

"Wi-Fi, Cellular, Bluetooth, Oh My"

Technology can be fascinating, liberating, and complex all at the same time. Wireless technology allows you to move about freely yet remain connected to the Internet, friends, family and even your vehicle. However, it can also be somewhat confusing given the various technologies, standards, and terms used in the industry. I hope the following article will help "de-mystify" wireless technology a bit, and help you use it to connect with others.

# The Big Picture

Wi-Fi, Cellular, and Bluetooth are three primary ways you can communicate or connect your various devices to enable you to do virtually anything over wireless networks. Ultimately, these wireless networks allow you to access the Internet, which is the largest global network of all. A wireless network has three main elements that allow them to work – radios, antennas, and routers (primarily for Wi-Fi). Your mobile devices have radios and antennas built in which allow them to connect to Wi-Fi, cellular networks, and Bluetooth-enabled devices. If you are setting up your network at home, you would need to purchase and install a Wi-Fi router which you then connect to your Internet provider's modem in order to access the Internet with your devices inside your home. For cellular, you do not need a Wi-Fi router. Your device will seamlessly connect to the Internet if you are in range of a cellular tower, and you have purchased a data plan from a service provider.

There is a fairly simple way to think about these three wireless technologies. You can use Bluetooth for very short distances – in your home office, car, den, etc., Wi-Fi for larger areas like homes, restaurants, and businesses, and Cellular for much larger areas and most outdoor connections.

## What is Wi-Fi?

<u>Wi-Fi</u> is a high-speed Internet connection that allows you to wirelessly connect various devices to a network. This could be your home network, your workplace, public networks (free and "fee" also sometimes known as "hotspots"), and the Internet. Many restaurants, airports, and other public locations offer Wi-Fi services.

Wi-Fi works by connecting your device to a wireless router, which then connects to the Internet. Unless you have a wireless router in your home, you will not see these devices. Most phones and tablets today seamlessly search for Wi-Fi connections as you move around. Typically, cell phones and tablets have a Wi-Fi range of about 150' indoors or 300' outdoors depending on the type of device you are using. The quality (and distance) of the signal is greatly affected by the construction of your home, office, or building where you may be. This is why you may lose a WI-FI signal in an elevator or even in your home if you are far away from your wireless router.



You can also use Wi-Fi to make and receive calls. <u>Wi-Fi calling</u> is useful when there is a poor or unavailable cellular signal, or you wish to avoid data charges for using your cellular data plan. For most providers (e.g., Verizon, AT&T), when you use Wi-Fi calling while traveling internationally, you will be charged at domestic US rates when you make or receive a call from a domestic US number. Wi-Fi calls made to a non-US number would be treated as an international call. It is important to remember if you do use Wi-Fi calling while traveling internationally, to place your device in airplane mode in order to turn off cellular access (and ensure you are using Wi-Fi for your call). You can also download and use apps like WhatsApp which uses your Wi-Fi connection to allow you to send and receive messages, calls, photos, videos, documents, and voice messages even while traveling internationally.

You may also notice that WI-FI generally operates in two "bands" – 2.5GHz and 5 GHz. For example, if you are visiting a family member and wish to use their Wi-Fi network, you may see both versions available when your device scans for networks. Without getting too technical, most devices sold today will operate in both bands. What is helpful to know is that 2.5GHz has longer range but slower data rates than 5 GHz which may be useful if you are in an area where coverage is weak.

## What is Cellular?

<u>Cellular</u> is a type of connection that allows your devices to connect to the Internet by accessing cellular towers when you purchase a data plan from your service provider (AT&T, Verizon, Sprint, etc.). A typical



cell phone can pick up the signal from a cell phone tower up to 45 miles away. These are called cellular networks because as you move around, these tower (or cells) transfer your mobile device to the next one, and so on thereby allowing you (hopefully) seamless and continuous communications throughout the network. The actual distance and quality of signal you receive depends on geography (rural vs. urban), terrain, structures, and population density. This is also why you may notice "drops" or lower quality signal when you are in large buildings or remote areas where the signal is weaker, or there are a large number of users present (e.g., football game or concert).

