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WI-FI7 SYSTEM SPECIFICATION GUIDE

QUICK PRIMER ON WI-FI7



As many of you have heard, Wi-Fi 7 (802.11be) is the latest standard of Wi-Fi that has been released. This is a HUGE upgrade compared to anything that has come out previously for multiple reasons. Not only does the spec pack even more data into each transmission, but it also includes a ton of additional spectrum available for communicating. This means a lot more channels and a lot less congestion. The 6GHz channel which has been approved for use by the FCC allows for 60 channels (compare that to the 11 channels in the 2.4GHz frequency). You can even make channels 320MHz wide, though in the real world that will be difficult to do with other networks broadcasting in the same space.

An exciting new feature is MLO (Multi-Link Operation). This means that a device can now connect on multiple frequencies at once! Not only does that help with performance, but it will also help when you reach the edge of what a higher frequency can travel and you can seamlessly maintain the connection on the lower frequency.

Another useful feature is Preamble Puncturing. This helps alleviate an issue that's long plaqued Wi-Fi where if there is some unknown device broadcasting on the same channel as you are it creates co-channel interference, sort of like someone yelling in the middle of a conference room making it hard to hear the presenter. Puncturing allows for puncturing through that to allow the rest of the channel to be used, recovering the channel space that would usually be dropped.

WITHOUT PREAMBLE PUNCTURING

Unavailable

Wasted Channels

WITH PREAMBLE PUNCTURING

Operating Channel

Puncturing

Recovered Channels

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There are other features as well, and a LOT of features carried over from Wi-Fi 6e such as Target Wake Time. As with every new iteration of Wi-Fi there is also increased QAM (Quadrature Amplitude Modulation). As this document will be more about what to spec for systems I won't get into all the details here but you can read more info on Wi-Fi 7 here:



GBPS 50 40 30 20 10 0 WI-EL4 WI-EL5 WI-EL6 WI-EL6 WI-EL6 WI-EL7

WI-FI 7 5X INCREASE IN THROUGHPUT

Important things to realize here is that with Wi-Fi 7 we'll see a split in our industry, and the kinds of luxury clientele we all have that usually ask for the best, not everyone will be able to afford it. Everyone will want to have the fastest speeds possible in order to play everyone's favorite video game and attempt to reach the high score over their neighbors.....speedtest.net. They'll undoubtedly see things like the above image and request that for their next upgrade.

IMPORTANT CONSIDERATIONS

- Wi-Fi 7 APs support 10Gbps Ethernet interfaces. To get that speed over copper you need at least CAT6a infrastructure with a max distance similar to previous specs of 100m.
- The more Wi-Fi 7 APs you put on a switch means you'll quickly fill up whatever uplink you have upstream. Consider 10 Wi-Fi 7 APs all running at 10Gbps. Although in real world scenarios that will most likely not happen, that all 10Gbps would be used, but taking that into consideration as worst case you would then need at least a 100Gbps uplink if just putting those 10 APs on that switch. This means you not only need a switch with 10G access ports to serve up the APs, but you also need a much bigger uplink with fiber so that you don't bottleneck those clients connected to those APs. In a real world scenario though, most APs won't be serving up that much data per, but you get the idea that you would probably want at least a 20G connection for those 10 APs in a residential scenario.

These APs require 802.3bt (PoE++) power in order to run at full capacity and with all features, signal, and radios intact. Your switch will need to support that at least for the amount of APs you plan to deploy.

Putting all of the above infrastructure in place is worthless if your router or firewall upstream cannot support multi-gig operations. If someone is only receiving gig speed or less from their ISP then unless they're moving a lot of data internally, for example sharing files between PCs, this may just be a waste. If they're able to get 2.5G, 5G, or even 10G from their ISP then this would create the need for upgrading their gateway appliance. Depending on how fast they want to go this too can be costly. Add on top of that security inspection on the gateway to detect threats at those high speeds, inspecting every packet that enters the network, and now the cost balloons up to something that most will have trouble affording, or at least question the benefits.

These are all very important things to consider when sizing a system for Wi-Fi 7 APs.

NOTE:

Even if you do not have the right infrastructure, have a slow ISP, or cannot afford to upgrade routers and switches you could still benefit from using the 6GHz frequency in high traffic areas such as an apartment in Manhattan where the wireless space is often crowded with neighboring APs flooding the area with noise. With so many additional channels, and in the near future slow adoption, this could be a great way to give someone their own super-highway to communicate on, provided their devices support transmitting on 6GHz. You can still run these APs in lower power mode with a regular PoE+ switch and gigabit links.

