FIX YOUR Wi-Fi

These steps won't solve all issues, but they may help resolve some common problems with home Wi-Fi networks.

It might not be your Wi-Fi's fault!

What service plan are you getting from your ISP? The FCC defines "broadband" as 25mbps download and 3mbps upload. Anything less than that and you might not be able to work online as you'd expect. Call your ISP if you're not sure what service you're getting or to upgrade to a faster plan. Having more devices in your home means you need a faster connection to handle them all. You ISP can guide you as to which plan they offer best suits your needs. If they cannot meet your needs, switching ISPs may be an option.

How old is your modem/router?

Haven't upgraded your equipment since it was installed 5 years (or more) ago? Time to upgrade! The current Wi-Fi standard was released in 2016. Equipment older than that might be causing things to run slowly. See Page 2 for suggestions on what to look for and what to avoid in new equipment.

Where is your router?

Line of sight between your router and your laptop/tablet/phone is best. If you've got it set up in the basement or the utility closet or it's always falling behind the filing cabinet, try to move it to a more central location in your home.

Check your settings.

Many Wi-Fi routers are marketed as being ultra-powerful and lightning-fast, but that is only true in an ideal laboratory setting. For most home users, you'll actually want to turn off some of the bells and whistles to get better performance. Have you ever turned music up too loud and it sounded distorted? The same thing can happen with Wi-Fi. See Page 3 for tips on settings to check.

Keep non-essential devices off your network when doing critical work.

Wi-Fi uses radio technology much like a walkie talkie does—only one person can be talking at a time. Wi-Fi devices all take turns talking with the router. If you're on an important Zoom video call and your roommates or other family members are all playing online games, watching live video streams, or downloading large files, ask them to wait until your call is over. Start to download large files before you go to bed and they will be ready for you in the morning.

Do you need to be on VPN?

Some enterprise VPNs are actually quite fast, but if you don't need to use it then don't. VPN routes all your network traffic through the corporate network so you can access services as if you were still there. If the majority of your work is "in the cloud" (Zoom, Office 365, OneDrive, etc.) then you don't need to send your data to your office first. Disconnect from the VPN unless you're sure you need it. Your IT department should be able to tell you which services require you to connect to VPN first.

Plug it in!

If you're able to, plug your laptop directly into your router with an ethernet cable. This will eliminate any Wi-Fi specific issues you may be experiencing. If you've still got trouble at this point, give your ISP a call; they may be able to solve problems on their end.

Bars are not everything.

You can have 5 bars of Wi-Fi signal and still have problems. But, if you have only 1 or 2 bars, then don't expect your connection to work very well. Move closer to your router and see if the problems persist. Bars of cell signal are unrelated to Wi-Fi.

Time to buy a new modem or router? Here are some things to look for!

Do you need a new modem or do you need a new router? They serve different functions yet both are required. A modem converts the Cable or DSL service from your ISP into Ethernet. A router then converts that Ethernet into Wi-Fi and/or more Ethernet ports. Sometimes, a single device can be a modem and a router all-in-one.

Some ISPs require you to use a modem they provide while others let you purchase and use your own. Check with your ISP first before purchasing one to make sure it is compatible with their service or to see if you would even benefit from getting a new modem. Sometimes an ISP will upgrade your modem for free! No ISP can prevent you from purchasing and using your own router, however. Even if they provide an all-in-one device, you can turn off the built-in router features and use a better or more modern device to provide Wi-Fi to your home. Ask your ISP to assist you with setting up your modem for use with a separate router. They may call it "bridge mode".

<u>When purchasing a new Wi-Fi router, look for the following:</u>

802.11ac — This is the current Wi-Fi standard and will support all devices in use today. 802.11ax (aka Wi-Fi 6) does exist, but the standard is not final. The majority of devices don't support Wi-Fi 6, so save your money.

Dual Band — Look for the phrase Dual Band or a mention of both 2.4GHz and 5GHz support. Tri Band does technically exist, but it is more of a marketing gimmick than anything else. Most Dual Band devices support the same technology as devices labeled Tri Band.

3 Antennas — More antennas is not always better, but due to the way Wi-Fi equipment is designed, 3 antennas will often be better than 2 antennas; 4 antennas are okay too. Any more than that is just marketing again. Some routers appear to have no antennas; they do exist, but are just hidden inside the plastic enclosure. External antennas can perform better than internal antennas. Keep the antennas vertical/pointed up!

