variant due to the way they're constructed. The performance impact of Spectre patches are expected to be 'negligible'.

There is "zero AMD vulnerability" to Meltdown thanks to chip design, AMD says. If operating system patches exclude AMD CPUs from the new Meltdown restrictions, the performance war between Intel's chips and AMD's new Ryzen CPUs may get even tighter.

AMD says there is zero vulnerability to Meltdown

Apple and Shazam

Apple's purchase of Shazam means much more to the iPhone than its acquisition of Beats, writes **Michael Simon**

Shazam was a true game-changer as one of the first apps to appear in the App Store back in July 2008. With just a tap, Shazam could identify nearly any song you heard without needing to know anything about it. Shazam was a magical app that I used to show off my iPhone, and unlike all those other apps whose novelty wore off in just a few weeks (anyone remember iBeer?),

Shazam has only gotten better over the years. Apple has long had partnered with Shazam to power Siri's song identification service, but now the Cupertino giant has confirmed that it is buying the company outright for a cool $400 million, a relative bargain in today's tech dollars. On the surface, a Shazam purchase ensures that Siri will always be able to recognize the song you're listening to and will provide a boost to Apple Music, but I think Apple has much bigger plans for the service.

Like everything else Apple seems to be doing now, it's about augmented reality and machine learning. And it could be the thing that finally puts Siri back at the front of the pack.

Listen up

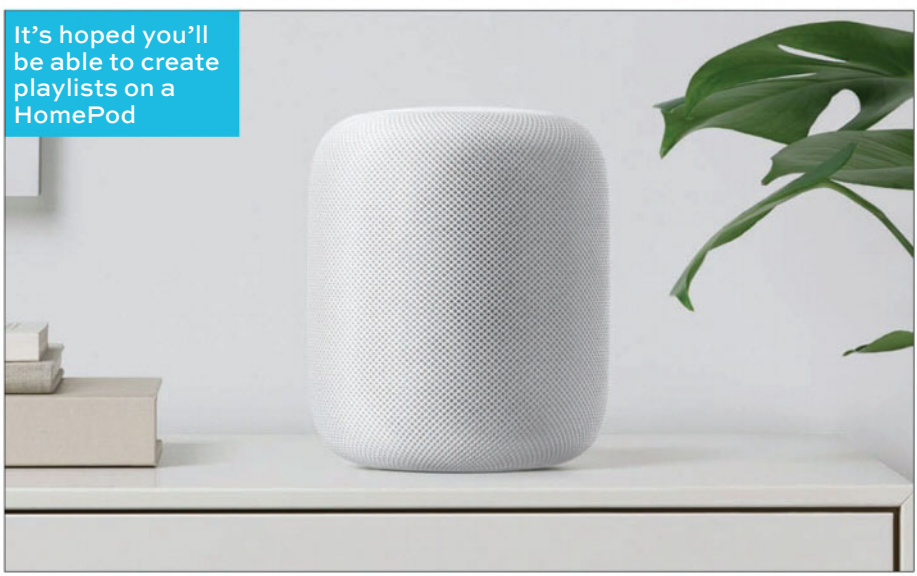
Shazam's main strength is music identification, and that fits well into Apple's current strategy. It's not just Siri on our phones: AirPods, HomePod, and Apple Watch could benefit from Shazam's uncanny ability to name that tune.

And we might not even have to ask. On the new Pixel phones, Google has implemented a feature that displays the name of a song playing nearby even if Assistant hasn't been asked. It's a neat feature that's all done locally, and I use far more often than I thought I would. A similar feature would be great on the iPhone, and with Shazam's massive library at Apple's disposal it would be far superior to Google's.

But where Shazam could really help Siri's ears is with HomePod. Apple wants its new home

speaker to 'reinvent home music', but if all it does is sound good, that's hardly revolutionary. If Apple could leverage its Shazam acquisition to build some serious smarts into HomePod, it could be a difference maker. We will already be able to ask Siri to play things like the most popular song in 1986, but Shazam could amplify its knowledge considerably. It would be great to tap your AirPods and ask "Play the song that goes like this ..." or "Play that Ed Sheeran song about Ireland". Shazam might not be able to do that now, but the groundwork is certainly in place, particularly when paired with Apple's own AI musical capabilities.

And it could go beyond simple song identification too. Apple could use Shazam to create personalized playlists right on HomePod, based on your



It's hoped you'll be able to create playlists on a HomePod

listening habits and tastes. Apple Music already creates mixes that are pretty great, but Apple's machine learning could use what it hears to create customized playlists for the time of day that only play in our homes. That alone could be a reason to spend £349 on a HomePod.

Seeing is believing

Shazam may be a household name when it comes to song identification, but the underlying technology has much broader application. Back in 2015, Shazam added visual recognition to its portfolio, and while it hasn't caught on quite as well as its audio capabilities, Apple's new AR push could definitely benefit.

Even with ARKit, Apple is lagging when it comes to augmented reality, especially on the AI side of things. Most notably, Google has introduced a technology with the Pixel 2 called Lens, which works with Assistant to identify and interact with real-world objects. For example, you could point your phone at a building and Assistant will tell you about it, or you can scan a business card and it will automatically be added to your contacts. Google will soon be rolling out Lens to all Android phones, and once it does, Siri on the iPhone will seem even more outdated than it already does.

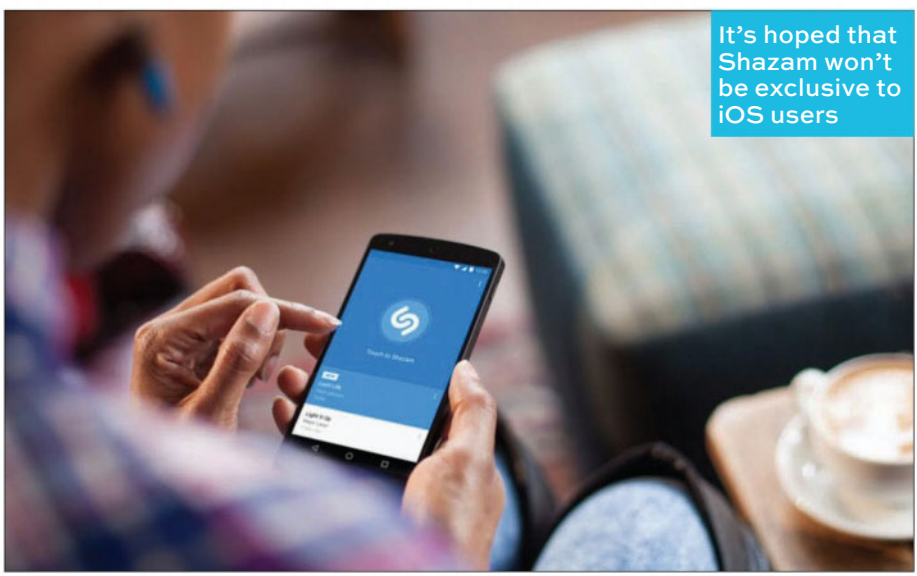
But Shazam could give Apple a real boost here. While the public face of Shazam's visual recognition has mainly focuses on brands – like scanning a movie poster to access a trailer – but Apple could tap into Shazam's engine to give Siri a whole new

class of intelligence. We've read enough rumours about the Apple car and Apple glasses to see that AR is the next area of focus, and Shazam could help bring that future into view. We know Shazam will amplify Siri's ears, but it could be a boost to its vision too.

Better but not exclusive

When Apple bought Beats, I expected Apple would force users to buy an iPhone if they wanted a new pair. That hasn't happened. Instead, Apple has made the experience better on the iPhone with seamless pairing, a feature that I suspect has sold more iPhones than forcing people to switch.

I expect something similar with Shazam. While conventional thinking would suggest that Apple



It's hoped that Shazam won't be exclusive to iOS users

would shutter the Android app in a few months, I don't think that will be the case. But I do think Shazam will be better on iOS. Android users will get the same song-identifying Shazam that's available today while iOS users will enjoy more features, even beyond what's baked into the newer products. Apple likely won't cut people off, but it will add enough cool features for people to notice. I think we'll see a delineation between the Shazam app on the Play Store and the App Store, as Apple enhances its capabilities on iOS and adds exclusive features.

Apple's purchase of Shazam might have been a bigger deal three years ago, but it could have much more of an impact on your Apple devices now. Earlier today, TechCrunch reported that Spotify and Snap were also interested in purchasing Shazam, so the potential here is more than just cornering the market on song identification. Apple is poised to leap into the AI and AR race with both feet, and Shazam could be the perfect technology to vault them to the head of the class.

And if not, well, at least Siri will be better than Assistant and Cortana at IDing songs. That's worth $400 million, right?

REVIEW

Apple iMac Pro

RATING: ★★★★☆

Entry-level model £4,899 inc VAT from fave.co/2COcC5s
Review unit £9,039 inc VAT from fave.co/2DOcCTy

We're still waiting for the new Mac Pro (and don't even know which year it'll be launched in), but in the meantime Apple is placating its pro users with this high-powered slab of processing muscle.

It's available with anywhere from eight to 18 cores, and from 32- to 128GB of RAM. The thermal architecture, so problematic on the Mac Pro, has been redesigned with 'dual blowers' for a claimed 80 percent increase in thermal capacity. And the

machine looks great too, with the current 'pregnant iMac' design given a new and rather lovely Space Grey finish, and matching peripherals.

Design

Picture the 2017 27in iMac (the i7 model – we'll be making comparisons with this machine); now imagine it in Space Grey. That, in most external respects, is what you get with the Pro.

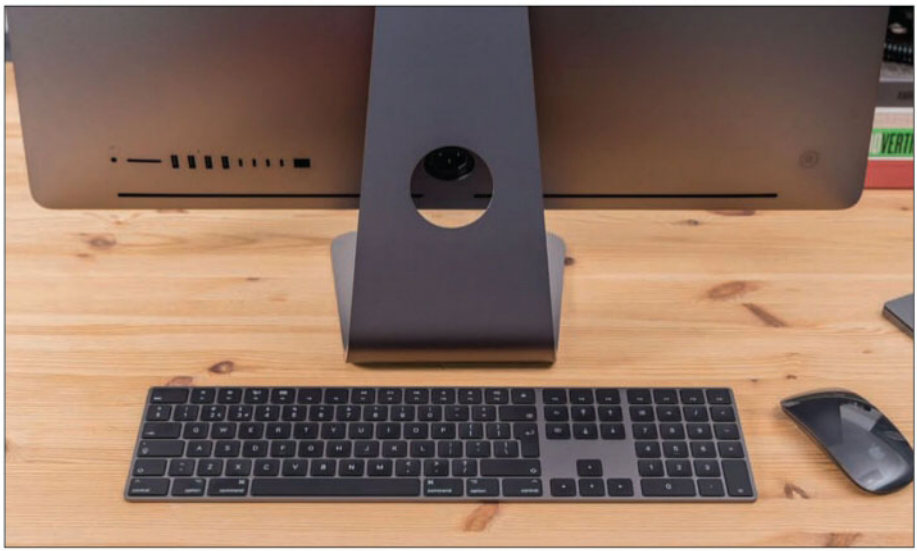
It's an attractive, classic design. There are razor-thin edges around the monitor, giving the illusion of a flat screen device, but most of the innards are concealed within a gently bulging belly on the back.

We like the reassuring heft and minimalist look of the stand, too, which is made from a single bent piece of aluminium of subtly varying thickness (thickest at the bend and tapering away as it approaches the user) and featuring a cleverly simple cutout to keep your power cable tidy and tucked away. And while it could never be described as lightweight (it's 9.7kg) or mistaken for a portable device, the iMac Pro's balance and shape are such that it's surprisingly easy to pick up and lug to another room.

This is all old news, of course, since we've had this design in the iMac range for several years. So is the new colour worth talking about?

Colour finish

We're going to be drilling down into hardcore processing performance in this article so it's tempting to disregard cosmetic changes like colour



finish; but this would be a mistake. The Space Grey finish looks superb, and given that you're going to be looking at this object for multiple hours a day that isn't an unimportant factor. It looks modern, and classy, and still unmistakably Apple. It will look great in a studio.

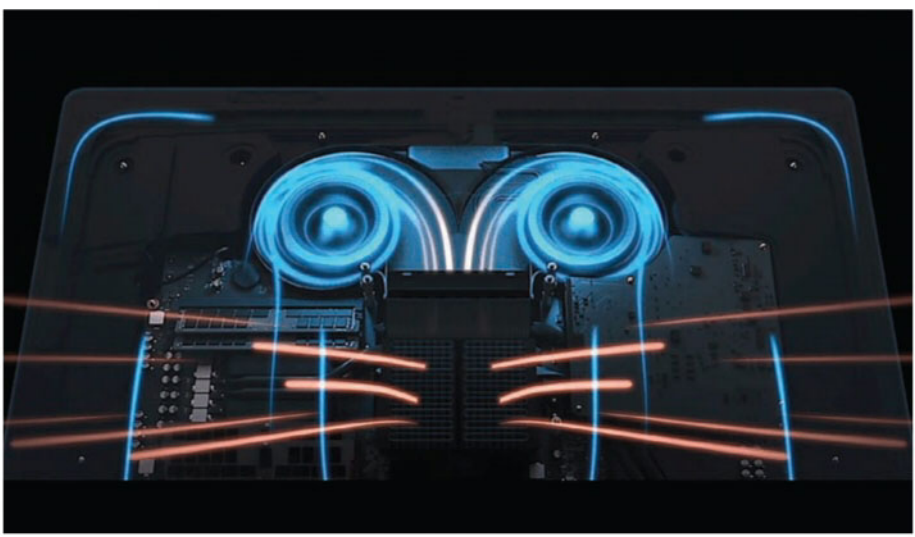
The Space Grey Magic Keyboard, Magic Mouse 2 and Magic Trackpad 2 that are available with the Pro are also stunning to look at, although the mouse in particular is a little less stunning to use; it's so prone to collecting fingerprints that Macworld's art director made us work with a substitute until we'd finished doing photography. And hilarious though it might seem to normal people, the bundled black Lightning cable that you use to charge the peripherals has tickled the fancy of Apple fans.

Thermal design

In its mea culpa to the creative and design community who depend on the Mac Pro, Apple admitted that machine's thermal design was unsatisfactory, making it next to impossible to upgrade. The company expected the industry to move in the direction of multiple GPUs, whereas the trend was actually towards larger single GPUs, which generate more heat and which the Mac Pro's trash can design is unable to deal with thermally.

The iMac Pro should have no such problems. Apple says it offers 75 percent more airflow than the 27in iMac (thanks to the 'dual blowers') and 80 percent more system thermal capacity.

