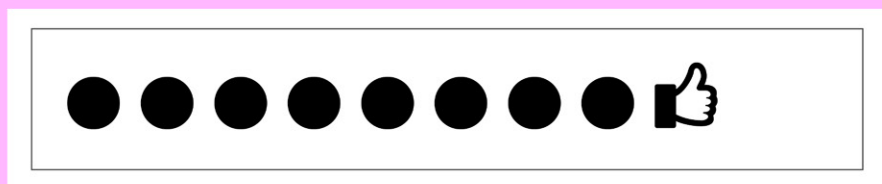


CONNECT & SECURE YOUR IPHONE & IPAD



Covers iOS 13.1 & iPadOS 13.1

BY GLENN FLEISHMAN

Welcome

This is an excerpt from *Connect and Secure Your iPhone and iPad*, version 1.0.3, written by Glenn Fleishman, published September 26, 2019, by Aperiodical LLC. This excerpt covers the Personal Hotspot feature in iOS 13.1 and iPadOS 13.1.

If you like the excerpt, you can [get the entire ebook via this link](#). The ebook comes in three formats (PDF, EPUB, and MOBI) and no DRM—you can read your book on any device you choose.

This book describes how to use your iPhone and iPod touch with iOS 13.1 and iPad with iPadOS 13.1 on Wi-Fi and cellular/mobile networks securely, making connections with ease while protecting your data and your privacy. It also covers Bluetooth, tracking an Apple mobile device, the Apple Watch, managing passwords, Safari's cookie protections, Personal Hotspot and Instant Hotspot, two-factor authentication with an Apple ID, Sign in with Apple, using AirDrop and AirPlay, and solving connection problems.

Find me on the web at <http://glennf.com/guides>.

If you have the ebook edition and want to share it with a friend, I ask that you do so as you would with a physical book: “lend” it for a quick look, but ask your friend to buy a copy for careful reading or reference. Aperiodical LLC is a tiny independent publishing company—just Glenn!

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Introduction

The book is divided into three major sections:

Networking should be simple, and security should be automatic. And money should grow on trees. Despite how intuitive it is to pick up and use an iPhone or iPad, requiring little thought as to how it connects to a cellular or Wi-Fi network, it becomes complex as soon as you drill down to any details. This is especially true when connectivity fails, and you try to troubleshoot.

Privacy deserves the attention it's now getting. Your information is your own to choose how it's shared, whether it's your location, your food preference, or your address and phone number. iOS and iPadOS provide tools that enhance your ability to control that.

Security is an even denser area. Apple makes its default choices reasonably secure, but to ensure real protection for your data—when you select and use passwords, while your bits are traveling through the æther, or in the event that your device is stolen—you need to know how it all works.

Note: Apple split iOS into two parts in its latest release. iOS is now the name of the operating system that runs an iPhone or iPod touch, while iPadOS naturally powers the iPad. Because nearly everything covered in this book remains identical across both systems, I will frequently refer to them collectively as “the OS” to avoid repetition.

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Make a Mobile Hotspot

Every iPhone and every iPad with cellular has a built-in data modem that lets the device access high-speed mobile data networks. This modem lets us use our iPhone or cellular iPad while we're traveling instead of having to buy a separate cellular modem or router with a separate monthly service fee.

Personal Hotspot lets you connect other devices to your phone or tablet as a conduit to the mobile Internet. While the name implies a Wi-Fi hotspot connection, which is one component of it, you may also *tether* via Bluetooth or USB with desktop computers and other devices to extend access. All three methods may even be used simultaneously.

Personal Hotspot's availability varies by carrier, although operators around the world offer it: [Consult this list by Apple](#) to check on yours.

Note: I refer to a mobile hotspot or Personal Hotspot when I mean all its features, but I use the term *tethering* when the discussion is specifically about Bluetooth or USB.

WARNING! Most cellular operators put limits on Personal Hotspot use. They may offer a data rate lower than that of your phone (600 Kbps instead of LTE, for instance), cut you off after a certain amount of data (like 15 GB), or throttle you to 128 Kbps (2G) or 3G speeds after a monthly cap is hit.

Work with Personal Hotspot Settings

Personal Hotspot is always available even when it says it's off. That sounds like a strange way to provide a service, but it makes sense in how Apple approaches it, particularly starting in iOS 13.1 and iPadOS 13.1.

