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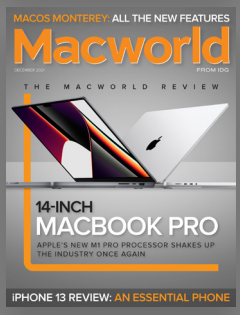

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Our offices are located at 501 Second Street, 6th Floor, San Francisco, CA 94107; phone, 415/243-0505; fax, 415/512-7130. *Macworld* staff can be reached by email at *firstname_lastname*@idg.com.

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July 2022, Volume 39, Issue 7


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I think it's just vapor. It won't hurt my kid like cigarettes, right?
The vapor that's inhaled from e-cigarettes contains harmful chemicals that can cause irreversible lung damage.
And e-cigarettes have nicotine, a toxin that's addictive and can change your kid's brain. Those are the facts.
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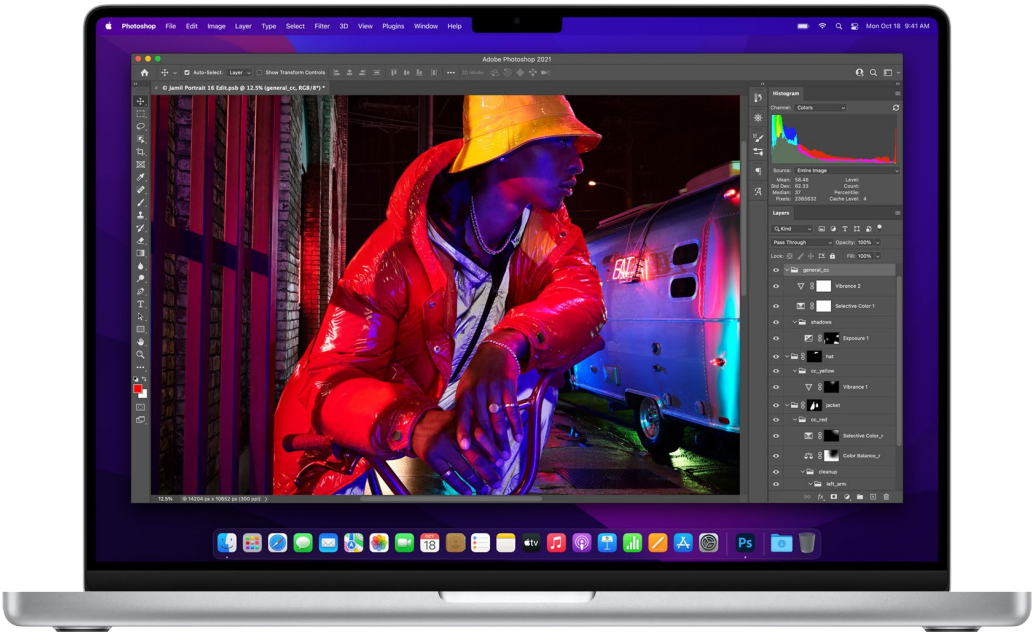


5 reasons to buy a MacBook over a desktop Mac

A fancy new Mac Studio may be the attractive option, but a MacBook has benefits too.

BY BRITTANY VINCENT

Whether you're making the jump into the Apple ecosystem or updating from an older machine, picking up a new Mac can be a great way to supercharge your productivity. How do you decide which type of Mac is right for you? With so many options to choose from, as well as different types of Macs, finding one that fits your setup and delivers everything you need can be tricky.

If you're going to pick up a new Mac, then going with a MacBook can have some distinct advantages over Apple's desktop options. Don't get us wrong, all of these machines are perfectly capable of

IMAGE: APPLE

doing what you need them to do, but there are some places where Apple's laptops shine brighter than the iMac and other desktop machines. As such, here are five great reasons to choose a MacBook over a desktop Mac the next time you upgrade.

1. MOBILE WORKSTATION

It almost goes without saying that one of the biggest advantages to choosing a MacBook is portability. The MacBook Air and MacBook Pro are extremely easy to pick up and transport and they are perfect for anyone who finds themselves traveling for work, or is just looking for a way to be able to move from a desk to a kitchen counter or even a couch. Apple does have desktops that are relatively light and easy to move–and apparently, using (fave.co/3wLVWdw) an iMac as a portable (fave.co/3LESUfa) computer (fave.co/3yXyYRT) is a thing (fave.co/3GkbB6F). You don't have to be like that.

MacBooks come in multiple sizes. You can go with the 13-inch MacBook Air for ultimate portability; it's Apple's thinnest and lightest laptop. The 13-inch MacBook Pro is a tad thicker, but not by much, and if you grab a bigger 14- and 16-inch MacBook Pro, you'll have more of a load to bear, but you'll also have a powerful pro-centric computer. But all of Apple's laptops are extremely light, portable, and ready to get up and go.

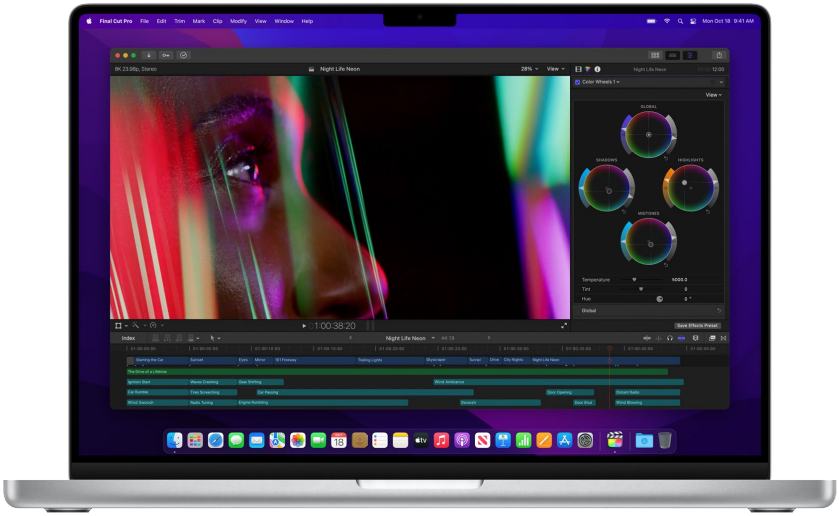
2. DESKTOP PERFORMANCE

When Apple featured Intel processors in all of its Macs, desktop Macs offered more processing power than a MacBook. Laptops have more limitations to work with due to the need to keep the device at workable temperatures, which meant the Intel processor could only go so fast.

One of the biggest advantages to choosing a MacBook is portability.

But now

Macs feature the M1 family of chips, and it's a lot easier to figure out the performance differences (fave.co/3wLW4tw) because now, a desktop and laptop Mac that use the same M1-series processor have the same processing speed. For example, the M1-based MacBook Air, 13-inch MacBook Pro, iMac, and Mac mini all have the same CPU—MacBooks are no longer slower than desktop Macs and you can truly take the performance of a desktop Mac anywhere you go.



With Apple silicon, laptops don't need to be slowed down because of the form factor. For example, the 16-inch MacBook Pro's M1 Max provides the same processing power as the Mac Studio's M1 Max.

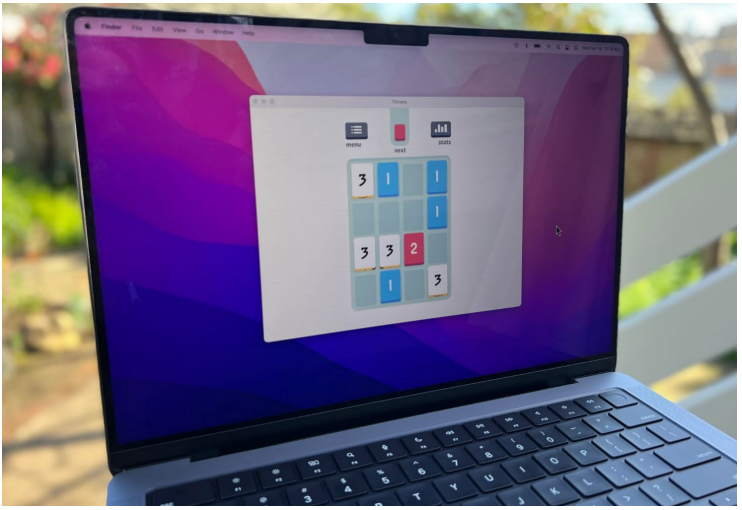
When we say using an M1 series MacBook is like taking one of the most powerful desktop computers in the world and putting it on your lap, it's not an exaggeration. Apple's M1-series MacBooks outclass most of the Intel-based desktops the company has ever released. M1 MacBooks are so powerful now, that a MacBook can serve as your main computer. Even if you need more power than the M1 offers, the newer MacBook Pros with the M1 Pro and M1 Max deliver unprecedented performance that's faster than any desktop Mac except the top-of-the-line Mac Studio.

3. FANTASTIC DISPLAYS

Apple has always made fantastic displays, but the latest MacBooks take them to the next level with crisp visuals and colors that pop, especially on the new MacBook Pros. Together with the power of the M1 chip, professionals–or really anyone in general–can enjoy creating new content like photos and artwork with a fantastic screen that doesn't compromise. And it's not too

bad for watching movies either.

On the other hand, the iMac is the only desktop Mac that comes with a display, and though it is a very good one, it doesn't compare to the MacBook Pro's Liquid Retina XDR display. And if you want to hook up an external display, you can do that too, with the MacBook Air and 13-inch MacBook Pro allowing a second display and the MacBook Pros letting you connect three.



The 14- and 16-inch MacBook Pros have displays with notches at the top, but they don't get in the way of your work.

4. FREEDOM FROM THE POWER OUTLET

It's not just the ability to travel—sometimes you just want to work on your couch or on the porch. Since MacBooks have a built-in battery, you don't have to be tethered to a power outlet, which is necessary with a desktop Mac. If it's a beautiful day outside and you're feeling inspired by it, you can take the MacBook with you. Even with a

All Apple laptops can charge via its Thunderbolt/USB-C ports, but the 14- and 16-ich MacBook Pro also have MagSafe power adapters, a magnetically-connected plug.

nice setup, you just can't do that with a desktop Mac—well, you can, but you'll need a really long extension cord or a portable power source.

A great thing about Apple's updated M1 MacBooks is the improved battery life, and the M1 is much more power efficient than the old Intel processors that Apple used to use. The MacBook Air offers 15 hours of wireless web use, the 13-inch MacBook Pro offers 17 hours, the 14-inch MacBook Pro offers 17 hours, and even the crazy-fast 16-inch MacBook Pro with an M1 Max offers 14 hours. That's more than enough juice to get you through the day, without having to worry about lugging a charger around or even think about where the outlets are.

Apple finally got it right with the Magic Keyboard in its laptops. The Magic Trackpad is second to none.

5. A GREAT TYPING EXPERIENCE

Typing is a big part of working on a computer, so having a good keyboard makes all the difference in the world. Response time, overall sound, and just the general size and layout of the keyboard included in the MacBook makes it easy to fall in love with working from your laptop, even if you're used to the larger keyboards found connected to many desktop computers. Since every MacBook has a fantastic Magic Keyboard, your fingers won't want to use any other keyboard.

The MacBook trackpad is the built-in device for moving the pointer, making selections, and other ways to interface with macOS. Apple set the standard for trackpads with its excellent feel, durability, and versatility. It's the right size and the right feel, and you won't find a better mouse or trackpad anywhere else. ■

5 reasons to buy a desktop Mac over a MacBook

A MacBook may be the attractive, portable option, but a desktop Mac has benefits too.

BY BRITTANY VINCENT

Whether you're making the jump into the Apple ecosystem or updating from an older machine, picking up a new Mac can be a great way to supercharge your productivity. How do you decide which type of Mac is right for you? With so many options to choose from, as well as different types of Macs, finding one that fits your setup and delivers everything you need can be tricky.

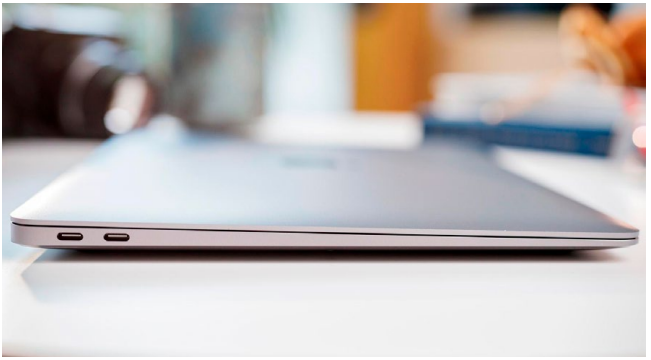
If you're going to pick up a new Mac, then going with a desktop Mac can have some distinct advantages over Apple's portable MacBook options. Don't get us wrong, all of these machines are perfectly capable of doing what you need them to do, but there are some places where the desktop Macs shine brighter than the MacBooks. As such, here are five great reasons to choose a desktop Mac over a MacBook the next time you upgrade.

1. PORTS AND EXPANDABILITY

One of the biggest benefits of buying a desktop Mac over a MacBook is that

IMAGE: APPLE

desktop Macs tend to have more options for expandability. While the newest MacBook Pros have more ports than they've had in many years—three Thunderbolt 4 (USB-C) ports, HDMI, and an SDXC card slot—it's still a far cry from what you get with the Mac mini (two USB-A ports) and Mac Studio (up to six Thunderbolt 4 ports and two USB-A ports), and even the 24-inch iMac has two Thunderbolt 4 (USB-C) ports and two USB 3 ports. An extra port might not seem like much, but it allows you to connect even more external devices—hard drives, keyboards, and other things you might need for your daily work—without hubs and dongles.



The MacBook Air has only two Thunderbolt/USB 4 ports, both on one side. Desktop Macs like the Mac mini offer more ports.

However, the days of tinkering with desktops are over. Even if you get a Mac mini or Mac Studio, Apple silicon Macs do not allow for user-installable internal upgrades, desktop or laptop. The RAM is integrated with the processor, so if you think you need more RAM than the standard configuration, customize your order at the point of purchase. The same goes for the SSD for file storage, though with more ports you can easily add external storage.

The only Mac that Apple currently sells with easy user-upgradable components is the Mac Pro. This computer, however, is designed with high-end professionals in mind, and they're pricey machines. Also, it is one of two Mac models left that still use Intel processors. It's possible that Apple will issue a new Mac Pro (fave.co/3orSP5J) this year with its own silicon that will be user upgradeable, but it might also be just as locked up as the Mac Studio.

2. BRING YOUR OWN DISPLAY

Another big perk for desktop Macs is the versatility they offer with different displays. Yes, it's true that you can connect a display to a MacBook, but you're also paying a higher price for the display that's built into it, which will more than likely be closed when connected to an external display. If you're going to be parked at a desk most

of the time or want the flexibility of a multiple display setup, a desktop Mac is easily the smarter choice.

Just make sure you know what you need. Apple's remaining Intel Macs and Mac Studio can power more than two displays, but Apple silicon Macs are different: the M1 Mac mini is limited to a total of two displays (one via Thunderbolt and another using HDMI). The 24-inch iMac can add a second display via Thunderbolt. Still, that's more than Apple's M1 laptops–the MacBook Air and 13-inch MacBook Pro–which can only connect one additional display, making it difficult to run a proper multi-display setup, and you'll need to drop $1,999 or more on a 14- or 16-inch MacBook Pro for up to four external displays to using the Thunderbolt 4 (USB-C) and HDMI ports.

So if you want the best value for your multi-display setup, choose a desktop Mac and shop around for a good external display.

3. THE MOST SPEED

One of the main reasons you might choose to go with a desktop Mac over a MacBook is Apple's M1 Ultra processor (fave.co/38hcErH). This is the fastest, most powerful chip that Apple has designed to date, and it's only available on the $3,999 Mac Studio.

Don't get us wrong, the MacBook Pros offer insanely good performance, especially on the newer models, but they don't offer the M1 Ultra, which makes Apple's desktop Macs the company's most powerful ever. And because of the M1 Ultra's cooling requirements, it may never make it to a laptop.

Apple's top-of-the-line M1 Ultra System on a Chip is currently only available in the $3,999 Mac Studio desktop computer.

4. DESIGN THAT FITS ANYWHERE

While MacBooks can be extremely portable, they might not always fit

directly into the style and space you have in your office, another area where desktop Macs can shine. While Apple has some of the more basic-looking designs like that of the Mac mini or Mac Studio, the 24-inch iMac gives Apple users multiple color options to choose from. That means you can choose a computer that fits your office's color scheme without having to settle for the more minimalistic silvery color of a standard MacBook.

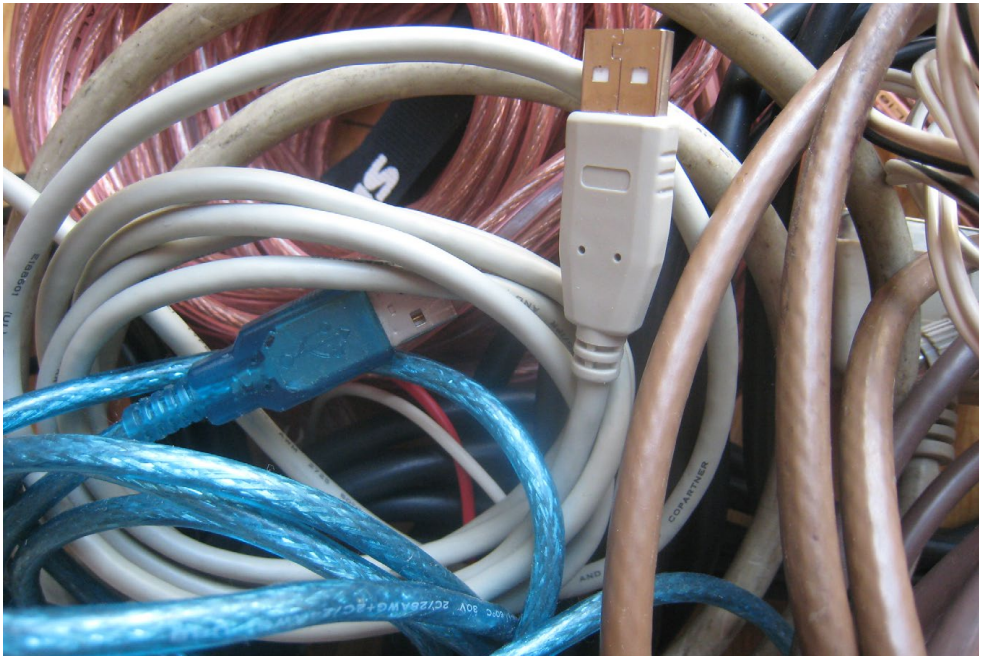
Apple designed the iMac so it'll look good almost anywhere in your home.

Because there are smaller options like the Mac mini and Mac Studio, you can find a powerful computer that blends right into your office space, even if you don't have a lot of room on your desk. That allows you to maximize your desk space without losing a lot of it to your computer.

5. THE BEST VALUE

MacBooks can be exceptionally pricey, especially if you're going for the more powerful models. But you don't have to settle for breaking the bank to get a great Mac computer. Instead, there are multiple pricing options available for several of the different desktop Macs out there. For instance, the new Mac Studio costs the same price as some of the more powerful MacBook Pros, but you're getting more power, more ports, and more features.

Further, the 24-inch iMac which Apple launched with the M1 processors starts out at just $1,299, a good deal cheaper than the newer MacBook Pros with smaller displays. Or you can pair a 24-inch 4K display with a Mac mini for even less. Macs aren't cheap, but with the right combination of desktop and display, you can get a whole lot of computer without needing to bust your budget buying a pricey MacBook Pro. ■



Learn to untangle USB and Thunderbolt cables

Digging into these multi-purpose standards can help you troubleshoot problems and obtain your best connection rates.

BY GLENN FLEISHMAN

One of the world's least-exciting sentences is, "Let's talk about technology standards!" But I promise I'm not digging down into wiring schematics, pinout diagrams, and 1,000-page protocol descriptions. Rather, I want to help you get up to speed on how USB and Thunderbolt work separately and together so you know how you can best use them—and troubleshoot them when incompatibilities arise.

The path forward relies on the latest standards: Thunderbolt 4 and USB4. While

IMAGE: DOM PATES

not perfectly compatible with each other, they are nearly so. Most importantly, the two standards have effectively converged on a single cable type you can purchase and use almost universally with Thunderbolt 3 or 4, and USB 3.1, 3.2, and USB4 via USB-C.

USB: THE ONCE AND FUTURE UNIVERSAL STANDARD

USB was at one point the great hope of the future: Universal! Serial! Bus! All three words pointed in the right direction. Instead of many serial connectors and buses (and even some parallel ports), USB would unify many kinds of purpose into one controller with a limited set of jacks and plugs designed for different purposes. All USB devices could plug into any USB port, given the right cable.

A lovely idea, but one that was ruined by the large number of USB plug types that emerged. There are currently nine kinds of USB connectors. But that's not the only issue: even though you may be most familiar with the rectangular USB Type-A plug and jack, a USB cable cannot have a Type-A plug on both ends, whether full-sized, Mini, or Micro.

In a chart from Wikipedia's extensive USB entry (fave.co/3LM61eL), shown below, the eight kinds of USB connectors run across the top and down the side. The following points are worth noting:

> Type-A can't connect to Type-A: it's noted as ***"Proprietary, hazardous"*** (the pale red squares) as it's that dangerous and bad.

> The profusion of red squares reading "No" also help tell the story about the lack of like-to-like and even unlike-to-unlike options.

> Across the top, you can see Type-A was once the most compatible, connecting to all the B types (four of them) and then to USB-C.

Plugs, each end	USB A	USB Mini-A	USB Micro-A	USB B	USB Mini-B	USB Micro-B	USB 3.0 Micro-B	USB-C
USB A	Proprietary, hazardous	Proprietary, hazardous	Proprietary, hazardous	Yes	Yes	Yes	Yes	Yes
USB Mini-A		No	No	Deprecated	Deprecated	Non-standard	No	No
USB Micro-A			No	Non-standard	Non-standard	Yes	No	No
USB B				No	No	No	No	Yes
USB Mini-B					OTG non-standard	OTG non-standard	No	Yes
USB Micro-B						OTG non-standard	No	Yes
USB 3.0 Micro-B							OTG non-standard	Yes
USB-C								Yes

This chart from Wikipedia has too much detail to read, but the color tells the story.

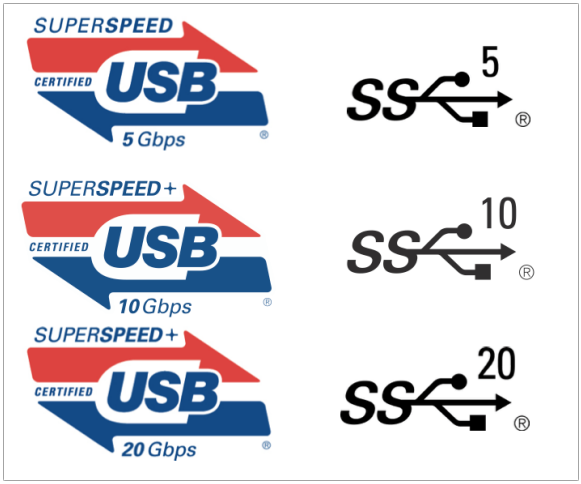
However, the final column reveals the truth and the evolution: USB-C can connect to most formats—mostly importantly, to itself. (Mini-A and Micro-A are so rare, it's not a real missing link that USB-C can't work with them.) I'll return to USB-C in a moment.