The significance and success of this redesign is hard to estimate at launch, since the Mac Pro seemed fine initially and the problems emerged only

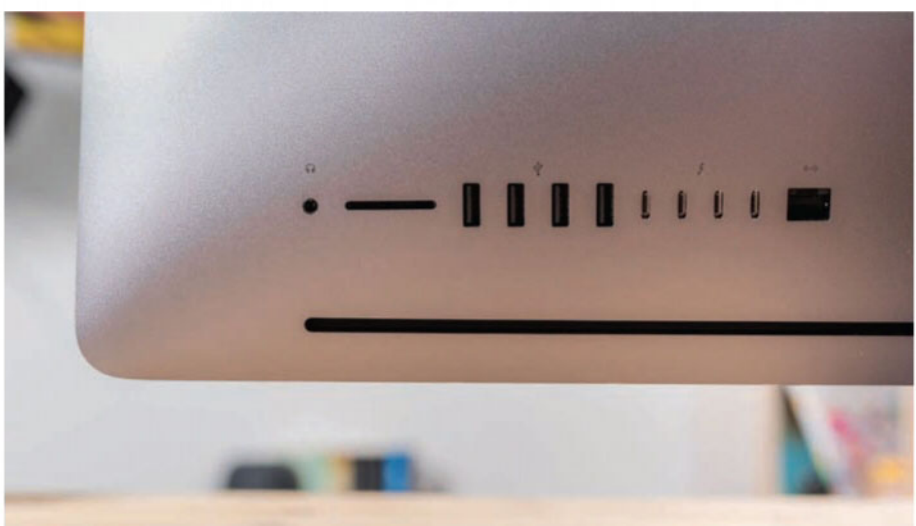


later. Looking at the matter subjectively, however, we can report that when using the Unigine Valley graphics test on a loop (with Extreme HD settings) the GPU topped out at 91°C.

That's a little on the high side for what we're used to, and a touch warmer than the iMac 2017, which peaked at 87 degrees while admittedly pumping out significantly lower frame rates. But it didn't cause any detectable slowdowns, and there was very little noise from the fans. All the parts of the casing that are reachable from the front remained cool to the touch, although naturally there was a decent flow of hot air pumping out of the vent.

Ports

The Pro has a solid bank of ports round the back: four each of USB 3 and Thunderbolt 3/USB-C. In



this respect it sits neatly between the 27in iMac (which has four and two) and the trash can Mac Pro (four and six, although the latter are only Thunderbolt 2).

There are four microphones on the Pro's chassis: one on the top edge, just above the FaceTime camera (like on the 2015 iMac), one either side of the camera, and one on the back. The 2017 iMac has only one, on the bottom edge.

Display

The display is the same Retina 5K 27in unit you get with the larger of the 2017 iMac range. That means a whopping resolution of 5120x2880, claimed support for a billion colours, and 500 nits brightness. Subjectively it's beautiful to look at: crisp, vivid and bright.

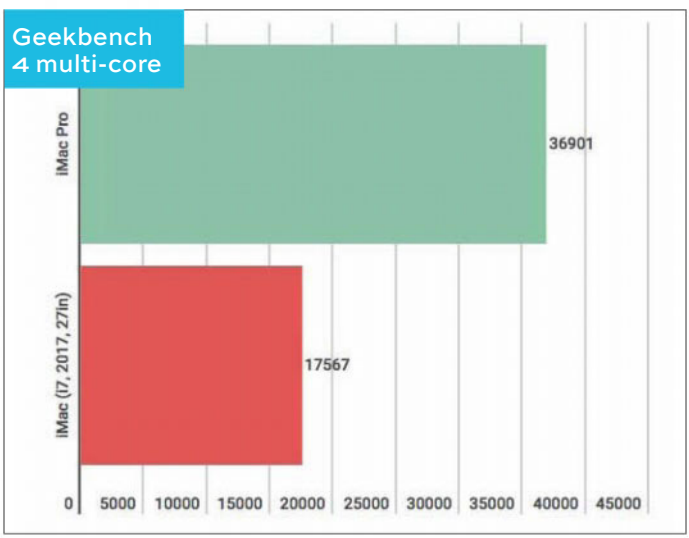
Performance

The iMac Pro is a powerhouse of a system. We reviewed the 10-core model with 128GB RAM and the Vega 64 GPU with 16GB of memory; Apple has been keen to stress that in terms of both processor and GPU chips the new iMac Pros are the fastest machines it's released.

With all this power at our fingertips, we were excited to put it through our battery of tests. Here's what we found out.

Geekbench 4.2 (64-bit)

The iMac Pro averaged 5,424 in the single-core segment of Geekbench 4.2's CPU test, and a monstrous 36,901 in multi-core. This is a test of pure processing speed, and higher scores are better. The Pro's results dwarf the numbers we saw

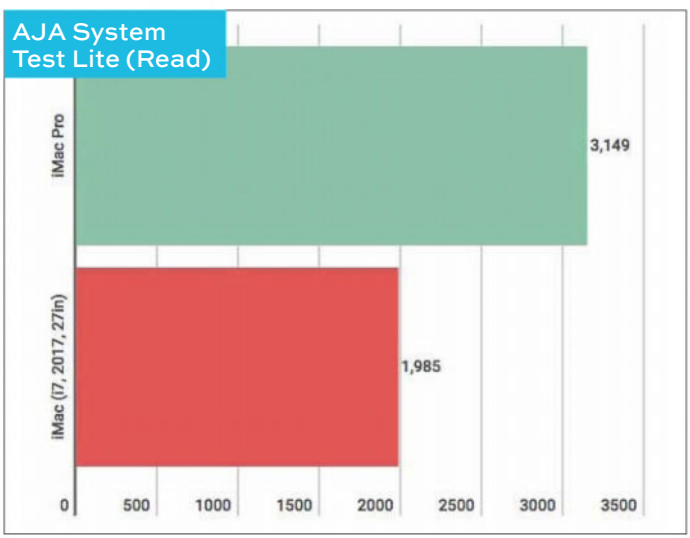


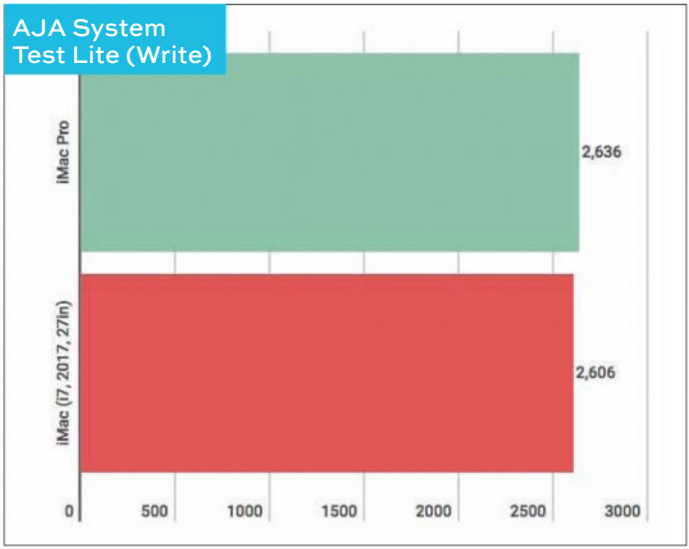
with the 3.4GHz version of the 27in iMac (2017) in the multi-core segment, although that device managed a shade more in single-core: it scored 5,507 and 17,567 respectively.

This category of performance is niche to say the least, and you're unlikely to see much difference between those two machines in anything but the most processor-intensive applications - although the gap will become more readily apparent in the years to come. But even now video editors, visual effects artists and 3D illustrators, among others, will appreciate the extra processing welly.

AJA System Test Lite

We used AJA System Test Lite next. This benchmark evaluates drive performance, and again higher scores are better. (We tested using





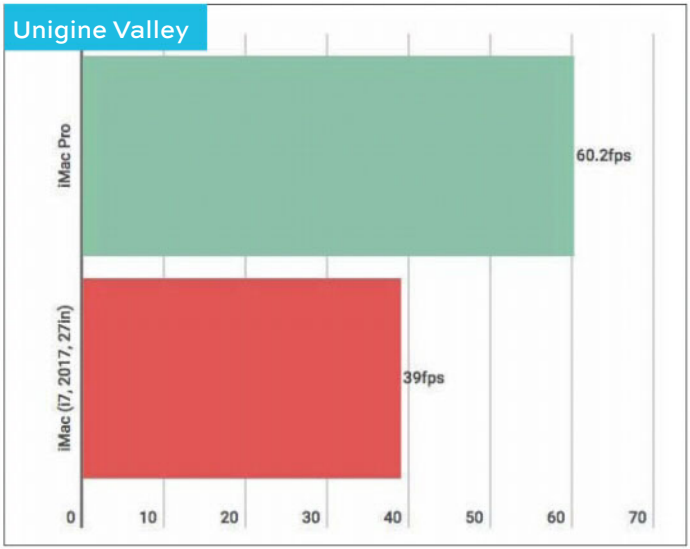
the settings 5K RED, 4GB, single file and disk cache disable.)

The iMac Pro recorded an average of 3,149MB/s write speed (an exceptional result, and far higher than the iMac's 1,985MB/s) and 2,636MB/s read speed (roughly the same as the iMac's 2,606MB/s).

Apple predicted impressive drive performance for the iMac Pro partly because it's split into two drives (512GB each in the starting configuration) for greater throughput. You're also automatically given an SSD: there's no option for a moving hard drive.

Unigine Valley

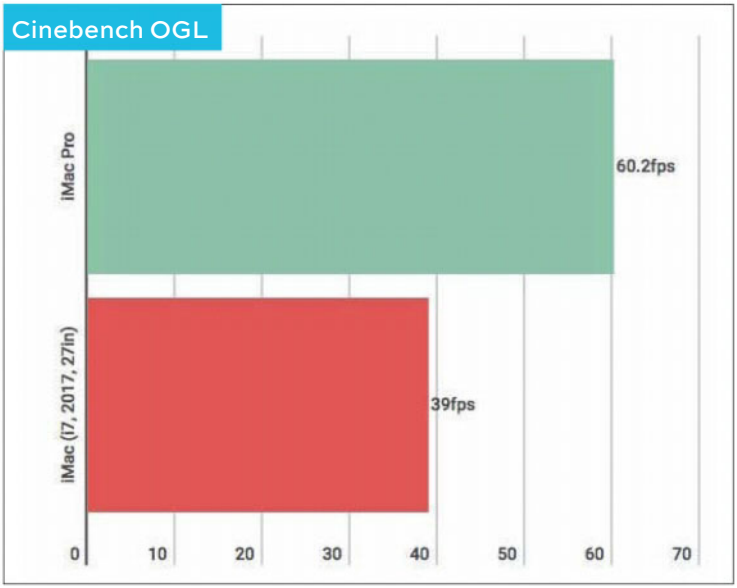
We ran the iMac Pro (and 2017 iMac) in Unigine Valley Benchmark 1.0, which evaluates performance and stability under high graphical workloads.

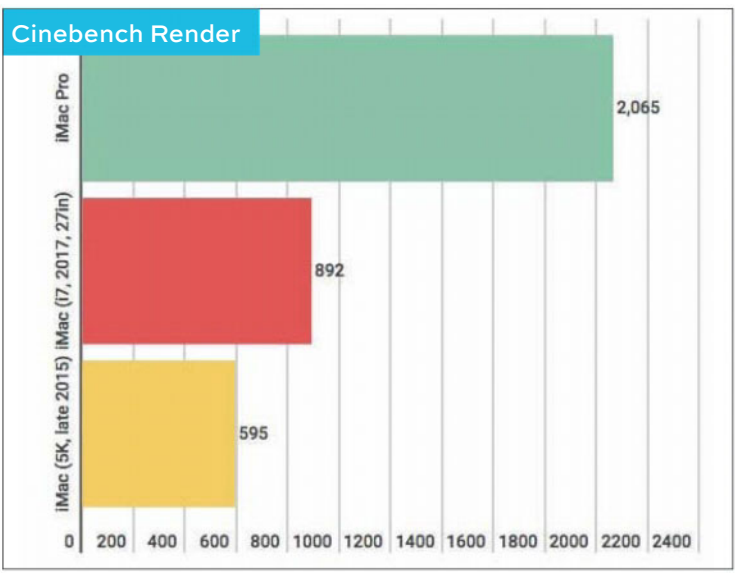


Using the Extreme HD presets, it recorded an impressive average frame rate of 60.2fps (maximum 106.8fps, minimum 30.5fps) and scored 2,520 points. That compares to the iMac's average 39fps and score of 1,633. You should note that while it's capable of high frame rates, this isn't a gaming machine, and won't provide value for money if that's what you're looking for. As mentioned above in the thermal design section, the Pro's GPU got pretty warm during this stress testing, peaking at 91°C, but didn't display any signs of distress or slowdown. The thermal system coped fine.

Cinebench

Our colleagues at *Digital Arts* ran the iMac Pro in Cinebench, a benchmark suite which tests a


Cinebench OGL
iMac Pro
60.2fps
iMac (i7, 2017, 27in)
39fps
0
10
20
30
40
50
60
70

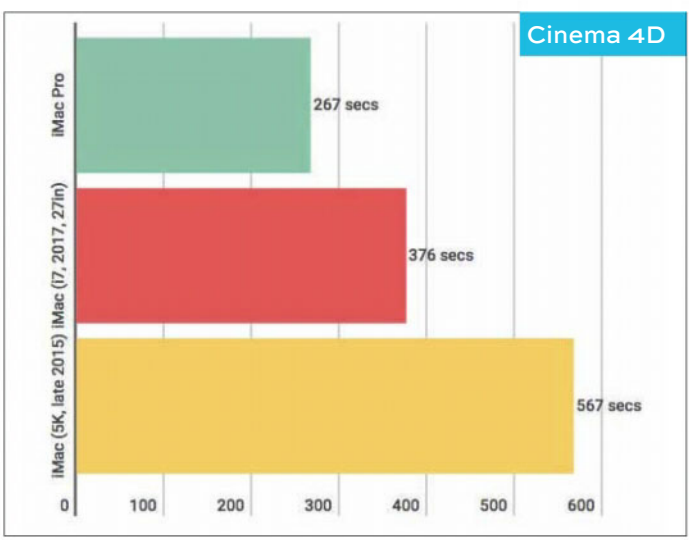

Cinebench Render
iMac Pro
2,065
iMac (i7, 2017, 27in)
892
iMac (5K, late 2015)
595
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400

system's ability to render 3D scenes and stresses both CPU and GPU. They used the test, in which higher scores are better, to compare against the iMac 2017 and the late-2015 iMac 5K, too.

The Pro scored 135 in the OGL test, and 2065 in the render: both very high scores, albeit not the highest we've seen (the Lenovo ThinkStation P900 tops that particular list). The iMac 2017 scored 126.93 and 892 respectively, and the late-2015 iMac 5K 94.74 and 595.

After Effects

Again, our thanks to *Digital Arts* for this set of test results, using Adobe After Effects 2018 (and in most cases using the CineWare plug-in) to evaluate the iMac Pro's ability to complete complex graphical processing tasks. These are



times taken to finish the tasks, so in this case lower scores are better. In seven out of eight tests, the iMac Pro recorded a time less than half that of the iMac (which was noticeably faster in turn than the iMac 2015, as you'd expect), but we'd like to focus on the eighth test, Cinema 4D. This stresses the GPU, processor, disk input and output and RAM, and provides the clearest overall assessment of a system's capabilities. In this test, the Pro took four minutes 27 seconds; the iMac 2017 took six minutes 16 seconds and the iMac 2015 took nine minutes 27 seconds.