In this new approach, a Personal Hotspot is something that any device logged into the same iCloud account can access on demand. You can also make it available to family members if you use Family Sharing. And if you want to let people or devices outside those two sets have access, you can tap a button and make the device act like any mobile hotspot.

Avoid Blowing Through Bandwidth

Devices that connect to a Personal Hotspot treat it like a regular Wi-Fi or Ethernet network, making it easy to consume huge amounts of cellular data. On your devices that connect to a Personal Hotspot, pause or disable sync and backup services, like Dropbox and Backblaze. Some third-party apps in macOS let you disable the use of specific Wi-Fi networks.

On other iPhones and iPads, you can enable the new Low Data Mode for the Personal Hotspot Wi-Fi network in Settings > Wi-Fi > *network name*. You have to be connected to enable Low Data Mode.

macOS doesn't yet offer a Low Data Mode, though Android does and Windows 10 has some tools. It would be great if every platform was cognizant of the increased use of mobile hotspots, which almost all come with limits or overage charges.

Personal Hotspot has three states:

- **Off:** You would think Off means off, but it means “standby.” Off appears in the main Settings app next to the Personal Hotspot item.
- **On:** If you connect with another iCloud-linked device, or a member of your Family Sharing group connects, the Settings app shows On next to its item. The On label also appears if you allow access from other devices or people and one of them is connected.
- **On and Discoverable:** Other devices can also connect. This label appears only in the Control Center if you hold on the network area to reveal the Personal Hotspot button. In Settings, *no label* appears in this state! Yes, it's very consistent.

Let's dig into these overlapping states of being.

Tip: Before you use Personal Hotspot the first time, you may need to open it via Settings > Cellular (iOS) or Settings > Cellular Data (iPadOS).

Access via iCloud Devices

All your Apple devices logged into the same iCloud account can access your Personal Hotspot on demand. The capability is part of Continuity, a set of connections between your Apple mobile devices and between iOS, iPadOS, and macOS. (This feature used to be called Instant Hotspot.)

The limitation is the same as with many Continuity features: Your iPhone or cellular-data iPad and other devices that want to connect to it must all have Bluetooth enabled and be on the same Wi-Fi network.

On another iPhone or iPad device, go to Settings > Wi-Fi and choose the device in the Personal Hotspots list (**Figure 7**).

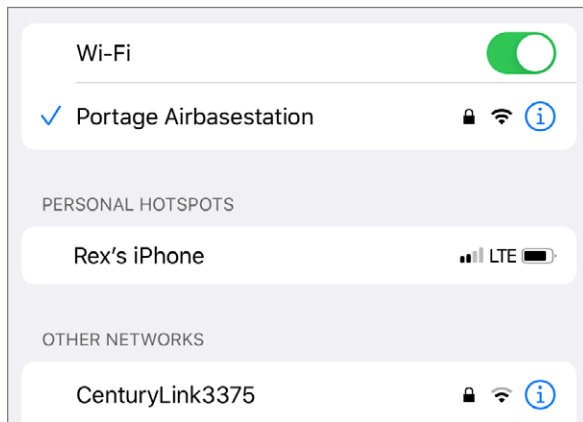



Figure 7: In Wi-Fi settings, pick a device from the Personal Hotspots list.

You can also use an option, new to this OS release, in Settings > Wi-Fi: Auto-Join Hotspot. Set it to Ask to Join or Automatic, and you'll be asked or automatically connected when no other Wi-Fi network is available.

On a Mac, select the Wi-Fi  menu, and choose the device in the menu under Personal Hotspot (**Figure 8**).

Even if you're not planning to connect, you can see the battery life, signal strength, and connection strength of your device as a compact set of graphics in the menu or list.

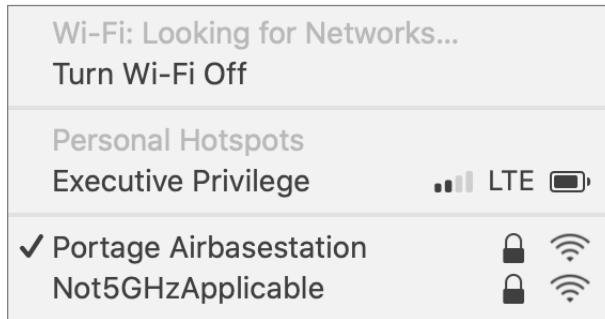


Figure 8: Available Personal Hotspots appear in the Wi-Fi menu in macOS.