USB'S STANDARDS EVOLUTION

As USB connector types proliferated, the underlying technical standard evolved, too. The evolution drove the newer connection formats. USB from 1.0 to 3.0, and from 1.5 Mbps/12 Mbps to 5 Gbps, generally relied on the same rectangular Type-A connector. USB 1.1 (1998) became widely used and was particularly useful for keyboards, mice, and other input devices. USB 2.0 (2000) offered 480 Mbps, providing a rate suitable for external hard drives, and contending for a few years with FireWire 400 and 800 (Apple's choice). But USB won out.

Its standards association, the USB Implementers Forum (USB-IF) released USB 3.0 in 2008, skyrocketed the data rate to 5 Gbps. Marketed as SuperSpeed, it also bumped up power flow from 150 milliamps (mA) to 900 mA, allowing for mobile device charging and bus-powered peripherals.

It was only 2014 that the USB-C connector debuted with USB 3.1. Type-A connectors were limited to 5 Gbps, but USB 3.1 Gen 2, as it was called, could reach 10 Gbps with computers and peripherals equipped with appropriate hardware. In 2017, that was bumped upward again with USB 3.2. A 3.2 Type-A connector can offer 5 or 10 Gbps; a USB-C connector, 10 or 20 Gbps. The USB-IF rebranded its standards names, too, to SuperSpeed USB 5 Gbps, 10 Gbps, and 20 Gbps.



In 2017, the USB-IF rebranded its standards names to SuperSpeed USB 5 Gbps, 10 Gbps, and 20 Gbps.

This is where I ask you to hold on to your socks and remove the space between USB and a digit. USB4 (see, no space) only allows for USB-C connectors and is an

USB4 has separate 20 Gbps and 40 Gbps labeling (left, packaging; right, on devices).

implementation of…*Thunderbolt 3*! USB4 can operate at either 20 Gbps or 40 Gbps; in the latter form, it's marketed and labeled as SuperSpeed USB 40 Gbps.

The evolution of USB was therefore away from profusion and toward the USB-C single jack/plug type that could work everywhere—truly universal at last!

THE EMERGENCE OF USB-C

Finally, a single connection type that was used on both ends of a cable, reversible by 180° as a plug inserted into a jack across its long end, had a compact factor, and could carry up to 100 W of power (and, later, up to 240 W). Power flow could go either way: a laptop or desktop could charge a mobile device or power pack, or vice versa.

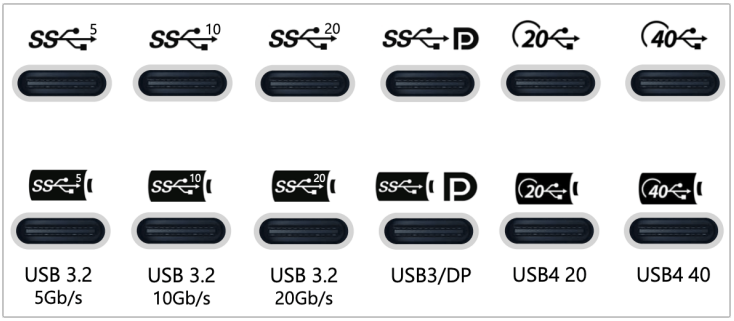
With Intel's adoption of USB-C starting with Thunderbolt 3 and the near-complete convergence of USB on Thunderbolt standards, it's all perfect, isn't it?

Well, no. First, people had invested a lot into equipment that had USB Type-A connectors. Early computers with USB-C jacks tended to scrimp, and docks with many USB Type-A ports were in short supply. From 2015 to at least 2019, people complained endlessly—and largely rightly so—that they had to buy and keep handy a large array of cables, adapters, and mini-docks. By 2020, it seemed to settle down: peripherals switched to either be USB-C based or included a cable or adapter, less-expensive docks were widely available, and computer makers—particularly Apple—decided to include more and different kinds of jacks to reduce the hassle.

Second, during the awkward Thunderbolt 3, USB 3.1, USB 3.2, Thunderbolt 4, and USB4 transition, you could wind up buying a USB-C cable that wouldn't properly connect two devices with USB-C ports, wouldn't connect them at the highest possible data rate (dropping to 10 Gbps, say, instead of 40 Gbps), or would only pass 15 W or 60 W of power instead of 100 W. That problem still hasn't gone away, but it has decreased and will improve even more in the near future.

Third, as USB has moved from 3.1 to 3.2

to 4, and added options for power offered by ports and carried by cables, the profusion of markings has become more than baroque.



It might seem ridiculous, but each of these USB jack labels indicates a different mix of capabilities.

Thunderbolt doesn't replace USB, but the convergence of it with USB does help clear away some of the underbrush, as I explain next.

THE THUNDERBOLT STANDARD

Intel introduced Thunderbolt under the name Light Speed in 2010 and Apple—then a keen user of Intel CPUs—helped set the direction adopted it in all their computers. The original version of Thunderbolt offered what was then a blazing 10 Gbps of data simultaneously in both directions—so blazing that it outstripped most storage and other hardware of the time.

Recognizing the shortage of ports on computers at the time, Thunderbolt was built from the start with support for daisy chaining, similar in concept to the earlier SCSI standard, and something that made sense for stringing together a series of high-performance optical drives, hard drives, or arrays of drives in a single enclosure (RAID). Up to six Thunderbolt devices could be daisy chained.

The original Thunderbolt also allowed DisplayPort to pass over the same connection, and could provide at least 10 W of power.

Intel doubled throughput to 20 Gbps in 2013 with Thunderbolt 2 and then again to a maximum of 40 Gbps in 205 with Thunderbolt 3.

First-generation Thunderbolt and Thunderbolt 2 relied on a plug/jack style identical to Mini DisplayPort. This was conveniently what Apple had already adopted a few years before for external video connections, making the transition easier—at least within that customer segment.

With Thunderbolt 3, Intel adopted the USB-C form factor in a completely

standard fashion. Thunderbolt 3 brought several features and options to the communication standard. This is what you should expect from any Thunderbolt 3 port on any computer or device:

40 Gbps (jack only): Thunderbolt 2 maxed out at 20 Gbps; all Thunderbolt 3 ports have to support 40 Gbps. However, depending on the cable, you might achieve only 20 Gbps; see Thunderbolt Capabilities in Link Devices with Cables.

4K displays: Each Thunderbolt 3 controller must support at least a single 4K display at 60 Hz using DisplayPort 1.2. However, later versions of Thunderbolt 3 controllers could optionally incorporate DisplayPort 1.4 and handle up to two 4K displays at 60 Hz, one 4K display at 120 Hz, or one 5K display at 60 Hz. (The 5K option initially required a controller unique to Apple's computers.)

Minimum 15 W power: Where Thunderbolt and Thunderbolt 2 had to deliver up to 10 W, Thunderbolt 3 starts at 15 W, more appropriate for charging a later generation of smartphones and tablets.

Peer-to-peer networks: Thunderbolt allows computers to daisy chain together and achieve up to 10 Gbps, as if they were connected by 10 Gbps Ethernet. (See Use Peer-to-Peer 10 Gbps Thunderbolt.)

Optional USB Power Delivery: With support for USB Power Delivery, a Thunderbolt 3 port can optionally push up to 100 W of power to a compatible device, like a laptop.

Optional hubs: Thunderbolt 3 could allow for up to four-port Thunderbolt hubs. This feature wasn't generally supported until Thunderbolt 4 became available.

Thunderbolt 4 amps things up a bit by increasing minimum requirements or making optional Thunderbolt 3 features mandatory in Thunderbolt 4.

The two biggest changes that might affect you directly are cable and compatibility improvements. First, Thunderbolt 4 cables up to 6.6 feet (2 m) don't have the "active" circuitry requirement that was needed in Thunderbolt 3 to achieve 40 Gbps regardless of cable length. Second, Thunderbolt 4 jacks must be fully backwards compatibility at least 10 Gbps USB 3.1/3.2, but can support up to 40 Gbps USB4.

The result is the *elimination* of the major host/cable/peripheral compatibility that has dogged Thunderbolt. With a Thunderbolt 4 jack and Thunderbolt 4 cable:

> Any cable connecting a Thunderbolt 4 jack to a USB 3/USB4 peripheral port over USB-C will always work and always offer at least a 10 Gbps data rate.

> Based on market research so far, any Thunderbolt 4 cable is also fully USB4 compatible. When connecting any two

Thunderbolt 4, USB 3.x, or USB4 jacks with such a cable, you will always achieve the maximum common data rate.

This change alone should bring a lot of relief from cable clutter, standards confusion, and frustration over low data rates or incompatibility. But there's more! Here's what else you can expect from Thunderbolt 4:

USB4 requires a minimum of only 20 Gbps, not 40 Gbps.

Always 40 Gbps: Thunderbolt 4 accepts no compromises. All jacks and cables must support 40 Gbps.

Two 4K displays: Thunderbolt 3 could optionally handle up to two external 4K displays at 60 Hz; that's now the minimum requirement for Thunderbolt 4.

Required 100 W power on a host: Any computer with Thunderbolt 4 must have at least one jack that delivers up to 100 W.

Minimum USB support: As noted above, all Thunderbolt 4 jacks must support USB 3.2 Gen 2×1 and 1×2 (10 Gbps), but can optionally support up to USB4 (20 Gbps and 40 Gbps).

Wake from sleep: While not a marquee feature, Thunderbolt 4 requires that a host computer monitor the port for a "wake from sleep" signal. This allows a peripheral to wake the host. A similar feature was added to Ethernet in 1996, called Wake-from-LAN.

Thunderbolt ports on dock: Instead of being an option, operating systems and jacks must allow up to four external Thunderbolt 4 ports on a dock.

USB AND THUNDERBOLT COMPATIBILITY

The biggest area of port and cable confusion I ever encounter is the matrix of compatibility between generations of USB and Thunderbolt. It's natural to be confused: the two have converged, but in what ways? Here are the simplest ways to distinguish the capabilities of USB4 and Thunderbolt 4:

Thunderbolt 4 is almost entirely a superset of USB4: Thunderbolt 4 has

support for USB Power Delivery specification only up to 100 W. Some Thunderbolt 4 controllers might not support 20 Gbps and 40 Gbps USB4, making it impossible for a USB4-based peripheral or host to exceed 10 Gbps between two devices.

USB4 is a superset of Thunderbolt 3, not including the mandatory elements of Thunderbolt 4: USB4 requires a minimum of only 20 Gbps, not 40 Gbps, making a USB4 controller on a host or peripheral potentially slower than a pair of Thunderbolt 4 devices. It can deliver up to 240 W of power.

These differences largely apply if you're have a high-performance environment in which the difference among 10, 20, and 40 Gbps throughput is crucial. For most people, owning a computer with a Thunderbolt 4 port and purchasing a 10 Gbps USB 3.x or USB4 device won't have a high impact.

But it also makes your choice of cables and peripherals moving forward far simpler than in the past.

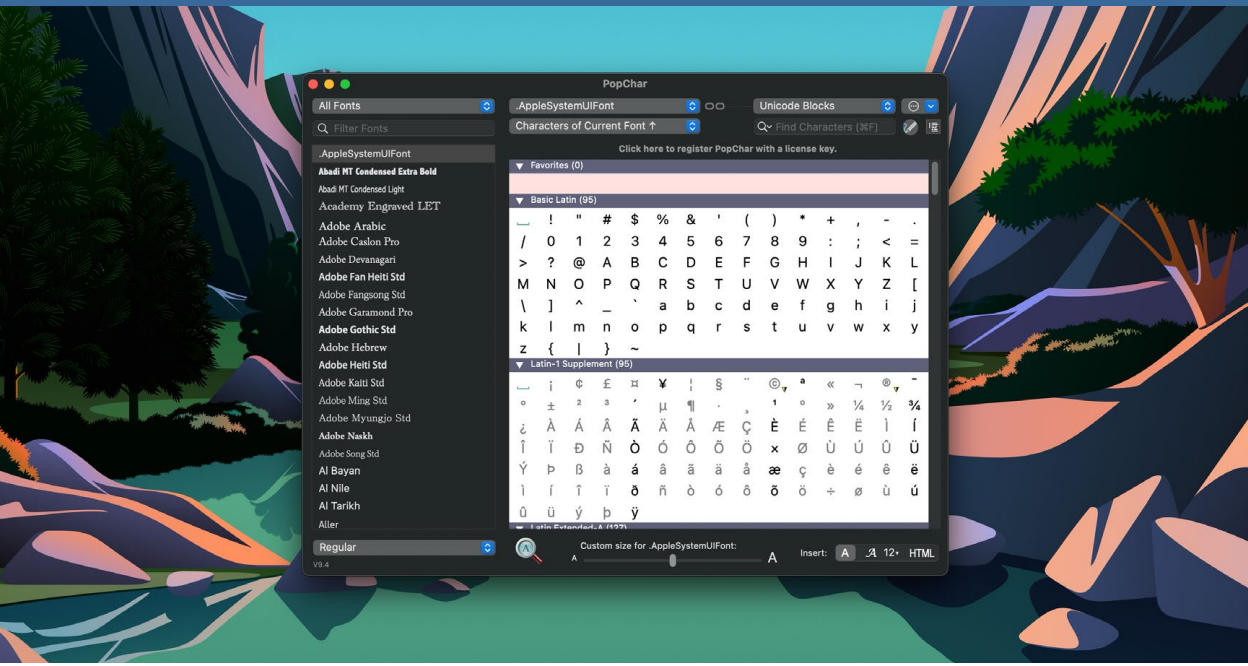
First, when buying new peripherals check the capabilities of your computer or mobile device. If it only supports USB 3.0, 3.1, or 3.2, you can opt for what is typically a far cheaper USB 3-only peripherals, like an SSD, than a Thunderbolt 3 or 4 model. For Mac users, you can often pick between USB 3.x and Thunderbolt 3 or 4 on the basis of performance and cost because Apple offers Thunderbolt 3 and USB 3.1 all from all new Macs starting in 2016.

Second, when buying a new cable, your best choice is almost always a Thunderbolt 4/USB4 cable. While Thunderbolt 3 cables were quite expensive relative to USB-only ones, a new generation of Thunderbolt 4/USB4 cables from many manufacturers cost about $25 to $60 from about half a foot to two meters. These cables are universally compatible among USB 3.1 and later and Thunderbolt 3 and later, and work with adapters with older standards.

Third, avoid two kinds of cables: "Charging-only" USB-C cables, which offer up to 100 W of power but only 480 Mbps of data; Apple still ships one of these with some of its laptop models; and "active" Thunderbolt 3 cables if you work with a mix of USB 3.x and Thunderbolt hardware. An active Thunderbolt 3 cable throttles USB to 480 Mbps as well; a Thunderbolt 4/USB4 cable works at the full 5 Gbps to 40 Gbps rate available across USB 3.0 to USB4.

Most of the compatibility confusions, cable clutter, and port mismatches of the past have disappeared with new standards and cables. Keep yourself informed to get the best results with legacy gear, but you can look forward to a simple future. ■


WHEN THE GAMES BEGIN.
NEVER GIVE UP
UNTIL THEY BUCKLE UP.
VISIT SAFERCAR.GOV/KIDSBUCKLEUP
NHTSA
www.nhtsa.gov
Ad Council



FONT UTILITY

POPCHAR X: FIND THE CHARACTER YOU NEED IN A FONT WITHOUT FUSS

BY GLENN FLEISHMAN

Few pieces of Mac software can claim the history of PopChar (fave.co/38I8YQ4), a utility that makes it a click and a hover to see the appearance of individual characters in fonts installed on your Mac. Released in 1987 for System 5 and revamped as PopChar X for Mac OS X 10.2 in 2002, many current users weren't born when some of us relied on PopChar as a critical part of our daily workflow in PageMaker, QuarkXPress, and InDesign. (Or even Ready, Set, Go!)

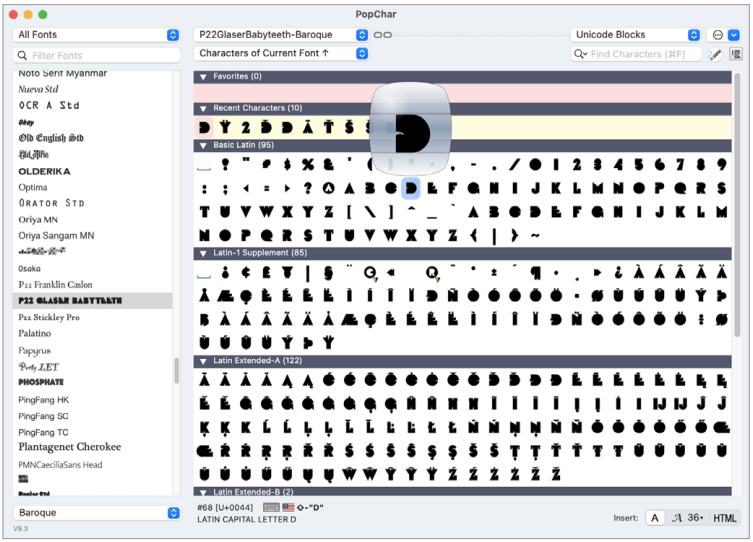
From its earliest days, PopChar *popped*. When you click in a preferred corner of the screen, the utility pops out, giving you easy access to hundreds to tens of thousands of characters in a given

IMAGE: ERGONIS

font in its palette-like window. Examine the repertoire available in the font. Hover over a letter to get more information. Click to insert it as plain text, rich text (at a specified size, even), or HTML. And browse your installed typefaces to find the right fit for what you're designing or producing. You can adjust a given font's viewing size individually if the default is too large or too small.

Even when adding Shift and/or Option, pressing keyboard keys only reveals a fraction of modern fonts' characters. (A font here is a set of characters, or *glyphs*, in a given typeface and style packed into a font file.) Many typographic extras are hidden. You either need to use a design program with a view-all-characters option—like Adobe InDesign's Glyphs viewer—or use the Typography option in the Fonts palette, accessible within Pages and many other apps. (See "How to make use of typographic refinement in Pages and other macOS software [fave.co/3yYcikr].")

Fonts hide many extras. Many fonts include full Latin, Greek, and Cyrillic alphabets; swash characters; oodles of ligatures, or combinations of letters drawn together to avoid clashing stroke parts; small caps, which are essentially "lowercase" capitals; lining ("uppercase") and old-style ("upper/lowercase") numerals; superscripts and subscripts; and other symbols.



PopChar's main view lets you select a font and then view its entire set of character organized in various ways. The status bar at bottom shows you detailed information, including how to type it (if available) and what format to insert it in.

Apple provides little help, and that's why PopChar continues to flourish. Before Mac OS X, Apple's Key Caps

app let you select a font and see how characters appeared on a keyboard. OS X brought Font Book, which can reveal the entire set of characters in a style of a typeface—but not provide any organization, ease of access, or simple insertion into a document.

Beyond scanning characters visually, you can retrieve information about them. Hovering over offers two sets of choices: review information in a packed status bar at the bottom or Control-click for contextual goodies.

The status bar shows all the technical details of the glyph: its decimal number, its Unicode code point, and its full human-readable description in Unicode. The app shows a keyboard symbol plus a flag corresponding to your currently selected keyboard layout. If the keyboard symbol has an X through it, the character can't be typed with that layout; otherwise, the combination of modifier keys and keycaps you need to press appears.

PopChar recognizes your keyboard layout and lets you know how to type characters if they're available. Here, a Greek keyboard layout is in use.

The contextual menu lets you copy the character's underlying information as well as find similar glyph shapes and mark the character as a favorite. Select Character Info, and you can view all the font's details in a dialog box, including a pleasing grid display that shows how the letter or symbol maps against standard typeface measurements. You can also see the same glyph across all fonts that contain it in Character Info's Fonts tab.

If you need a particular character and want to see which fonts have it, hover over the character in a face that does, Control-click, and select Mark Fonts Containing "[character]". PopChar puts an identifying

PopChar offers multiple methods, including via a contextual menu, to find the same "glyph" or character across all your installed fonts.

symbol next to each font in the left-hand font list that contains a glyph for that item.

Click instead of hovering or Control-clicking and the glyph is placed at the current insertion point in a document, if such a point exists. You can choose in the status bar to insert as plain text, rich text at a size at intervals between 9 and 36, or as raw HTML. That last option inserts an *entity*, or the form of the character that works with nearly any HTML encoding.

You can use PopChar in a lot of ways. You might know or want to find out if a given special character exists in a font you're using. You could be trying to figure out the typeface that works for a design or interface but need to examine what the font offers in full before proceeding. Looking for a flourish or symbol? You can quickly scan through font collections you've organized in Font Book using PopChar.

Ergonis, PopChar's developer, lets you try out PopChar indefinitely by installing a free version that reveals only a subset of characters in each font. The company prices its software in euros: a single-user license is €29.99 (about $33) for two machines owned by the same person or company, and a same-household, non-commercial license for up to five machines is €49.99 (about $55).

PopChar remains a useful adjunct for print and interactive designers and interface builders 35 years after its introduction. If you have the motor memory of twitching your cursor into a corner and clicking, it will come back to you. If not, you'll quickly find revealing PopChar becomes an instinct. ■

PopChar X

PRICE
$33

COMPANY
Ergonis

THUNDERBOLT 4 DOCK

CALDIGIT THUNDERBOLT STATION 4 REVIEW: THE ULTIMATE THUNDERBOLT HUB FOR YOUR MAC

BY GLENN FLEISHMAN

Macworld EDITORS' CHOICE

Apple had a habit of being stingy with ports on its Macs for many years. The low-water mark was the 12-inch MacBook (fave.co/3Gh0SKi), the first of its computers with USB-C—and it sported just a single USB-C port for power and peripherals. Later iterations of the MacBook Air at least upped the count to two USB-C ports. Apple is changing, though—the company became downright baroque with the 2021 M1 Pro and M1 Max 14-inch and 16-inch MacBook Pro models, providing something closer to a pre-2016 range of built-in connectivity options.

But many laptop owners and some with desktop Macs still long for more

IMAGE: CALDIGIT

ports—sometimes a lot more. If you ever felt, "What I really need is a dock with 18 jacks in it that draws over 200 watts of peak power," the CalDigit Thunderbolt Station 4 (fave.co/3hRzUh3) (TS4) may answer your cry.

The TS4 has an almost absurd profusion of ports splayed across its front and back sides. Yet the choices about which ports and how many are thoughtful. It's also not so much a dock as a combination of port extender and charging station, given its power-output design for recharging mobile devices and laptops.

This is a modern Thunderbolt 4 dock, offering Thunderbolt hub support, an option for Thunderbolt 3 and required for Thunderbolt 4. To use the dock to its fullest extent, you need either a Mac with macOS Big Sur 11.4 or later installed. That can be an Intel Mac with Thunderbolt 3 or any M1-series Mac. (Big Sur's 11.1 release enabled the optional feature on Macs with Thunderbolt 3; CalDigit seems to require a later update of Big Sur.)

