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RenRabbit420



Choosing a 5G module for custom router

Unsolved

For some context, I live in the middle of nowhere where the only actual options for internet plans are satellite. Even “cellular internet” plans don’t officially cover us. However, we have a data only 5G/4G LTE SIM card from AT&T with a truly unlimited premium data that we’ve had plugged into Cudy N300 cellular router for the last 9 months or so. We get maximum Ethernet speeds around 100mbps, WiFi around 10-20mbps, if we’re lucky. We do however have a strong LTE connection from outside, and there’s a 5G tower about 6 miles from us.

I’m about to get on building a custom router with an old desktop running pfSense, with a dual port 2.5G NIC and an M.2 5G to USB 3.0 adapter enclosure using an Ubiquiti UniFi 6+ access point for WiFi. I also plan to add an external directional outdoor antenna pointed in the direction of the 5G tower nearest us.

The issue I’m running into is that I know incredibly little about cellular networking, cellular modules, etc. I’ve seen people online talk about the Quectel modules being the best for 5G but they’re running \$300+, and I’m seeing 5G modules for laptops on Amazon ranging anywhere from \$50-\$200. I’m pretty certain we will never have a good



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One difference between a "integrated device" here, is that you don't get limited loss of signal strength and the antenna should at least in theory be designed around the radio solution. E.g. a few meters of antenna cable from the antenna to a module in a PC, would reduce the signal strength and potentially pick up more noise.

The modules are typically based on chipsets from Qualcomm and Mediatek. At least in the market here. These solutions can typically use multiple carriers at once, but how many can differ based on chipset - which again comes down to cost. For an example, an Qualcomm X65 device is better than a X62 device, but more expensive. How directional the antenna are will also differ between the products. If you only have one cell tower in the area and it is a long distance, as directional as possible would be the best.

For the radio part here, there might also be differences. And in terms of radio performance, these components can play a important role. Remember - it is not only the signal from the cell tower than needs to reach you - the signals from you also need to reach the cell tower with good quality.

Where I live, there are multiple service providers offering fixed wireless/mobile broadband services to even houses in somewhat remove areas where there is mobile coverage, including cabins. Typically they use devices like the Nokia Fastmile 5G and Zyxel NR7000-series.

Also remember: "5G speeds" are "relative". 5G on a low frequency (e.g. 800MHz) does not have the same performance/capacity as on a high frequency (e.g. 3500MHz). But the signal travels longer. 4G on a high frequency can be faster than 5G on a low frequency.

  1  ...**RenRabbit420** OP • 1y ago

Thanks for your response! I have come to the determination that I should probably do something based around a Quectel module.

I do expect that we'll likely have better speeds and reliability by sticking to LTE bands for now, but I'm trying to be prepared for 5G coverage expansion so I don't have to upgrade in the near future. We do have multiple towers closer by supporting LTE, the nearest tower supporting 5G bands at current is the one about 6 miles away.

Largely, I'm just trying to maximize our network performance for the lowest cost possible, hence the custom build approach. But, it sounds like you're saying running an M.2 module with a USB 3 adapter would introduce enough latency to nullify that idea. With that in mind, would you recommend something like [this then?](#) [or this](#)

Not necessarily even that specific piece of hardware, but something of the sort? If I do get an indoor unit I could always get a weatherproof box to put it in mounted to a post outside and add a stronger external antenna, my question is more whether you think I'd get better performance out of something premade like that as opposed to a custom build with something like a Quectel RM520N-GL in a USB adapter enclosure.

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