Let Your Family Share It

In the latest OS, you can also opt to make your Personal Hotspot available to others in your [Family Sharing group](#) in iCloud. If you use Family Sharing, the Personal Hotspot settings will include a Family Sharing menu. Tap it and you can choose to turn it on. You then select which family members must ask for approval and which can join automatically.

Allow Others To Join

The Personal Hotspot is always available to the devices and people mentioned above, but you can also provide access to other hardware and humans who aren't in your iCloud set or Family Sharing group via Wi-Fi and adding USB and Bluetooth tethering.

In Settings > Personal Hotspot, switch on Allow Others To Join (**Figure 9**). You can also enable this mode in Control Center. Swipe to reveal it, hold down on the network area, then tap Personal Hotspot (see **Figure 11**, ahead). I discuss these extra options in [Other Ways To Connect](#).

Set a Wi-Fi Password

When you first turn on Allows Others to Join in Personal Hotspot, the OS creates a strong WPA2 password. To connect a non-linked device over Wi-Fi to the hotspot, you must enter this password on that device.



Figure 9: The Personal Hotspot view lets you control who and what can access it.

You *must* use a password—Apple doesn't let you have an open hotspot. But you may choose to compose your own. For advice on picking a memorable password that's both secure and easy to enter, see [Create, Manage, and Use Strong Passwords](#).

Tip: If you're worried about Wi-Fi at a public location, you can use a Personal Hotspot connection for greater security. Whether via the physical security of USB or the wireless encryption of Bluetooth or Wi-Fi, you're protecting your data more strongly. Although the backhaul to the cellular data network isn't impregnable, it's orders of magnitude less vulnerable than a public Wi-Fi connection.

Use Cell Data while Talking

All iPhones that can handle iOS 13 can let you use data and have a voice conversation at the same time. The technical name is Voice over LTE (VoLTE), referring to the 4G LTE cell standard. (It's also part of new "5G" networks, which so far run 4G technology with a 5G sticker on them.)

VoLTE is often paired with a higher-quality *compression algorithm*, which dramatically improves the quality of a voice conversation by increasing the frequency range. It sounds more natural and less muddy.

Note: Cellular networks have gone through generations: 1G was analog; 2G used digital voice and very low-speed data; and 3G added high-speed data, but it was sort of stapled on, making voice and data impossible to use at once. Even when LTE first appeared, the VoLTE technology wasn't ready. Finally, it's all here!

You can't control whether or not your iPhone will use VoLTE. Two main provisos exist:

- **Carrier must have deployed.** Many carriers around the world have deployed VoLTE. In the U.S., AT&T, T-Mobile, and Verizon have it turned on, while Sprint does not. Some of the country's smaller networks also have it enabled.
- **May have to be on the same network.** VoLTE should work interoperably between carriers, but it doesn't always! As with the first proviso, there's no way to tell and no way to force it to work.

If you meet these requirements, receiving a call or placing one will engage VoLTE, and your Personal Hotspot or other data use will continue at full LTE speeds.

However, if you find yourself on a 3G or slower network, your iPhone will manage a call differently depending on the network:

- **AT&T, T-Mobile, and GSM networks:** GSM networks are used by most carriers worldwide. Data use continues, but is shunted to a slower 3G, 3G+, or some of the rarer 4G network without LTE.
- **Verizon, Sprint, and most CDMA networks:** CDMA networks are rare outside the U.S. Data use, including Personal Hotspot, is immediately suspended.

If you don't answer a call or when you hang up, data use returns to the highest-speed available network.

Name Your Wi-Fi Network

The Wi-Fi network created by a Personal Hotspot has the same name as your device's name. This is typically your name, or that of whichever account you used to set up the device, plus a possessive and the word iPhone or iPad. If you don't feel like broadcasting your account name whenever you turn on Personal Hotspot, you can change it.