A PROFUSION OF PORTS

Let's start with the rundown because this dock has—as I've said—a lot of ports:

> Six USB-C jacks (three Thunderbolt 4/USB4 and three USB 3.2 Gen 2)

> Five USB Type-A jacks (also 3.2 Gen 2)

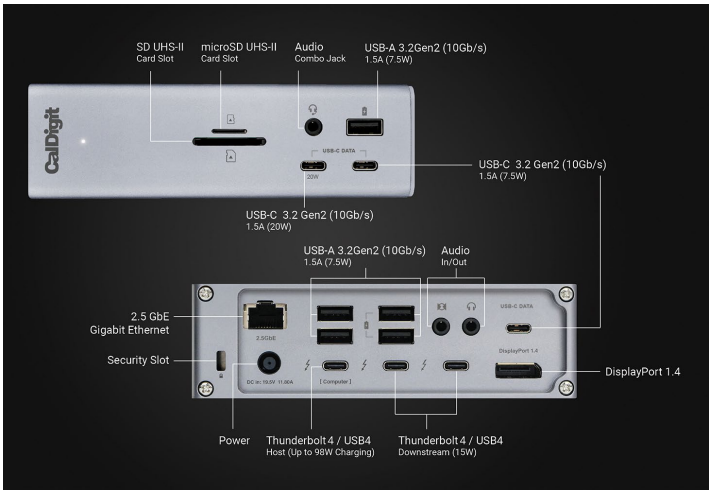
> One 2.5Gbps ethernet port

> Two memory card slots: SD UHS-II and microSD UHS-II

> Three audio jacks for input, output, and the in/out combo

> One DisplayPort 1.4 port

As with all USB-C-based ports, you have to devote one of your computer's Thunderbolt connections to the dock; likewise, the dock has a connection



There's no stick big enough to shake at all the ports found on the CalDigit TS4. What's more, the collection for data, video, and charging make sense for a user looking for a high-end desktop dock.

specifically designed for the computer. If you're connecting the dock to a laptop, as is likely, you can take advantage of the up 98W charge that passes over the dedicated computer port.

When you run the math on this dock, you don't wind up with much additional Thunderbolt connectivity: the two unused Thunderbolt jacks on the dock replace the one occupied on your computer and net you just one additional.

Front-facing jacks provide spring-loaded SD Card slots, three USB 3 ports (one offering 20W charging over USB-C), and audio output for headphones.

CalDigit's USB-C and Type-A jacks that use USB 3 standards are all 3.2 Gen 2's 10Gbps flavor, allowing throughput up to that data rate over both USB-C and Type-A. (A compatible 3.2 Gen 2 Type-A device is required on the other end, of course, otherwise it drops to 5Gbps.) The USB-C Thunderbolt 4 ports are indistinguishable from Thunderbolt 3 in function and are backward and cross-compatible with USB standards.

The inclusion of 2.5Gbps ethernet is a nice bump up from 1Gbps, and reflects the growing availability of faster-than-gigabit wired networking available in the home and small office, and the inclusion of 2.5Gbps LAN ports on some higher-end home Wi-Fi gateways. You'll appreciate it if you're moving large files around your network or have a faster-than-gigabit internet connection.

The SD card slots have the extra of being spring-loaded. The extra push required makes it clear when you've fully inserted a card and gives you a little help when ejecting to remove it.

With this many ports, a little help managing mounted connected devices can help. CalDigit offers a Mac utility that shows all connected drives and allows a single click eject of those drives to avoid disconnecting the dock with mounted volumes. That software also allows the TS4 to support the Apple USB SuperDrive. SuperDrive support is uneven (fave.co/3GgIDWy) via docks and adapters due to peculiar power requirements.

CalDigit isn't cheating with its port claim, by the way: the security slot and power jack (for up to 19.5 volts at 11.80 amps, or 230 watts) aren't included in that total of 18. This gives CalDigit what I believe is the current bragging rights for most ports on a Thunderbolt dock.

The Thunderbolt Station 4 conserves your Thunderbolt 3/4 jacks with a built-in DisplayPort connection.

POWER TO THE MACS—AND iPADS

That's the data side, but CalDigit considered recharging as a fundamental part of this AC-powered mega-dock. It requires a separate rundown to understand how it powers devices and at what wattages.

CalDigit pushes out three other wattages via specific ports:

> Two of the three USB-C ports that handle just USB 3.2 Gen 2 (one on the front, one on the back) provide up to 7.5W (at up to 1.5A).

> All of the USB Type-A ports, also USB 3.2 Gen 2, offer the same (one of those is on the front; four on the back).

> The front-facing USB-C jack delivers up to 20W (at 1.5A).

> The two rear-facing Thunderbolt 4 ports can pass up to 15W.

Because the dock can suck in so much power, you can actively charge a laptop, an iPad, and multiple other mobile devices, including an iPhone, at full speed or nearly full speed.

CALCULATING THE NUMBER OF VIDEO ADAPTERS

The video part of the equation is quite complicated. Mac video support for external displays resembles the myth of snowflakes: no two is alike. It's not entirely true, as a handful of Mac models can allow up to the same number and mix of external monitors. (My complete rundown on display support is here [fave.co/35VEFDq].)

Of Intel and M1 Macs of the last decade

or so, some models include an HDMI port to allow a display of up to 4K resolution in addition to any other external displays allowed over other ports. For all Macs introduced since 2015, any other display is added via a USB-C connector on a Thunderbolt 3 or 4 port. (A handful of monitors have native USB-C-based DisplayPort connectors.)

Adding a dock doesn't increase the number of displays you can attach to a Mac (or to a PC), but it does make it easier to do so and keep more ports free for other purposes. The TS4 includes a standard DisplayPort jack, reducing the need to use a Thunderbolt port with an adapter for most monitors. If your Mac can handle one 4K display via HDMI and one higher-resolution one over USB-C, the TS4 DisplayPort connection means you need no adapters at all.

If you want to add more displays or at higher resolution than a potential native built-in HDMI jack on your Mac and the TS4's DisplayPort jack, you can only use a Thunderbolt port on the TS4 or one built into the Mac. That could come into play with newer Macs, like the Mac Studio and 14- and 16-inch MacBook Pros. The USB-only USB-C ports don't carry DisplayPort video. (The dock splits USB 3.x traffic off separately from DisplayPort data.)

CalDigit has an extensive table about the quantity of displays support across which ports and at which resolutions for both Mac and PC models on the TS4 product page (fave.co/3hRzUh3).

VERDICT

The CalDigit TS4 is the perfect hub if you want to set up a workstation with multiple monitors, external drives and peripherals, and wired input devices. You can just add your Mac laptop, and you're ready to go. Some Mac mini and iMac owners might also find it useful for the sheer number of additional ports and the wattage that can be fed out of many of them for bus-powered devices and charging mobile hardware.

The only flaw in this jack-festooned dock is that it adds a net of one Thunderbolt 4 port. A net of two would have been better. But that may not be a drawback for the audience it appeals to—and where would you have put yet another USB-C jack on this device?

You no longer need to imagine the ultimate Thunderbolt 4 dock. It's here, and it's the CalDigit TS4.37. ■

4½

CalDigit Thunderbolt Station 4

PROS

- Provides a desktop's worth of ports for a laptop user.
- Acts as charging station for laptop, phone, tablet, more.

CONS

- Only adds a net of one Thunderbolt port.
- Requires Big Sur 11.4 or later.

PRICE

$199

COMPANY

CalDigit

Hot Stuff

What we're raving about this month

SONOS ROAM

sonos.com

Introduced last year, the Sonos Roam portable spear was available in Black or White. The company has now expanded the color choices to include Olive, Wave, and Sunset. It's still 6.1 x 2.4 x 2.4 inches, weighs a hair less than a pound, and has a 16mm tweeter and an oval mid-woofer. And given its compact form factor, the Roam still packs in exceptional—sometimes shockingly exceptional—sound. The Roam's audio quality gets a solid assist from its Auto Trueplay feature, which automatically tinkers with the sound whenever you pick up the Roam and place it down in a new location. **—BEN PATTERSON**

PRO-JECT E1 BT

pro-jectusa.com

This turntable connects has a built-in phono preamp and it can connect to a line-level input of any receiver or integrated amplifier, even the auxiliary input of a smart speaker. You can also turn off the phono preamp use it with another device with a dedicated phono input. Since it also has Bluetooth, you can also use the turntable with most Bluetooth-enabled speakers and soundbars as well as A/V receivers that have Bluetooth receivers. Each turntable includes an Ortofon OM5 cartridge factory-mounted on the aluminum tonearm, and a hinged acrylic dustcover. **–KEVIN HUNT**

Hot Stuff

SWITCHEASY MAGMOUNT MAGNETIC iPAD STAND

switcheasy.com

For iPad Pro users who are truly invested into Apple's look and feel, the MagMount is the only stand to get. This aluminum stand is designed to look like an iMac's stand—so much so that a mounted iPad Pro or iPad Air looks like a miniature iMac. iPads attach magnetically and the stand rotates 360 degrees and tilts 180 degrees, so you can position the iPad in just about any position. A silicone rubber pad underneath the stand keeps it in place. **—ROMAN LOYOLA**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YOUR RETIREMENT. YOUR RULES.
Learn how to save for your retirement at **WeSaySaveIt.org**.
WE SAY $AVE IT
AARP
ad COUNCIL

>> How a silver lining forms

>> It starts at sea.
>> Tropical waters heat up.
>> Warm air soars skyward.
>> Cold air rushes to the void.
>> Cold air warms up.
>> Cycle repeats.
>> Faster and faster—a 50,000 foot engine of air.
>> At seventy four miles per hour it earns a name.
>> Harvey, Irma, Katrina.
>> Then landfall.
>> Roads rendered useless.
>> Buildings destroyed.
>> Families stranded.
>> But for a brief moment,
>> A silver lining appears.
>> People see neighbors instead of strangers.
>> And labels that divide are forgotten.

>> But when rains ease,
>> when clouds part,
>> silver linings need not fade.

>> Let's embrace our shared humanity.
>> Let's connect with one another.
>> Let's find our love for each other.
>> Every single day.

>> Come together at lovehasnolabels.com

love has no labels

ad COUNCIL

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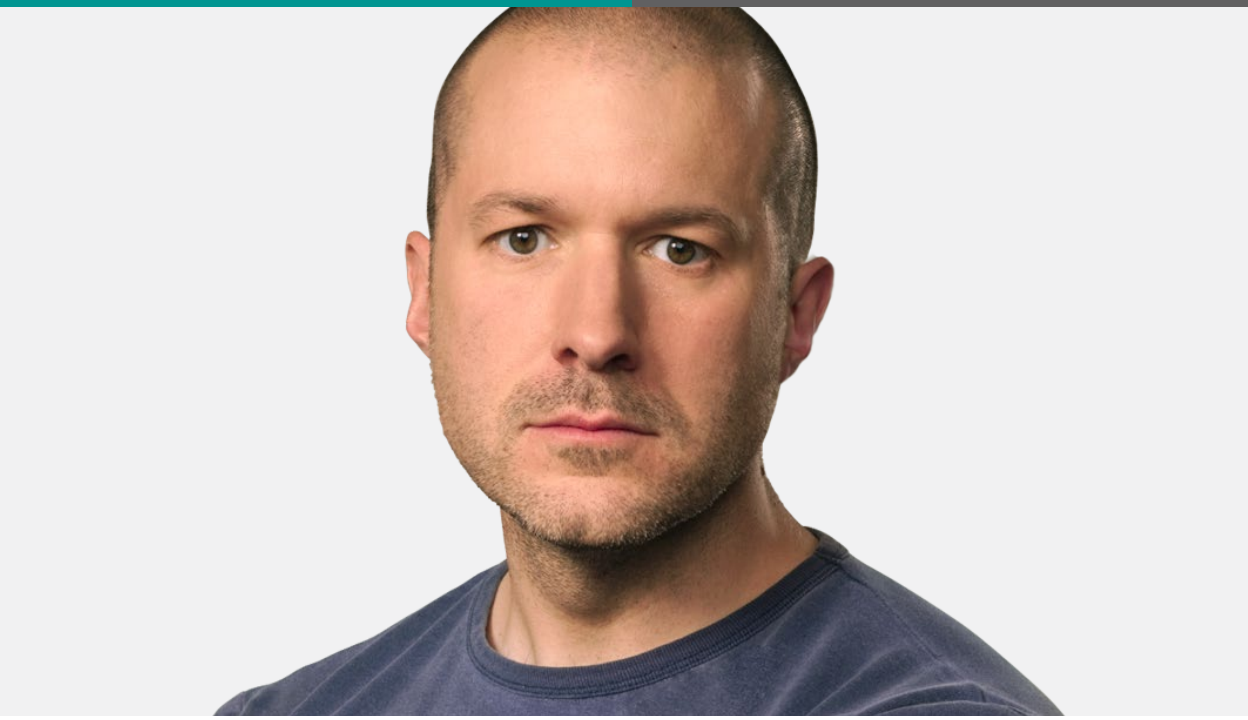


Apple exposé details how the $25M Apple Watch keynote led to Jony Ive's departure

New York Times reporter details tumultuousness following Steve Jobs's death.

BY MICHAEL SIMON

When Jony Ive announced in July 2019 that he was leaving Apple, there was rampant speculation as to why. Some thought it was due to a shift to services, others mused that Ive was bored since Apple's products had become more iterative following Steve Jobs' passing. But the real reason has nothing to do with a product at all, it was a product announcement.

According to New York Times reporter Tripp Mickle's new book (fave.co/3GoLk7A),

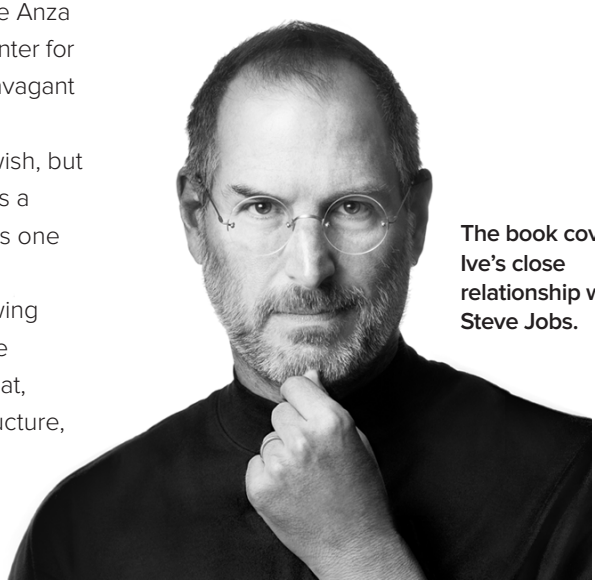
IMAGE: APPLE

Tripp Mickel claims Jony Ive's souring on his position began with the introduction of the Apple Watch in 2014.

"After Steve: How Apple Became a Trillion-Dollar Company and Lost Its Soul," Jony Ive's souring on his position at Apple began with the Apple Watch introduction in September 2014. Ahead of the event (fave.co/38jaelY), Ive pushed CEO Tim Cook to remove two dozen trees from the De Anza College campus next to the Flint Center for the Performing Arts to erect an extravagant white tent for the hands-on area.

After much debate, Ive got his wish, but people close to him say he saw it as a Pyrrhic victory and felt the issue was one of "the first moments that he felt unsupported at Apple." In the following months and years, Mickle writes, Ive openly griped about "corporate bloat, chafed at Mr. Cook's egalitarian structure, lamented the rise of operational leaders, and struggled with a shift in the company's focus from making devices to developing services."

The book covers Ive's close relationship with Steve Jobs as well as his 20-year history at Apple. It also reveals his "wilderness of grief" following Jobs's death, clashes with Apple's finance team, and $100 million-plus exit package. The book is available now, and can be bought on Apple Books (fave.co/3sXRZA9) or wherever books are sold (fave.co/3wLx4CC). ■



The book covers Ive's close relationship with Steve Jobs.

Apple to support ‘passwordless’ iPhone logins on Android phones and PCs

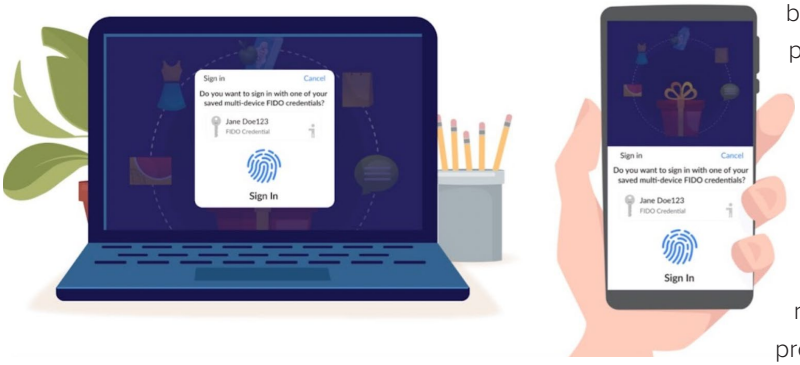
New partnership with Microsoft and Google marks World Password Day by working together to eliminate passwords once and for all.

BY MICHAEL SIMON

To mark World Password Day, Apple has announced (fave.co/3LTf8ds) a partnership with Google (fave.co/3apEpPx) and Microsoft to get rid of them. According to joint press releases, the three companies are working on new capabilities for that would “expand support for a common passwordless sign-in standard” across website and apps using your iPhone.

Apple hails the partnership as “radically more secure when compared to

IMAGE: PROSTOCK-STUDIO/SHUTTERSTOCK



The aim of the partnership is a "passwordless sign-in standard."

passwords and legacy multi-factor technologies such as one-time passcodes sent over SMS" and focuses on two main components:

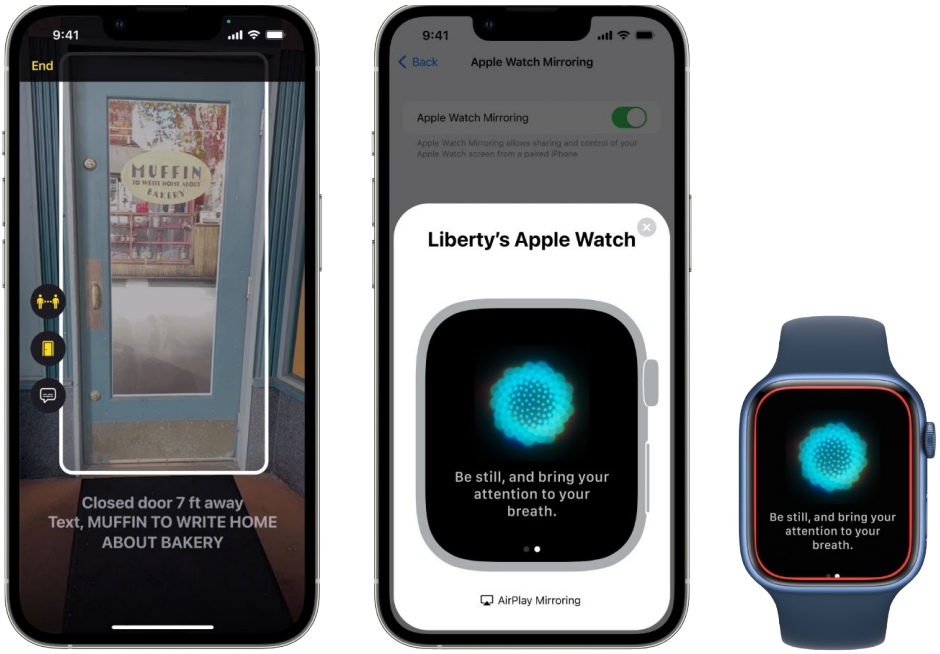
1. Allow users to automatically access their FIDO sign-in credentials (referred to by some as a "passkey") on many of their devices, even new ones, without having to reenroll every account.

2. Enable users to use FIDO (fave.co/3yZKn3G) authentication on their mobile device to sign in to an app or website on a nearby device, regardless of the OS platform or browser they are running.

Here's how it'll work. The new passwordless process will let you choose an iPhone as a method of authentication by storing a FIDO passkey on the device. Then when you sign into the app or service on any device, your iPhone will receive a prompt to use Face ID, Touch ID, or a passcode to allow access. It's similar to the way Apple uses trusted devices as two-factor authenticators when logging into iCloud accounts and Apple services.

Apple doesn't give a release for the new capabilities but says they are "expected to become available across Apple, Google, and Microsoft platforms over the course of the coming year." ■

Apple says these abilities will be available later this year.



Apple previews Live Captions, Apple Watch gestures coming later this year

Apple is bringing several new accessibility features to iPhone, iPad, and Mac.

BY ROMAN LOYOLA

Ahead of WWDC beginning June 6, Apple on Tuesday announced a set of accessibility features (fave.co/3lNhTSU) for the iPhone, iPad, and Mac that will be coming "later this year." The software features are for "users with disabilities to navigate, connect, and get the most out of Apple products."

Apple did not announce how the new accessibility features will be rolled out, though they're likely to be part of the next

IMAGE: APPLE

crop of operating systems. Apple is expected to reveal iOS 16, iPadOS 16, and macOS 13 at WWDC, but Apple's press release did not specifically state whether the new features are part of these new operating systems or the current versions. Here are the new features coming to Apple devices.

DOOR DETECTION

The iPhone and iPad's Magnifier app will get a new Detection Mode feature that supports Door Detection, which will help users locate doors and provide information about the door itself (such as numbers, symbols, or signs), if it is open or closed, and how the door can be handled. Door Detection can work with the Magnifier's People Detection and Image Descriptions to help with navigating an area. Apple Maps will also have sound and haptic feedback to help find the starting point for walking directions.

APPLE WATCH MIRRORING, QUICK ACTIONS

This feature mirrors the Apple Watch user interface on a paired iPhone, giving users access to Apple Watch controls on the iPhone instead of using the watch itself. iPhone's Voice Control and Switch Control can be used to interact with Apple Watch, as well as voice command, sound actions, head tracking, and external Made for iPhone switches.

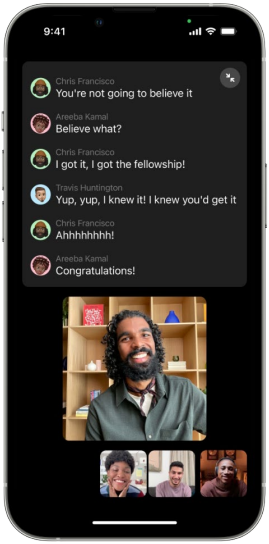
Quick Action is a double-pinch gesture that can be used for several Apple Watch functions, including answering or ending phone calls, dismissing notifications, taking pictures, play or pause in the Now Playing app, and start, pause, or resume a workout.

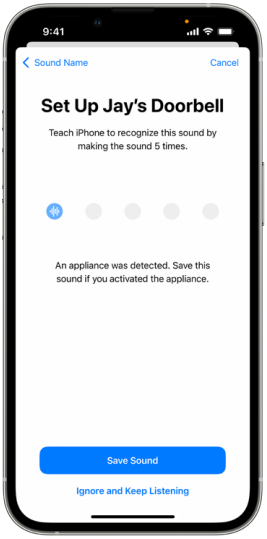
The Double Pinch Quick Action will be available on the Apple Watch.

LIVE CAPTIONS

Live Captions will be available on iPhone, iPad, and Mac on "any audio content." Apple states FaceTime calls, video conferencing, streaming media content, and

Live Captions will be available in FaceTime group calls.





Sound Recognition can be adjusted to learn sounds specific to an environment.

in-person conversations as examples where Live Captions will work. Live Captions will have adjustable font sizes and appear to all participants in a group video call, and typed responses can be spoken aloud. Live Captions are generated on the device, which means a user's privacy is secured.

VOICEOVER, SIRI PAUSE TIME, AND MORE

Other new features include:

> **VoiceOver** support for over 20 new languages and **VoiceOver on Mac** will have a new **Text Checker tool** to look for formatting issues in written text.

> **Buddy Controller** combines two game controllers into one that can be used for the input of a single player.

> **Siri Pause Time**, which allows manual adjustment of Siri's response time.

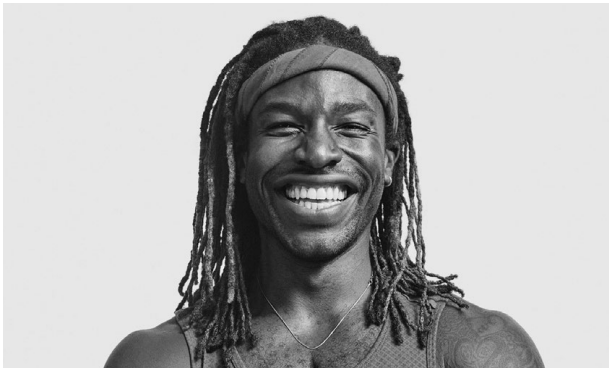
> **Voice Control Spelling Mode** allows dictation of custom spellings using letter-by-letter input.