YOUR CLIENT WANTS WI-FI 7, WHAT SHOULD YOU SPECIFY?

I'll give a few examples of what the price looks like for some of the components for a fully Wi-Fi 7 top tier base system with 10 APs on ONE switch, so we're not even talking about connecting multiple switches with larger uplinks, just a switch to a gateway appliance.



Gateway Appliance (Router or Firewall)

As we haven't reached a point where Residential ISP's are offering more than 10Gbps on the WAN we'll use that as the "best" for now. A router that can support that would be the Fortigate 90G, our model WR90G_Base. This router can handle up to 28Gbps of throughput WITHOUT security services and has 2 shared fiber and copper ports that can auto-negotiate speeds of 1, 2.5, 5, and 10G. It's a perfect solution for this if you're NOT utilizing security inspection services.



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Now because you need to connect this router to the switch at 10Gbps you need some transceiver modules, either MMF or SMF, but these are relatively inexpensive and doesn't add much to the cost of the system. That said, you WILL need to add a fiber module in the expansion port of the switch as it only comes with embedded 40/100G ports which the less costly router doesn't support.



To recap, without any licensing, extended service, transceiver modules, or rackmount kit for the router the total of just the router and switches is: **\$19,265**. Add 10 X R770s to that and the total is **\$45,215** (MSRP)

Keep in mind that this pricing is WITHOUT security services included. So if they wanted to inspect traffic at 10Gbps on the WAN they would need a much larger unit because once you apply gateway anti-malware inspection to the WR90G the speed drops to 2.5Gbps on the WAN. Not only does the unit itself get larger but so does the price of the security services. For Enterprise security on a true firewall inspecting at 10Gbps (NGFW) you would specify the WR400F. With a 3 year Enterprise security services subscription this unit comes to \$45,000 MSRP, essentially doubling the cost of the overall system and bringing it closer to \$100k.

Yes there are slightly more cost effective options if you wanted to go with 5Gbps but it's still not doable for most. If someone wants "the best" then this is what they're generally looking at. Scary, right?

ALL IS NOT LOST!

Without breaking the bank you can still get a much better upgrade than ever before, utilizing all of the latest features of Wi-Fi 7, the clean 6GHz spectrum, MLO, Preamble Puncturing, lower latency connections, and also much better throughput than on previous generations. The trick here is that you'll be bottlenecking everything at 2.5Gbps. Keep in mind that wireless has generally been below gigabit speeds except in certain scenarios prior to this, so you're going to be giving your clients almost 3X that speed and in many cases more. Keeping the speed at 2.5G you can now leverage more cost effective gear including the above mentioned WR90G but WITH security service inspection, the ICX7150 or ICX8200 switches, and not have the need to go crazy with uplink speeds between switches. This also negates the need for the ICX7650 10G module as the switches already have either 10G or 10/25G ports built in. Let's take a look at the same system mentioned above but with us bottlenecking at 2.5G.



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This brings the total cost of all the wired gear, minus the rackmount and transceivers, and any additional AP licenses or service extensions to only **\$14,805** MSRP for a pretty badass core network that includes 3 years of full security inspection services. Add the APs and the total is **\$40,755**. Compare that to the close to \$100k system and it's a drop in the bucket. If you want basic security, which includes IPS and gateway anti-malware the price drops even further to **\$37,952.50**. If you skip the security inspection altogether that overall price drops even lower to **\$35,050**. Obviously the largest price difference you'll see is when you're trying to apply security services at 10G WAN speed.

IN SUMMARY

Hopefully this guide helps you understand the requirements of Wi-Fi 7 deployments and how you can make smart decisions to give your clients the benefits of this giant leap forward in Wi-Fi capabilities without needing to go full bore unnecessarily. Bottlenecking the system at 2.5G is still much faster than most people will need for the foreseeable future (let's see how well this ages), and will give them a system faster than anything they've experienced anywhere before. Couple that with the latest AI features in RUCKUS One, part of our Cumulus6 offering, and the system will self-heal, manage radios and signal strength more efficiently, and give your clients a wireless network unmatched in residences around the world.

Please feel free to reach out any time if you have questions regarding anything above. If you need a quote with YOUR PRICE for an upcoming project, or just want to create a fake project to get an idea of full system pricing, please always start by going to **intake.whyreboot.com**. Don't forget, we offer free predictive models to help determine the number and placement of APs required.

MAKE IT A GREAT DAY!