To change the name, in iOS or iPadOS, visit Settings > General > About > Name. Tap and revise the name or enter a new one. With the device connected to a Mac, click its icon in Locations in the Finder's Sidebar, then click in its name or select the whole name, type a new name, and press

Return (**Figure 10**). Turn Personal Hotspot off and back on for the new name to be broadcast. (In macOS before 10.15 Catalina, use iTunes and click the device’s icon near the top.)

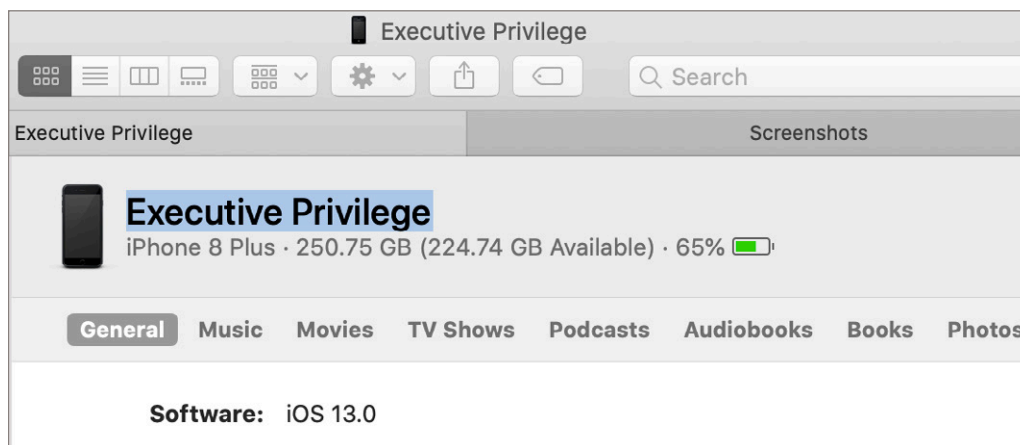


Figure 10: The Wi-Fi network name is identical to the name of your device.

Other Ways To Connect

With Allow Others To Join enabled, you and others can use your Personal Hotspot by connecting via one or more of these three ways:

- **Wi-Fi:** Any Wi-Fi-equipped device can connect just as if the iPad or iPhone were a wireless router.
- **USB:** Plugging a computer into your iPhone or iPad offers a high-speed data connection that you know works as long as the cable isn’t bad. The downside? Being literally tethered.
- **Bluetooth:** This method requires more steps to make a connection initially, but it gives you cable-free flexibility. Most Bluetooth-equipped devices can connect through this method. No more than three devices may connect via Bluetooth at the same time.

Pick Wi-Fi or Bluetooth? Wi-Fi can consume more battery power than Bluetooth, so you might opt for Bluetooth tethering, but Bluetooth tops out—even in the latest 5.0 spec—at 3 Mbps of raw throughput or about 2.1 Mbps of actual throughput. That’s as little as 1/10th of LTE speeds.

Regardless of your carrier, you can't connect more than five devices across all these methods, although Apple stopped documenting that limit years ago. Additional connections will be refused.

Once you make a connection, a banner appears across the top of the iPhone or iPad's screen (**Figure 11**). iPhones with notches minimize this display to the upper-left corner. The banner shows the number of devices connected, too. The same banner appears on the Lock screen.

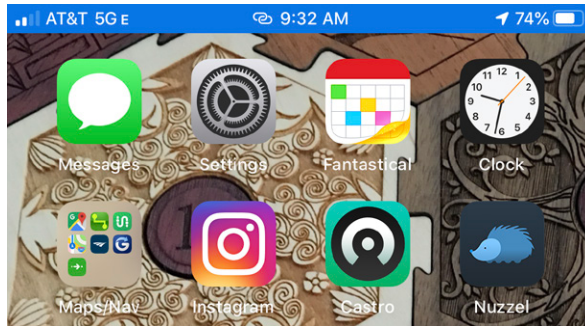



Figure 11: A banner lets you know whenever Personal Hotspot is in active use.


Note: Windows computers, Android phones, and other devices can also connect via Wi-Fi and Bluetooth; and Windows can also tether via USB. The process is identical on those platforms to hooking into a Wi-Fi, Bluetooth, or USB shared network.