Mobile cellular networks have evolved through a series of generations, each representing major technological improvements over the previous generations. The first two generations of mobile networks introduced analog voice (1G) in the 1980's, and then digital voice (2G) in the 1990's. Subsequent generations supported the proliferation of smartphones by introducing data connections (3G) and allowing access to the Internet during the early-2000's. The 4<sup>th</sup> generation (4G) service networks introduced in the mid-2000's improved data connections, making them faster and better able to support video streaming. The latest technology is the 5G network, which promises even faster speeds (10-20x faster than 4G), greater bandwidth, security, and connectivity compared with 4G while reducing interference with other nearby wireless devices. 5G is not widely available yet as it is currently being implemented by many network providers and phone suppliers. To simplify the discussion somewhat, you can think of it this way. The higher the number, the higher speeds, security, and connectivity you can expect.

You may also see designations like "GSM", "EDGE", and "LTE" (part of 4G) on your phone or tablet which represent previous generation technologies which provide lower data transfer rates although for most applications (e.g., voice calls, email, texting, Internet access), they work fine. They are also widely available globally which is an advantage over new or emerging technologies.

Fortunately, newer generations of phones and tablets are "backward-compatible" so you do not need to worry about this unless you seek to have the fastest available Internet connection and data transfer capability.

# What is Bluetooth?

<u>Bluetooth</u> is a form of low power wireless connection used to exchange data between devices over short distances, typically less than 30'. You would generally use Bluetooth to connect your phone to your car (to access your contacts, music, or navigate), or connect things like your headset, keyboard, mouse, and speakers to your computer. You may also connect your printer using Bluetooth.



You do not need to have a Wi-Fi or cellular network to use Bluetooth. It is a completely different technology. You connect these devices through a process called "pairing" where you set both Bluetooth-enabled devices you wish to communicate into a search mode and connect them following on-screen instructions. Once connected the first time, these devices will automatically detect one another when they are in range of one another, so it is easy and seamless for you to use.

What does this all mean?

Now that we have explained what these technologies are, the real question is what does it mean to you? Unless you have an older generation phone or tablet, most smart phones and tablets now come with both Wi-Fi *and* cellular connectivity. This is so that you can have access to the Internet whether there is an available Wi-Fi network in the area or not. If you are like me, you generally do not pay attention to how you are accessing the Internet to talk to your family, surf the web, access social media, or purchase things. However, if you have a phone or tablet which supports both Wi-Fi and cellular, it does help to pay attention to how you access the Internet if you have paid for a limited data plan and wish to avoid expensive cell phone bills. This is where Wi-Fi comes in.

If you connect to the Internet without being connected to a Wi-Fi network, you are using cellular data. If you have a cell phone plan with a limit on the amount of monthly data you can use, you may want to minimize your use of data by connecting to Wi-Fi when you access the Internet.

When you are at home, work, or another location with a secure Wi-Fi network, you may want to connect to Wi-Fi when you are using the Internet. If you are using a lot of data to stream or download videos, you should probably be connected to the Internet via Wi-Fi.

If you are traveling internationally, use Wi-Fi when it is available to avoid expensive charges for international roaming. Even if you sign up for an international data plan, charges for cellular data outside your home country can be expensive.

# How can I tell what I am using?

If you see the Wi-Fi signal icon, your phone is connected to Wi-Fi. Check your Wi-Fi and cellular signals to see how strong they are. The images below show an iPhone screen on the left and an Android screen on the right. The Wi-Fi icon is the one that looks like this: The cellular symbol is the one that looks like this: The more "bars" you see, the better the signal strength.



iPhone Wi-Fi & Cellular symbols (left) and Android Wi-Fi & Cellular symbols (right)

In Settings, go to Wi-Fi and make sure it is turned on. You can also see which Wi-Fi network you are connected to as well as any other Wi-Fi network options. iPhone and iPad users may want to turn off Wi-Fi Assist in Settings to be sure you stay connected to Wi-Fi and not automatically switching to cellular when the Wi-Fi signal is weak