Verdict

The iMac Pro is an exceptionally powerful and stable system, but that was never in doubt. The real question is whether you need its power and can justify its cost. This isn't a gaming rig you'll get similar specs at a fraction of the cost elsewhere. This is targeted at the niche of users in the creative, design, visual effects and illustration fields who need the ability to process major graphical and 3D rendering and editing tasks at a decent speed. Those involved in music production may find it ticks their boxes, too, but this is likely to be expensive overkill for the rest of us. We love the Space Grey finish, incidentally, and the matching peripherals look fantastic. **David Price**

Specifications

- 27in (5120x2880) Retina 5K display
- macOS High Sierra

- 10-core, 3GHz Intel Xeon W, Turbo Boost up to 4.5GHz, 23.75MB cache
- Radeon Pro Vega 56 graphics processor, with 16GB of HBM2 memory
- 128GB of 2,666MHz DDR4 ECC RAM
- 2TB SSD
- Wi-Fi 802.11ac
- Bluetooth 4.2
- 1080p FaceTime camera
- Stereo speakers
- Four microphones
- 3.5mm headphone jack
- SDXC card slot with support for UHS-II
- 4x USB 3.0 ports
- 4x Thunderbolt 3 (USB Type-C)
- Space Grey Magic Keyboard with Numeric Keypad
- Space Grey Magic Mouse 2
- 650x516x203mm
- 9.7kg

ISSUE 127

iPad & iPhone user

FROM IDG

The iPhone and iPad in 2018

+ iPhone BUYING GUIDE

Get more from your iPhone X with our top tips

Guide to iOS 11.2

FEATURE

Apple in 2018: what we expect, what we want

Apple had a big year, but 2018 can be even bigger. Here's what **Jason Cross** expects from the world's most valuable company

Apple released some killer products in 2017, and made some really big software screw-ups. Will the company continue its rapid pace of new product releases? Can it keep up the pace without sacrificing quality and security? What's it going to do with its enormous pile of cash?

Predicting the future of tech is notoriously hard, and doubly so with a company as famously secretive as Apple. Still, we have some idea of what to expect in 2018. Here are our own predictions and shameless wish list items for the coming year.

A whole new iPad

It's time for a new iPad. Apple dominates the premium tablet market, but it's not going to keep things that way if it rests on its laurels. Sure, innovations like Apple Pencil are fantastic, but the iPad hasn't seen a really big design refresh in a long time.

The bezel-less iPhone X is the perfect breaking point from which to re-imagine the iPad, and according to rumours, a new design is on the way.

We expect old-style iPad to continue to be sold, but at least one new iPad with slimmer bezels and no home button is probably on the horizon. It'll have an A11X or similar 'big A11' processor, the best display ever in an iPad, and will probably be pitched as an augmented reality and AI powerhouse.

iPads are often announced in the spring, but in 2016 Apple took the lid off the new iPads during its WWDC keynote in June. In a way, that makes the most sense, as it gives a good opportunity to showcase them with upcoming iOS 12 features.

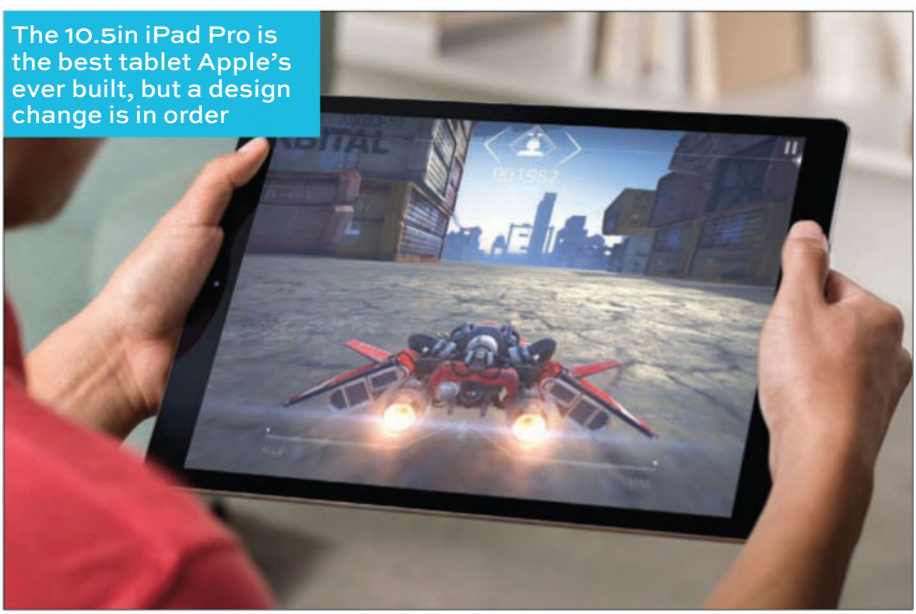
Face ID everywhere

Touch ID isn't going to fully disappear this year, but it seems obvious that Apple's a big believer in its TrueDepth camera system and Face ID. We might

see better hardware in Apple's camera-and-sensor array, but certainly, improved software will make Face ID faster and more secure.

It'll also spread out to more products. Whatever comes after iPhone X will of course feature Face ID, and it's a shoo-in for a new top-tier iPad model.

But we'd love to see it on Macs, too. Microsoft's Hello tech has made it clear that facial recognition has a place in laptops and desktops, and the FaceTime cameras in the entire Mac lineup are in desperate need of improvement. Swapping it out for the TrueDepth module as seen on iPhone X could not only give Macs some really useful capabilities (like locking the system automatically as soon as you step away and unlocking when you come back),



The 10.5in iPad Pro is the best tablet Apple's ever built, but a design change is in order

but would also rocket the webcam quality to the front of the class. Kill two birds, Apple.

iPhone X, part 2

If the rumours are to be believed, we will see a follow-up to the iPhone X, very similar in shape and size but with small refinements and an all-new, faster, better A12 system-on-chip.

It may be accompanied by a larger 6.5in version, virtually identical save for its larger size and higher-resolution display. If Plus-model iPhone are any indication, it'll also have a larger battery. We hope, however, that Apple doesn't keep some functions only for that larger model, as it keeps the dual camera module exclusive to Plus-sized iPhones.

A third iPhone is also said to be in the works. It would carry a 6.1in display at a lower resolution, using and LCD instead of OLED, but still use the roughly 2:1 ratio of current iPhones with slim bezels and Face ID instead of Touch ID. This would be the more affordable of the new iPhones, but it will still probably cost somewhere around £700.

Of course, Apple will continue to fill out its line-up by selling last-year's models, and two-year-old models, too. So you'll still be able to buy the iPhone 7 and 7 Plus, along with the 8 and 8 Plus, all at reduced prices. The iPhone SE may get a small spec bump, too, but nothing more.

Massive Siri improvements

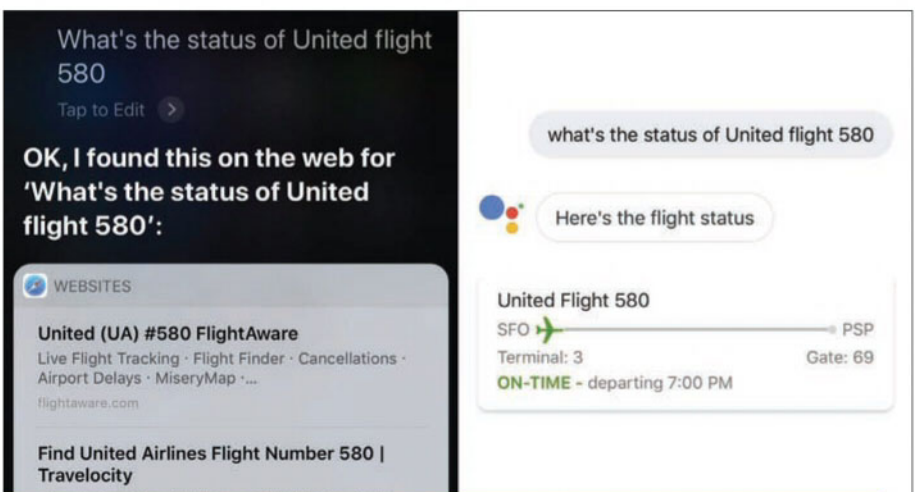
If we're being honest, Siri needs work. It's in a distant third behind Google Assistant and Alexa.

It doesn't understand our speech as accurately. It doesn't give us useful answers. It doesn't integrate with as many other services and smart home appliances.

Just one example: if I ask for the status of United flight 580 (a textbook AI-assistant type of task), Siri performs a web search while Google gives me an answer.

It seems like Apple took its eye off the ball with Siri for a couple years, perhaps not realizing how much its competitors were investing in AI assistants and how quickly its lead in that area would vanish. What was once a competitive advantage has become a sore spot.

But Apple doesn't iterate in public like some other companies do. We've got a sneaking



Siri (left) can't give a straightforward answer to many of the questions we'd expect an AI assistant to help with. Google Assistant (right) can

suspicion that the company has been hard at work on major advances for Siri, the development of which recently changed hands from Eddy Cue's team (Internet services like Apple Pay and Maps) to Craig Federighi's (macOS, iOS).

Unfortunately, we'll probably have to wait for iOS 12 to be unveiled at WWDC in the summer to see what Apple has in store for Siri. But we have a feeling it's going to be big. It had better be!

More AR and AI

Apple's betting big on augmented reality. The AR capabilities of the latest iPhones are industry-leading, and ARKit was a really big first step toward enabling developers.

Apple rarely speaks definitively about the future, but at a recent earnings call, CEO Tim Cook said:

"I view AR as profound. Not today, not the app you'll see on the App Store today, but what it will be, what it can be, I think it's profound, and I think Apple is in a really unique position to lead in this area."

So yeah, expect lots more AR stuff in 2018. It's probably too early to expect a standalone AR headset. But augmented reality will be a major selling point of new iPhones and of iOS 12. It wouldn't shock me in the slightest to see AR built into Apple Maps, the editing tools in Photos and iMovie, even AR stickers in iMessage.

Meanwhile, ARKit will surely become far more advanced for developers, enabling new features

like vertical surface scanning, and ushering in a whole new wave of apps. This will be enabled, in part, by new machine learning advances and further breakthroughs in AI.

Apple invests deeply in machine learning and leans on it for everything from improving the photos we take, to making Siri sound more natural, to measuring our workouts with the Apple Watch. It's a fundamental, yet often unseen, aspect of so much of Apple's software.

Expect to hear a lot more in the coming year about how AI and machine learning is transforming Apple's software.

Virtually placing IKEA chairs is just the tip of the iceberg. AR will get more advanced, and more useful, in 2018

Mac Pro

All the way back in April 2017, Apple admitted that the 'trash can' design of the Mac Pro was a mistake. It made the product hard for the company to update frequently enough, and nearly impossible for users to upgrade or service themselves.

It said a new Mac Pro is on the way with a "completely rethought" modular design. Oh, and new Apple Pro displays are coming with them.

Well, 2018 is the year. It just has to be. If the whole year comes and goes without a big new Mac Pro reveal, Apple's going to make a lot of its most important customers really upset. Besides, the company has apparently had top talent working on this product for some time. If not this year, when?

I've got no idea what a new Mac Pro would look like, but I suspect a more traditional tower (perhaps a 'compact' tower) is likely. That's the best way to manage the thermals of a wide variety of modular components and to let users upgrade drives, ram, even graphics cards. It'll probably have a whole lot of high-speed I/O ports (Apple has always considered that a core Pro requirement) and if I had to guess, whisper-quiet operation is going to be a selling point.

It will also be expensive, utilizing workstation-class processors like Intel Xeons and workstation graphics cards. While I don't think it's likely, how cool would it be for Apple to offer system based on the next-generation Ryzen (or Threadripper) CPUs from AMD?

macOS 10.14

Apple's not quite on the same cadence with macOS as it is with iOS. It's just where their customers are. Still, a new version of macOS gets announced every year at WWDC in June, and released later in the year. macOS High Sierra (10.13) was somewhat of a "maintenance release," adding only a few new features but mostly focusing on stability, performance, and under-the-hood upgrades like the Apple File System (APFS).

There will probably be a macOS 10.14 in 2018, but we don't expect a major, feature-packed facelift. Like High Sierra, 10.14 will probably focus on a few core technologies and a small handful of comparatively minor new features, with major design changes landing in 2019.

Apple will update its desktop OS in the autumn

That said, we do have a few items on our wish list for a new version of macOS. The split-view multitasking on iPads is great, and would be a boon to laptop users (who often work full-screen). It's less necessary on big 27in iMacs, but the Mac market leans heavily toward the laptop side.

The new Control Centre in iOS 11, with a series of simple user-selectable controls, would be welcome on macOS. It has been suggested that it replace the dated, and not very useful, Apple menu on the status bar. I think that's a great idea. Of course, Control Centre on the Mac would have a different set of controls and customization options than on iOS, and an API for developers to allow optional Control Centre functions wouldn't be a bad idea.

Finally, we really hope iTunes is getting a big overhaul. Removing apps in 12.7 was the first step, but it needs much further refinement. I'd love to see video watching, organization, and purchasing in one app and all the music stuff in another.

Code name: Marzipan

A recent report from Bloomberg suggested that Apple is planning a single, unified app development system for iOS and macOS.

"Starting as early as next year, software developers will be able to design a single application that works with a touchscreen or mouse and trackpad depending on whether it's running on the iPhone and iPad operating system or on Mac hardware, according to people familiar with the matter."

It's even got an internal code name: Marzipan.

I'm sceptical, though. The whole 'write once, run anywhere' dream has been attempted many times in computer science, and it never really plays out. Besides, macOS and iOS are just too different. iOS has no concept of a mouse, macOS always assumes a pointer of some sort. iOS has supported multitouch as a core concept from the beginning, but Apple has been clear that it does not intend to bring touch to Macs (and the trackpad is no real substitute).

That said, I wouldn't be at all surprised if Apple is working on bringing together the macOS and iOS App Stores, and giving developers a new toolkit and suite of APIs that make developing cross-compatible apps much easier.

Apple could easily unify many aspects of app development, leaving developers to worry primarily about how to deal with different interaction models and variable window sizes. It could quite simply unify the macOS and iOS app stores, allowing users to 'buy once and run anywhere'. This wouldn't mean that every iOS app would run on macOS, but at least when a developer does make an app available across multiple platforms, we wouldn't have to buy it twice. That's a big win for everyone.

There could even be shared iCloud configuration and save space for apps, so that your app preferences, game saves, and configurations would sync between iOS and macOS versions.