Access via Wi-Fi

Using Wi-Fi to connect to a Personal Hotspot is the easiest case because no special setup is required. You use whatever method you normally employ to connect to a Wi-Fi network from the device, and I provide directions for several common operating systems just ahead. The name of your iPad or iPhone is the name of the Personal Hotspot network.

Connect via Wi-Fi in macOS

In macOS, you can use the Wi-Fi  menu on the menu bar to select the Personal Hotspot network by name:

1. Click the Wi-Fi  menu to see a list of available networks.

2. Choose the network's name. If you're part of its iCloud set of devices, it appears under Personal Hotspots as described earlier (**Figure 12**).
3. If prompted for a password, enter it, and click Join.

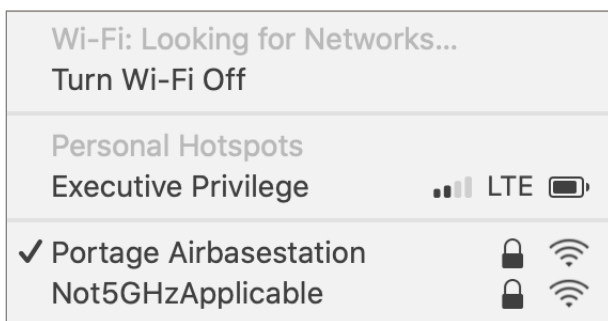



Figure 12: Select the hotspot under Personal Hotspots.

Note: If you have iCloud Keychain enabled and connect to a Personal Hotspot that isn't linked to your iCloud account, the password is synced among all your devices. You won't have to enter the password again on any of your other linked hardware.

Disconnect from Personal Hotspot Wi-Fi

To stop using the Personal Hotspot, select the Wi-Fi  menu and click Disconnect From *Network Name*. Your link is severed.

Don't join automatically in the future

If you want to prevent the Mac from connecting automatically in the future, follow these steps:

1. Connect to the Personal Hotspot.
2. Open the Network preference pane and click the Wi-Fi adapter in the list at left.
3. Uncheck Automatically Join This Network.

Note: As I write this edition of the book, the above steps don't appear to "stick"—the setting change disappears when you reconnect manually to a Personal Hotspot. I expect this will be fixed in a future macOS release.

Note: Before macOS 10.15 Catalina, you needed to click the Advanced button when viewing the Wi-Fi adapter and then uncheck the Auto-Join box next to the Personal Hotspot network's name.

Connect via iOS or iPadOS

Use the Settings app to connect to the Personal Hotspot network:

1. Select Settings > Wi-Fi.
2. Choose the network from the Personal Hotspots list (**Figure 13**).
3. Enter the password if prompted.

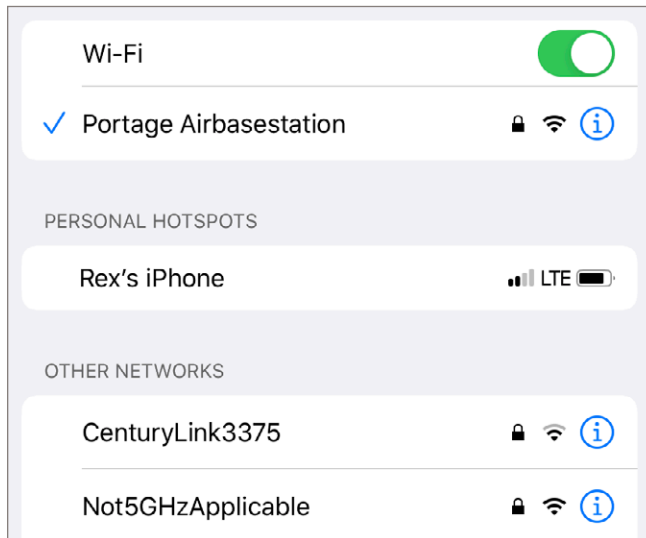




Figure 13: Look in the Personal Hotspots section (above) or for the chain  icon in the Networks/Other Networks list.

You are now connected. The chain  icon appears at the left of the OS's status bar instead of the normal Wi-Fi icon.

To stop using the mobile hotspot right away, choose another network from the list, disconnect Wi-Fi via Control Center, or turn off Wi-Fi.