AC1600, AC1750, or AC1900 — These numbers are marketing designations based loosely on theoretical speeds defined by the 802.11 Wi-Fi standard. When looking for a router, start your search on products with these terms in their description. AC1200 or AC1350 products may be a bit slower than the higher-numbered models, but more budget friendly. Anything less might be too slow, and anything more will not benefit you.

<u>Things to avoid:</u>

Gaming-Grade — There is no such thing as gaming grade Wi-Fi. All consumer Wi-Fi devices implement the same international standard. Any 802.11ac router claiming to better support games or video streaming is no more capable than any other similar 802.11ac router in normal home environments. If you're serious about gaming, plug your device in with an ethernet cable.

Repeaters or Range Extenders — Remember the game telephone? The one where you whisper a message to the person next to you and they in turn whisper it to the next person and so on? That is how repeaters and range extenders work. They take your data and pass it from one repeater to the next. It takes longer to reach the destination, and the chance that the data gets corrupted or interfered with increases with every hop.

802.11n without mention of 802.11ac — 802.11n is from 2009. 802.11g is from 2003. 802.11a and b are from 1999. You want to make sure you're buying something that supports 802.11ac (2016) at a minimum.

802.11ad, 802.11ay, or WiGig — This is not Wi-Fi as you know it. You phone, laptop, tablet, etc. do not use these protocols and you will have zero benefit from a router that supports these. Virtual reality headsets and some very high-end laptops are the only consumer devices that support these protocols.

Ooh! What does this button do?

Wi-Fi routers have a lot of settings that can be adjusted. Some are set correctly out of the box while others need to be adjusted. No single configuration will work for all situations and not every router has the same settings available. The recommendations below are some best practices that should work for most home environments.

Things to set:

Dual Band, or 2.4GHz and 5GHz — You never want to be using just the 2.4GHz or b/g/n band. Make sure that Dual Band or 5GHz or a/n/ac is also turned on. If your router does not support Dual Band or 5GHz, then consider buying a new one. Don't turn 2.4GHz off, but make sure that 5GHz is on.

Channel Assignment — Channels 1 thru 11 are for the 2.4GHz band and channels 36 thru 165 are for the 5GHz band. For the 2.4Ghz band, turn off automatic assignment and pick one of channels 1, 6, or 11. Do not pick any other channels. All the other channels (2-5 and 6-10) actually interfere with each other. Strange, but true. For the 5GHz band you can leave the channel assignment set to automatic. Devices outside the US may have other channels available, but the recommendations are the same.

Channel Width — Bigger is not better. For the 2.4GHz band, choose a channel width of 20. Never choose 40 if it is an option. For the 5GHz band, choose a channel width of 40. If you live in an area where there are a lot of other Wi-Fi networks visible on your devices, choose a channel width of 20. Never choose 80 or 160.

Transmit Power — The FCC limits the maximum amount of power a Wi-Fi router can legally use. Turning the power up all the way will usually not solve any problems. 20dBm or 100mW is plenty. The typical smartphone can only transmit about 12dBm or 16mW anyway. dBm and mW are just different units of measure, like feet and meters; some routers use one instead of the other in their settings. One unit is not better or worse than the other. If your router uses percentages instead, aim for about 90% power.

Wireless Multimedia (WMM) and Quality of Service (QoS) - Just turn these on and leave any other related settings alone. Turning these on may help improve the quality of voice and video calls.

Things to avoid:

WEP, WPA 1, or WPA without the 2 — WEP and WPA 1 security settings are insecure. WPA2 is what you should be using. If asked between Personal or Enterprise, choose Personal for your home network. This lets you log into the Wi-Fi with a password. If you have a choice between TKIP and AES, choose AES and not TKIP. TKIP is much slower. Never run your home Wi-Fi without a password!

Rate Limiting — It sounds like a good idea to slow down the kids' devices so your work laptop can be faster, but in practice this doesn't help. Imagine someone driving at 30mph on a single-lane highway. Even if you want to go 65mph, you'll have to slow down as you approach them. Turn rate limiting off.

Beamforming and MU-MIMO — these technologies are great in theory but terrible in practice. Turn them off if you have the option. Leave MIMO (without the MU part) turned on if that is a separate option!

Technical tips from the Internet — You wouldn't seek medical advice from random people on the internet, would you? Don't seek technical advice from them either. There is plenty of good information online regarding Wi-Fi networks, but there is much more bad or outdated information than there is good. It's difficult to tell the two apart. If you want some more technical insight, Verizon has created a good overview: https://www.verizoninternet.com/bookmark/guides/how-wifi-works-intro/