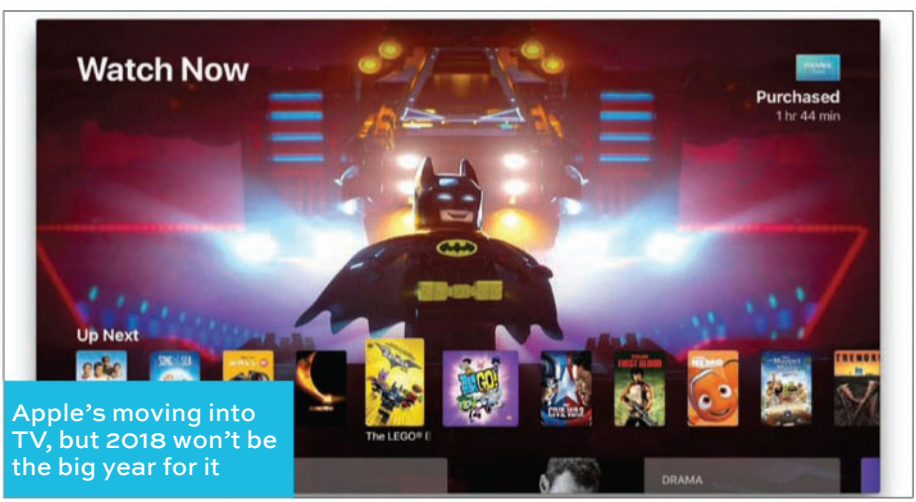
It's a big undertaking, but it's exactly the kind of thing Apple's ecosystem needs. Apple's the only

company left with a very popular mobile platform and a PC platform that sells tens of millions of units a year to consumers around the world. Overlapping iOS and macOS apps, to the degree that it makes sense and is technically feasible, could be a big win.

What we *don't* expect in 2018

Speaking of TV shows, Apple's going big into its own original content. It's going to spend $1 billion on its own TV shows, including a $5 million-per-episode revival of Spielberg's *Amazing Stories*. We'll just start to see the first of these efforts in 2018, but it's not going to be Apple's 'big TV year'. It takes plenty of time to develop, shoot, and edit a big TV series. Apple will be busy with all of that in 2018, with the bulk of the shows premiering in 2019.

There's a fair chance Apple will launch some sort of new video service in 2018, it's own competitor



Apple's moving into TV, but 2018 won't be the big year for it

to Netflix or Hulu, but I think we should temper our expectations here. Apple has reportedly been trying to make an over-the-top TV service for years, but I think that ship may have sailed. What we all want is an Apple Music for television – one price (more than £10 a month of course), with unlimited commercial-free access to new TV as it airs and old TV archives. Whatever Apple's plans were, it clearly was never able to work out the licensing deals. Apple's eventual video service is probably going to focus on original content and a sampling of older licensed movie and TV content – it'll probably be more Netflix than Sling TV.

Also in the 'coming eventually but not in 2018' mode is AR glasses. Apple's betting big on augmented reality, and has a better shot than anyone of producing a wearable AR product people are actually to slap on their face. It's an enormously complex task for which the technology simply won't be ready until at least 2019, though.

Apple's also not going to release a car (in 2018 or ever). Apple's probably working on some nifty car software combining some level of autonomous driving, safety, mapping, and maybe even something unique like a heads-up display. But Apple's play there is to work with car makers to be the user-facing software platform for their cars, not to produce a car itself. Even just doing the software – without building an Apple car – would involve unravelling a complicated Gordian knot of dealership laws, hardware integration, testing regulations, and more.

Year in review: 2017

Apple had one of its best years ever in 2017. And one of its worst. **Jason Cross** reports

It has become cliché to use the term 'mixed bag' to describe anything with both good and bad qualities, but there is no better term for the kind of year Apple has had in 2017. It was a year marked by some of Apple's best product releases in years, and the company has the growing sales to match. At no point in Apple's history has it has so many products that reach so many people, and it has never had a bigger impact on the world of consumer technology.

These bright notes are soured by a whole host of screw-ups, delays, and stagnation. Perhaps Apple's doing too much too fast, but it seems that the most valuable company in the world should probably have the resources to maintain quality as it expands its reach.

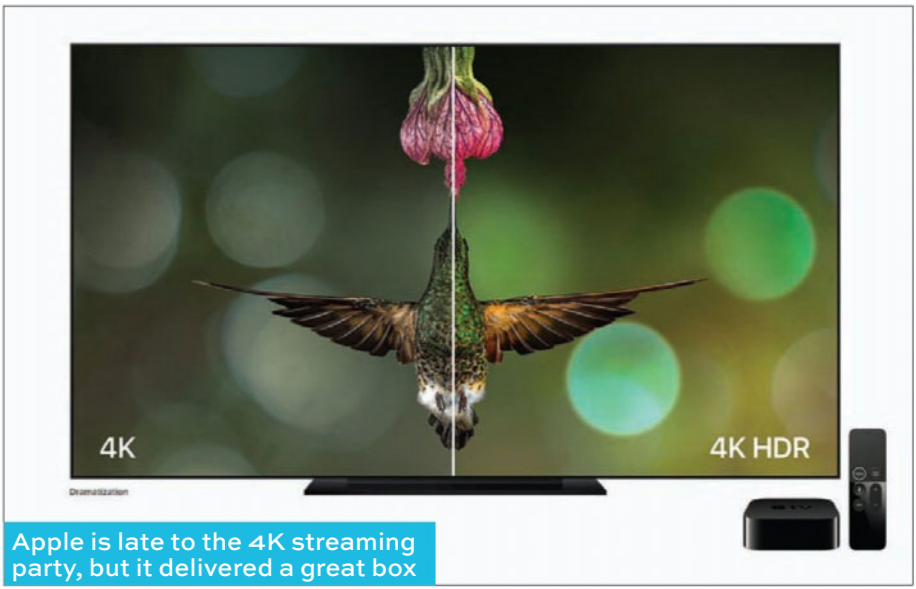
Here's a look back at Apple's major hits and misses of 2017.

Catching up with hardware

Apple has always made sophisticated hardware with incredible craftsmanship, but Android enthusiasts could rightly lay claim to a few very desirable features. This year, Apple finally delivered wireless charging, an extremely 'bezel-less' design, fast charging via USB Power Delivery, and perhaps the world's best OLED display in a mobile device. We could argue about other features like removable storage, but for the most part, the iPhone line is no longer feels like it's missing significant features relative to top-tier Android phones.

Apple caught up in other areas, too. The Apple TV 4K feels like the last streaming box to support 4K and HDR, but it's one of the best. And Apple did the right thing by making iTunes movie purchases and rentals in 4K cost the same as the HD version, and even updated HD movies in your library to the 4K version automatically (if available).

When it comes to smart watches, there's Apple Watch and there's everything else. Apple's dominant position in this market hasn't stopped fans from looking sidelong at those Galaxy Gear



Apple is late to the 4K streaming party, but it delivered a great box

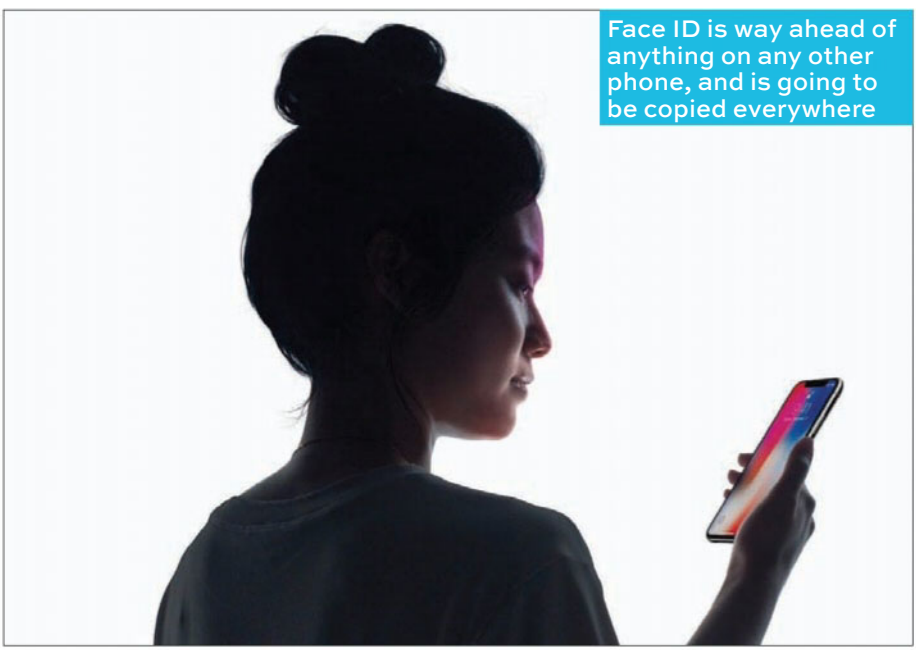
watches with LTE, wishing Apple would get the hint. Apple delivered in a big way with Apple Watch Series 3, which manages to pack LTE support and a faster processor into the same form factor. When you look at the whole picture – speed, software support, interface, build quality, aesthetics, size, comfort, battery life – Apple Watch Series 3 is so far ahead of the rest of the smartwatch market it's laughable.

Leading the way

While much of Apple's hardware efforts in 2017 could be viewed as catching up to features present in top competitors, we also saw industry-leading innovations.

Take Augmented Reality. ARKit in iOS 11 is leagues ahead of the competition. The maturity, accuracy, and robustness of these developer tools resulted in a mini-explosion of AR apps. And while Google's Project Tango has never caught on, ARKit apps run on any iPhone or iPad sold in the past few years – hundreds of millions of devices. Google tried to catch up with ARCore, but it has limited reach and scale. It seems made in clear response to Apple's ARKit.

Face ID on iPhone X is another great example of Apple pushing the industry forward. The TrueDepth camera is far more sophisticated than the front-facing sensors on other phones. Apple's not the



Face ID is way ahead of anything on any other phone, and is going to be copied everywhere

first to implement facial recognition in a phone, but it's the first to do it with the speed, reliability, and security necessary for it to fully replace your fingerprint, even for authenticating purchases. There was controversy around Face ID and the elimination of Touch ID, but time has proven it to be a hit. You're going to see Face ID and other TrueDepth features like Animoji copied by everyone else in the course of the next year or two.

And, while the iPad didn't a major overhaul (we could see that in 2018), Apple continues to dominate the premium tablet market with features, performance, battery life, and app support far beyond its Android competitors. The 10.5in iPad Pro is easily the best iPad Apple's ever made.

Falling behind

For all of Apple's leading advances, there are some core products that feel like they're coasting.

Siri is perhaps the most important area in which Apple is being left in the dust but its competitors. iOS 11 brought only marginal improvements, while Amazon's Alexa and Google Assistant are in a whole other league. Siri simply understands our speech less effectively, delivers less desirable results, is all-around less reliable, and has a very limited feature set compared to Alexa and Assistant. For Siri to catch up, it has to make major strides along every axis, all while Google and Amazon drive forward as fast as they can. This is not an area where Apple should be content with second-best, much less distant third.

Apple's Photos app suffers similar deficiencies compared to the best from Google. From a service standpoint, Google offers free unlimited photo and video storage with the purchase of one of its phones; a huge benefit that would be trivial for Apple to replicate. Google Photos' ability to quickly and accurately identify people in our photo libraries is light years beyond Apple's (it even does pets), and its AI-powered search functions are an order of magnitude more advanced.

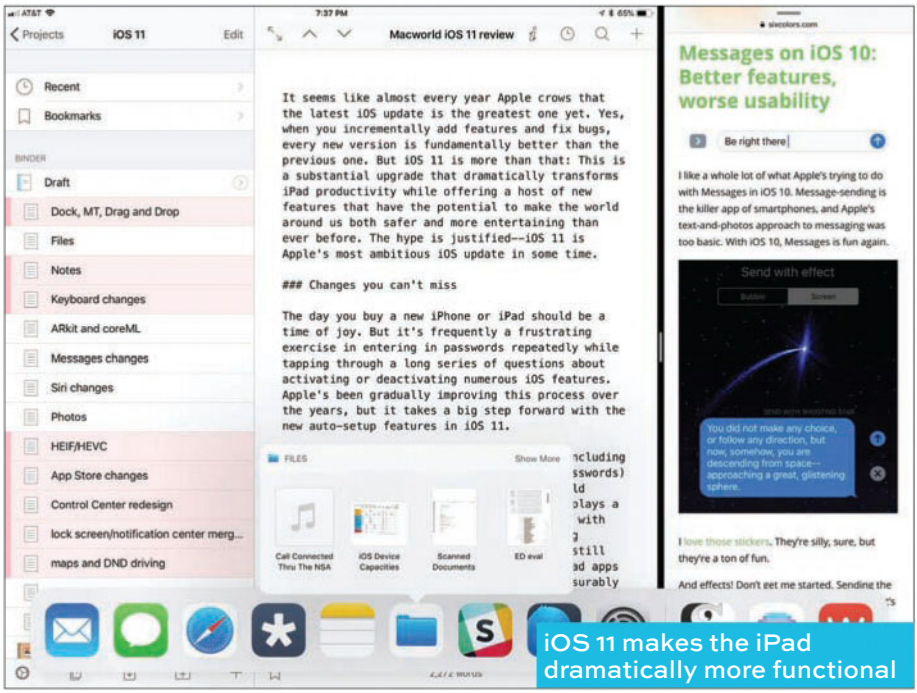
Apple has rarely jumped aboard the latest processor releases as fast as the Windows ecosystem, but there's little excuse for the MacBook Pro to still sport a dual-core CPU when those quad-core 8th Generation Core i7 processors are all over the Windows laptop scene. It's not a big platform overhaul – these are almost drop-in replacements.

We've got a laundry list of substantial changes we'd like to see in the MacBook line, but in the meantime, Apple could at least keep the processors current, especially when the new model offers such enormous performance benefits.

iOS 11's big leap forward

iOS 11 is a really, really big update. It's the most ambitious iOS update in years, and incorporates a lot of new under-the-hood technologies together with significant new design changes.

There's so much 'new' in there. New setup experience. New Control Centre. New app store. There are new toys for developers like ARKit,



iOS 11 makes the iPad dramatically more functional

new photo and video formats (HEIF/HEVC), improvements to Siri, indoor Maps, the list is extensive. Nowhere is iOS 11 a bigger deal than on iPad. iPads with iOS 11 are capable of serious work thanks to a new Dock, changes to multitasking, drag-and-drop support, and a smart new keyboard feature called QuickType.

iOS 11 is so big and ambitious that a couple of its key features didn't make the initial release. Apple Pay Cash just landed in iOS 11.2, and we're still waiting on Messages in iCloud. Nonetheless, from a features standpoint, iOS

11 is a massive improvement that mostly gets things right. Except...

Software bugs abound

iOS 11 is full of bugs, and Apple just can't seem to shake them. Every iOS release coincides with complaints about it "slowing down my iPhone," many of them imagined. iOS releases also prompt cries of, "it ruined my battery life," but in iOS 11 there seems to have been some real bugs that caused serious battery life problems for a big number of users.

