This is about a 15 to 20 min. presentation. It's mostly words.

The problem:

I moved from Waltham, MA to Lexington, MA. Comcast set me up with new equipment, including an XB7 xFi Comcast Gateway.

I wanted to try out the new WiFi 6 and WPA 3 technologies, partly due to how many neighbors there are here at Brookhaven at Lexington. Our building transmits WiFi and Bluetooth signals readily, making for a crowded 5 GHz spectrum here. Also, many of the folks here are not tech savvy. Their systems and networks can get infected with malware, which they could then retransmit unknowingly, creating a security risk for my equipment. I believe that the best defense in such an environment is to use WiFi channels not used by others, and to have better security than my neighbors.

Hardware change #1: upgrade the Gateway to an XB8. (Show browser tab with picture.) I won't be doing WiFi 7 or other kinds of bleeding endge technologies in the foreseeable future, so I don't need the extra features of WiFi 7. The security and bandwidth of WiFi 7 aren't better than for WiFi 6/6e, so I see no need to jump the gun on upgrading to the XB10 gateway. That gateway also limits the features of my landline phone service from Comcast, including battery backup. And Linux especially, but also Windows 11 24H2, do not have adequate support for the few WiFi 7 devices there already are.

Hardware change #2: (No visuals) Testing revealed that the Qualcomm Atheros WiFi Card which came OEM with my Powerspec Tower PC is not going to be able to do 802.11ax, aka. WiFi 6/6e. It won't do 6 GHz, but it will do WPA 3. So, security-wise, it's a reasonable fallback for Linux if a new WiFi 6/6e card wouldn't work in that OS.

My motherboard in the Tower is the ASUS PRIME H610M-E D4. Specs: https://www.asus.com/us/motherboards-components/motherboards/prime/prime-h610m-e-d4/techspec/. (Type in the Linux Command line ways to ID your system's motherboard and WiFi Card info.) Its WiFi card fits into a PCIe 3.0 x1 slot.

So how did I know what hardware is inside my PCs? Linux has some commands for that:

sudo dmidecode -t 2 (motherboard ID)
(sudo password required)
lspci (Internal PCIE WiFi card) (Can be run with sudo for more information and better detection.)
lsusb (WiFi dongle) (Running with sudo isn't very productive.)

Generally, lsusb can't provide anywhere near the amount of information about a dongle which the other commands can deliver from an internal WiFi PCIE card. (Actually, WiFi cards are quarter-cards in PCIE 3.0.)

For any WiFi, card or dongle, a good antenna or antennas will be of some help in getting good, solid performance. Also, a network and WiFi environment with fewer and more WiFi-transparent materials. (I have a wall between my Comcast gateway and my computers, but it's not steel or anything like that. Very few wires in there either.)

You may need to ID the chipset your WiFi device is using:
lspci -v | grep -i wireless -B 1 -A 5

lsusb
lshw -C network

Hardware Info Tools (GUI, but very little info displayed):
sudo apt install hardinfo
(sudo password)

I am not very impressed with the amount of data the Hardware Info Tools present, compared with the Command Line tools. (Show the GUI output of the Hardware Info Tools.)

My NUC fared much better. The WiFi Card in there is the Intel Wi-Fi 6 AX201 Gig+. It will do 802.11ax, but only in the 5 GHz band. No WiFi 6e or 6GHz. However, it too does support WPA 3. (A more up to date internal card would be the Intel AX211 card, but the card in a NUC is soldered into place.)

Hardware change #3: I tried changing the WiFi card inside the Powerspec Tower per the instructions from the Micro Center in Cambridge, MA. That card is the ASUS (Mediatek) AXE5400 (PCE-AX59BT) card, apparently Revision 2. That card did work in LMDE 6 and Mint 22.1, but the connection kept getting broken. Eventually, LMDE 6 stopped workiong at all with Wifi 6, and then Mint stopped working with it. I still don't know what went wrong. I updated firmware and drivers, but all to no avail. More on Linux support for WiFi 6/6e drivers later.)