> **Sound Recognition** can be adjusted to learn the sounds specific to an environment.

> **Apple Books** will have features to make books easier to read, as well as new themes.

GLOBAL ACCESSIBILITY AWARENESS DAY

Global Accessibility Awareness Day (fave.co/3LOmO0w) is on May 19, and Apple made several announcements to



Apple Fitness+ trainer Bakari Williams use American Sign Language to showcase accessibilty features.

commemorate the day:

> **SignTime** is expanding to Canada. This provides Apple Store and App Support customers with on-demand American Sign Language interpreters.

> **Live sessions** about iPhone accessibility will be happening in Apple Stores.

> Apple Support **social channels** will feature how-to content.

> The **Shortcuts** app on Mac and Apple Watch will have support for the Accessibility Assistant.

> **Apple Fitness+** will have trainer Bakari Williams use American Sign Language to showcase accessibility features.

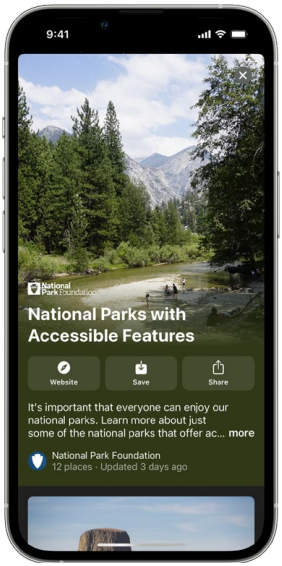
> New guides in **Apple Maps**. There is one for the National Park Foundation, Park Access for All, and a set of guides from Gallaudet University (fave.co/3wQgiB1) that focuses on sites that prioritize service to the deaf community.

> The **App Store** will highlight accessibility apps.

> **Apple Books** and **Apple Podcasts** will showcase stories by and about people with disabilities.

> **Apple Music** will offer **Saylists** playlists, a collection of playlists that each focus on a different sound to practice vocal sounds or speech therapy.

> **Apple TV+** will showcase movies and shows of "authentic representation of people with disabilities." ■

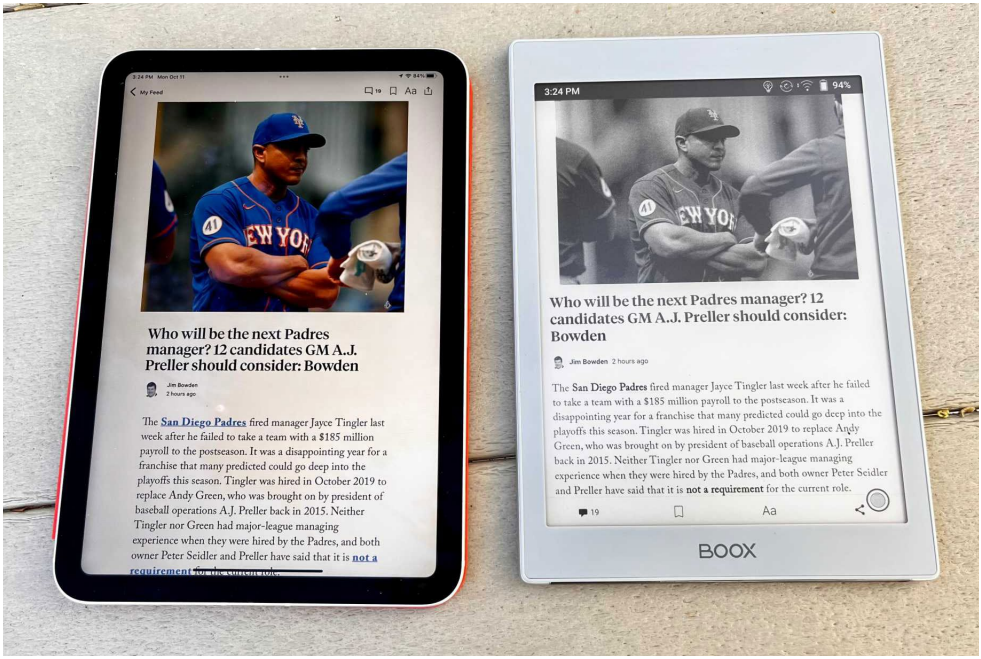


Apple has added new guides to Apple Maps.

An Apple E Ink display could be a game-changer—even without a folding iPhone

The unique screen tech opens up some real opportunities.

BY JASON SNELL



Earlier this week, supply-chain analyst extraordinaire Ming-Chi Kuo suggested that Apple's investigating E Ink displays (fave.co/3GjIS1U) for future foldable iPhones. Now, Apple surely investigates lots of things—and most of them never make it across the finish line to become real products.

But as a long-time admirer of E Ink as a technology, I'm excited about the possibility that Apple might use it in future

IMAGE: JASON SNELL

devices. E Ink is a niche technology with some very real limitations, but it's also got some huge advantages.

WHAT'S E INK?

E Ink is a display technology (fave.co/3MSstUF) that's fundamentally different from LCD, OLED, and other display technologies. It works by using electricity to set tiny capsules of pigment to show or hide. The result is a surface that works more or less like traditional ink on paper, hence the name.

Since an E Ink screen only uses power when the screen is being rewritten, it's great for applications in which the display doesn't update very often. Most people know E Ink displays from e-readers like Amazon's Kindle and Rakuten's Kobo. These devices can have very long battery lives because they're generally only using battery power when you turn the page.

E Ink crops up in a few other locations, too. There's a lot of digital signage (think price tags on supermarket shelves) that's starting to use E Ink–another case where the text remains fixed most of the time, so there's very little power draw. (My favorite E Ink project may be this one that resembles a flattened original Mac [fave.co/3IKQvVH].)

I like E Ink because it's easier on the eye and feels natural in natural light. However, the technology has lots of

E Ink Gallery 3 was introduced in April, offering an improved color gamut and fast refresh rates, but it's still too slow for multimedia.

liabilities that have led to it not being used widely. For starters, it doesn't emit light. In sunlight, E Ink screens are beyond reproach, but in darkness, they're unreadable. (To compensate, most e-readers now come with a built-in ring of LED lights around the screen.)

Worse is the slow refresh rates of E Ink screens. The refresh rate has increased over time–on state-of-the-art displays, it's now 350 milliseconds–but it's nothing like the ultra-fast refresh rates of computer displays. That means it's inappropriate for

animation, video, and pretty much any interface designed for quick animations. (Last year I reviewed an E Ink Android tablet [fave.co/3NGLRnL] and trying to use the Android interface at such a low refresh rate was painful.)

E Ink displays also don't offer the ultra-high resolutions of modern Apple displays. And while E Ink displays have begun to support color (after years of only supporting shades of gray), the quality is only now getting up to par, and the refresh rates are still quite slow.

WHERE APPLE MIGHT USE E INK

According to Kuo (fave.co/3wOIK6g), Apple is testing E Ink "for future foldable device's cover screen & tablet-like applications." It makes sense. Foldable devices generally fold inward to protect their displays–leaving an outer surface devoid of information. To counteract that, phone-makers have been adding supplementary "outer screens" to do things like display the time and basic information widgets while others have full-sized OLED displays that obviously use lots of battery life.

Due to its ultra-low-power profile, an E Ink display would be a pretty good fit for a cover display. (Think of how the always-on Apple Watch display has a low-power mode that doesn't update the display very often, making things like second hands disappear in order to save power.) With a color E Ink external display, Apple could display the time, notifications, and even widgets on a device's outer screen.

But auxiliary E Ink displays aren't necessarily just for foldable phones. Consider a future MacBook that included a low-power E Ink screen on the outside so that you could see notifications and other basic status information without opening it.

E Ink technology might also allow the creation of some interesting accessories, especially when coupled with something like the Smart Connector port on the iPad, which can transfer data and supply power. For example, imagine an iPad smart cover that included an E Ink Display (shoutout to reader Adam L. for this idea), to display widgets, status information, and maybe even static displays from apps, all of which would be visible even in bright sunlight. Alternately, how about an iPhone case that included an E Ink display on the back for status widgets?

E Ink is probably never going to be a mainstream display technology. The OLEDs and LED/LCD displays of the world provide high resolutions and refresh rates that can't be beaten. But there are many niches that E Ink can serve well. I'd love to see Apple deploy E Ink's unique characteristics in some creative ways. ■

Longtime WhatsApp users might soon need a newer iPhone

Later this year, the messaging app won't work with iOS 10 and iOS 11 devices, which is bad luck for owners of the iPhone 5 and iPhone 5c.

BY DAVID PRICE

WhatsApp has warned that it will drop support for iOS 10 and iOS 11 devices later this year, which means iPhone 5 and 5c owners will need to find an alternative way of using the app. Those with newer handsets, meanwhile, may need to update to a newer version of iOS.

wabetainfo.com was the first site to report the plan, which was corroborated by information on the WhatsApp support site (fave.co/3PHUmAK). It explains:

IMAGE: KASPARS GRINVALDS/SHUTTERSTOCK

"Currently, we provide support for and recommend using the following devices: Android running OS 4.1 and newer; iPhone running iOS 12 and newer; KaiOS 2.5.0 and newer, including JioPhone and JioPhone 2."

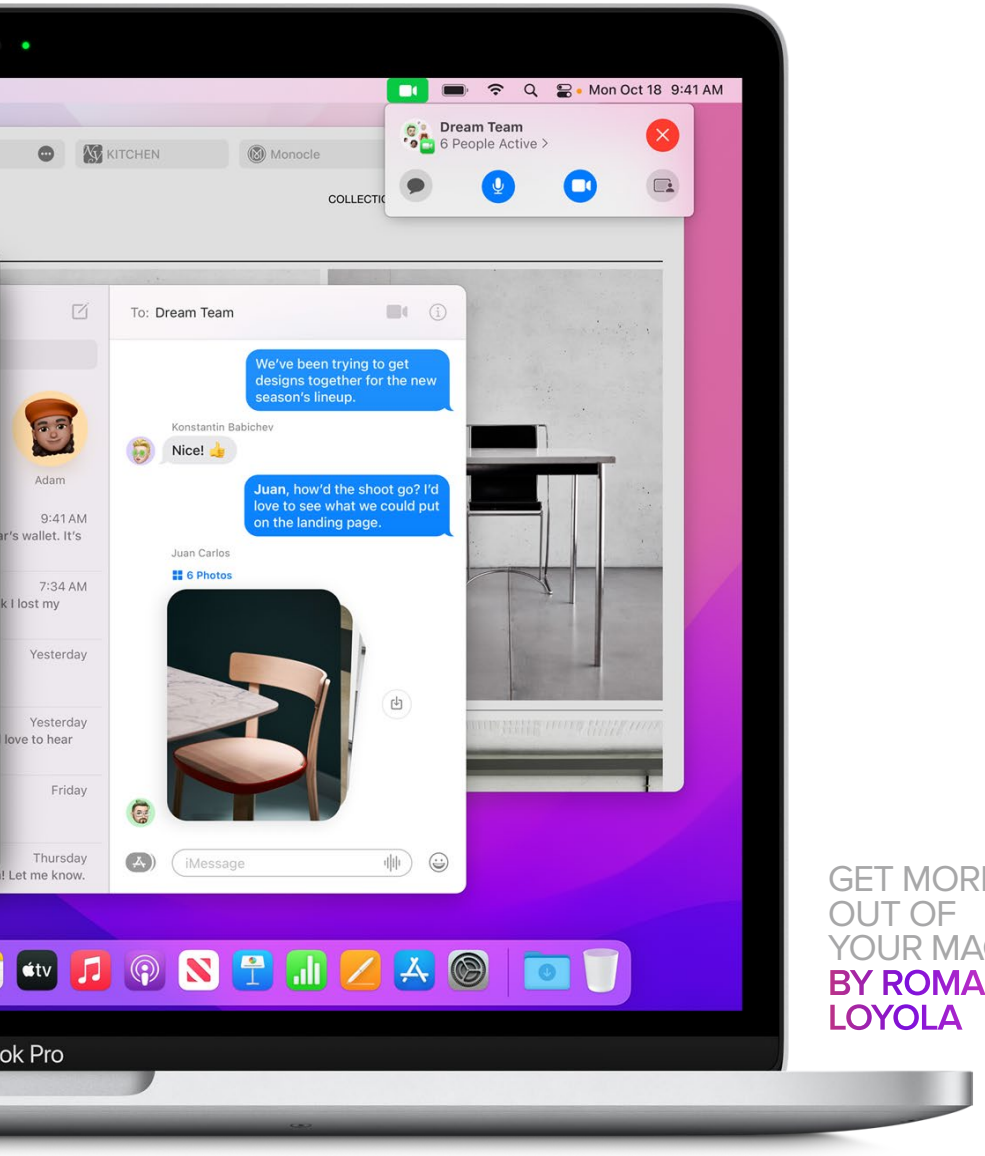
Despite what it says on the support page, owners of iOS 10 and 11 devices are still currently able to use WhatsApp, but have started receiving warnings that they should "update to the latest version of iOS to continue using WhatsApp." These messages indicate that the change is scheduled to happen on October 24. From that point on, anyone running an older version of iOS will be unable to use WhatsApp.

The move–or something similar to it involving iOS 10 only–was rumored towards the end of last year but didn't end up happening. But WhatsApp has evidently decided that it needs to act this year. "To choose what to stop supporting, every year we, like other technology companies, look at which devices and software are the oldest and have the fewest number of people still using them," it explains in the support article. "These devices also might not have the latest security updates, or might lack the functionality required to run WhatsApp."

Even if you're not currently running iOS 12 or later, the chances are that you will be able to update your iPhone (fave.co/3LPo1EM) to something newer. The problem comes if you've got an iPhone 5 or 5c, since these handsets aren't able to install iOS 12. They're pretty old, so if WhatsApp is critical for you it might be worth buying a new iPhone (fave.co/3sUMNg3). ■

If you're not running iOS 12 or later, you'll need to update your phone.

10 LITTLE-KNOWN MA WILL TRANSFORM



GET MORE OUT OF YOUR MAC.

BY ROMAN LOYOLA

AC FEATURES THAT M YOUR DESKTOP

The Mac operating system that we use today was introduced 21 years ago. Whether you've been using the Mac longer than that or just bought your first M1 MacBook, macOS is a vast operating system and there are tons of tucked-away features that you can take advantage of to help you get stuff done.

Here are ten macOS tips and features that you may not know or have forgotten about that can help you get more out of your Mac. Some of these are old, some just arrived in the past year, but all of them are incredibly handy to have in your arsenal.

1. REARRANGE MENU BAR ICONS

The menu bar is a good way to quickly access frequently-used settings and other functions. To get the most out of it, you can rearrange the icon order to your preferred locations. To move an icon, hold the Command button, and then click and drag the icon to where you want.

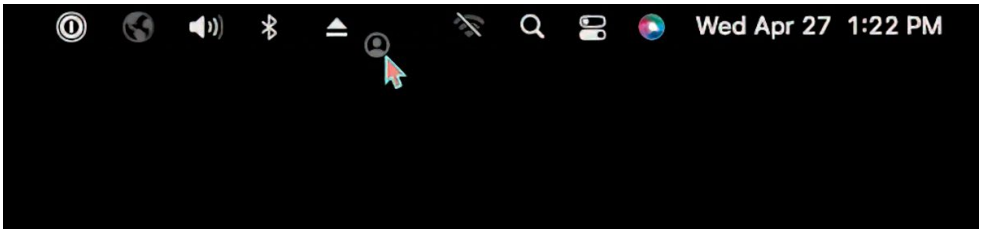
A few menu bar items can't be moved, such as the date and time, Siri, and Control Center. All of the icons to the left of those immovable icons can be rearranged.

2. CUSTOMIZE (AND LOCATE) YOUR CURSOR

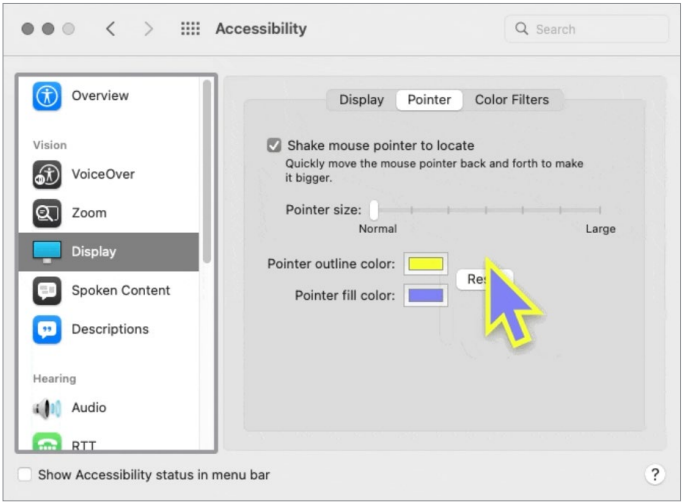
If you've been using the Mac for as long as I have, that white-and-black pointer cursor is a familiar sight. You can actually give it a little personality with some customizations in the Accessibility settings.

In the Display section of Accessibility, there are settings for Pointer, which modify the Mac's cursor. You can make the cursor bigger, and you can change (fave.co/3m1GfIE) its outline and fill colors. Have a little fun and make your Mac a little more personal.

And here's a bonus tip: Inside the Pointer tab you'll find a checkbox for "Shake mouse pointer to locate." Turn it on and you'll be able to wiggle your mouse back and forth quickly to briefly enlarge your cursor. This is great if you often find yourself unable to spot the cursor.



You can rearrange most of the icons in the menu bar.



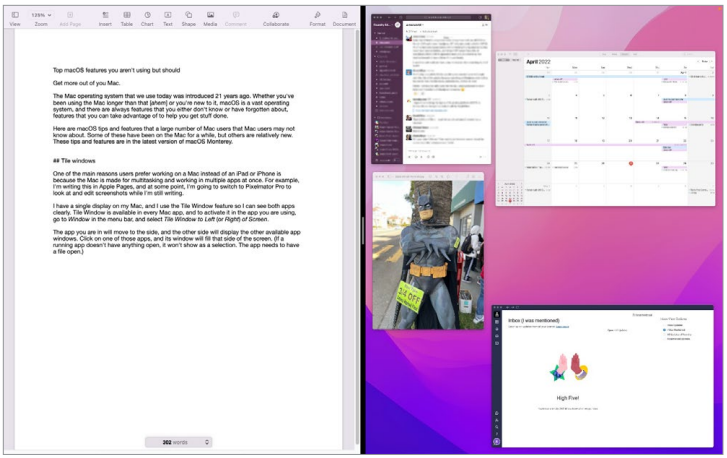
Pointer settings are found in the Accessibility system preference.

3. TILE YOUR WINDOWS

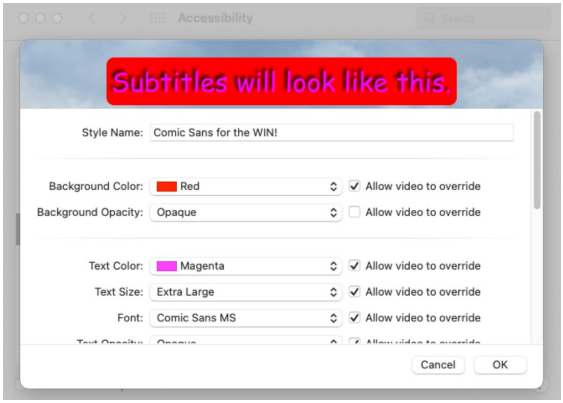
One of the main reasons users prefer working on a Mac instead of an iPad or iPhone is because macOS is made for multitasking and working in multiple apps at once. For example, I'm writing this in Apple Pages while jumping over to Pixelmator Pro to look at and edit screenshots.

I have a single display on my Mac and I use the Tile Window feature so I can see both apps clearly. Tile Window is available in every Mac app, and to activate it in the app you are using, go to Window in the menu bar, and select Tile Window to Left (or Right) of Screen.

The app you are in will move to the side, and the other side will display the other available app windows. Click on one of those apps, and its window will fill that side of the screen. (If a running app doesn't have anything open, it won't show as a selection. The app needs to have a file or window open.) To exit this view, press the



Tiled windows in macOS.



You can customize captions that appear in the TV app and other Apple apps.

Escape key on your keyboard.

4. CHANGE THE CAPTION STYLE

My hearing isn't what it used to be, and I also watch more international shows than ever. So I've been watching TV with captions on and I've been able to enjoy the show without worrying about misunderstanding what anyone is saying. But the Apple TV app's default caption style is a little too obtrusive for my taste.

The way to change the caption style is not in the TV app's preferences but in System Preferences ➔ Accessibility. In the left scroll window, scroll to the Hearing section and click on Captions. Apple offers four caption styles, and you can select one of them. Or you can click on the "+" and create your own style.

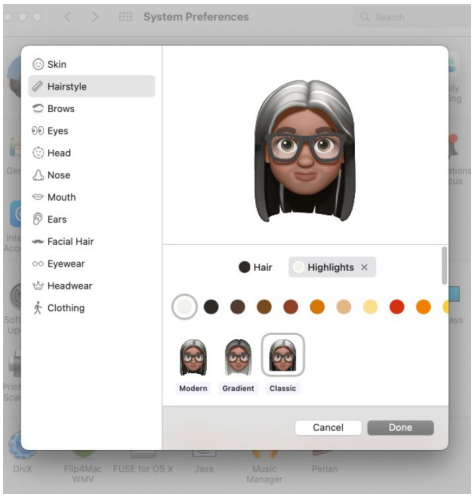
Note that the caption style set here affects only Apple apps such as TV. If you watch a YouTube video, for example, you're subjected to the style that YouTube implements.

5. CREATE AND CUSTOMIZE MEMOJIS

Memojis (fave.co/3Gz3Big) are thought of as an iPhone/iPad thing, and while they are a bit more functional (and fun) on those devices, you can still create or make them in macOS. Here's how.

1. Launch System Preferences (located under the Apple menu).

2. Your account should be at the top of



Creating a Memoji on the Mac.

the System Preferences window. If you move the cursor over your profile pic, “edit” should appear. Click it.

3. In the window that appears, a list of different profile pic options are on the left. Make sure Memoji is selected.

Live Text allows you to select text and copy it from an image.

4. Your available Memoji appears on the right. If you already have a Memoji and you want to make changes to it, select it and click the Edit button. To make a new Memoji, click the “+” button.

5. You will be presented with a set of characteristics you can modify, from Skin to Clothing. Go through each one and make your selections.

6. Click Done when finished.

After creating a Memoji, you can also set a Pose or a Style (which is basically a background color). If you want to set the Memoji and your Mac’s user profile pic, select it so that it appears in the lower-left corner. Click Save.

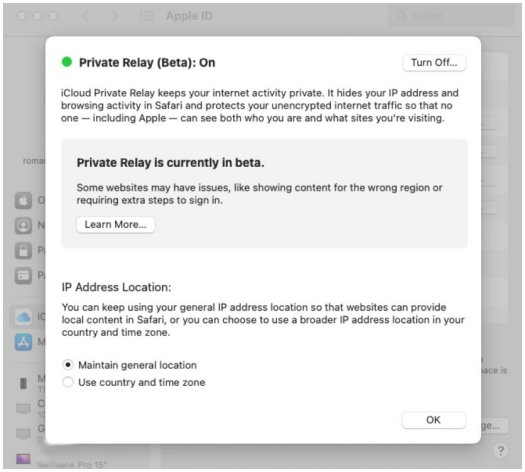
If you’re using iCloud and your devices are on the same account, your Memoji will carry over to your other devices.