You can change your smart phone or tablet default settings to avoid unwanted cell service or charges for using more data than you purchased in your plan. However, it can be inconvenient. You must remember to turn your cell service back on when you are done using the Wi-Fi. On a tablet, you may find it is best to leave cell connectivity turned off by default and only turn it back on when there is no other connectivity option available. For example, in my family we have an iPad that has Wi-Fi but no cellular

service. This works great for us when we are at home or traveling to meet friends by accessing their Wi-Fi network. It is not as convenient if you need to be connected while traveling or outside of a Wi-Fi network, but that can also be solved by using a **personal "hotspot"** on your smartphone. Basically, what this means is if your phone is operating on a cellular network, you can create a hotspot to allow your Wi-Fi enabled tablet to communicate with your phone. It may sound complex, but once you have tried it a couple of times it is not too difficult.

### When to use Wi-Fi

You may want to use Wi-Fi when:

- The Wi-Fi network is secure
- You are streaming video
- You are traveling internationally
- You need a faster connection
- Your phone has a strong Wi-Fi signal
- You have a limited cellular data plan and may exceed your monthly limit
- You wish to connect a wireless printer to your PC or laptop
- You are at home or a location with Wi-Fi service

### When to use Cellular

You may choose to use a Cellular connection when:

- There is no Wi-Fi network available
- The Wi-Fi network is public or not secure
- The Wi-Fi network is slow
- You are not in danger of running out of cellular data for the month
- Your phone's Wi-Fi connection is weak
- You are not traveling outside the US

### When to use Bluetooth

Bluetooth connection is best to use when:

- You wish to connect your phone to your car for "hands-free" use
- Connect accessories like keyboard, mouse, and printer to your PC or laptop
- Connect wireless headset to your laptop or PC
- Connect your smartphone to wireless speakers or headphones
- You may also use Bluetooth to transfer files

### **Tech Coach Assistance**

Tech Coaches are now providing remote Tech Coaching. Simply send an email to *techcoach@laketravislibrary.org* and one of our coaches will respond to assist you with any questions or challenges you have with wireless technology. We can also help you set up or modify your device if you require assistance. You may also use the following references to help guide you through any questions setting up or modifying your devices to work with Cellular, Wi-Fi, or Bluetooth networks.

### **References:**

Connect to Wi-Fi on your iPhone, iPad, or iPod touch: https://support.apple.com/en-us/HT202639

Make a call with Wi-Fi calling (Apple): <u>https://support.apple.com/en-us/HT203032</u>

View or change cellular settings on iPhone: <u>https://support.apple.com/guide/iphone/view-or-change-cellular-settings-iph3dd5f213/ios</u>

Check the cellular data usage on your iPhone and iPad: https://support.apple.com/en-us/HT201299

View or change cellular settings on iPad: <u>https://support.apple.com/guide/ipad/view-or-change-cellular-settings-ipadbfe780eb/ipados</u>

How to set up a Personal Hotspot on your iPhone or iPad: <u>https://support.apple.com/en-us/HT204023</u>

Pair a third-party Bluetooth accessory with your iPhone, iPad, or iPod Touch: <u>https://support.apple.com/en-us/HT204091</u>

Connect to Wi-Fi networks on your Android device: https://support.google.com/android/answer/9075847?hl=en

Make calls over the Internet on Voice (Android): https://support.google.com/voice/answer/7649189?co=GENIE.Platform%3DAndroid&hl=en

Connect to mobile networks (Android): <u>https://support.google.com/nexus/answer/2926415?hl=en</u>

Reduce & manage mobile data usage (Android): https://support.google.com/android/answer/9458407?hl=en

Share a mobile connection by tethering or hotspot on Android: https://support.google.com/android/answer/9059108?hl=en

Connect through Bluetooth on your Android device: https://support.google.com/android/answer/9075925?hl=en