Hardware change #4: I tried a USB dongle, the Netgear Nighthawk AXE3000, which does do all the WiFi 6 tricks, but needs to occupy a USB slot. Even with an extension cable and cradle (included) this is fine for the Tower with all its spare USB ports (and people laughed at me when I added more USB ports!). But the NUC has only a limited number and really bad locations for USB-A ports. The internal USB 3 port I added has stopped working, at least for the dongle and for flash drives. But I do have one Thunderbolt-3 multi-port USB-A dock, and I decided a different configuration for a dock would be better for saving desktop space. So that's Hardware Change #5.

I'd like to show how the NUC is set up now. (show on Web Cam #2, if possible).

Hardware Change #6: I tested the various cards (OEM Qualcomm Atheros, OEM Intel AX201 Gig+, and the dongle). All work well. While LMDE 6 and Mint can't do WiFi 6e (6 GHz) yet (more on Mint and LMDE later), they both could recognize and use the Netgear Nighthawk AXE3000 out of the box, no drivers or firmware needed. Linux kernel version 6.(anything) is more than sufficient for WiFi 6 in the 5 GHz band. Rock solid stable, no disconnects. The acid test: temporarily go inside the Comcast xFi XB8 gateway, and disable WPA 2. (This has to be done with their phone app for some reason only known to the minions of evil who run the Portal to Hell which is Comcast Tech Support.) Without WPA2 access allowed, the Netgear dongle worked with Windows 11 Pro 24H2 and Mint 22.1 and LMDE 6. So, Cinnamon DE can use its Network Manager to set up a Newtwork Connection -- not a Network Setting -- to restrict the WiFi to use only WPA 3 Personal.

(Show how to distinguish between Mint's Network settings applet and its Network Connections Applet, and show but don't mess with, the different views of the drop-down options supplied in each view of the network setup. Also show that there are two available network interfaces now that I have two different cards/dongles in each of my computers.) It is best to turn off one or the other interface, to avoid interference. All except the NUC's internal card have their own antennas. My internal Qualcomm Atheros came without an antenna, but under the desk I have the two antennas attached to it now,

borrowed from the ASUS card. Those make that OEM card pretty good, considering its limitations. But it doesn't do WiFi 6.

Hardware Change #7: So the final change I made was to buy a second Netgear dongle, for the NUC, and attach it with the new Thunderbolt dock.

One more nice thing about using a dongle is that it's not a permanent commitment. Any dongle which works with Linux can be used on any hardware which supports its features and throughput rates. (Hence Thunderbolt rather than USB-3 for the main connections to the computers, where available.) You may need to supply drivers and firmware. How to do this is beyond the scope of this mini-presentation, though if anyone is interested, I can show how it's done. It involves some sleuthing through online forums and databases, as well as copying files as Root to a system area. Not for novices!

If you choose carefully, based on online discussion forums, you will quickly find that only a few dongles for WiFi 6/6e are really good for use with Linux. One is the Netgear model I'm using, and a few related models. The other is the Intel AX200 series. Mediatek makes compatible chipsets, but the way ASUS implements these chipsets, they are best left on the shelf. Especially for the 6 GHz band, good antennas (they come inpairs) are a good idea. For better range with little loss of throughput, stick with the 5 GHz band. WPA3 support is nice to have, and since Linux kernel version 5.15 it's been in there, though not always obviously displayed in the user interface of the Network Manager.

-- Bob Primak -- Monday, May 26, 2025 -- 10:28 PM EDT --

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Now on to the news portion of my mini-presentation:

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Mint 22.2 Due out sometime mid-summer, 2025.