6. COPY TEXT IN A PHOTO

In macOS Monterey, Apple introduced Live Text, the ability to select and copy any text in an image. For example, if you took a picture of a sign, you can open that picture in the Preview app, move the pointer over the words in a sign, and the pointer changes to the text selection tool. You can then select the text, copy it, and then paste it into a text document. You can learn more about how Live Text works in our overview article (fave.co/37kwL7o).

7. TURN ON iCLOUD PRIVATE RELAY

Apple created iCloud Private Relay to help preserve your privacy when you’re browsing the web. When you use Safari, the data that is sent is encrypted, and then it travels through two intercept relays—



You can set up Internet Private Relay's IP address location to be as broad as you want.

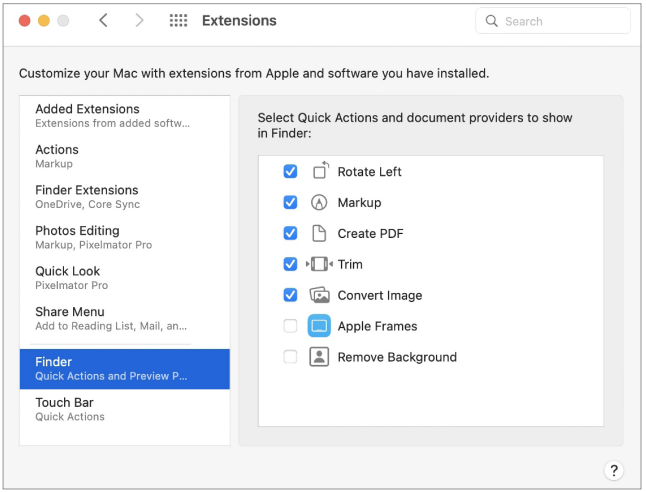
points on the internet that data travels through—to help hide your location, IP address, and browsing activity to prevent a profile about you from being created. The second relay is performed by a third-party service to prevent Apple from knowing the user's information. It's not quite a VPN, but it's a great tool for privacy.

To turn on iCloud Private Relay, go to System Preferences and click on your Apple ID. In the checklist on the right, look for Private Relay (Beta) and check the box and click the Options button. There's also an IP Address Location setting you can modify. Learn more about what iCloud Private Relay can do in our FAQ (fave.co/3GAq2DR).

Internet Private Relay is still a beta feature, which means it is usable but it still has some obvious kinks to work out and Apple could at any time make a major change to how it works. It requires an iCloud+ subscription, which costs as little as a buck a month for 50GB.

8. ADD EXTENSIONS TO YOUR CONTEXTUAL MENU

The macOS contextual menu, accessible by right-clicking, control-clicking, or

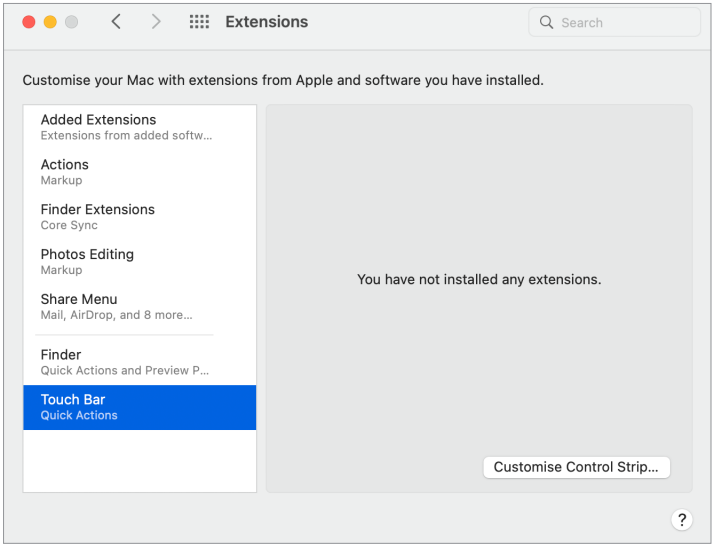


The macOS contextual menu allows you to do some tasks immediately, saving some steps.

tapping with two fingers on the trackpad, is great in that it can allow you to do some tasks immediately, saving some steps. It's not just system functions, though—when you install an app, it often adds functions to the contextual menu.

You may see some app-related actions at the bottom of the pop-up menu, or, when you right-click a file and select Quick Actions, a list of app-related tasks appears. When an app adds this kind of functionality, it's adding an extension to macOS. But sometimes there are items in the menu that you never use, or you may not know that there are functions available that you could be using.

To manage the contextual menu, go to System Preferences and open Extensions. To specifically manage the Quick Actions section of the contextual menu, go to the Finder section. There are other sections in the left column where you can add to remove tasks. For example, in the Share section, you can add apps to the Share menu.



The Touch Bar's functions can be customized.

9. CUSTOMIZE THE TOUCH BAR

If you're using a MacBook Pro with a Touch Bar, you can customize the Touch Bar functions. Here's how.

1. Go to System Preferences ➜ Extensions.

2. In the left column selection Touch Bar.

3. Click on the Customize Control Strip button.

4. A new screen will appear with a selection of buttons at the bottom of the screen. This is the set of Touch Bar buttons that appear when the Control Strip is collapsed.

> To add a button, click and drag the

button to the bottom of the screen. The Touch Bar will show the new button.

> To remove a button, move the cursor to the bottom of the screen until a button is highlighted, then move left or right to select the button you want to remove. Click and then drag up on the screen and the button should appear with a "Remove from Touch Bar" tag. Drop the button to remove it.

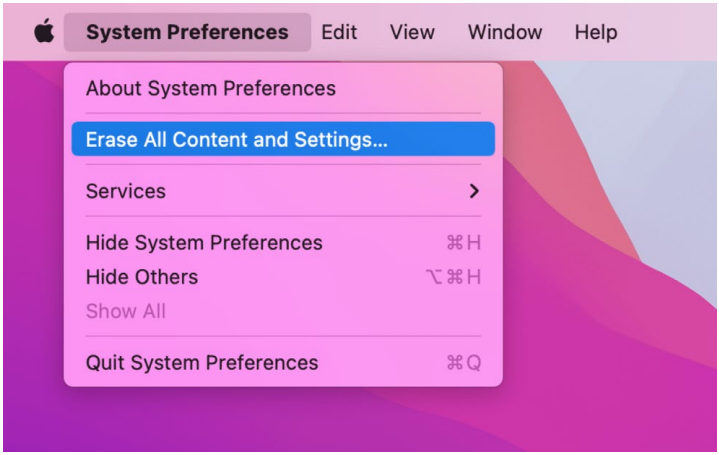
To customize the Control Strip when it is expanded in the Touch Bar, follow the steps above. At step 4, expand the Touch Bar, and the button set will adjust on-screen. Below is a quick video on what these steps look like.

10. ERASE ALL CONTENT AND SETTINGS

We all run into issues on our Mac that could use a factory restore. If you're using an Apple silicon Macs or an Intel Macs with a T2 security chip running macOS Monterey, there's a quick way to erase your Mac's settings, data, and apps while keeping the currently-installed operating system. This doesn't erase a Mac completely, just your personal stuff.

Open System Preferences (Apple menu ➔ System Preferences), and then with the System Preferences window at the front, go to the menu bar and click on the System Preference menu. Under About System Preference is a new item called Erase All Content and Settings. It works just like it does on the iPhone and iPad: select it when you want to wipe out your personal info without wiping and reinstalling the entire operating system.

You'll need to enter an administrator password, and you'll have to go through the steps of the Erase Assistant. The Mac will restart and take you through the setup process. If you don't want to set up the Mac, press and holding the power button to shut it down. ■



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13 INCREDIBLY USEFUL THINGS YOU DIDN'T KNOW SIRI COULD DO

IBLY

SIRI IS GOOD FOR A LOT MORE THAN SETTING TIMERS, MAKING PHONE CALLS, AND ASKING ABOUT THE WEATHER.

BY JASON CROSS

Everyone knows Siri can set a timer or alarm, add a reminder, start a phone call or send a text, or do simple math calculations. But Siri can do so much more!

Apple keeps improving Siri year after year, so if you've gotten in the habit of only using it for a few select things because of your experiences a couple of years ago, you may be surprised by all the things Siri can do quite well today. Give these features a shot, and you may find yourself using Apple's voice assistant a lot more often.

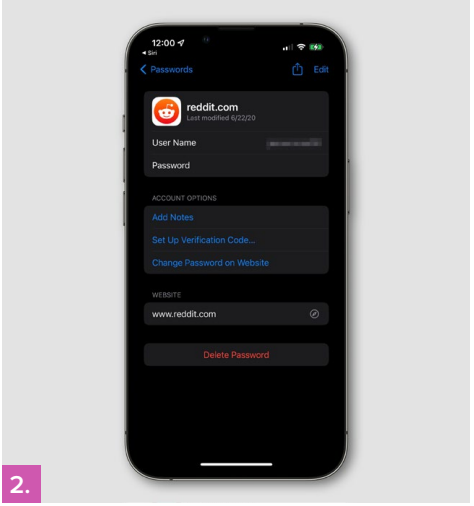
Looking for funny and silly things with less practical use? We have a huge list of fun things to ask Siri (fave.co/3lXwvzq).

1. BE MORE SPECIFIC

A lot of the basic things you use Siri for today can be modified when you make a more specific Siri request. For example, you can make a call on speakerphone by saying, "Call [name] on speaker," or shuffle your music by saying, "Play [playlist, artist, or album] on shuffle." Or ask for walking or transit directions specifically if you're not driving. You'd be surprised how many common tasks can be tweaked in useful ways.

2. ASK FOR A PASSWORD

Your iPhone does a great job of auto-filling logins and passwords that are stored on the device, but what do you do when you need that password on another device? You can ask Siri for a password (e.g. "What's my Reddit password?") and your iPhone will authenticate with Face ID or Touch ID, and open Settings > Passwords directly to the entry for that site. This is especially helpful if you have a note stored on the password for things like challenge questions.



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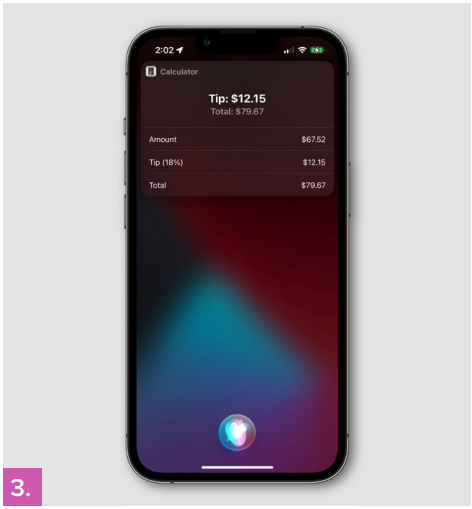
3. CALCULATE TIPS

Of course, Siri can answer simple math questions (and even pretty complicated ones), but it's especially useful for calculating tips. Say something like, "What's an 18 percent tip on 67 dollars and 52 cents?" and you'll get a nice card breaking down the math. You can follow



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that up with, “Split the bill three ways” or the like, and you’ll get the amount each person owes (along with a fairly useless response about how much the tip is per person).

4. CHANGE DEVICE SETTINGS

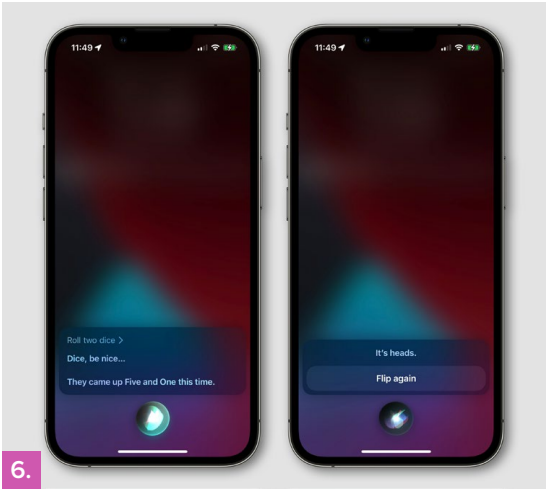
A lot of iPhone users don’t realize that Siri can control common device settings. This can be a lot easier than fumbling around to find them in Settings or even Control Center. You can tell Siri to turn Wi-Fi or Bluetooth on or off, turn on or off airplane mode, turn on the flashlight, adjust brightness, adjust volume, enable or disable Night Shift, enable or disable Dark Mode, and more. For features like brightness or volume, you can give absolute directions (e.g. “Change the volume to 70 percent”) or proportional ones (e.g. “Make the volume quieter”).

5. SNOOZE OR TURN OFF AN ALARM

We all know you can use Siri to set an alarm, but not many think to use it to end one. You can tell Siri to snooze your alarm or end it, which can be easier than fumbling around sleepy without your glasses and trying to find the button.

6. FLIP A COIN, ROLL A DICE, EVEN CONSULT A MAGIC 8 BALL

Siri’s great for making unbiased decisions! Don’t know whether to get tacos or burgers? Tell Siri to flip a coin. Siri can also



6.

roll dice, even uncommon dice (“roll a d20”). You can tell Siri to roll two dice, and it will give a funny response as though it’s gambling.

Finally, Siri has a Magic 8 Ball built in. Just say “8 Ball” and you’ll get one of 20 responses that roughly correlate to the original Magic 8 Ball. (It seems to work best if you do not say “magic”) Will you try it? Signs point to yes.

7. IDENTIFY AN AIRPLANE FLYING ABOVE YOU

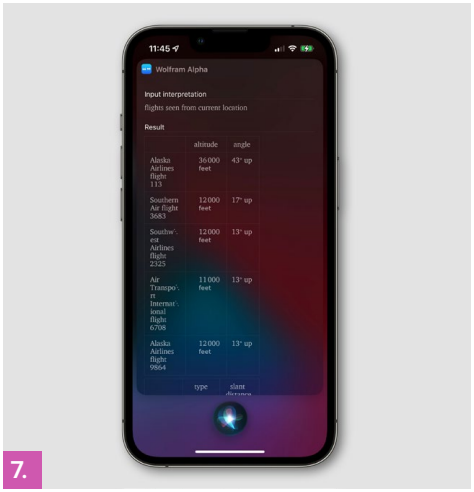
Have you ever looked up and wondered exactly what plane is streaking across the sky? You can ask Siri which planes are overhead, and get a list through its partnership with Wolfram Alpha. It only covers commercial flights, but you’ll get a couple of handy charts showing the flight, plane type, altitude, and angle relative to your position.

8. ID A FOUND LOST PHONE

Ever find an iPhone and not sure what to do with it? Start by asking Siri whose phone it is. If they have a “Me” contact (most people do), Siri will tell you their name and might even pop up a limited contact card. If the phone is locked there may not be a lot you can do, but knowing the name will really help whoever is in charge of lost and found.

9. CHOOSE A NICKNAME FOR YOURSELF

Speaking of names, you don’t have to settle for Siri using your real one. Just say, “Hey Siri, call me by a nickname” and it will prompt you for one. It can be nearly



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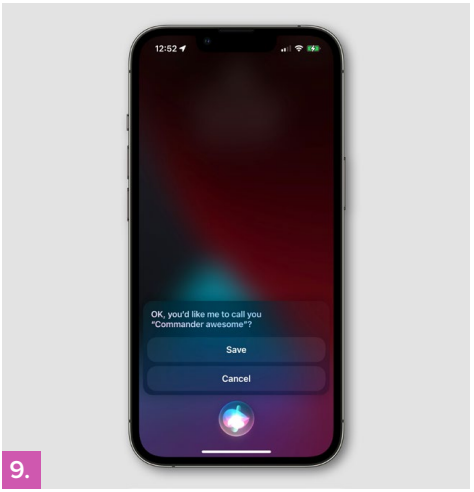


9.

anything you want. This gets added to the "Nickname" field of your contact card, in case you want to change or delete it later.

10. NAME THAT TUNE

Apple bought the music-identification app Shazam back in 2018, and while you can still download the app and it's great in a lot of ways, you no longer need it to simply identify a song you hear. Simply ask Siri "what song is this?" and it'll listen for a few seconds and give you the answer. It's really pretty accurate.

11. FIND A FRIEND

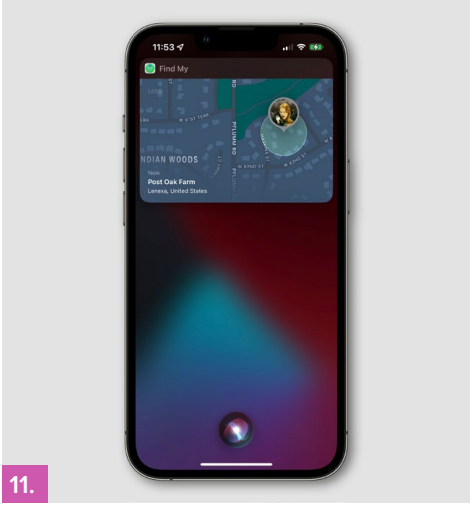
Siri can find anyone who shares their location with you in the Find My app. Just say, "Hey Siri, where's [name]" and you'll get a pop-up card with a map.

12. FIND A DEVICE

Now, where did you leave your Apple Watch? Siri can help you find any of your devices and will make them play a sound if nearby so you can locate them. This is especially handy if you have a HomePod or other Apple device and are constantly setting your iPhone down somewhere and forgetting about it.

13. REMEMBER WHERE YOU PARKED

If you attach your iPhone to your car via CarPlay, and sometimes even if you're just driving around and your iPhone determines that you're driving from its motion sensors, you'll often find it automatically remembers where you parked.



11.

But it's not foolproof, and it's useful to know that you can trigger this manually, too. Just say, "Hey Siri, remember where I parked" and Siri will annotate the map with your parking location. You can find the icon in the Maps app and delete it there, or tell Siri to forget where you parked. "Hey Siri, take my to my car" or similar phrases will pop up walking directions right to your parking spot–within about 10 meters or so.

It's the perfect thing for really big parking lots, like at shopping centers and amusement parks. ■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How to attach an action to a Mac folder for automatic workflows

macOS lets you trigger behavior just by the contents of a folder changing.

BY GLENN FLEISHMAN

Folder Actions are one of many hidden gems in macOS. You can set an action to occur whenever the contents of a folder are changed. This can be a simple action drawn from a list that Apple provides with macOS, an AppleScript, or a workflow produced in Automator. Automator lets you extend these actions into Terminal shell scripts and other languages.

You can use Folder Actions for a lot of disparate purposes:

IMAGE: APPLE

> Resize images or convert them another file format when they're added to a folder.

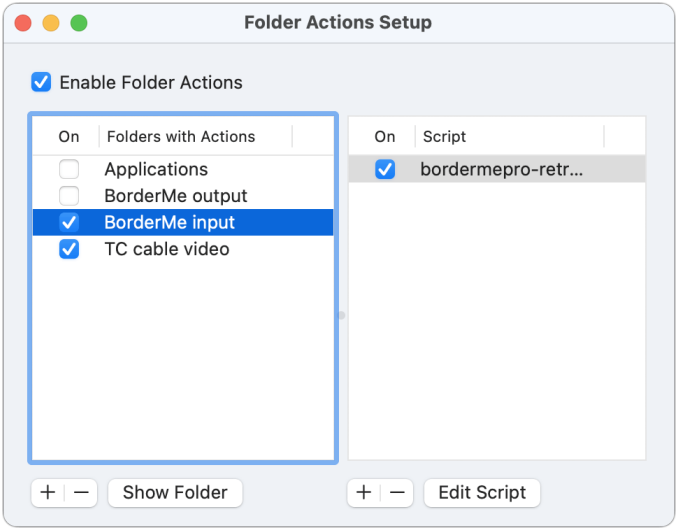
> Provide a popup alert when items are added to a folder through an automated process that you otherwise wouldn't know had completed.

> Add a downloaded MP3 to the Music app.

Control-click any folder in the Finder and choose Services ➔ Folder Actions Setup in Monterey. In early versions of macOS, the option appears in the main lists of contextual items. To avoid the malicious and accidental installation of Folder Actions, macOS requires a confirmation step that can't be automated: click Run Service in the Confirm Service dialog. This adds the current folder to the Folders with Actions list without adding actions.

The Folder Actions Setup window appears with a dialog already open that reads Choose a Script to Attach. This list includes ones that Apple seeded, locating them inside the **`/Library/Scripts/Folder Actions Scripts`** folder. Any scripts installed by apps or that you've created and placed inside your Home directory's **`~/Library/Scripts/Folder Actions Scripts`** folder appear as well.

Folder Actions Setup shows all folders macOS is watching. Select any folder to see which scripts are attached. You can use checkboxes to toggle scripts on or off and folder watching for each folder on or off.



The Folder Actions Setup window manages all watched folders and attached scripts.

You can create Folder Actions in a numbers of ways:

> Use an item Apple provides in the dialog that appears when you invoke Folder Actions Setup. These mostly relate to image processing.

```
on adding folder items to theAttachedFolder after receiving theNewItems

    tell application "Retrobatch"
        set d to open "/Users/glenn/scripts/BaseWorkflow.retrobatch"
        tell d
            execute input items theNewItems
        end tell
    end tell

    tell application "Finder"
        move theNewItems to the trash
    end tell

end adding folder items to
```

This stub of a script lets me drop images into a folder and have macOS automatically run a Retrobatch Pro workflow.

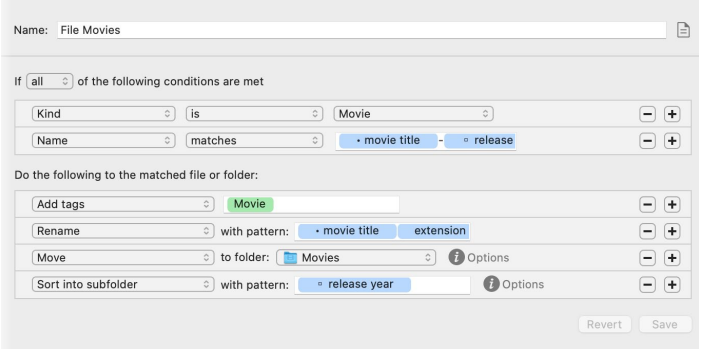
> Create a Folder Action in Automator using its broader set of tools. This can include passing information to an AppleScript, JavaScript, or shell script.

> Write your own AppleScript to perform a task.

AppleScript is relatively easy to write and can be adapted from simple recipes. Apple offers some in its developer documentation (fave.co/3PK3jJD) of the feature. I also recommend reading Jessica Thornsby's article (fave.co/3sZShWW).

You can use AppleScript as a simple bit of connective tissue, too. For instance, I have a workflow in Flying Meat's Retrobatch Pro (fave.co/3GlERtM) image-processing software that puts a border around an image. A simple AppleScript turns a folder into a spring-loaded passthrough for th Retrobatch Pro operation. This stub of a script lets me drop images into a folder and have macOS automatically run a Retrobatch Pro workflow.