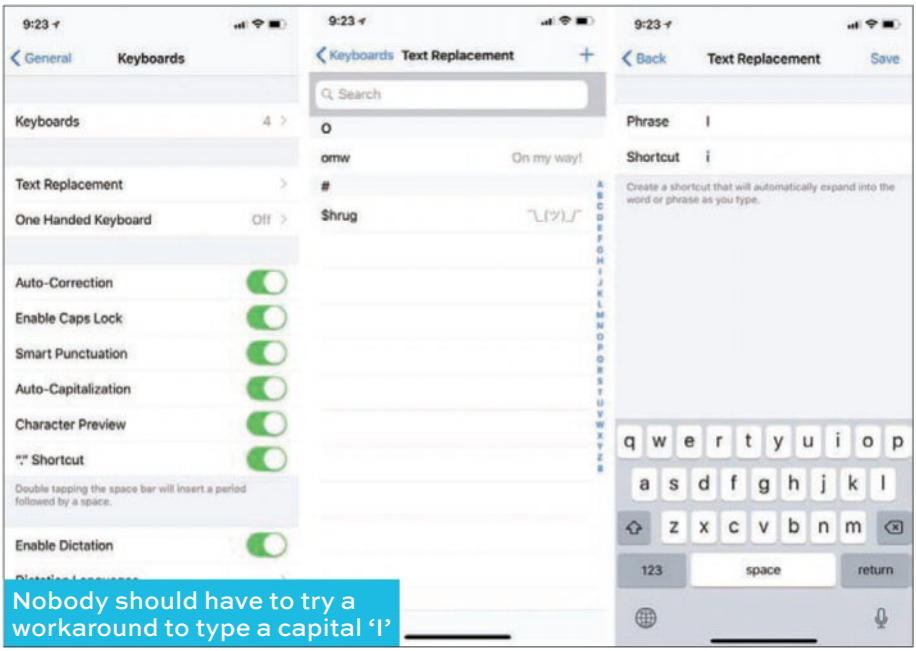
Apple's problems with iOS 11 seem never-ending. A quick 11.0.1 update fixed a problem with Exchange email servers. 11.0.2 fixed a problem that caused some iPhone 8 and 8 Plus owners to hear crackling in their earpieces. Then there was a problem with haptic feedback on some iPhones, fixed in 11.0.3.

The 11.1 release added lots of new emoji, but introduced a really obvious bug: typing a capital 'I' autocorrected to a capital 'A' followed by an undecipherable unicode symbol.

Oh, but then some iPhone X users found that their touchscreens stopped working in cold weather, and that had to be fixed in 11.1.2 (along with a bug with Live Photos).

Apple even had to kick out iOS 11.2 in the middle of the night on a weekend, because it fixed a bug whereby daily notifications would cause iPhones to reboot starting at 12:15am on 2 December.

Apple didn't end the year on a high note, confirming what many iPhone users had



Nobody should have to try a workaround to type a capital 'I'

speculated: the power management built into iOS can slow down performance on iPhones with old batteries. This isn't a bug, however, and Apple's reasoning makes sense on a technical level; the company is trying to preserve battery life and prevent crashes and shutdowns on older iPhones as batteries lose their ability to supply peak voltage. But Apple screwed up the delivery of this feature and its messaging to users, and it's led to a number of class-action lawsuits that will probably be settle sometime next year.

Amateur-hour bugs like these are the antithesis of the Apple marketing pitch – that when you control the hardware and the software, 'it just

work'. Lest iOS have all the fun with dumb bugs that should have been caught, macOS got in on the fun with a the very serious Root Bug. The company responded very quickly, but then botched that by breaking file sharing and re-introducing the bug if you upgraded to 10.13.1 after installing the fix. Wasn't the whole point of macOS High Sierra to focus on reliability and performance instead of introducing major new features?

Apple's had a rough year with software. iOS 11 has a ton of big improvements, but some of its features didn't make release and the reliability has been far below the company's usual standards. Even some of the releases that weren't bug-ridden caused headaches, like when iTunes 12.7 dropped support for iOS apps. It's a necessary step in de-cluttering the bloated mess that is iTunes, but it could have been handled in a way that didn't catch so many users off guard.

Delays, delays, and more delays

As much as Apple has done this year, it was supposed to do more. Delays are a normal part of tech, but this is rarely true of Apple; the company develops in secret, only announcing something when it is sure it is going to release when promised.

But we're still waiting on Messages in iCloud. We had to wait months for Apple Pay Cash.

Thanks to manufacturing difficulties, the iPhone X had to launch six weeks after the iPhone 8 and 8 Plus, and was set to be in very limited supply for many weeks thereafter. Apple and its

partners have done a great job fixing supply issues and improving availability, but it's a delay that shouldn't have happened.

HomePod is already a year or two behind its competitors in the home speaker space, and now it's going to miss 2017 entirely. Missing this holiday season will certainly impact sales – Alexa and Google Home are hot items, and people don't want to buy another smart speaker just a few months later. Especially one that, at £349, costs way more.

In some cases, Apple promised a release by the end of the year and just barely squeaked in under the wire. Amazon Prime Video on Apple TV dropped in December (six months after its announcement) and the iMac Pro shipped with just a couple weeks

Apple's complex TrueDepth camera array caused a delayed launch for iPhone X, and shipping shortages. It was rectified quickly, at least

left in 2017 – and you can't even buy the big 14- and 18-core configurations.

Here's to a smoother 2018

We put a lot of pressure on Apple. We constantly expect new market-defining, groundbreaking products on the scale of the iPhone or iPad. If a year passes without an Apple Car, or Apple AR Glasses, or an Apple over-the-top streaming television service, we read scores of op-ed missives about how Apple has lost its ability to innovate.

I think more important than Apple's ability to disrupt new industries is its implicit promise to its users: that complete vertical integration and fanatical attention to detail makes Apple products more reliable, performant, and secure than their counterparts.

2017 was a year marked by a bunch of exciting new Apple releases in both hardware and software, but a heaping pile of shameful bugs and product delays cast doubt about Apple's ability to execute at the quality level we expect. If there's one thing we want most from Apple in 2018, it's a commitment to improving quality.

And a new Mac Pro.

Should you buy an iMac Pro?

Apple most powerful Mac is an attractive computer. **Jason Snell** asks whether you really need it

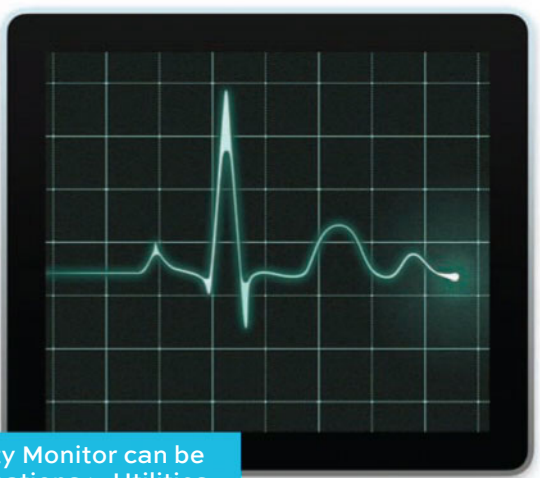
Apple's biggest sellers have been on store shelves for a while now, but for fans of high-powered Macs, Christmas came early last year with the release of the iMac Pro. It's undoubtedly going to take the crown as the most powerful Mac ever made – and will undoubtedly

hold onto that distinction until a new Mac Pro arrives on the scene.

There's a lot to be said for the iMac Pro. It's the first Mac with workstation-level processors with a plethora of processor cores (8 and up) since the Mac Pro in 2013. The Radeon Pro Vega is the most powerful graphic processor ever in a Mac.

If you're someone who uses a 5K iMac to get work done today, should you consider buying the iMac Pro or not? Here's a list of reasons why you should – and also a few reasons you might want to keep that credit card in your pocket.

Not every workflow is built equally. Though modern processors usually feature multiple cores capable of executing code simultaneously, not all software is written to spread the workload across those cores. There are certain audio plug-ins I use



Apple's Activity Monitor can be found in Applications > Utilities

that will absolutely swamp a single core of the i7 processor in my 5K iMac – while the other cores remain entirely untaxed.

But the right tools, written to grab as many cores as possible and use them to their fullest, will absolutely fly when given the ability to max out the eight to 18 cores in the iMac Pro.

Talk to professionals and you'll probably find that they know exactly what their most processor intensive tool is: for me, it's the Spectral De-Noise filter in the audio processing package iZotope RX 6. That filter, which does a remarkable job of removing background noise from audio tracks, will max out my iMac's cores. Even with that, it still takes a very long time to do its job, which is why an iMac Pro would probably be a big time saver for me.

If you don't know if harnessing many processor cores can help you do your job, open the CPU Monitor window in the Activity Monitor app. It'll show you all your cores (including 'virtual cores' used in Intel processors supporting hyper-threading), and you can see whether the most intense work you do is spread across all your Mac's processor cores, or is limited to just one.

If you feel the need for more speed and your apps are already pushing your Mac's cores to the limit, the iMac Pro would probably give you a big speed boost.

If you need graphics power

Powered by the Radeon Pro Vega, the iMac Pro is a workstation with graphics abilities that outstrip

any current Mac. If you're interested in working in advanced graphics, or VR development, while remaining on the Mac platform, this is the Mac that's going to be the most capable.

But beyond sheer processing power, the iMac Pro supports twice the number of external displays as the 5K iMac. If you're someone who needs two eternal 5K displays, or four external 4K HDR displays, you need the iMac Pro.

If you want the best 5K iMac

Priced at £4,899, the base model iMac Pro comes with 1TB of flash storage and 32GB of RAM. The

top-of-the-line iMac, outfitted with the fastest processor available on that model and with RAM and storage specs to match the iMac Pro, costs £3,509. That extra £1,260 nets you a much faster processor with twice the cores, a major graphics power boost, and more. (In fact, if you max out the specs on the 5K iMac, you can get one for £4,949, more than the iMac Pro's starting model. But that model has more RAM and more flash storage than the base model iMac Pro.)

My point is this: if you're in the market for a high-end iMac anyway, it's worth considering the iMac Pro. The leap in price isn't as dramatic once you're maxing out the specs of the 5K iMac in order to get the most powerful model.

If you want Space Grey peripherals

Here's a reason not to buy an iMac Pro: yes, it comes with Space Grey versions of the Magic Keyboard, Magic Mouse, and Magic Trackpad, colour variations that are not available anywhere else – at least for now.

While I have no doubt that these keyboards and input devices will be hot items on eBay, please do not buy a £5,000 computer for a keyboard in a slightly darker shade of silver.

(Look, I am not the fashion police: Buy what you want. It just seems a bit silly to spend that much money on a colour variation of the same input devices we've had for ages. The iMac itself is a similar story: if you've always wanted a Space Grey iMac, you can get one now. But the 'black tax'

for this model is much higher than the one for that black MacBook back in the day.)

If you like installing aftermarket RAM

The iMac Pro, unlike the 5K iMac, doesn't have a RAM door on the back, which means you can't buy the lowest amount of RAM possible from Apple and then install cheaper RAM from a third party later. Yeah, that's kind of a downer; that's what I did when I bought my 5K iMac. If you're frustrated with Apple blocking the very last bit of user upgradeability on the 27in iMac line, I get it.

If you're afraid of first-generation hardware

This is a brand-new model. The iMac Pro, first of its name, with new processors and hardware (and even an Apple-built ARM co-processor, the T2, which probably won't bring about judgment day). The conventional wisdom has always been, first-generation hardware has quirks and bugs, so it's best to let the brave jump in on the first go, while the savvy shoppers wait a year for the first hardware iteration that stamps out all the unexpected bugs.

It's not a bad strategy, if you're a patient person. Are you patient? If you've waited this long for a new professional Mac desktop, maybe you are.

If you're really in the market for a Mac Pro

We know literally nothing about the composition of the Mac Pro whose existence Apple executives acknowledged earlier this year. They made no commitments about when it would ship or what it

would contain. We can assume that it will be more powerful than the iMac, and possibly more expandable (it couldn't be less), and won't ship with a 27in display attached to its front.

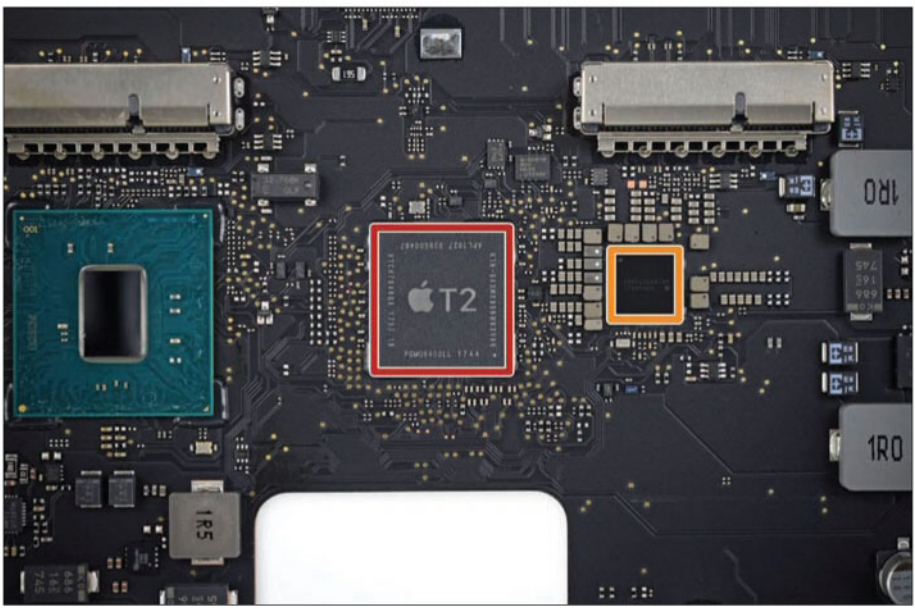
If you simply don't want to own an iMac, if you really would prefer a (potentially) more expandable and powerful Mac Pro, then it's probably a good idea to wait. But if you're someone who uses Macs to get work done, and who needs the fastest Mac in existence to do that job, you might consider this: There will probably be a robust resale market for the iMac Pro when the Mac Pro comes out. You could always buy this thing and use it until 2018 or 2019 or whenever the Mac Pro arrives, then sell it and put that money toward the Mac Pro.

Maybe you've been so patient waiting for this iMac that you're willing to be even more patient. Or maybe you've waited long enough. In the end, the difference between those two states may be the ultimate factor in deciding whether the iMac Pro is right for you.

FEATURE

The T2 chip marks the start of a Mac revolution

Sure, it's the fastest Mac ever made, but the T2 chip is what really makes it different. **Jason Snell** reports



I've spent the past week with Apple's new iMac Pro, and in most ways it's just a faster Mac. It's the first pro Mac desktop in over three years and the fastest Mac yet made, granted, but still entirely familiar. And yet in many ways – some noticeable, some entirely invisible – this new Mac is completely different from all past Mac models.

The iMac Pro may be an outlier today, but in the future we'll probably look back on it as the start of a new era for the Mac, all because of the Apple-built T2 chip it carries inside. Here's how the T2 makes this iMac Pro unlike all other Macs.

The power behind the throne

The T2 processor isn't doing the heavy lifting in the iMac Pro – that's the Intel Xeon processor with between 8 and 14 processor cores. The T2 is the brain behind that brain, running the subsystems of the iMac Pro from a single piece of Apple-built silicon. The result is a simplified internal design that doesn't require multiple components from multiple manufacturers.

On most Macs, there are discrete controllers for audio, system management and disk drives. But the T2 handles all these tasks. The T2 is responsible for controlling the iMac Pro's stereo speakers, internal microphones, and dual cooling fans, all by itself.