If the device offering a Personal Hotspot isn't part of your iCloud set of hardware, you can also disable future connections by forgetting the network. While the hotspot connection is active, tap the network name and

then tap **Forget This Network**. This removes the network’s stored setting and also disconnects the device from the Personal Hotspot. However, for iCloud–linked devices, the settings aren’t actually forgotten.

Disable Wi-Fi sharing in iOS or iPadOS

To turn off the hotspot on the device that is sharing its connection, just tap **Settings > Personal Hotspot** and then turn off the **Personal Hotspot** switch; or, open **Control Center** and hold down on the networking area, and then tap the **Personal Hotspot** icon.

You can also block all existing connections from client devices that aren’t using iCloud Keychain by changing the Wi-Fi password on the **Personal Hotspot** screen. This will also prevent devices with a stored password from reconnecting automatically or manually until you provide the changed password. (iCloud Keychain synchronizes the correct password among all connected devices, which means after you reconnect successfully, so will all other devices after they sync.)

Tether with USB in macOS

Connect your iPhone or iPad to your computer using a USB cable. The first time you enable **Personal Hotspot** and plug the device into a Mac via USB, macOS alerts you that the interface is added and the Mac’s **Network** system preference pane adds an adapter entry (**Figure 14**).

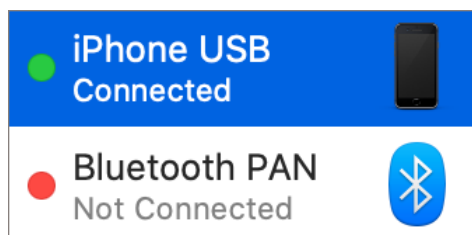



Figure 14: An entry appears in the adapters list.

macOS automatically activates tethering and turns that red dot green.

Note: Apple offers a security feature that disables USB on an iPhone or iPad if it hasn’t been unlocked for an hour or more. You may need to unlock your device to get it to tether via USB as a result. A message appears on the lock screen if so.

To halt the active USB tethering connection, disconnect the USB cable. Alternatively, you can disable the iOS or iPadOS adapter profile. In the Network system preference pane in macOS, select the iPhone USB or iPad USB adapter, and then from the gear  pop-up menu, choose Make Service Inactive. Click Apply in the lower-right corner.

Tip: The iPhone or iPad USB connection is set by default to activate if no other Internet connection is in place. If you'd like to override that, uncheck the Disable Unless Needed box. Then you can manually enable and disable USB-based Internet access.

Connect with Bluetooth

On your hotspot device, make sure Bluetooth is turned on: Swipe to show Control Center and check that the Bluetooth icon is active. If it's not, tap it. (You can also manage Bluetooth from the Settings app.)

Once you're sure it's enabled, you can make a Bluetooth connection from macOS, iOS, or iPadOS, as I describe next.

Note: I cover Bluetooth in more detail in [Set Up Bluetooth](#) if you'd like to learn more.

Bluetooth uses less power than Wi-Fi, almost nothing in standby mode, so a Bluetooth connection could allow both an iPhone or iPad and a paired piece of hardware to work longer without AC power.

Bluetooth tethering with macOS

Follow these steps to set up a Bluetooth connection between your hotspot device and a Mac running Yosemite or later:

1. Launch System Preferences, and select the Bluetooth pane.
2. Your iPhone or iPad should appear in the list of devices. Click Pair. (If it doesn't appear, check that Bluetooth is enabled on the iPhone or iPad and that it's within a few dozen feet of your computer.)
3. A pop-up dialog appears with a 6-digit code. On the iPhone or iPad, a similar confirmation dialog pops up (**Figure 15**).
4. Confirm that the code is identical, which prevents a so-called man-in-the-middle attack with someone nearby trying to intercept the connection. (That's very unlikely, but it could happen.) The additional cue

is the name of the device. Click Pair on the hotspot device. On the Mac, your mobile device now appears with the word Connect to its right.