If you need more sophisticated watched-folder behavior, turn to Hazel from Noodlesoft (fave.co/38LOMgb), a supercharged third-party version of Folder Actions. ■

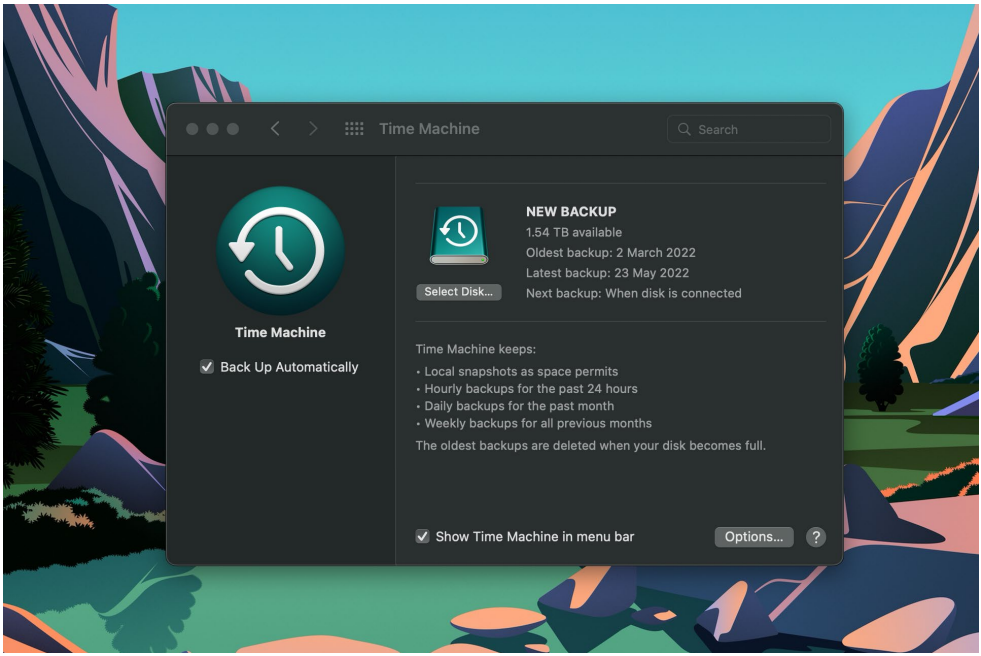


Hazel is a supercharged third-party version of Folder Actions.

How to see how much space Time Machine backups actually occupy

Apple's method of linking files in Time Machine archives can result in perplexing totals.

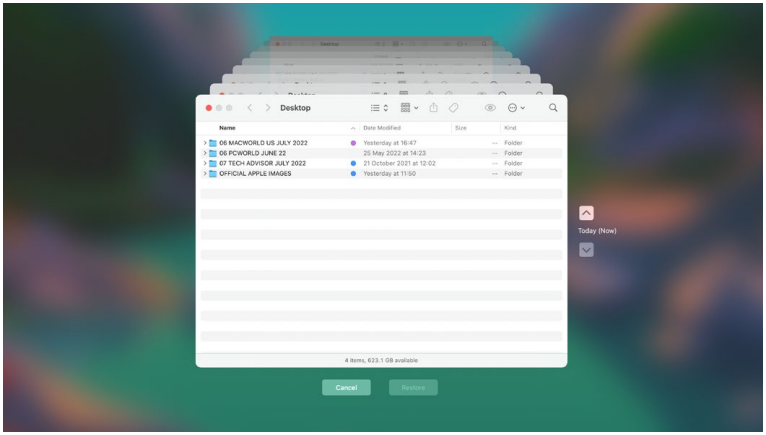
BY GLENN FLEISHMAN



Time Machine backups don't add up! Or, rather, if you're viewing the contents of a Time Machine backup volume in the Finder and choose File ➜ Get Info and enable Calculate All Sizes, the totals of all the snapshots typically far exceed the capacity of the volume. That can't be—and it perturbed one reader whose snapshots were 1.7 terabytes—he thought he was running out of space on a 12TB drive.

Apple's Time Machine is an idiosyncratic method of backing up volumes and providing snapshots compared to how most cloning and archiving software works and ever worked.

IMAGE: FOUNDRY

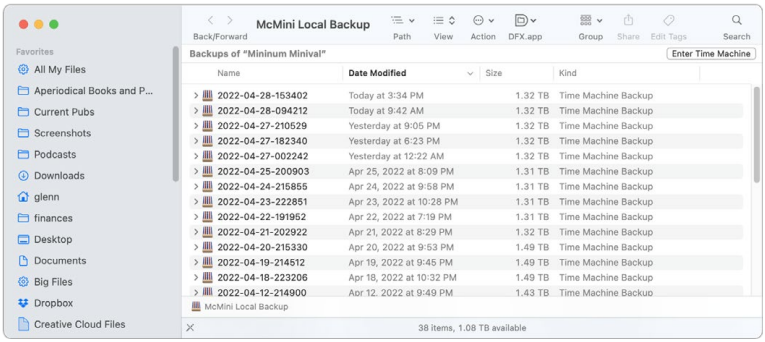


Time Machine provides snapshots of backed up data.

Similar software typically makes an initial snapshot and then stores the changed portions of files along with a log of deletions and folder changes. When you restore a file, you're offered timestamped versions to choose among; restore a snapshot and the software figures out which combination of files from the original snapshot it has to juggle with later changes to reproduce the results.

Time Machine offers a different approach. Instead of making a single comprehensive volume snapshot or ones at long intervals and only storing differences, Time Machine creates the equivalent of timestamped virtual volumes that appear when browsing a Time Machine volume to store every file from the backed-up volume.

The backup algorithm does create an initial snapshot to ensure that every file and folder on a volume has a corresponding entry on the Time Machine volume. After that, however, any file that hasn't changed since the previous Time Machine backup isn't copied. Instead, the



Each of these snapshots doesn't occupy well over a terabyte, but any can be used to reconstruct the entire backed-up volume.

next backup creates a link to the original copy of the file. When you browse a snapshot on a Time Machine volume by opening a timestamped folder, it appears that every file is in the snapshot, not just the modified or new ones. And the Finder relies on those links to perform a calculation, making each snapshot folder seem to contain the full set of files.

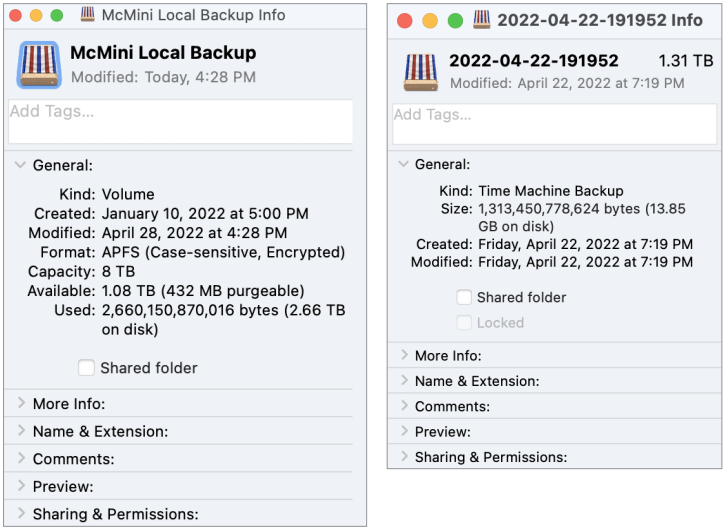
(A technical aside: With HFS+ volumes, Apple's long-running filesystem, these were hard links, a special kind of one-to-many filesystem linking format. In Time Machine backups to an APFS-formatted drive, Apple uses a kind of central data store (fave.co/3PINkM7) and creates a link in Time Machine snapshots from that store. The effect is the same.)

Behind the scenes, Time Machine prunes older snapshots both over time and as the storage in an allotted volume fills up. You should always have the most recent 24 hourly snapshots and the last rolling month's worth of daily snapshots. Time Machine retains weekly snapshots older than a month until it has to delete them.

If you want to know the **actual amount of storage** remaining on a Time Machine volume or occupied by a snapshot on the volume:

For a volume, select it in the Finder and choose File ➔ Get Info. The number following Available is the true remaining capacity.

For a snapshot, select its folder on the Time Machine volume and choose File ➔ Get Info. The Size field indicates its occupied storage on disk. ■



The Finder reveals the actual storage occupied on disk by Time Machine snapshots: left, the storage remaining on the Time Machine volume; right, the bytes used by the individual snapshot.

How to use file sharing on your Mac

File sharing is a click of a button plus many more subtle settings.

BY GLENN FLEISHMAN

Apple was the first computer company to make networked file sharing easy. Decades after introducing that feature on the Mac, it's less important in an era of cloud storage. Unless you're on a corporate network–and often even so–it's easier to push files to a central repository by copying them to a folder or volume on your desktop that syncs. Cloud storage also bypasses network configuration issues, like the dread "double NAT (fave.co/3wTybQs)," which can prevent making file-exchange connections over the internet.

Still, it's frequently helpful to allow access to files stored on your Mac by

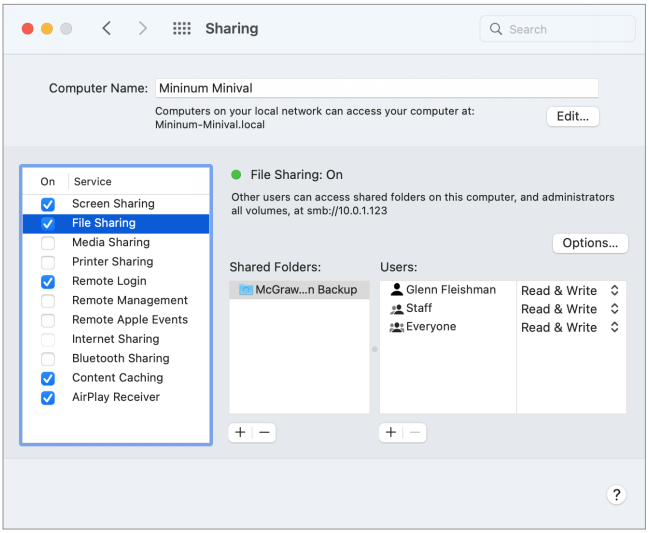
IMAGE: KLARA KULIKOVA/UNSPLASH

other computers on a local network. Let's look at what's required to set it up.

ENABLE FILE SHARING

Start with System Preferences ➔ Sharing. This one-stop shop for all networked services that macOS includes a checkbox for File Sharing. Enabling file sharing lets you or anyone with an account on that Mac access the computer's file server using account credentials and requiring no additional configuration. Anyone with an account with Admin below their account name in Users & Groups can access files across the startup and all mounted volumes. People with regular user accounts can access their home directory and the Home folder's Shared folder by default.

Apple discontinued its original file-sharing software, AFP (Apple Filing Protocol), in favor of the Microsoft-initiated SMB (Server Message Block). This allows a huge range of devices to connect to a Mac that has file sharing turned on. You can see the history of Apple's support by selecting File Sharing in the Sharing preference pane and clicking Options. For the last few releases of macOS, only the "Share files and folders using SMB" checkbox appears, an odd choice. But for several years, AFP and SMB were separately selectable before AFP disappeared.



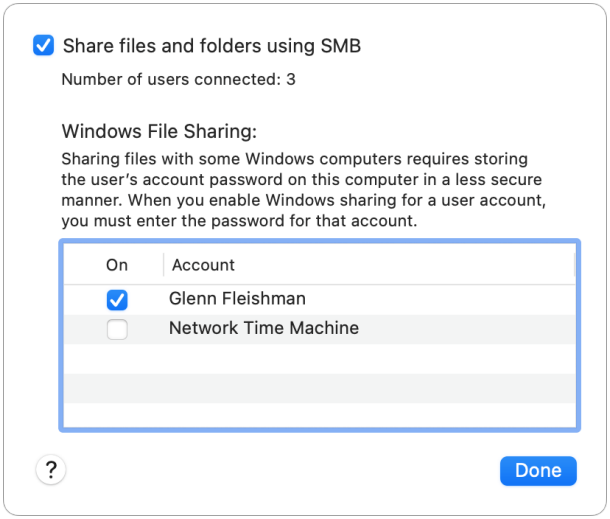
The Sharing preference pane lets you configure file sharing for local and Internet access from your Mac.

However, this is also where you can enable backward compatibility for Windows systems that use an older version of SMB.

CONFIGURE FILE SHARING

You have several options for what you might share and with whom:

> Limit sharing to you and other people with regular and admin accounts on the Mac. That's the default and requires no further work.



While SMB is now the only choice for file sharing, you can optionally enable a Windows-compatibility mode needed for some operating system versions.

> Create shared folders that people with regular accounts on the Mac can access to create pooled local storage or a write-only drop box. (That's the lowercase "drop box": a place to deposit things.)

> Create sharing-only users, who can't log into a Mac or connect to it via a Terminal session; they can only access shared folders. (See "How to create a sharing-only user in macOS to limit access [fave.co/3wQsYsF].")

Add shared folders by clicking the + (plus) at the bottom of the Shared Folders list. You can select any volume or folder. Remove a folder or volume by selecting it and clicking – (minus).

Assign users and permissions to shared folders by selecting the folder in the Shared Folders list and then modifying existing permissions in the Users list. You can add users groups by clicking +. (You can also remove certain users and groups by selecting one and clicking "-".)

The permissions next to each user or group entry are the same as found in the Finder:

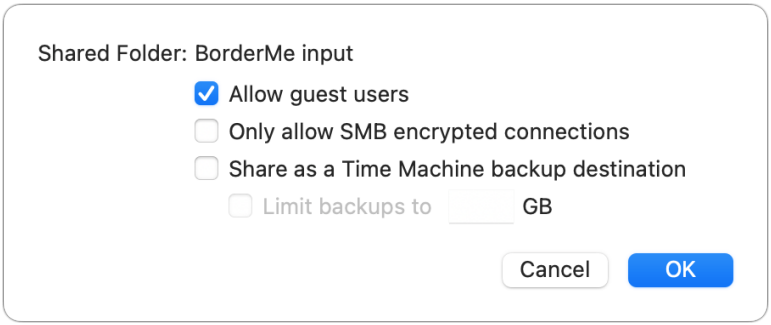
Read & Write: All access, including deleting items and adding them.

Read Only: Retrieve anything in the folder, including nested items.

Write Only (Drop Box): Allows a user to copy a file to the destination but not view it or any other contents of the folder.

No Access: Available only for Everyone to disable access to all other users and to guest connections.

If the Guest User in System Preferences ➔ Users & Groups has "Allow guest users to connect to shared folders" checked, guest users can access any shared folder that has Everyone set to a value other than No Access. However, you can also explicitly disable guest access by Control-clicking a shared folder, choosing



Advanced Options provides further configuration restrictions and features.

Advanced Options, and unchecking "Allow guest users."

You can also use Advanced Options to enable networked Time Machine backups to a particular folder on a volume. I explain that process in "How to set your Mac as a shared backup destination for Time Machine (fave.co/38nu0D9)."

A quick warning! With file sharing active, conceivably anyone anywhere in the world could reach your Mac and act as a guest user or try to log in. On most home networks, ISP and router configuration make it nearly or entirely impossible. Still, I suggest disabling or restricting guest access to avoid sharing anything you didn't intend to with the world.

CONNECT TO A MAC'S FILE SERVER

From macOS, you can connect to a file server in the Finder. Open any Finder and look under the Locations list. Macs with file sharing or screen sharing enabled appear there. (If you don't see them, go to Finder ➜ Preferences ➜ Sidebar and check Bonjour computers.) Click any server and then click Connect As, enter credentials, and select an available volume.

Some servers won't show up in the Finder, depending on your local network. Click the Network link in the Finder sidebar under Locations or choose Go ➜ Network (Command-Shift-K).

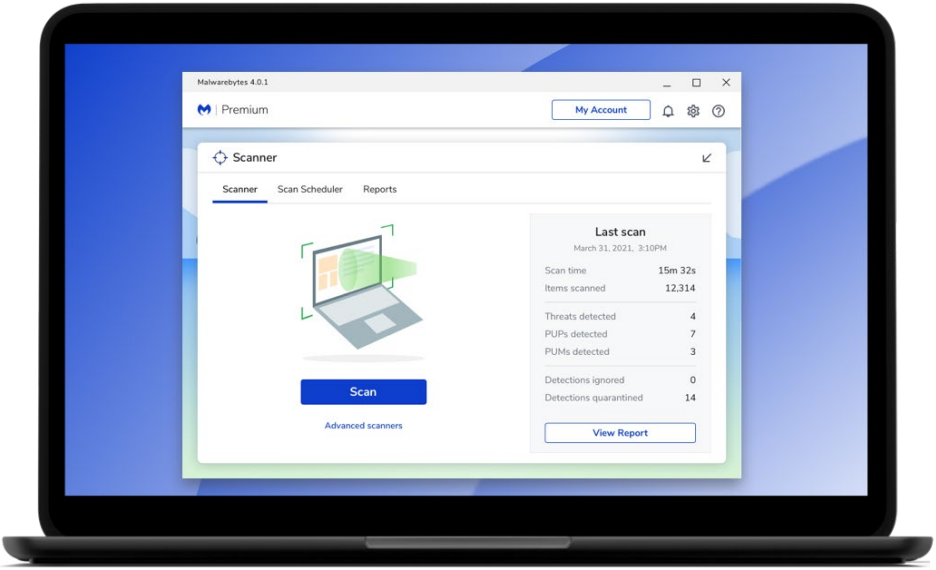
If you need to enter a Mac's address, choose Go ➜ Connect to Server (Command-K). You enter the address in the **`format smb://address`**, such as **`smb://10.0.1.120`**, and click Connect or press Return. A Finder window appears, just as if you clicked a server in the Finder sidebar.

For Macs that you can't see via Bonjour or to connect to a Mac from a Windows computer or other system, you can find the Mac's address in System Preferences ➜ Network. Select any active interface in the left-hand list, and in the main section of the pane under Connected the IP address will appear. ■

Malwarebytes Premium for Macs

Effective security but certain advanced features are lacking in the Mac version.

BY LANCE WHITNEY



Offering security protection for Windows, macOS, Chrome OS, iOS, and Android, Malwarebytes comes in both free and premium editions for personal use. The premium edition sounds promising with a host of features increasingly needed to defend you against today's threats—real-time and on-demand virus, malware, and spyware scanning; protection against malicious website links and phishing attempts; and security against ransomware and zero-day exploits.

But wait, all that describes the Windows version. The Mac edition, not quite as much. Malwarebytes Premium version 4.15 for the Mac (fave.co/3POkzO8) includes the basis virus and malware scanning as well as the ability to detect malicious apps, or PUPs (potentially unwanted program). But it doesn't directly come with the protection against malicious links and phishing attempts. Nor does it offer the

IMAGE: MALWAREBYTES

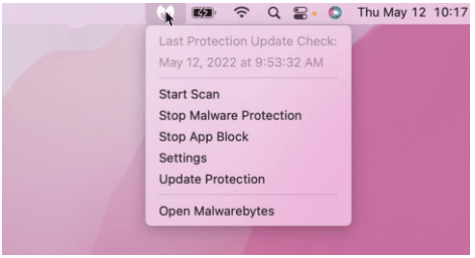
safeguards against ransomware and zero-day exploits.

The premium version costs $3.33/£2.50 billed monthly or $39.99/£29.99 billed annually for one device, and $6.67/£5.83 billed monthly or $79.99/£69.99 billed annually for five devices. You can try before you buy with a free 14-day trial. Once the trial ends, Malwarebytes Premium reverts to a free version, which includes just the basic virus scanning.

INSTALLATION AND SETUP

Installing Malwarebytes Premium on a Mac is quick and easy. After installation, the program nestles itself into memory, accessible through a menu bar icon. Clicking the icon displays a menu with options to start a scan, temporarily turn off the malware protection and malicious app blocker, update the program, view and tweak its settings, and open the management console.

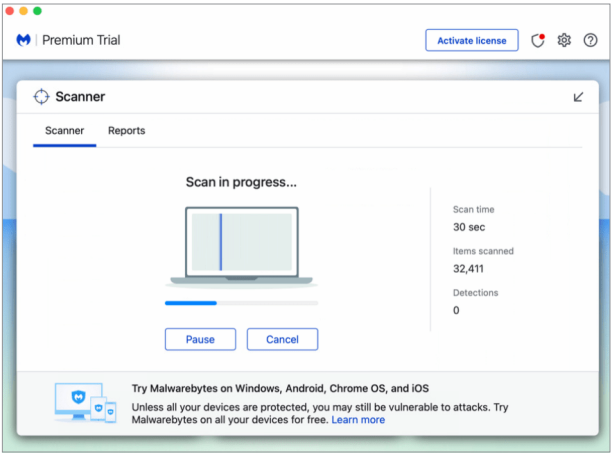
The Mac version of Malwarebytes Premium protects against malware in general as well as adware and PUPs. The real-time protection constantly monitors your system for security threats, automatically blocking and quarantining anything that could infect your computer.



Clicking the icon displays a menu with options to start a scan.

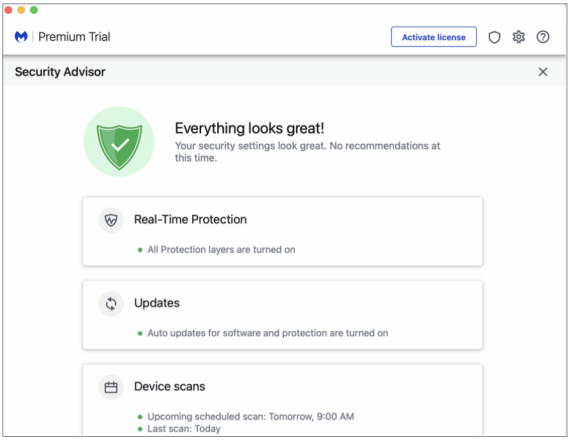
From the management console, you're able to trigger a manual scan and set up scheduled scans to run on a recurring basis. A detection history displays all quarantined items for your review so you can delete blocked malware as well as restore any legitimate items incorrectly flagged.

To avoid false positives, an Allow list



You can run and monitor a manual scan from the management console.

lets you add any legitimate files or programs that were mistakenly flagged as malware. A security advisor suggests specific settings to change to tighten your security. An activity log keeps track of all actions, including scans, quarantined items, and updates to the software.



An advisor alerts you to any settings that should be tweaked to improve security.

PERFORMANCE

Starting in early 2021, the product has regularly and consistently gotten top marks from AV-Test (fave.co/3t1blUW) for protection, performance, and usability. In real-world testing conducted by AV Comparatives (fave.co/3LQCH6z) during February and March of 2022, the software scored 100% at blocking malware, though it had a high number of false positives.

To protect against more advanced online threats, Malwarebytes Premium offers a free browser extension called Malwarebytes Browser Guard. This extension can detect and block adware and trackers, malware, online scams, PUPs, suspicious domains and websites, and even credit card skimmers. The extension is compatible with all the major browsers, both in Windows and macOS. The Windows version of Malwarebytes Premium warns you if the extension is missing and helps you install it. The Mac version makes no mention of the extension, so you might not even know it exists unless you check the website.

I've certainly found similar Windows vs Mac drawbacks with other products. Vendors focus more of their time and energy on the Windows version of their software since that's the key money maker. With a much smaller market share, the Mac version often gets less love and fewer features. ■

Malwarebytes Premium

PROS

- Offers all the basic types of security.
- Easy to use.
- Reasonably priced.

CONS

- Mac version missing certain features compared with its Windows counterpart.

PRICE

$40

COMPANY

Malwarebytes


It's Up
to Us
#MaskUpAmerica
Help keep America open for business.
idsociety.org/masks
ad COUNCIL
IDSA
Infectious Diseases Society of America

After 20 years, Apple officially retires the last remaining iPod

The iPod touch is finally dead.

BY JASON CROSS

Pour one out for the iPod, a line of devices that revolutionized portable music more than two decades ago.