A FaceTime camera like no other

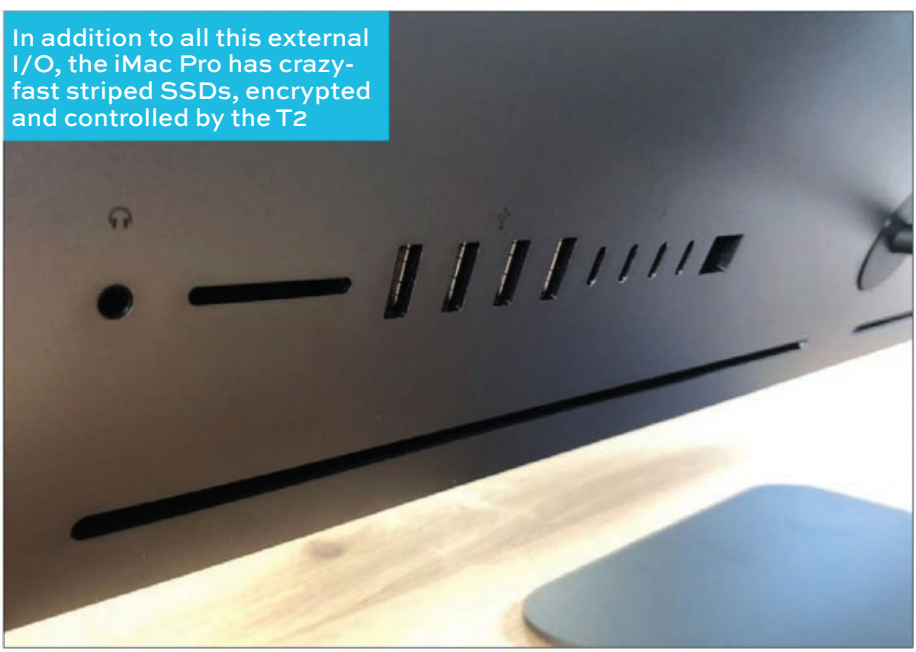
The iMac Pro's FaceTime camera can capture 1080p video, an upgrade from the 5K iMac's 720p resolution. But this new FaceTime camera is driven by the T2 processor, which means it's got intelligence that previous FaceTime cameras lacked. Like its cousin processors that drive the iPhone, the T2 has an Apple-designed image signal processor that detects faces in order to properly set exposure and white balance, dynamically adjusts exposure, and a whole lot more – all in the service

of producing a better image, just like what happens when you shoot photos or video with your iPhone.

What flash storage?

The iMac Pro offers between 1- and 4TB of flash storage, also commonly referred to as an SSD, or 'solid-state drive'. This is hardly the first Mac to include SSDs, but it's a very different approach to storage than previous models.

Most solid-state drives, whether they fit into a drive bay like a spinning hard drive or are reduced to a chip that slides into a slot somewhere, are self-contained – they're a bank of memory combined with a controller. On the iMac Pro, though, that's



In addition to all this external I/O, the iMac Pro has crazy-fast striped SSDs, encrypted and controlled by the T2

not the case – the SSD that comes with the iMac Pro is actually two banks of NAND memory. (Every iMac Pro has two banks that are 'stripped' together into a single drive – if you get the 1TB model, your iMac Pro has two 512GB NAND banks; the 4TB model has two 2TB NAND banks.)

As for the disk controller? There isn't one – or more accurately, the disk controller is built into the T2 itself. This gives the T2 complete control over internal storage on the iMac Pro. This has some major benefits in terms of speed and security. Every bit of data stored on an iMac Pro's SSD is encrypted on the fly by the T2, so that if a nefarious person tried to pull out the storage chips and read them later, they'd be out of luck.

(For additional security, Apple strongly suggests you turn on FileVault, which ties SSD encryption to your password. This provides an additional level of security, because your disk can't be decrypted without the proper hardware and your password.)

All this encryption happens invisibly, so the SSDs in the iMac Pro still operate at full speed – approximately 3GB per second.

Boot twice for safety

You know you're a Mac nerd when you have opinions about the keys you need to hold down when rebooting while troubleshooting a problem. But on the iMac Pro, booting and rebooting is different – very different. In essence, it's a two-stage process, first driven by the T2, then driven by the more traditional system boot process.

When you start up the iMac Pro, the familiar Apple logo appears. This is a sign that the T2 is taking control. For security reasons, the T2 is the iMac Pro hardware's 'root of trust', and it validates the entire boot process when the power comes on. The T2 starts up, checks things out, loads its bootloader, verifies that it's legitimate and cryptographically signed by Apple, and then moves on to the next part of the boot process.

This new boot process means there's also a new utility for Mac users to get to know: Startup Security Utility, which you can only access by booting into Recovery mode by holding down Command-R while starting up. Startup Security Utility gives the T2 guidance about just how strict it should be when judging whether it should boot your computer. By default, security is set to Full, which means that only the current operating system or another OS version signed and trusted by Apple – meaning it hasn't been tampered with in any way – can be booted by the computer. This version requires a network connection when you attempt to install any OS software updates, because it needs to verify with Apple that the updates are

legitimate. You can also set the security level lower, to Medium (which allows older version of macOS to run regardless of Apple's level of trust), or turn the feature off entirely, emulating the way all other Macs currently start up.

(This goes for Boot Camp, too – the T2 respects Microsoft's signing authority for Windows 10 beginning with 2017's Fall Creators Update, so Boot Camp users can reboot into Windows 10 while remaining fully secure.)

A hybrid Mac? Not quite.

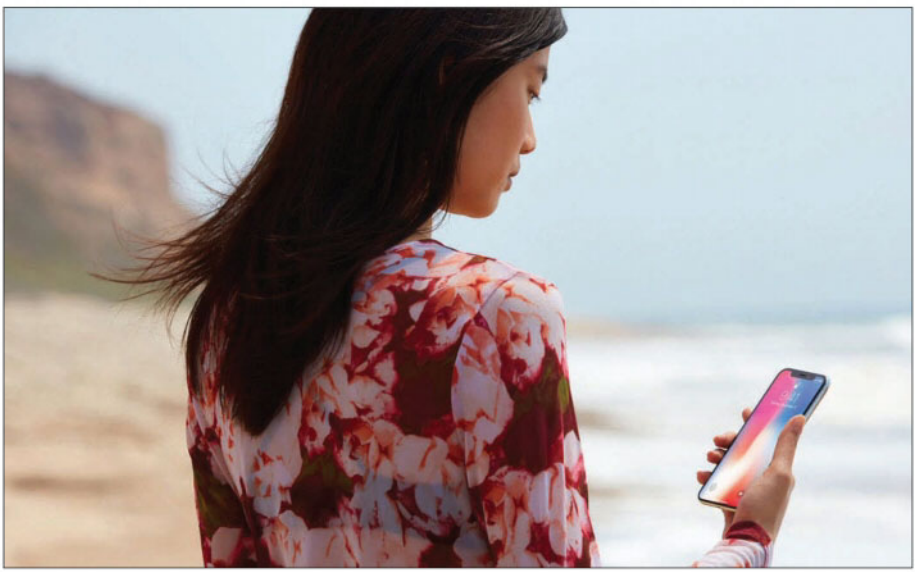
Before the iMac Pro was released, there was a lot of speculation that it was part of a trend toward creating a 'hybrid Mac' that is driven by both an Intel processor and an Apple-designed ARM chip like those found in other Apple devices. The iMac Pro is definitely a hybrid of a sort, but probably not the one people were expecting. With the T2, Apple is using its chip-design prowess to take more control over parts of the Mac hardware that were previously outsourced to other controllers, and reaping the benefits of integrating them all together.

The iMac Pro isn't running iOS apps, but it does get to take advantage of most of the work Apple has done to bolster the security of iOS devices and enhance the quality of photos and video taken by iPhone cameras. Apple will almost certainly continue to push this technology into more future Mac models, because it allows Apple to use the work it's already done on iOS to improve the features and security of the Mac.

FEATURE

What's next for Face ID?

iPhone X is the first Apple device to incorporate Face ID, but it's a solid bet that it won't be the last, writes **Dan Moren**



Ahead of the iPhone X's announcement back in September, there had been plenty of rumours about it including biometric security based on facial recognition, as well as whether or not Apple was struggling to incorporate Touch ID into this new model. Unsurprisingly, there was a lot of hand-wringing over this move, with plenty of pundits who insisted that Face ID was only a sop until Apple could figure out how to incorporate Touch ID into its new all-screen phone.

Now that the iPhone X has finally made its way into the world, we've gotten a little more perspective on the matter. Not only have we seen how Face ID is a major departure from previous facial recognition systems, but we've also had Apple executives point out that the company had long ago made the decision to ditch Touch ID for Face ID, which we should have all logically considered when the rumours were flying, as the company's not going to be struggling with design decisions mere months before they ship millions of devices. But now that Face ID is about to become part of many of our daily lives, it's worth considering what else might be in store for this technology. Because if the company's moving away from Touch ID in its flagship device, you can bet that Face ID is here to stay.

More faces

As good as the early reviews say Face ID is, the technology isn't without its limitations. Some of these are on the minor side: for example, certain types of sunglasses might not be compatible because they block the wavelength of light needed for the infrared-based equipment in the True Depth cameras. Likewise, those of us in colder climes might need to pull down our scarves in order for the camera to recognize us. Hardly deal-breakers, but inconveniences. (Let's not laud Touch ID and pretend it didn't have its own problems, or have you never had to retrain the sensor when your skin was too dry?)

But in one way Face ID does take a step back from Touch ID: it only supports enrolling a single face. For many people that may be no problem at all, but for those users who allow others to use their device – a partner, child, parent, or so on – it can be frustrating to have to revert back to sharing a strong, possibly hard to remember passcode (and your passcode is strong, right?).

Similarly, sharing a password is a bigger security risk, since it allows for access to many protected parts of iOS that are otherwise inaccessible. And if you wanted to revoke the access you'd given someone with Touch ID, it was easy enough to remove a fingerprint from the device; changing your passcode is definitely more annoying.

In some ways this is easy to reconcile with Apple's philosophy – the company has always pushed the idea that an iPhone is really for a single user. (Ever tried to buy or download apps with multiple iTunes accounts?) But I'm also convinced that the company will eventually expand Face ID's purview to handle different people accessing the same device, for one very good reason.

More devices

Although the iPhone X is the first Apple device to incorporate Face ID, it's a solid bet that it won't be the last. The simplest reason is that if it does indeed provide the most reliable and most powerful form of biometric security, why restrict it to just a single device? Moreover, Apple would no doubt like to offer the feature on other devices to allow users to have a single authentication method on all their devices.

The iPad is the most obvious choice for the next device to get Face ID, at least if it follows the previous example of Touch ID. Bringing the system to another iOS device ought to be relatively straightforward, and Apple would no doubt like to get rid of the home button on its tablet and free up valuable space there as well. (Plus, the swiping up gesture to bring up the Dock and multitasking interfaces on the iPad in iOS 11 is already reminiscent of the iPhone X's replacement for the home button.)

More interesting, however, is the Mac. Touch ID has been slow to migrate to the Mac, appearing

only on the Touch Bar-enabled MacBook Pros. But the Touch Bar has been one of the company's less popular features of recent years, and while many – myself included – had expected the company might integrate Touch ID into a Magic Keyboard or Magic Trackpad, it certainly seems plausible that the company decided to skip that entirely once it had made the decision to bet on Face ID.

And unlike iOS devices, Macs don't generally suffer from the same limited space or power problems that Apple has to balance on phones and tablets. Plus it opens up a better experience for using Apple Pay on your Mac, and let's be honest: it'll probably be even more reliable than logging in to your Mac using your Apple Watch.

Both iPads and Macs are far more likely to be shared between multiple users, and Macs of course have explicit support for multiple accounts – which, on Touch ID-enabled MacBook Pros, even supports user-switching via fingerprints. So it seems a pretty good bet that Face ID would follow in that feature's footsteps. And hey, maybe it will even encourage Apple to acknowledge that iPads get shared between different users as well, and finally bring the multi-user support enabled for education into mainstream usage, but perhaps that's a topic for another day.

Help Desk

Glenn Fleishman answers your most vexing Mac problems

APP STORE AND iTUNES PURCHASES: YOU CAN'T DELETE HISTORY

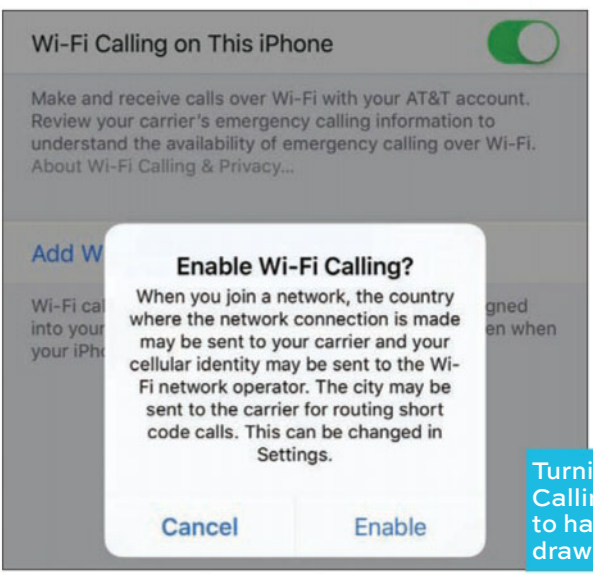
We don't typically run one-word answers to reader questions, but it's worth it in this case, because we regularly receive a question similar to this one from *Macworld* reader JLR:

"I want to dump, forever, some music and iPhone apps from my iTunes account and not have to deal with them just 'hiding'. Is this possible to do?"

No. Okay, I can't help myself, I need to give a complete answer here. Apple lets you hide purchases from appearing where they typically display in a list or are available via Family Sharing, but the purchase remains part of your account information and can be viewed when you examine your account. Apple hasn't explained why you can't delete your purchase history.

IS THERE A DRAWBACK TO USING WI-FI CALLING ON AN IPHONE?

Wi-Fi Calling is a feature that lets an iPhone effectively re-route mobile calls over the Wi-Fi network to which you're connected – if it has the right qualities instead of using the cellular network. Most carriers support Wi-Fi Calling.



Turning on Wi-Fi Calling seems to have no drawbacks

Macworld reader Steve wonders if there's a drawback to Wi-Fi Calling. His iPhone typically picks up a stronger Wi-Fi signal than a cellular one.

There's none that I can think of, even though carriers mostly offer no benefit to you off-loading phone calls from their networks to your own or someone else's. (At one point, T-Mobile's Wi-Fi calling option had some real cost advantages.)

Voice calls over 3G and 4G networks are just data, anyway. Calls use up very little bandwidth, so even on a lower-speed broadband network or one that has usage caps, the data consumed is minimal.

Wi-Fi Calling also optionally lets you connect all other kinds of Apple devices using the same iCloud account so you can make calls from them even if the iPhone is powered down or not on the same Wi-Fi network. That's a big advantage depending on how you work.

Apple doesn't reveal the specific means by which it tests that a Wi-Fi network has suitable characteristics for Wi-Fi Calling, but I expect it performs a quick test for data loss and latency, or the time it takes for data to start transmitting rather than its overall speed.

FUSION DRIVE OR HYBRID DRIVE: WHICH ONE SHOULD YOU USE?