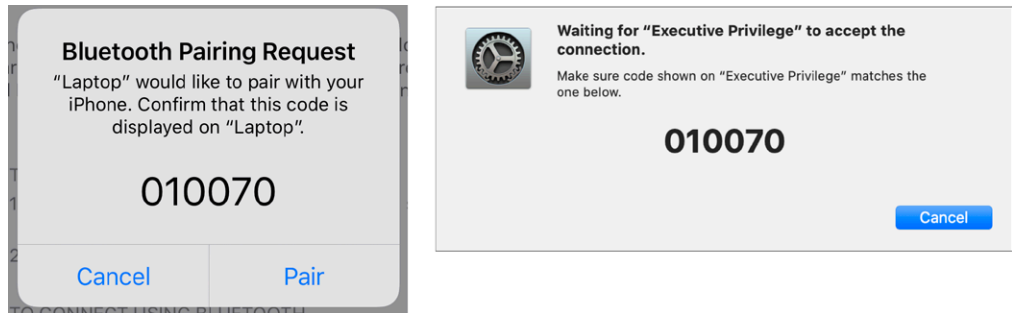


Figure 15: The iPhone and Mac display the same code.

5. Now, in System Preferences, click Show All, then select Network.
6. In the adapters list at left, you'll notice a new Bluetooth PAN entry; PAN stands for Personal Area Network, and it's the kind of network that Bluetooth creates. Your device should be selected in the Device pop-up menu (**Figure 16**). Click Connect.

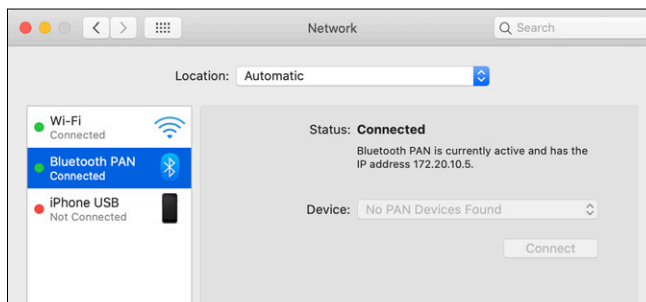


Figure 16: The Network preference pane lets you manage the connection over USB.

7. On the Mac, you'll see the Status label set to Connected, and if the Bluetooth system menu \mathbb{X} icon is showing, it will have dots bisecting it. On your hotspot device, the Internet tethering banner will appear.

To disconnect Bluetooth tethering, you can do any of the following:

- In the Network preference pane, with Bluetooth PAN selected in the adapters list, click the Disconnect button.
- In macOS, from the Bluetooth \mathbb{X} menu (if displayed via the preference pane setting), select the device and select Disconnect from Network.

- On your mobile device, in Settings > Personal Hotspot, tap the Personal Hotspot switch to Off.
- In iOS or iPadOS, open Control Center, hold down on the network area, and then tap the Personal Hotspot icon.
- Turn off Bluetooth networking. In iOS or iPadOS, tap Settings > Bluetooth; on the Mac, look in the Bluetooth system preference pane or the Bluetooth ⌘ menu on the menu bar and select Turn Off Bluetooth.

Bluetooth tethering with iOS or iPadOS

Although all Apple mobile devices have Wi-Fi built in, Bluetooth consumes less battery power and may be a more appropriate choice. You can set up a Bluetooth connection and a hotspot device quite simply:

1. View Settings > Bluetooth.
2. If Bluetooth is off, tap the switch to turn it on.
3. Tap the Personal Hotspot in the list of Devices/Other Devices (**Figure 17**). Both devices show confirmation dialogs. (It appears in My Devices if it was previously paired.)

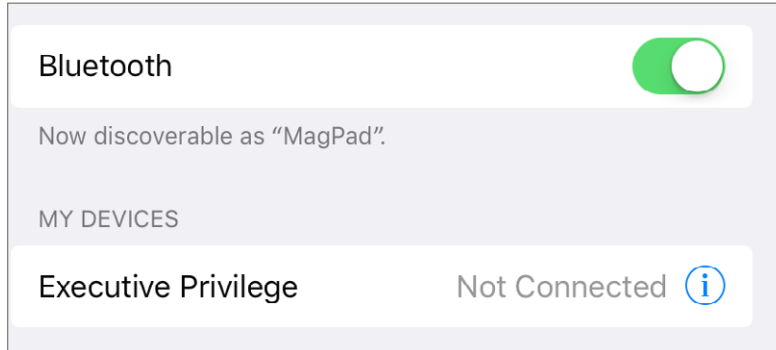



Figure 17: The hotspot appears in the My Devices list; here, it's "Executive Privilege."