On Tuesday, Apple announced that the iPod Touch will no longer be produced. The current model, introduced in 2019, will still be sold while supplies last (fave.co/38yoNbS). It starts at $199 for 32GB. The iPod Touch was the last of the iPod line–essentially an iPhone SE with an A10 processor and no cellular connectivity. It was an iPod in name, but Music was just one of the many apps filling the home screen.

The iPod has a long history (fave.co/3wR5Rgy), transforming the company when it debuted in 2001. At the time, it was the rare Apple product that wasn't a Mac—though it did need one to transfer music. The iPod was initially derided for its high $399 price tag, but it would soon take over the world and forever alter the landscape of digital music. The iPod led to broader interoperability with Windows, the

IMAGE: APPLE

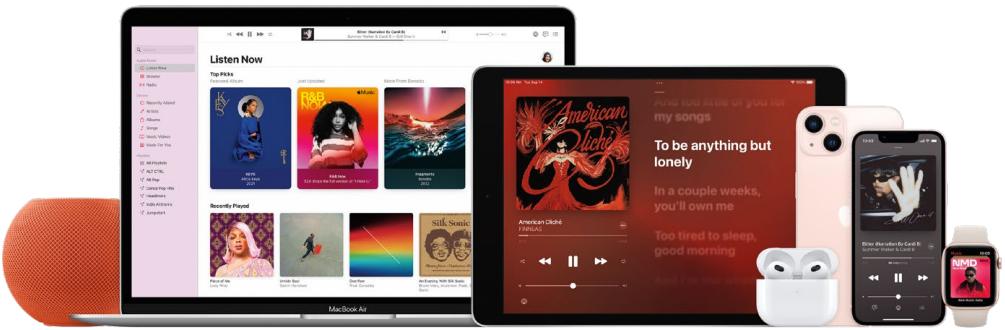
The first iPod debuted back in 2001.

iTunes Music Store and later the iPhone, and saved Apple from the brink of bankruptcy and irrelevance.

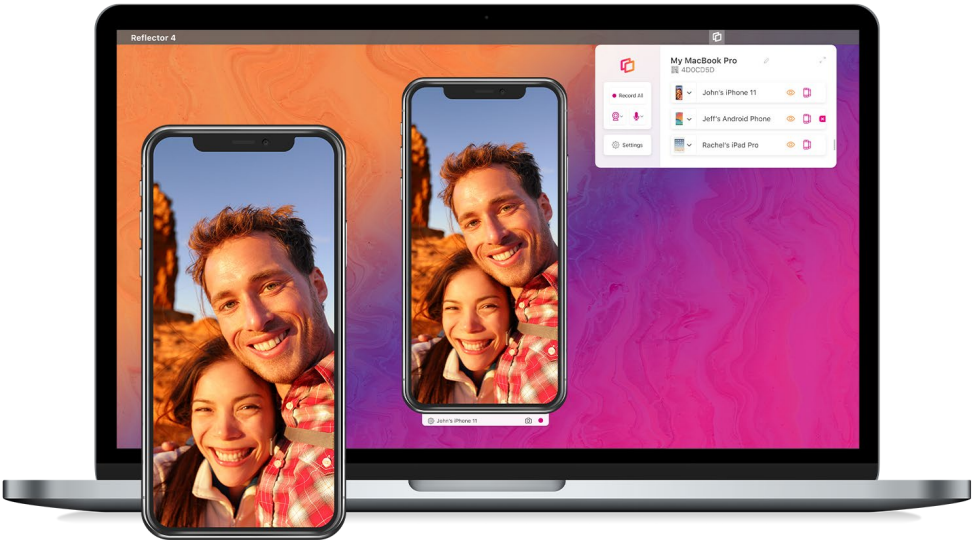
The iPod touch released in September 2007, just a few months after the iPhone arrived on shelves. However, it hasn't been promoted as a part of Apple's product catalog in some time, having lost its lone spot in the Music tab when Apple shuffled its site menu last year. The only way to find it now is to deliberately look for it in the Apple Store and few people are likely doing that.

Apple rightly notes that there's really no need for a dedicated music player anymore (not that the iPod Touch really was one). "The experience of taking one's music library out into the world has been integrated across Apple's product line — from iPhone and Apple Watch to iPad and Mac," the company notes in its press release (fave.co/3wXc7EB). "Today, the spirit of iPod lives on. We've integrated an incredible music experience across all of our products, from the iPhone to the Apple Watch to HomePod mini, and across Mac, iPad, and Apple TV. And Apple Music delivers industry-leading sound quality with support for spatial audio — there's no better way to enjoy, discover, and experience music."

Without the iPod touch, the cheapest device for kids falls on the 10.2-inch iPad (fave.co/3xb9FuN), which starts at $329. ■



These days, you can listen to your music library on any of Apple's products.



Reflector 4: A better AirPlay interface for Macs

Turn to Reflector for more than the bare necessities built into macOS Monterey.

BY GLENN FLEISHMAN

Macworld EDITORS' CHOICE

Apple's AirPlay lets you stream audio or audio and video to other devices on your local network. This could be an embedded video on a web page in Safari on an iPhone that you stream to your Apple TV, or an album from the Music app on a Mac that has its audio playing simultaneously through several devices.

Apple added support for AirPlay mirroring and desktop extension to the latest release of macOS, allowing Apple devices (at least iOS 14, iPadOS 14, or macOS Monterey) to stream to Mac models released started in 2018 and running Monterey. (Some features work at lower resolutions on older devices; see Apple's support note [fave.co/3LRxw6E].)

That's a lot of provisos. To wipe away Apple's requirements and enhance compatibility beyond the Cupertino giant's

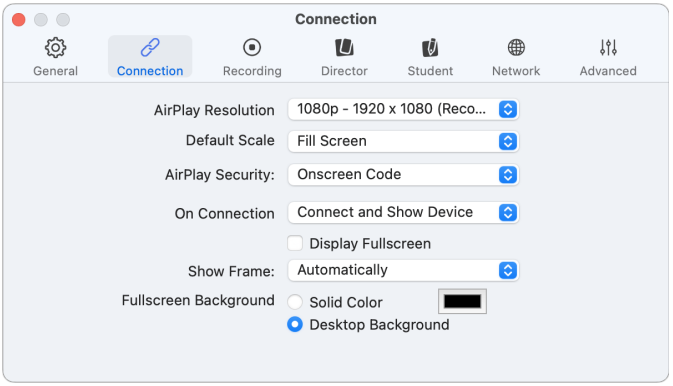
IMAGE: SONY

Reflector acts as an AirPlay receiver for a range of Apple, Google, and other devices.

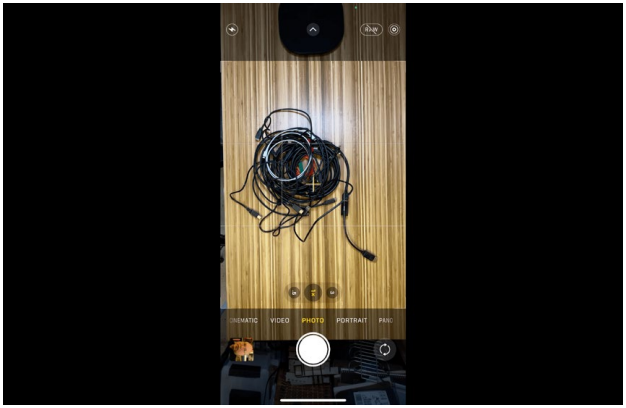
ecosystem, turn to Reflector 4 from Squirrels (fave.co/3LSZI92). Under development across four versions since 2012, the latest version has an updated interface. The developer, Squirrels, reworked the app to offer native support for Apple's M1 series. It works with macOS 10.15 Catalina or later and requires no special iOS, iPadOS, or macOS support—just built-in AirPlay streaming capability.

After launching Reflector, the app appears as an AirPlay destination on all supported devices. To differentiate from macOS-native AirPlay support, "(RF4)" is appended to the name, but you can use Reflector ➔ Preferences ➔ General to set a custom broadcast name.

Select the Reflector name as a destination, and you're prompted to enter an AirPlay confirmation code; the code is shown on your Mac. You can change this behavior so that no code is needed, a password you set is used, a recurring code appears (the Onscreen



The app lets you customize security, display, skeuomorphism, and other elements to your liking.



Monterey's AirPlay mode, shown here presenting the incorrect orientation, is lacking in features, to say the least.

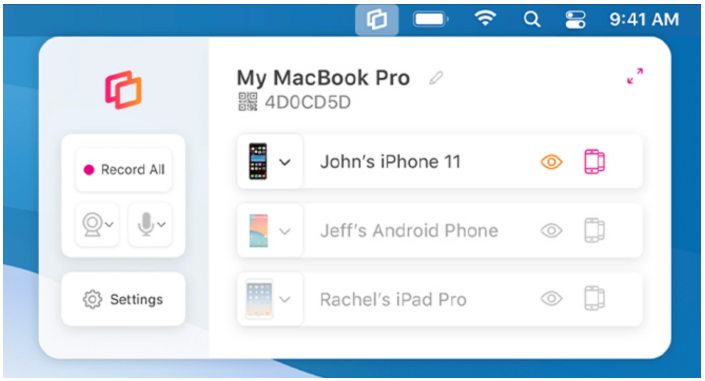
sending device. You can disable that.

By contrast, Apple's built-in Monterey AirPlay receiver always enters full-screen mode. There are no options to turn it into a window. On a Mac with multiple displays, you can choose which one Monterey shows the AirPlay stream. But that's about it.

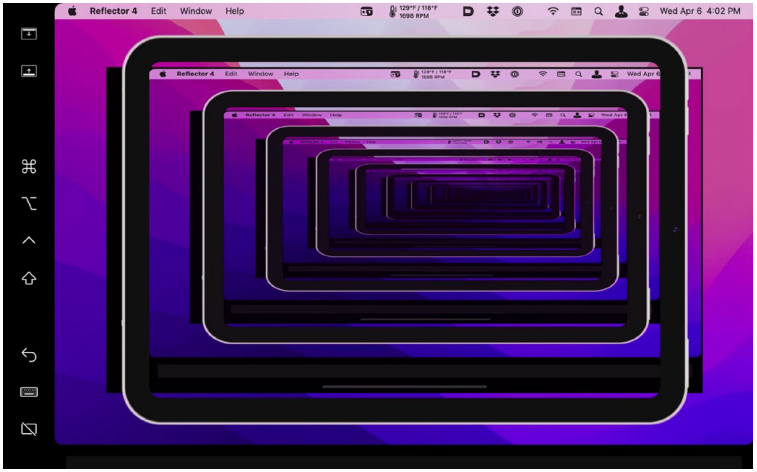
There's far more in the app, too. Reflector can receive AirPlay broadcasts from multiple devices at once. And it's not limited to AirPlay: it's compatible with streaming via Google Cast and the broadly supported Miracast. Squirrels also offers AirParrot (fave.co/38UI4UT), a kind of complementary product to Reflector, which

Code option, the default), or a new code is generated each time. Consider your environment's risk before making your choice—in most cases, you won't need a code at all.

When Reflector begins to show the received display, it appears by default in a floating window that hovers above all other windows. You can opt for full-screen mode or disable the above-all-apps options. In a nod to skeuomorphism—a digital design style mimicking real materials and textures—the display appears in a frame identical to the



A system menu reveals all connected devices, and gives you single click options for acting upon them, including starting recordings.



Using Reflector and Sidecar at once on an iPad can lead to a trippy result.

can stream from macOS or Windows to a range of audio-video and computer receivers, no matter their receiving protocol.

You can click a button to take a screenshot of what appears on the receiver or record the video stream. Reflector can let you create a video control center on your computer for a variety of devices to put together recordings for demonstrations or run live demos for an in-person crowd or through live streaming to online services.

A system menu provides a control panel for switching among received displays, recording, and accessing settings with a click. Where Monterey doesn't allow modifying what it thinks the correct received orientation is, Reflector is both better at making the right choice and lets you force a rotation if that's required.

Reflector also works with Reflector Director (fave.co/3wSdhRR) ($6.99 on the App Store; fave.co/3a03zDU) to allow iOS/iPadOS control, letting you use your Mac as a multi-input source device. This can be useful in education. Squirrels also provides the free Reflector Student (fave.co/3LShzgy) for iOS/iPadOS to let students share their displays with an instructor running Reflector while also viewing shared devices from the instructor's screen.

Reflector 4 costs $19.99 for a macOS or Windows license, $21.99 for a universal license for either platform, and $33.99 as a bundle with the complementary AirParrot. (AirParrot separately is $17.99 for macOS or Windows or $21.99 for a Mac/Windows universal license.) ■

Reflector 4

PRICE
$7

COMPANY
Squirrels

B&O Beoplay EX: Stylish, sweet-sounding true wireless headphones

These beautiful in-ear headphones look, fit, and sound so fantastic, you might not care that they don't offer best-in-class active noise cancelling.

BY THEO NICOLAKIS

Macworld EDITORS' CHOICE

Bang and Olufsen's Beoplay EX true wireless, noise-cancelling earbuds feature beautiful design, a secure fit, strong wireless performance, great sound, and decent battery life. They're also entirely waterproof—to the point they'll survive being submerged in up to one meter of water for 30 minutes. If their $399 asking price doesn't make you check your wallet, read on and see why they could be B&O's finest in-ear headphones.

DESIGN CUES

B&O audio gear is about form as much as function, and the Beoplay EX certainly make a statement. Once you get past the fact that their stem-shape reminds you of

IMAGE: BAND & OLUFSEN

Apple's Airpod, you'll marvel at the Beoplay EX's beauty. They're designed by Copenhagen's Thomas Bentzen, whose industrial designs are known for their "simplicity, rationality, and functionality."

The Beoplay EX are as much a fashion accessory as they are earbuds. I can't quite explain why, but even after weeks of use, the Beoplay EX's design continued to draw my attention every time I opened the case or held them in my hands.

They're available in three finishes: Anthracite Oxygen, a matte black finish with blue accents; Gold Tone; and Black Anthracite. My review pair came in Anthracite Oxygen. The Beoplay EX's signature design element is a tinted, mirrored-glass touch surface sporting B&O's logo and accented with an aluminum ring.

The Beoplay EX are also available in a gold-tone finish.

B&O says the purpose of the aluminum ring is to offer protection as well as an aesthetic flourish. The aluminum ring is raised a hair above the glass disc, protecting it from abrasion and scratches. Even after weeks of use, the glass remained pristine.

The only downside is that the mirrored glass was prone to collecting fingerprints. I found myself polishing the glass quite often. Perhaps a future iteration could add some oleophobic protection.

FEATURES

The Beoplay EX sport 9.2mm drivers, the biggest B&O has ever used for a true-wireless headphone. The manufacturer says this results in a "significant upgrade in the power of each audio moment." I don't typically like marketing hyperbole, but the EX really do sound great with solid dynamics.

These headphones are equipped with Bluetooth 5.2 radios and support the SBC, AAC, and aptX Adaptive codecs. Wireless connectivity was excellent throughout my weeks of use. With my iPhone 12 Pro, I could walk more than 90 feet line of sight

The included charging case is slender enough to fit into your front pocket. The charging case has a USB-C port on the back and illuminates at the front to show you its charging status.

and not lose a beat. Going up or down a floor didn't interrupt the signal either. Perhaps more impressively, I was able to get better reception through walls and doors and around corners than with some other true wireless earbuds I've had in for recent review.

The Beoplay EX's battery life is respectable, but not category-leading, promising to deliver up to 6 hours with ANC and up to 8 hours without ANC. The charging case adds roughly 10 to 12 hours more for a maximum of 20 hours. A 20-minute charge should give you around 1.75 hours of playback.

The Beoplay EX's stems house six microphones. Bang and Olufsen says that beam-forming technology can distinguish between your voice and the sounds of the world around you.

Bang & Olufsen's weatherization works deserves special note. Many premium earbuds top out at IPX4, meaning they're resistant to sweat or a drizzle of rain, but they probably won't survive being dunked in a pool. The X designation, meanwhile, means the manufacturer makes no claim for protection from particulate matter incursion—dust or sand, for instance. An IP57 rating means the Beoplay EX will prevent enough particulate matter out to prevent failure, and they can survive being submerged in up to 1 meter of water for 30 minutes. The Beoplay EX aren't just pretty, they're remarkably tough.

SETTING UP THE BEOPLAY EX

The Beoplay EX package consists of the earbuds and charging case, a USB-A to USB-C charging cable, and ear tips. In a departure from the normal small, medium, and large silicone tips, the Beoplay EX come with five sets of ear tips: Large, medium, small, and extra small silicone tips, plus a set of medium Comply TrueGrip

TWR-200-B tips.

The Comply memory-foam based ear tips promise to provide you with a superlative seal and come with the company's "TechDefender" guard. This is a thin fabric that protects the earbud tube from ear wax, sweat, and debris. The Comply tips will be your best companion when you want to maximize noise-cancelling performance. Selfishly, I wish that the included Comply tip came in large. I found the medium size to be a bit too small for my ears.

If you have smaller ears and have been frustrated by the size and fit of true wireless earbuds, the Beoplay EX may be the perfect fit for you.

The large silicone tips fit my ears the best. Once I got the Beoplay EX in my ears, I was hard pressed to find a situation that would cause them to fall out. Putting on a shirt was no problem. The earbuds stayed secure. Running was no challenge. The earbuds didn't budge. Shaking my head didn't dislodge the earbuds. Their design is outstanding. I could wear these headphones for hours without fatigue.

MOBILE APP

B&O's companion mobile app delivers functionality where it matters most. I didn't have to fumble through complex menus or options to get to exactly what I wanted quickly.

Bang & Olufsen's Beoplay EX true wireless headphones provide an excellent fit.

All essential controls are at a glance: Playback; noise cancellation, transparency, and adaptive noise cancellation; listening modes (aka EQ settings); call settings; and standby (which turns off the Beoplay EX after 90 minutes of inactivity).

The app shows the battery charge of each earbud and the charging case. I noticed that if the charging case wasn't

open, it would not show up in the app. I had to close the case's cover and re-open it for the case to appear.

You can instantly engage noise cancellation or transparency intensity from 1-3 (don't ask me why it isn't labeled low, medium, or high). Turning on adaptive noise cancellation puts the Beoplay EX's sensors in control. The sensors automatically determined the amount of noise cancellation required.

The EQ settings are set along an X and Y axis visualized as a circle. You move the central dot within the circle to make the headphones brighter, warmer, more "relaxed," or more "energetic." The wheel changes color to indicate an intensity and thankfully signals if you're increasing or decreasing bass and treble. This is fine for the novice, but more experienced users will have no idea which frequencies you're effecting.

The Beoplay EX, shown here in Anthracite Oxygen, are as beautiful to look as they are to listen to.

ONLY AVERAGE NOISE CANCELLING

If you're looking for the best pair of noise-cancelling earbuds on the market today, the Beoplay EX aren't the earbuds you're looking for—and that's just fine with B&O. Over several discussions with B&O representatives over several years and product lines, the company's strong stance has been to deliver noise cancelling technology that doesn't interfere with their headphones' musical performance. From that perspective, the Beoplay EX follow a long-standing tradition.

I used the Beoplay EX during a recent cross-country flight from NY to LA. The Beoplay EX with the silicone ear tips did an average job of cutting down the

The Beoplay EX are available in three finishes, including the gold tone shown here.

airplane engine noise. It took the edge off, but no more. Had the included Comply ear tips fit me better, I would have been able gauge how much better the Comply tips aid ANC performance over the silicone counterparts.

Transparency mode is supposed to let the outside world in to let you hear announcements or make you aware of your surroundings. B&O's transparency mode likewise isn't magical like the implementation in Apple's Airpods. The difference with transparency enabled was subtle on the Beoplay EX. Wind is the Beoplay EX's kryptonite. I found it best to turn noise cancelling and transparency off in windy environments.

I would therefore say that the Beoplay EX are designed for individuals who relish the EX's other features and don't require best-of-breed noise cancelling or transparency features.

MAKING PHONE CALLS

Phone calls with the Beoplay EX were solid and reliable. Individuals on the other end could hear me clearly. I'd like to applaud B&O for providing control over how the Beoplay EX behaved during phone calls. I've chastised some manufacturers lately for failing to give consumers control over how the headphones behave when you make a call. Some companies stick you in transparency mode or default you to adaptive noise cancelling, where you'll miss what someone is saying as the earbuds fade the audio to switch modes. That's not a problem here. B&O's mobile app lets you take control if you want noise cancelling, transparency, or none of the aforementioned features active while you're on a call. These are the details that matter when you want to deliver a premium user experience.

MUSICAL PERFORMANCE

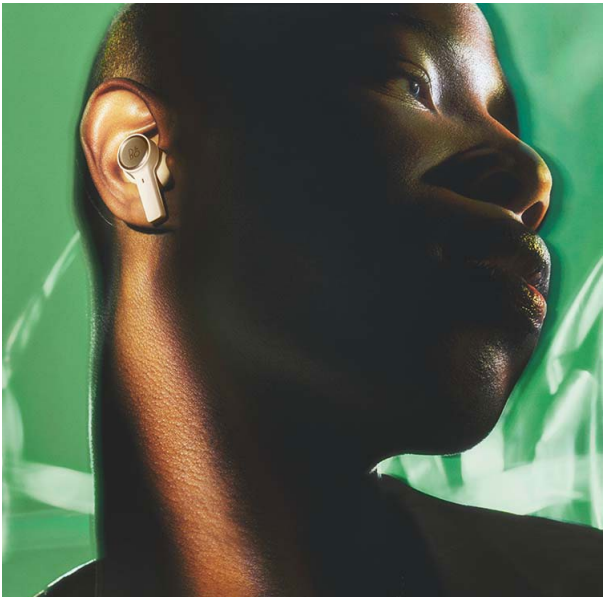
I tested the Beoplay EX with an iPhone 12 Pro using Tidal, Apple Music, and the Roon

app connected to my Roon Nucleus server. The Beoplay EX's sonic signature is sweet and musical. It reveled in delicate to dynamic musical numbers.

I was totally taken aback by the Beoplay EX's bass performance. I wasn't expecting the level of control, dynamics, and detail they pumped out. The pulsating bass from the opening of Bonnie McKee's "Trouble" sends subsonic rumblings through my home when played on my reference speaker system. The Beoplay EX somehow delivered the bass from that song in a way that I experienced it somatically—not just confined to my head, like so many true wireless earbuds. Bass lines from Lorde's "Royals," Billie Eilish's "Bad Guy," Imagine Dragons', "Believer," and Dido's "Northern Skies" landed with the precision of a hammer striking an anvil. And it didn't matter what genre I threw at them.

Choral pieces sounded surprisingly big and dimensional. The sense of space was evident on Capella Romana's "Ode 4 of the Canon of the Precious Cross" from Lost Voices of Hagia Sophia. The Beoplay EX authoritatively rendered organ notes from "Quit Fecit", the third track on Nidarosdomens Jentekor's Magnificat performed by the Trondheim Soloists. The bass drums on Aaron Copeland's "Fanfare for the Common Man," performed by Fiji Our and the Minnesota Orchestra, exploded. And if I wasn't yet convinced, the detail and texture of bass notes on Sade's "Soldier of Love" sealed the deal.

The Beoplay EX had no problem rendering microdynamics or complex musical layers. The EX had firm control over each instrument and musical layer on Michael Jackson's "Smooth Criminal," "Billie Jean," and "Beat It." Closing my eyes and focusing on any musical element was a breeze.



The bass performance is outstanding.

The Beoplay EX true wireless earbuds are the best earbuds Bang and Olufsen has ever made.

Vocals were dimensional and timbrally accurate. Adele, Bono, Natalie Merchant, Alicia Keys, Robert Plant, Rebecca Pidgeon, P!nk, Katie Melua, and Holly Cole to name but a few sounded fabulous.