Solid-state drives (SSDs) are expensive, especially if want a capacity above 1TB. That's why hard drives still rule the roost, even though they don't offer the speed of an SSD. Apple's software-based Fusion Drive provides a compromise: it

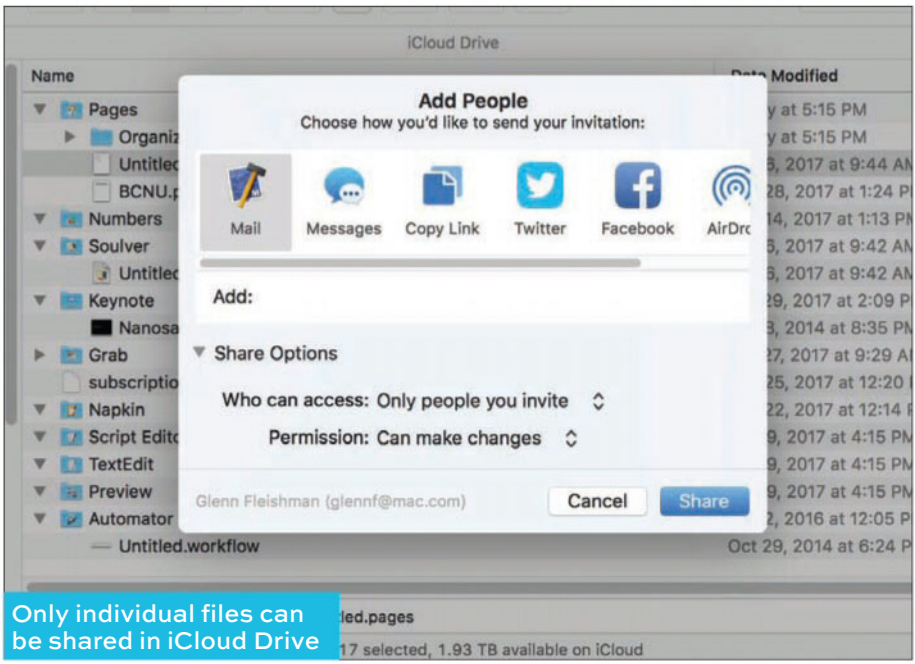
uses a small amount of high-performance SSD alongside a higher-capacity HDD. macOS caches frequently used drive-based data in the SSD, boosting performance. When deciding on a drive for an iMac I purchased earlier this year, I felt that the performance I'd get from the £700 jump from a 1TB Fusion Drive to a 1TB SSD simply wasn't worth it. Apple pairs a 32GB SSD with its 1TB hard drive, and 128GB with its 2- and 3TB options.

Macworld reader Terence would like to upgrade an older iMac to a newer version of macOS, and wants to create his own Fusion Drive. Apple's technical support told him, he says, that he can migrate to High Sierra and then use it to create a Fusion Drive with bring-your-own-drive options.

I'd say the far better option, if you're purchasing new drives anyway, is to find a hybrid drive with a good reputation and go with it. A hybrid drive is a single drive that combines a SSD with a hard drive. These seem to mostly max out at about 8GB of SSD, but can cost under £100 for a 1TB/8GB model. The caching happens below the driver level, so the drive winds up 'responsible' for making the choices, but there's less to fail, too.

DROPBOX OR iCLOUD DRIVE: WHICH IS BETTER FOR FILE SHARING?

iCloud Drive isn't quite like Google Drive or Dropbox. As with most Apple digital and cloud services, it's tied to a single identity without much in the way of sharing. iCloud Drive's sharing features seem a bit tacked on.



Only individual files can be shared in iCloud Drive

Macworld reader Howard writes in asking about an aspect of this. "I was hoping also to have my wife's iCloud drive show up on my Mac's Finder the way I do with Dropbox. I haven't been able to get this to work."

It's not you, Howard. You can only mount a given iCloud Drive associated with an iCloud account on an account in macOS logged into that same iCloud account. With some previous Apple cloud storage systems, you could use the credentials (user name and password) to mount a drive without having your system logged into the same account. You can select individual files in macOS, the iOS app, or via

iCloud.com and share them. But access is solely via the web, and you can't share folders.

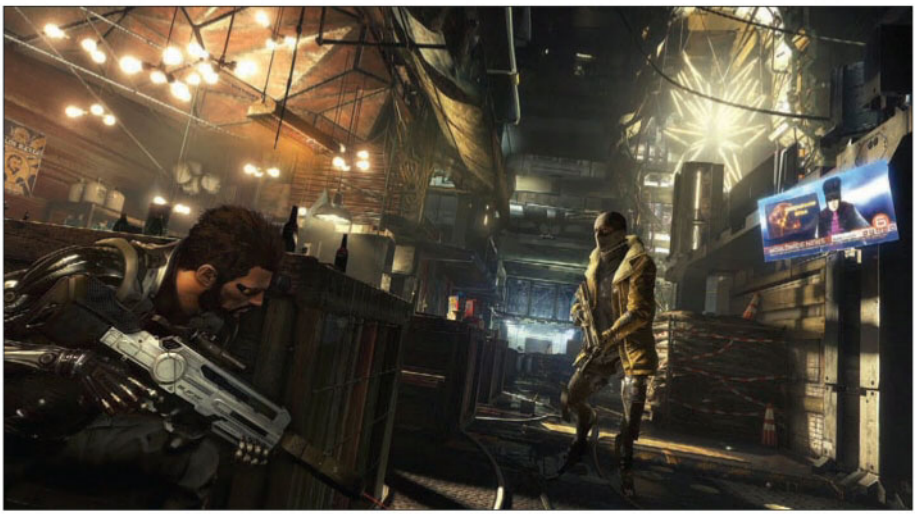
Apple lets you share iCloud storage using Family Sharing, but it doesn't provide any way to share files among those family members, either. Howard's family bumped up their storage and has now bumped against this limit.

Dropbox is a very reasonable way to have a shared folder, the contents of which are constantly synced among those connected to the folder. One other option would be to use Internet file storage via Panic's Transmit 5 (**fave.co/2COwsxt**), which allows several kinds of servers and cloud hosts to be mounted as Finder volumes. However, this doesn't use sync: you're really opening and saving files live over the Internet, which can add lag unless you have a relatively fast broadband connection.

Latest Mac games

Andrew Hayward looks at this month's best new releases

It's the start of the year, so we've rounded up the biggest and brightest new releases. Deus Ex: Mankind Divided, Battle Chef Brigade, and Bridge Constructor Portal are among the most notable games released over the past few weeks, but there are several more compelling options within.



1. Deus Ex: Mankind Divided

Price: £39.99 from Steam (fave.co/2CQyJvf)

Been waiting since the finale of the great Deus Ex: Human Revolution to see how Adam Jensen's story continues? If so, you're in luck – because Square Enix's Deus Ex: Mankind Divided is finally on Mac. Mankind Divided takes place in a futuristic, cyberpunk world in which tech-augmented humans (like Jensen) are segregated from their fully flesh-and-blood counterparts.

It blends stealth action with intense melee combat and cool cybernetic customizations, all within a huge, beautiful world. It needs heavy-duty hardware, though: Feral Interactive's port only works with AMD graphics cards for now, which means a select few Macs can handle it.

2. Battle Chef Brigade

Price: £15.49 from Steam (fave.co/2CSZSOa)

Battle Chef Brigade is surely the only cooking-themed, anime-inspired puzzle and combat game you'll ever encounter, as you fight monsters to snag ingredients and then cook them up by matching together items in your cauldron with Bejeweled-esque elemental gems. Yes, that is quite the unique premise. Battle Chef Brigade follows an Iron Chef-like tournament, albeit in a fantasy world of wild creatures and big personalities, and you'll need to defeat the competition by whipping up the most inventive dishes you can. This indie game delight has scored with professional critics and Steam users alike, and there's nothing else quite like it.

3. Getting Over It with Bennett Foddy

Price: £5.79 from Steam (fave.co/2CCH9mF)

Bennett Foddy tends to make a certain kind of game in different ways: they're incredibly difficult to control, yet that near-impossibility makes them absolutely addictive. We've seen it with web games like QWOP and GIRP, and now he's done it again with Getting Over It. You control a man who is firmly lodged inside a cauldron, who must use only a hammer to propel himself up a huge, jagged mountain, and you can't save your progress. How long will it take you to finish a run? Will you discover new depths of frustration in the process? Find out for just eight bucks, if you dare.

4. Bridge Constructor Portal

Price: £6.99 from Steam (fave.co/2CD90U2)

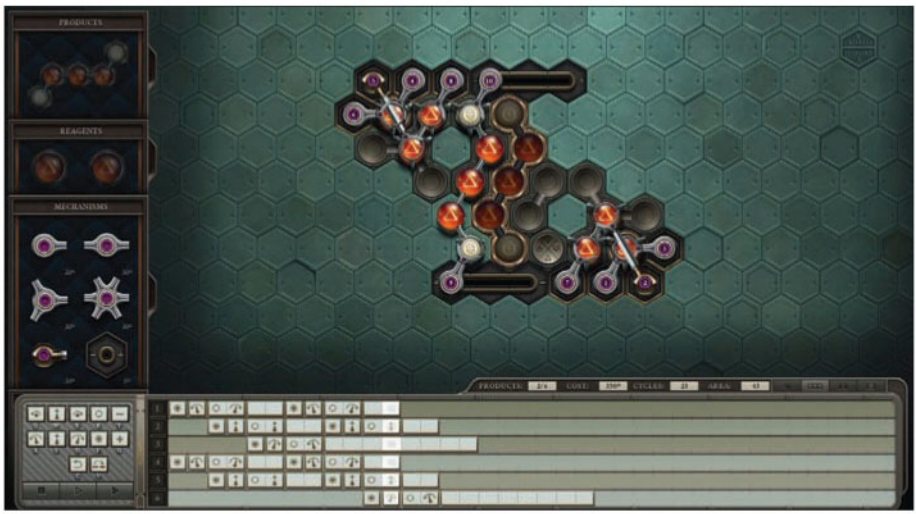
Bridge Constructor Portal merges one physics-based game with another, blending the bridge-building simulation of the former with the teleportation shenanigans, humour, and presentation of Valve's beloved latter series.

It's an unexpected pairing, but it's one that seems to have landed well with fans of both series. You'll put together intricate bridges and structures to guide the little forklifts through the familiar Portal test chambers, which gradually become more and more complex with the addition of portals and other hazards. With 60 levels, a cheap price, and enough of the Portal aesthetic in tow, this seems like a fun little brain-teaser.

5. Reigns: Her Majesty

Price: £2.09 from Steam (fave.co/2CDLIgL)

Reigns is an experience best suited for an iPhone or iPad, given its swipe-centric gameplay and portrait-view presentation, but if you'd rather play on Mac, it's available at the very same price. Like 2016's great original, the new Reigns: Her Majesty is a breezy monarchy simulator, letting you rule one decision at a time as you attempt to stay in power. As the title suggests, Her Majesty shifts the focus over from the king to the queen, and while the core gameplay is essentially unchanged from the first game, there's a much different slant to the queen's experience. Her Majesty expertly weaves its commentary on sexism and the patriarchy into the narrative while still providing fun along the way.



6. Opus Magnum

Price: £15.49 from Steam (fave.co/2COxiOd)

Zachtronics' games (like Shenzhen I/O and TIS-100) might not look like the most accessible puzzlers out there, but they are beloved by their fans. It's also been hailed as the studio's most ambitious, yet also most accessible game to date. Opus Magnum is a game about alchemy, and as a young alchemist, you'll have to solve problems by creating machines to carry out the various processes. It has a bit of a programming feel, like other Zachtronic games, but the open-ended puzzle design means you may be able to trial-and-error your way to a solution. However, creating an efficient solution will take plenty more fiddling and experimentation.

7. Finding Paradise

Price: £6.99 from Steam (fave.co/2CSWGCw)

Looking for a game that has the potential to get you all choked up? Finding Paradise might be your best bet – the trailer alone nearly brought a quiver to my lip. Like the earlier, much-loved To The Moon, it's a game about doctors that help dying people mentally fulfil their unachieved wishes from life. It takes the form of an old-school, 16-bit role-playing game, but what the game lacks in flashy visuals it seems to more than make up for with powerful moments and storytelling. Finding Paradise essentially repeats the premise from To The Moon, which you should play first (£6.99 from **fave.co/2CDYiMQ**), but player reviews suggest that it's another amazing adventure.

8. Tiny Metal

Price: £19.99 from Steam (fave.co/2CFRgHo)

Nintendo has an incredible stable of game franchises from over the years, but sometimes they're left dormant for ages – and besides, they're not coming to Mac anytime soon. Luckily, fans of Nintendo's Advance Wars series have a new spiritual successor to check out: Tiny Metal, which is published by rival gaming giant Sony. It's a visually enhanced, lightly tweaked take on the classic Advance Wars formula: a streamlined, turn-based tactical strategy game in which opposing military forces attempt to defeat the other. Steam reviews suggest it's rough around the edges especially with online play still in the works, but it could have a lot of upside for tactical combat fans.

9. Gang Beasts

Price: £14.99 from Steam (fave.co/2CDYc7P)

After a lengthy Early Access period, Gang Beasts has finally been released, and it looks hilarious. And I do mean looks: this is a game that appears to be just as much fun to watch as it is to play, as goofy-looking, Claymation-esque characters battle it out in raucous four-player skirmishes. It's mainly a silly, anything-goes brawler, but Gang Beasts also bundles in a soccer mode and battles against waves of computer-controlled foes. And whatever mode you're in, it's hard to believe that anyone won't crack a smile while playing.

10. Riot – Civil Unrest

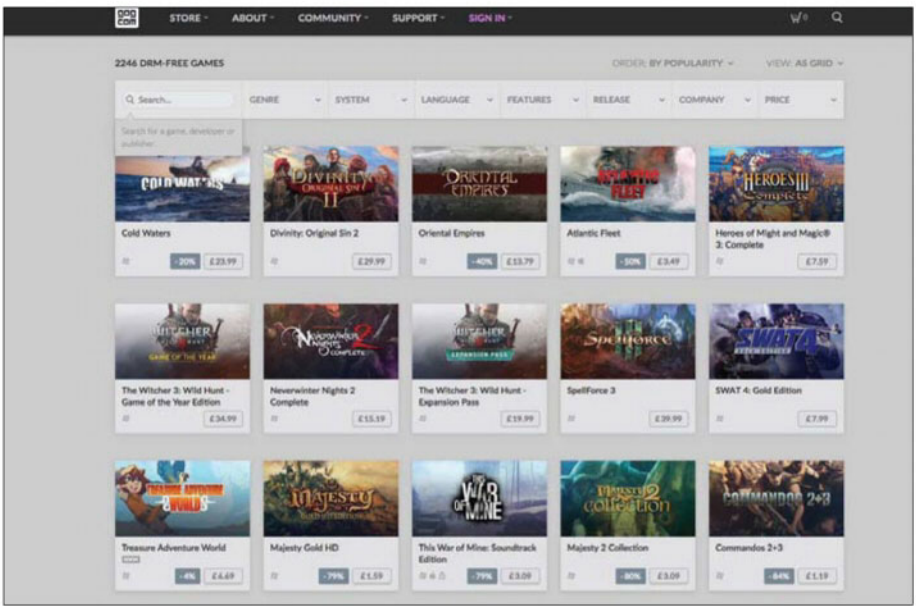
Price: £8.99 from Steam (fave.co/2CT6iwK)

As you might surmise from the title, Riot – Civil Unrest has the potential to be very controversial. It truly is a riot simulator, letting you jump into violent conflicts between angry demonstrators and police forces, with the game including historical skirmishes in locales such as Spain, Egypt, Oakland, Paris, and Italy. And you can play as either side in those scenarios. Riot's creators claim they don't take sides in presenting these playable recreations of extremely grim events, and you'll have to decide just how sensitively it handles such things. However, it is an intriguing concoction, as you control an entire mob pressing for action or the police forces that try to limit the damage.