4. If the codes match, tap Pair on both devices.
The device is now connected over Bluetooth, and a chain  icon appears in the status bar instead of the normal Wi-Fi icon.

To disconnect from the Personal Hotspot:

- **On the connected device:** In Bluetooth settings, tap the Personal Hotspot device and then tap Disconnect.
- **On the hotspot:** Turn off or disconnect Personal Hotspot or turn off Bluetooth.

To reconnect, open Settings > Bluetooth and then tap the Personal Hotspot, which now appears in the My Devices list.

Tip: You might want to discard a stored Bluetooth pairing from the My Devices list. Tap the info ⓘ button next to the device name and then tap Forget This Device.

Use Bluetooth Tethering from iOS or iPadOS to a Laptop

A side benefit of the capability to tether over Bluetooth is that you can also use your mobile devices to grab Internet access from a laptop. For instance, if you're in a hotel or other location in which you have to pay for each device you connect to a Wi-Fi network, this may make financial sense.

Under macOS, use the Sharing preference pane's Internet Sharing option to share the Wi-Fi connection via Bluetooth PAN. Choose Wi-Fi from the Share Your Connection From pop-up menu, and check the Bluetooth PAN box in the To Computers Using list. Then check the box next to Internet Sharing in the Service list at left.

Consider Turning Off Certain Radios

You might not want your hotspot to be available through Bluetooth or Wi-Fi, as your nearby devices might accidentally connect to it. The only way to prevent that is to turn off those radios. If you use Settings > Wi-Fi or Settings > Bluetooth to disable either or both of those radios, this can also disable a number of other features in the OS, like Continuity and Apple Watch connectivity.

For that reason, starting iOS 11 you can use a standby mode via Control Center. Swipe to show Control Center and tap Wi-Fi or Bluetooth: they switch to Not Connected. This leaves the radios on, but doesn't allow Personal Hotspot connections through those networking methods. (This is explained further in [Airplane Mode](#).)

Control Center lets you see Personal Hotspot's status at a glance. Swipe to reveal Control Center and hold down on the networking area to reveal an expanded network view.

This area includes AirDrop and Personal Hotspot in addition to Airplane Mode, Cellular Data, Wi-Fi, and Bluetooth (**Figure 18**). Every mode has text beneath that shows that method or feature's status.

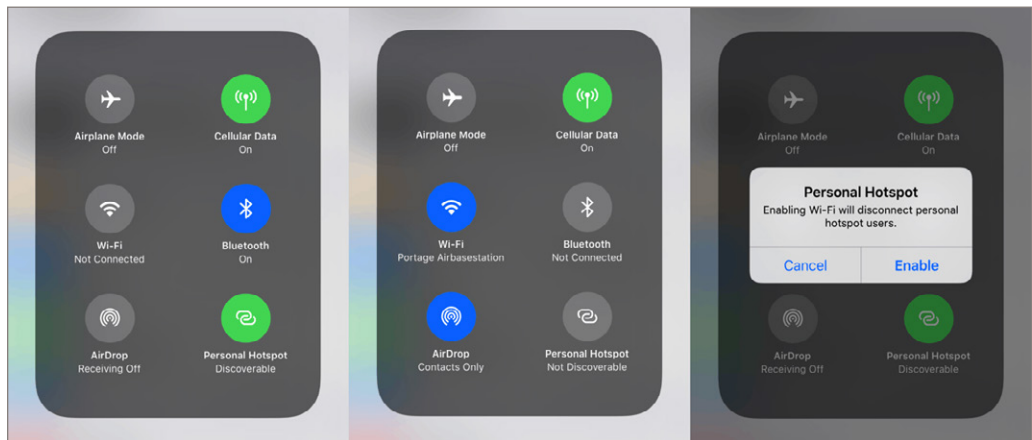


Figure 18: From left to right: hotspot on and Wi-Fi unavailable; Bluetooth and hotspot on standby; and trying to re-enable Wi-Fi with the hotspot running.

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Glenn Fleishman was trained as a typesetter, received a degree in art, and works as a journalist, type historian, and programmer. Glenn appears regularly in *Macworld*, *Increment*, *TidBITS*, *Fast Company*, and other publications where he writes about security, copyright, punctuation conventions, printing history, and much more.

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