In summary, the Beoplay EX delivered a highly satisfying sweet-sound that exhibited the kind of control, dynamics, and dimensionality I don't typically associate with true wireless earbuds.

BOTTOM LINE

Bang and Olufsen's Beoplay EX true wireless earbuds unequivocally demonstrate what happens when form and function merge into a stunning product. The Bang and Olufsen's Beoplay EX true wireless earbuds are, in my opinion, the best earbuds the company has ever made.

Their design isn't eye candy, it's high fashion. Their fit is the best of any B&O true wireless earbud I've ever used. The B&O companion app is functional, not frivolous. Their sound signature is exceptionally strong. The only features I found to be middle-of-the-road were the Beoplay EX's active and adaptive noise cancellation. If you can trade those features for audio performance, you'll dig these headphones. ■

B&O Beoplay EX

PROS

- Gorgeous design.
- Superbly comfortable and secure fit.
- Outstanding weatherization: IP57 means they can be submerged.

CONS

- Mediocre noise cancelling and transparency mode.
- Pricey.

PRICE

$399

COMPANY

Bang & Olufsen

Monoprice Monolith 600046 turntable: Great listening, 3 ways

This inexpensive turntable is a versatile device that's set up for Bluetooth streaming, ripping vinyl to a computer, or plugging into a home stereo system.

BY JAMES BARBER

Macworld EDITORS' CHOICE

Ask an aging audio head about the old days and more than a few will tell you about some of the amazing gear that Radio Shack released under its house brand, Realistic. Not everything was great, but the best gear—including the Minimus 7 bookshelf speakers—has a following to this day.

Monoprice has grown from its origins as the best source for cheap HDMI cables to replace Radio Shack as the go-to source for unflashy-but-quality audio gear. Its Monolith turntables continue the company's tradition of delivering excellence at a surprisingly low price. This review covers the belt-driven Monolith model 600046, which has a walnut-

IMAGE: MONOPRICE

The Monolith 600046 turntable comes with an Audio-Technica AT-VM95E cartridge.

FEATURES

The Monolith turntable comes with a dust cover, an AC power adapter with multiple plug options that can be switched based on where you live, a die-cast aluminum platter, a 45 rpm adapter, a counterweight, an anti-skating weight, a Monolith-branded felt slip mat, a cartridge alignment protractor, and a USB-A to USB-B cable. The turntable weighs in at a very light 9.7 pounds.

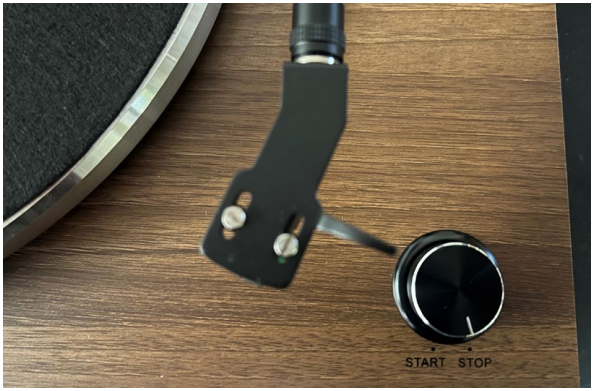
colored finish. The Monolith 600047 is virtually the same product, but with a glossy back finish.

The Audio-Technica AT-VM95E cartridge that Monolith bundles with both turntables includes an elliptical stylus and is well-known for its strong output level. (A third model in the lineup—the Monolith 600045—is available for $50 less because it comes with the lower-end Audio Technica AT-3600L cartridge.)

If you've set up a lot of turntables in the past, you'll appreciate the cartridge housing with threaded inserts, so you can mount the cartridge with just screws and forget about dropping the nuts on your first dozen tries.

Controls are very simple. There's an on/off power switch on the back of the turntable, a start/stop knob on the right front near the tonearm, and a 33/45 rpm selector on the left front of the plinth.

The Monolith is a manual turntable, so you'll need to drop the needle to begin



A start/stop knob is located on the right front of the Monolith 600046's plinth.

playback and pick up the tonearm and return it to its rest at the end of a side.

SETTING UP THE MONOLITH 600046 TURNTABLE

The Monolith isn't *quite* ready to go out of the box. The setup isn't difficult but it may be intimidating for someone who's never owned a turntable before. The instruction manual that comes with the turntable is helpful and well-illustrated.

You'll have to loop the belt over the motor pulley, which isn't hard but the next step involves putting the counterweight onto the tonearm and then balancing it. Experienced users will fly though this step but first-timers will want to be patient and take it slow. The same goes for the installation of the anti-skating weight, which involves aligning thin filament with the right slot on the tonearm and looing the weight through a wire support.

If you've never done these steps before, look for videos on YouTube or ask someone to walk you through the steps. Sure, there are plenty of plug-and-play turntables out there, but the Monolith is worth the extra steps and patience required.

A hole in the Monolith 600046's platter gives access to the turntable belt and motor pulley.

HOW WE TESTED

I tested this turntable with a Naim Mu-so speaker (fave.co/35ZB7jN) for Bluetooth streaming, a 2021 MacBook Air for vinyl recording and a system that includes a NAD Phono Preamp PP-1 through a NAD Stereo Preamplifier S100, a NAD Monitor Series Amplifier 2400, and a pair of vintage Bowers & Wilkins P5 floor-standing speakers.

As I set up the Monolith and turned it on, it automatically found and connected to the Naim Mu-so. Listening quality was exceptional. If you have a great Bluetooth speaker setup like this one, the Monolith turntable and Audio-Technica cartridge are good enough to take advantage of your investment in a high-end speaker setup.

I also tried it out with the portable Tronsmart Bang (fave.co/3a0O7aN), a very good Bluetooth speaker that's obviously in the same category as the Mu-so,

You'll need to install and balance the counterweight and anti-skate weight when you set up the Monolith 600046 turntable.

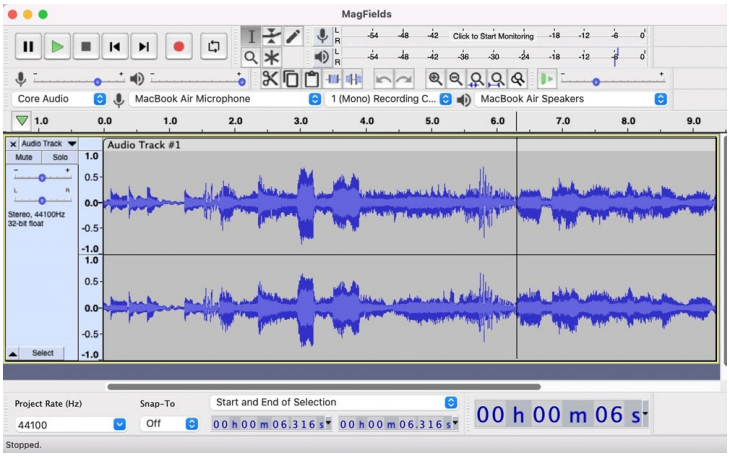
but is closer in price to the turntable. The Monolith connected easily, stayed connected, and sounded very good. No matter your setup, the Monolith delivers.

RIPPING VINYL

Monoprice suggests using the free application Audacity for recording records onto your computer. The audio input settings on my Mac took trial and error to be set just right, but I believe that's more a function of the current state of Audacity's interaction with the Mac OS than anything to do with the turntable.

The quality of the WAV files recorded from vinyl was outstanding. I've used half a dozen turntables with USB cables over the past decade (including the more-expensive Pro-ject Debut Carbon), and the results I've been getting from the Monolith 600046 are superior to anything I've experienced before.

If you have a stack of records you're looking to convert to digital, the Monolith 600046 is a great choice and, of course, you can choose any digital recording



Monoprice recommends using Audacity to rip vinyl records to a computer. Getting just the right settings on a Mac was a little trying.

When you're facing the turntable, you'll find a grounding post, RCA jacks, Phono/Line switch, DC power in, and a Bluetooth connection indicator light on the right-hand side of the Monolith 600046.

software you prefer if Audacity isn't right for you.

LISTENING WITH STEREO GEAR

The Monolith's built-in phono preamp is obviously getting the job done for Bluetooth listening and USB recording. It's also a more-than-adequate option for analog stereo listening. I was impressed with the audio when I set the turntable to Line Output and plugged it directly into my NAD preamp.

Changing the turntable's setting to Phono Output and using the NAD Phono Preamp PP-1 as a phono stage, however, gave the sound a huge boost. The Monolith 600046 offers excellent sound for the price but it's capable of even better performance if you're able to give it that extra boost.

Monoprice doesn't put an analog RCA cable in the box, so you'll need to order your own if you don't already have one and plan to use the turntable with a stereo system. Monoprice offers a wide variety of RCA audio cables in various lengths (fave.co/3Q2x5d5), so you can order one to go with your turntable.

The turntable has a post to attach a ground wire, and I used an RCA cable that came with a ground wire. There was zero hum when the ground wires weren't attached to the turntable and NAD preamp, so I found that I didn't even need the ground.

4½

Monoprice Monolith 600046

PROS

- Great for ripping vinyl.
- Very simple to operate.
- Excellent Bluetooth streaming.

CONS

- Does not include the RCA cable needed to connect to a stereo system.

PRICE

$249

COMPANY

Monoprice

BOTTOM LINE

The Monoprice Monolith is an outstanding turntable for the price. Even if you only need one of its three capabilities (Bluetooth streaming, vinyl recording or stereo system playback), it's an excellent choice. If you need all three, you get a great-looking and capable turntable that's remarkably versatile. ■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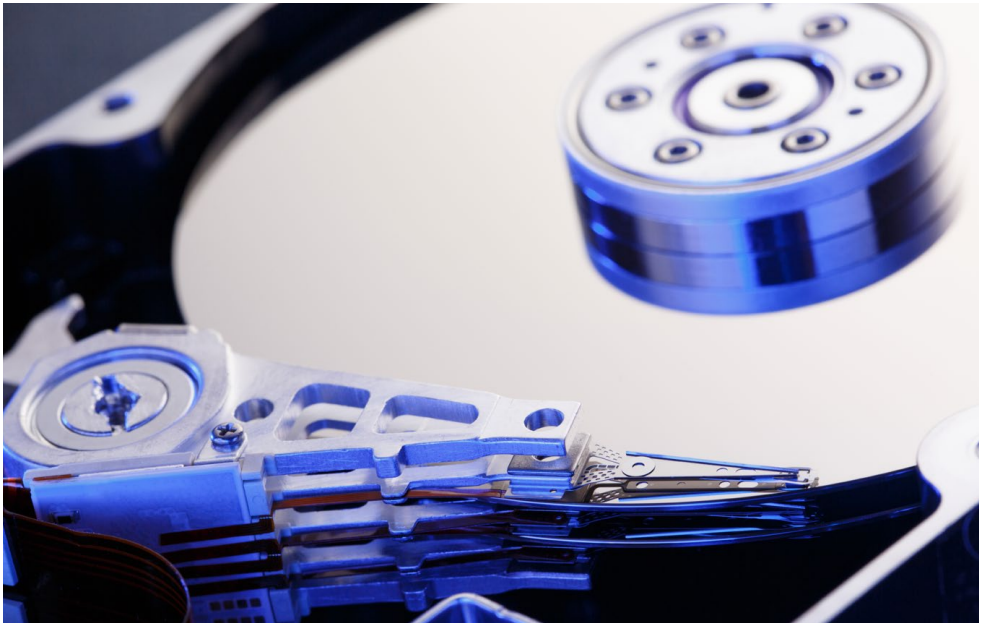
Mac 911

Solutions to your most vexing Mac problems.

BY GLENN FLEISHMAN



WHAT TO DO WHEN YOUR MAC'S INTERNAL STORAGE RUNS OUT

Once upon a time, Apple made it easy to crack open a Mac, remove a hard drive, and replace it with a new one when the old drive was no longer working, too slow, or of insufficient capacity. Those days are long gone for most Macs, leaving readers to wonder what the best path forward is.

You have effectively three options:

> Check iFixIt and other online guides to see how difficult it is to replace an internal drive. Depending on the model, it may be relatively easy for Macs released through 2014. For instance, a 2014 MacBook Pro requires just unscrewing the back case, unscrewing the SSD, and replacing it with an Apple-compatible SSD.

> Consider hiring a shop to upgrade your drive. For some Macs released in the 2010s, especially iMacs, an upgrade or

IMAGE: GARSYA/SHUTTERSTOCK

replacement requires removing and reinstalling a lot of screws, cables, and seals. Of course, consider labor costs: it could cost $150 to $250 just to open up and close the computer.

> Add an external drive via FireWire 800, USB 3, or Thunderbolt 2 or 3 (or even 4).

The last option is the most straightforward and works with any Mac. While I'm stretching back years when I bring up FireWire 800, if that's the fastest connection on your Mac, it's a better choice than USB 2.0 (800Mbps versus 480Mbps). (However, note that if your Mac has FireWire 800 and not USB 3 and it isn't an iMac, it likely has an easy drive replacement option.)

External SSDs up to 1TB and external hard disk drives (HDDs) of many terabytes have dropped to highly affordable prices. Match the drive to the interface you have: there's no sense in buying a high-performance SSD that can deliver 2 GBps (18Gbps) and plugging it into USB 3.0, which maxes out at 625MBps (5Gbps). However, if you have a computer new enough to have a Thunderbolt 2 (20Gbps) or 3 or 4 (40Gbps) interface, you can opt for a superfast SSD if that fits your budget and needs.

I upgraded my 2017 Intel iMac to a 1TB Thunderbolt 3 SSD in 2020, dramatically improving its performance. The iMac died abruptly (at nearly five years old) in 2021, and I opted to shift to an M1 Mac mini. Rather than pay the premium for Apple's 1TB internal drive on that model, I bought one with 16GB of RAM and a 256GB SSD, then migrated my iMac's system to the external drive via a Thunderbolt 4 connection.

External SSDs up to 1TB have dropped to highly affordable prices.

Later, I realized my Photos library was too slow on an external HDD. (I have two external 8TB HDDs for Time Machine backups and media storage.) To improve performance, I migrated my Photos library to an inexpensive 1TB USB 3 SSD, as described in "How to move your Mac's Photos library to an SSD for better performance (fave.co/3GoLIBZ)."

You have lots of different options in which you can mix HDDs, slower SSDs, and faster SSDs to find the right mix.

With a laptop, you may find an external drive irritating to manage while traveling, but spending $100 to $300 for an external SSD might avoid a cost after trade-in of hundreds to well over $1,000.

WHAT TO DO IF YOU CAN'T LOG INTO YOUR GOOGLE ACCOUNT ON YOUR MAC

Apple makes it simple to log into accounts for email, calendars, reminders, and notes run by other ecosystems, like Microsoft and Google. But you may have been bitten by some Apple/Google bug that prevents successful completion of a Google account login.

This can occur either in System Preferences ➜ Internet Accounts when you click Google and then click the Open Browser button, or in Mail when you go to Mail ➜ Preferences ➜ Accounts, click the + sign, select Google, and click Continue.

What you expect to see isn't a moderately large empty dialog box with a gray spinner inside and a Cancel button at the bottom. You would prefer to see a page that lets you select or enter your Google account information and validate its use with your Mac.

The solution isn't straightforward, but one of the following should work in my testing and based on trial and error folks online have engaged in:

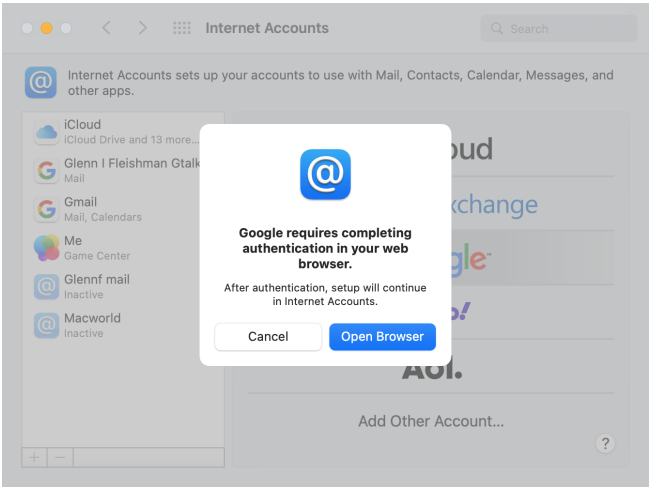
> Quit and relaunch Mail.

> Quit and relaunch Safari.

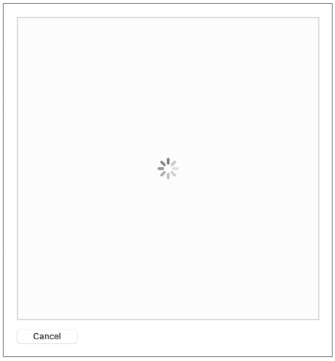
> Switch the default browser from Safari to Chrome in System Preferences ➜ General in the "Default web browser" pop-up menu.

> Or, perhaps, switch the default browser from Chrome to Safari. (It's worked both ways for me.)

Using a combination of the above strategies across several broken login



Prompted to authenticate, you click Open Browser.



An empty window with a spinner greets you.

attempts I was able to get the window to display correctly.

HOW TO FIND OUT WHAT DEVICES ARE LOGGED IN TO YOUR iCLOUD ACCOUNT

Want to know every device that's logged into your iCloud account? It's a breeze to find out—and may assuage any fears you have that someone has tapped into your accounts. In these uncertain times, the Mac 911 mailbox routinely hears from readers who worry that something is up. You can put at least one fear to rest by checking that iCloud device list. (Most recently, someone wondered if an unknown party was inserting entries into the Reading List.)

Nobody can gain access to any of your iCloud information without physical access to your devices, the ability to log in with your account information at iCloud.com (for limited kinds of data) or iCloud for Windows (even more limited), or by logging in to an Apple device with your Apple ID.

If someone logs in using anything but an Apple device:

> If your Apple ID has two-factor authentication enabled—and most accounts do—they must obtain the verification code from one of your trusted devices or phone numbers.

> If they succeed in logging in at a new location, Apple emails your Apple ID-associated email address with the login details.

> iCloud for Windows allows access to iCloud Keychain, a significant security risk, but you have to jump through a few verification and encryption hoops to get there—it's not as simple as having a password.

Any Apple devices logged into your iCloud account will always appear in a list Apple maintains. This includes any Mac, iPhone, iPad, or Watch, as well as any Apple TV, HomePod/HomePod mini, Windows system, or third-party smart TV with Apple TV software. You can access this list in three places:

> Via the Apple ID website: Go to appleid.apple.com, click Sign In, and log in with your credentials. Click Devices in the left-hand menu bar.

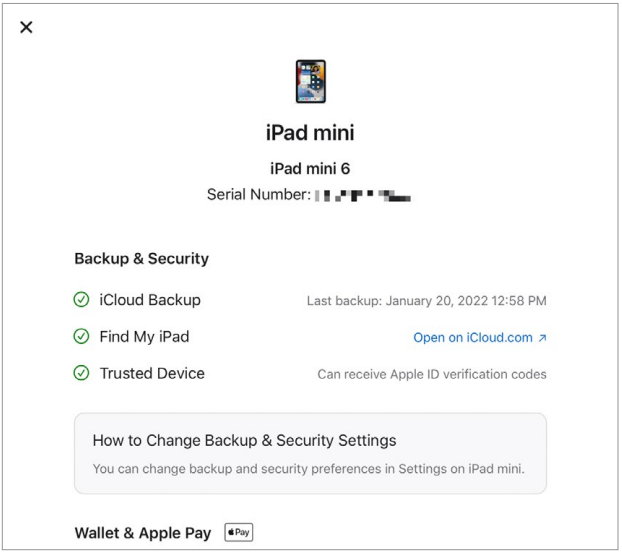
> In iOS/iPadOS: Go to Settings > Account Name and swipe down until you

see your devices.

> In macOS: Go to the Apple ID preference pane (Catalina or later) and scroll through the left-hand navigation list. (In Mojave and earlier, go to the iCloud preference pane, click Account Details, and click Devices.)

> In iCloud for Windows: Click Account Details and then click Manage Apple ID.

This list shows a lot of details when you select a device: its serial number, Find My status, last iCloud Backup (if any), whether it's correctly set up as a trusted device (for applicable hardware), associated Apple Pay cards, and installed version. This makes it easy to determine whether all the devices belong to you and should have access.



Apple lets you see details associated with all the Apple devices logged into your iCloud account at a glance.

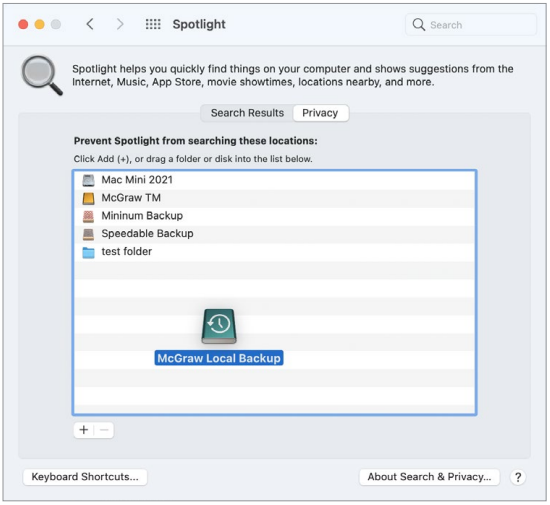
If you find a device that shouldn't be there, you can tap or click Remove from Account in all of the above views, and then confirm the action. Removing it breaks its connection with iCloud, disables its use as a trusted device, and deletes it from the list.

If you have access to the device you want to remove, you can instead sign out of iCloud and all other stores and services (fave.co/3GuJIsR) directly from the device.

IMPROVE YOUR MAC'S SPEED BY ADJUSTING SPOTLIGHT'S SETTINGS

On any Mac, you can experience odd slowdowns when copying or acting on a large number of files, such as duplicating a folder with many items in it, cloning a drive, or testing drive performance. That's because Spotlight never sleeps. It's constantly looking for modified or new files to index.

Spotlight's "polling" can have a significant performance toll. For example, cloning speed might be half the rate you expect or even lower. But you can tell Spotlight to keep its hands off while



Drag an item into the Privacy view to add it, or click the + to select a folder or volume.

performing operations that it might otherwise slow down. The secret is the Spotlight preference pane's Privacy view (System Preferences ➜ Spotlight ➜ Privacy).

Apple uses the term "privacy" to indicate you don't want items indexed that are shown in the volumes or folders list in that view. But it's really a "don't index me" list.

You can use the Privacy list in a lot of ways:

Add external volumes that contain backups, like networked Time Machine volumes or local clones. These don't need to be indexed. (Volumes that are entirely devoted to Time Machine are already excluded, but don't show up in the list.)

When creating or updating a clone, drag its volume icon to the list before starting. You can remove it later, but you likely don't need the clone indexed within the current startup volume's system.

Create or add folders that commonly hold large numbers of temporary files or are used for rapid reading and writing of data that doesn't need to be indexed. I discovered in using the Blackmagic Disk Speed Test, a free app for determining drive performance, that placing its test file in a Spotlight-indexed folder dramatically reduced tested throughput compared to a folder excluded from Spotlight. ■

Ask Mac 911

We've compiled a list of the most commonly asked questions we get, and the answers to them: go.macworld.com/mac911faq to see if you're covered. If not, we're always looking for new problems to solve! Email us at mac911@macworld.com including screen captures as appropriate.

Mac 911 can't provide direct email responses or answers for every question and we don't provide direct troubleshooting advice. For that, turn to AppleCare, an Apple Store Genius Bar, or the Apple Support Communities.