HOW TO

How to: Use GOG.com to play old games on a Mac

Whether you prefer 1980s gaming or cutting edge, GOG.com is a must if you're a Mac gamer. **Craig Grannell** shows how



Mac owners where's the best place to find and buy new games, and they'll likely suggest Steam – or perhaps the Mac App Store. But there are other digital distribution platforms of note, one of which is **GOG.com**.

A quick glance at the GOG.com website might make you question why you should pick it over

Steam. Its entry page looks perfectly nice, but nothing out of the ordinary. And if you delve deep, you'll soon find the catalogue is smaller than Steam's. However, there's good reason to consider GOG.com for at least some of your Mac gaming.

Why to buy from GOG.com

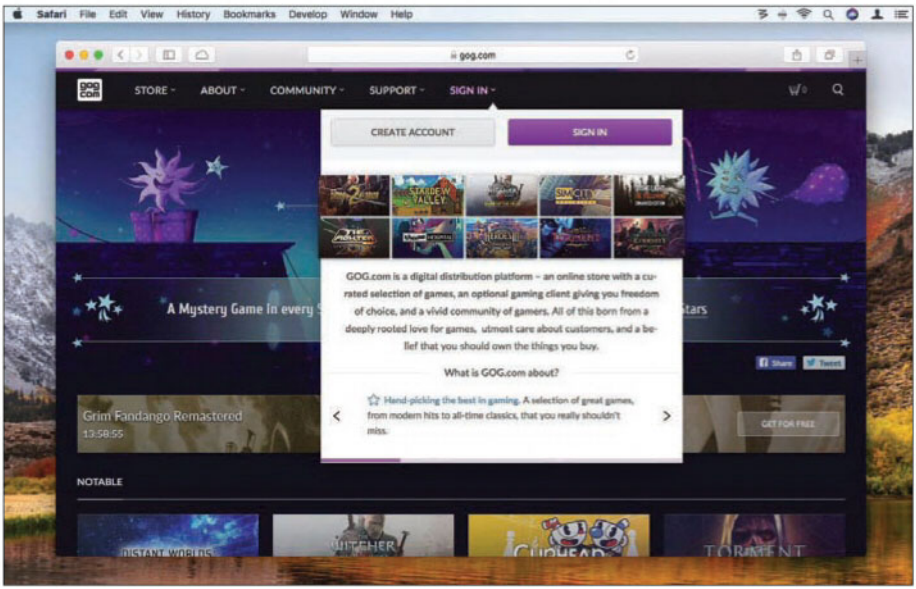
Perhaps the most obvious reason to check out GOG.com is shopping around. Like every other distributor, it has regular sales, and these often enable you to take advantage of big discounts. Unless you're desperate to have all your game purchases under the same distribution umbrella, comparing prices across stores is a smart idea.

The second reason is its DRM-free nature. This means when you buy a game, you own it; there's no activation and no online connection requirement. You can back up files you download, and install them on multiple Macs, if you like.

The final main reason to look at GOG.com is evident when you know its original name: Good Old Games. Although the site has since shifted focus, the service's original goal was to get classic games into the hands of a modern audience. And, yes, we know you can install emulators on your Mac to run ancient titles, but GOG.com wanted to remove the hassle, and also ensure people who owned the rights to old games still got paid.

Get started

If you've never visited GOG.com before, head to the site, click Sign In, and then Create Account.



You'll need to choose a user name, add your email, and enter a password to secure your account. Once you've done all that, the site will bid you welcome, and suggest you buy a bunch of games, offering you deals that only stick around for 48 hours.

To manually check out what the site has to offer, go to Store > Browse all games. You can then filter the site's collection to only Mac-compatible titles by clicking All games for Mac.

At the time of writing, there were over 2,000 games to choose from - far more than you'd have any hope of playing in a single lifetime. Fortunately, GOG.com's filters provide the means to quickly refine the selection further.

To do so, click any one of the menus and tick a checkbox. Hankering after cheap retro fare? Tick Release > Pre 2000 and Price > Under £4. Still after a bargain but not wedded to games from a particular era? Clear the Release filter by clicking the cross on its menu.

How to buy games

It's important to know whether a game you're keen to buy will run on your Mac. Find your Mac's specs by going to About This Mac in the Apple menu. On a GOG.com game's page, system requirements are listed part-way down on the right-hand side, and newer games are usually more demanding.

Limbo (2011), for example, will run on pretty much any Intel Mac running macOS 10.9+. But Firewatch (2016) demands an Intel Core i5, and 1GB of graphics RAM. The Witness (also 2016) has even higher demands, recommending a 2.4GHz processor, and a Mac capable of running Metal.

Once you've found a game you want to play, and that your Mac is capable of running, click the price (or 'free' badge) on a results list – or Add to cart on the game's page – to add it to your shopping cart. Click the cart icon and Go to checkout to continue, and then Pay for your order now. If your cart's only full of free games, they'll now be sent to your account.

Otherwise, you'll need to choose a means of payment, such as PayPal, a credit/debit card, or GOG.com Wallet. (The last of those is a fund you manually top up from another payment source. For

many people, it won't be worth consideration; but it's handy to control a budget for yourself or a child. Also, added funds never expire.)

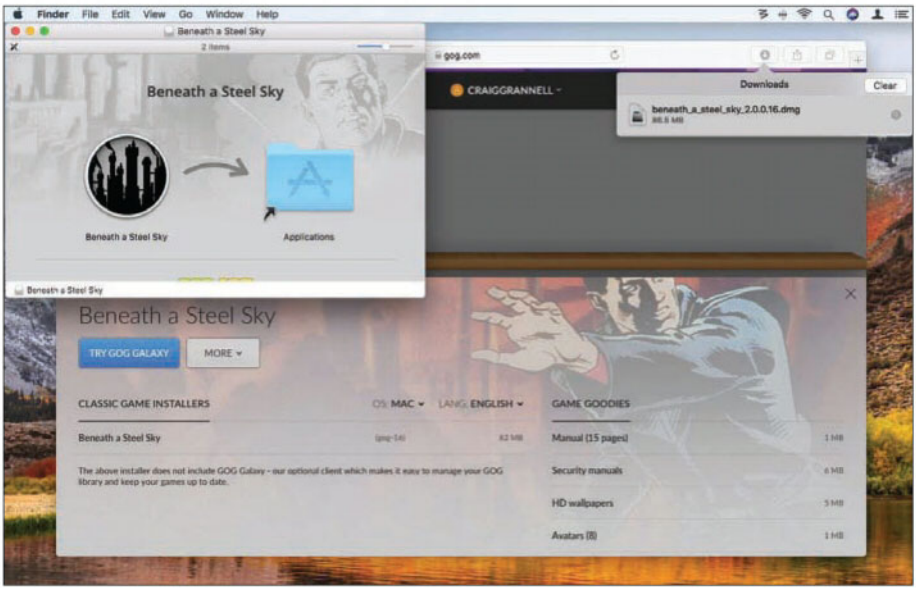
Be warned that GOG.com also sells soundtracks and add-ons for some games, and so always be sure of what you're buying. You don't want to buy what looks to be a gaming bargain, without reading the description, and find it's just some music – even if it's really good music!

Install purchases

Once you've gone through the checkout process, you'll get an email notification, and the game will be ready to install from the account section of GOG.com. Click your name on the GOG.com toolbar, and then Games. Click the game you'd like to install, and you'll see what's available.

To download a traditional installer, click the game's title under the Classic game installers header. The installer will then be sent to your ~/Downloads folder, and can be installed just like any other app. Note that because these games have been downloaded from the Internet, macOS will warn you when you first try to launch them.

It's worth noting that many games offer related 'goodies', which are listed to the right of the installers list. Said goodies may include manuals and wallpapers. Some go further – retro platformer VVVVVV provides early prototypes you can play in a web browser. Each game's downloads page also has a More button that's worth investigating; click that to access links to



the game's store page and forum, the latter of which may come in handy if you get stuck.

Install and use GOG Galaxy

Another button conspicuously sits on every game's downloads page: Try GOG Galaxy. Click that and you're sent to the GOG Galaxy page, which is also accessible from About > GOG Galaxy. A large Download GOG Galaxy button then invitingly urges you to click it.

But what is GOG Galaxy, and why might it interest you? In short, it's what GOG.com describes as an 'optional client' – a piece of software you can use to make your GOG experience a little easier and more convenient, but that you can at any point

abandon if you don't like it. If you do download and install GOG Galaxy, opening it reveals something almost identical to the GOG website, and where you can perform basically the same tasks – browsing the store, buying games, and so on. But the sidebar will also list titles you've installed using GOG Galaxy (note that it cannot magically detect any GOG games you've installed manually).

This games list can be searched, and clicking a game loads its page, presenting a big Play button, outlining your activity with the game to date, and providing access to other content (including the 'goodies', forums, and support pages) by way of the More button. You can also just double-click a game in the sidebar to launch it, or right/Control-click it to rapidly access settings and support links.

GOG Galaxy itself also has settings, accessed by going to GOG Galaxy > Preferences. In General, you can decide whether the app launches on system start-up, and whether the starting page is the store or your games library. Other important options include automatic game updates in Features, installation and download folders in Downloads, and for what reasons the app will attempt to gain your attention in Notifications.

To reiterate, though, GOG Galaxy is entirely optional. Stop using it and you can still launch your games from /Applications. There's no lock-in.

Four GOG.com classics to install on your Mac

Finally, given that we bigged up the retro side of GOG.com earlier, here are some old games you

can buy that are still worth your time. Note you need a two-button mouse or joystick to get the most from them.

Star Wars: TIE Fighter Special Edition B
Price: £7.49 from **fave.co/2CQKPVb**

Be the bad guys in this seminal space shooter. Hugely ambitious for the time, and still playable (and really tough) today, this game finds you recruited to the Imperial Navy, tasked with saving Imperial lives and wiping out those pesky Rebels.

Sensible World of Soccer 96/97
Price: £4.59 from **fave.co/2CT3zUf**

SWOS is from a time before football games were trying very hard to look like what you see on the telly. Its fast-paced overhead footie almost recalls pinball at times, but it feels superb - like you imagine football to be in your head.

Cannon Fodder
Price: £4.59 from **fave.co/2CSq0Je**

Eager conscripts are hurled into the fray in this once hugely controversial arcade/stealth/shooter/puzzler mash-up. The combination of tactics and reflexes remains intoxicating.

The only snag is this PC take lacks the superb audio from the Amiga original.

Populous
Price: £4.59 from **fave.co/2CCQevL**

This god simulator from way back in 1989 has you influence rather than directly control the tribe ambling about the planet's surface. Mostly, this is achieved by raising and lowering the land, to help them build larger buildings. Once your tribe's powerful enough, it can then duff up the opposition.

OPINION

Apple off to a promising start with revamped iMac

Dan Moren believes the iMac Pro points to an exciting future

So, the iMac Pro is shipping. After many years' worth of fretting, Apple once again has a pro-level desktop that boasts the modern technology. And all is right with the world.

But is it? There's no disputing that the iMac Pro is a capable machine: with up to 18 cores, a

maximum of 128GB of RAM, and a hefty video card, the benchmarks indicate that this is a machine that can take everything you throw at it.

And yet it's not Apple's whole "pro" story. In an interview with select outlets back in April of this year, Apple executive Phil Schiller had multiple shoes to drop, including this morsel:

"With regards to the Mac Pro, we are in the process of what we call 'completely rethinking the Mac Pro.' We're working on it. We have a team working hard on it right now, and we want to architect it so that we can keep it fresh with regular improvements, and we're committed to making it our highest-end, high throughput desktop system, designed for our demanding pro customers."

In other words, pro Mac users have a lot to look forward to in 2018 and beyond.

One size doesn't fit all

Let's just put it out there: Impressive as it is, the iMac Pro isn't for everybody. In that same interview, Schiller called the iMac "our most popular desktop with pros," though that's a bit disingenuous if you consider that the Mac Pro, at that point, had not been updated in close to four years. The iMac, meanwhile, had rolled on to become better and better, so if you were looking to buy a pro-level desktop from Apple, you only really had one choice.

While the iMac Pro's performance is hard to dispute, those who do take issue with the machine

The next Mac Pro probably won't look like its tower predecessor, but it will be a modular system

point to what they see as its major weakness: a lack of internal upgradeability and expandability. When you configure an iMac Pro for purchase, you're mostly stuck with any decisions you make at the time. Nothing, including the RAM, is user-upgradeable (at least not without voiding a warranty), continuing the trend that's been well-established across the Mac line over the past decade or so.

That's where the hypothetical Mac Pro comes in again. Schiller has said that "it is, by definition, a modular system," which seems like a response to the biggest criticism of that 2013 Mac Pro redesign. Apple tried to anticipate what pros wanted, merged

it with the company's own philosophy about the hardware that it built, and the result was pretty and impressive – but it kind of missed the mark for the intended audience.

It certainly seems like Apple's not about to make the same mistake twice.

Pros, not cons

The fact that Apple has dedicated so much attention to pro-level customers – not just with the iMac Pro but the recent revisions of the 5K iMac, and the upcoming Mac Pro – should go a long way to assuaging the concerns of power users. After all, it seems clear the company does care about the professional market. But it's this forthcoming modular Mac Pro that's going to show us whether the company cares about listening to its customers. The 2013 Mac Pro is poised to be the third-generation iPod shuffle (the one with no buttons) – elegant, attractive, and an impressive achievement academically, but ultimately not at all what people wanted.

Don't buy into the fallacy, though: not every power user is buying an iMac just because they can't get a Pro. Some people seem to genuinely prefer the compact

Third-generation iPod shuffle

form factor, the simplicity and beauty of the built-in screen, and so on. It's a mistake thinking all pros are cut from the same cloth.

But that goes both ways. Apple too has hopefully recognized that the iMac Pro and the cylindrical Mac Pro before it weren't a panacea to the ails of Mac users clamouring for professional-level equipment. While the tide has certainly swept towards computers that are more appliance-like, with a minimum of moving parts and a lack of internal expansion, that's not going to address the needs of all pros. Expansion and modularity are, for a segment of the population, mission critical.

That doesn't mean we'll get a return to the Mac Pro of yesteryear, the hefty cheese grater with plenty of space under the hood. I think it's clear that Apple believes that form factor has sailed. With the upcoming Mac Pro, Apple has set itself a task that's about delivering the expansion capabilities that a section of the pro market wants but staying true to the kind of hardware that the company would feel proud to deliver.


IDG