Mint already uses kernel version 6.8, which has good WiFi 6 support. However, in my tests, the mainstream version of Mint 22.1, Cinnamon 6, did not support the 6 GHz band natively. Mint 22.2 will have kernel version 6.11, which also should support the 6 GHz band. I don't know whether this will be the case right off the install or upgrade in practice, however.

Mint 22.2 arrival date and WiFi support:

AI Overview (Gemini AI, heading up a Google Search):

Linux Mint 22.2 generally has good WiFi 6e support, especially with newer hardware and kernel updates. However, some users may encounter issues with specific hardware and might need to update their kernel or drivers for optimal performance.

Here's a more detailed breakdown:

General Support:
Linux Mint, being based on Ubuntu, typically includes good support for WiFi 6e as the kernel and drivers evolve.

Kernel Updates:

Newer kernels (e.g., 5.15 or later) often include improved support for WiFi 6e hardware. You can update your kernel through the Update Manager.

Driver Manager:

If you have a proprietary WiFi card, the Driver Manager might offer a driver that enables WiFi 6e support.

Hardware Compatibility:

Not all WiFi cards are created equal. Ensure your specific WiFi card is listed as compatible with WiFi 6e. You can find information on the manufacturer's website or through forums like Linux Mint forums.

Firmware:

Make sure you have the correct firmware installed for your WiFi card, as this can be crucial for proper functionality.

Troubleshooting:

If you are still experiencing issues, consider checking forums or support communities for specific solutions related to your hardware and Mint version.

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LMDE 7 arrival date and WiFi support:

LMDE 7 moves from Debian 12 (Bookworm) to Debian 13 (Trixie). Release Date will probably lag behind the release of Mint 22.2, around Fall, 2025. There are significant differences between LMDE support for WiFi 6/6e vs. Mainline Mint.

Debian 12 "Bookworm" (LMDE 6) is based on the Linux kernel version 6.1, which does not support the 6 GHz band. Debian 13 "Trixie" does have support for the 6 GHz band, at least in theory. However, like Mint 22.1, such kernel level support may not translate into the 6 GHz band being available right off the install or upgrade. I have upgraded LMDE 6 to kernels as high as version 6.5, but WiFi 6/6e performance is not much improved.

AI Overview (Gemini AI, heading up a Google Search):

Debian 13 "Trixie" (LMDE 7) offers better support for WiFi 6E compared to Debian 12 "Bookworm" (LMDE 6) due to its newer kernel and package versions, which include drivers for more recent hardware like Intel's AX211 WiFi card, the Netgear AXE3000/8000 series dongles, or the Mediatek mt7922/2925u/au based WiFi cards from other manufacturers. Trixie is the testing release, while Bookworm is the stable release, meaning Trixie is typically more up-to-date with the latest hardware support.

Here's a more detailed breakdown:

Bookworm (Debian 12):

Stable Release: Bookworm is the stable release, which means it has been thoroughly tested for stability and reliability.
Mature Support: Bookworm generally has mature and stable drivers for common hardware, but may not include the latest drivers for brand-new WiFi 6E devices.

Potential Issues: If you have a very new WiFi 6E device, Bookworm might require manual firmware updates or driver installations to function correctly.

In summary:

If you need the most up-to-date WiFi 6E support for newer hardware, Trixie is the better choice due to its more current kernel and package versions.

If you prioritize stability and a well-tested system, Bookworm is a solid choice, but you might need to do some extra work to get the latest WiFi 6E drivers working.

Example Scenario:
If you have a laptop with an Intel AX211 WiFi 6E card or similar, and want to ensure it works smoothly, Trixie is likely the best choice as it is more likely to include the necessary drivers and firmware out of the box. If you choose Bookworm, you might need to manually install or update firmware to get the AX211 working with the 6 GHz band. The Netgear USB dongles are a good alternative, though they have drawbacks. ASUS branded cards can be the most difficult to configure for Linux use.

LMDE 6 has relied on Trixie backports for WiFi 6/6e full support, but has no support for the 6 GHz band.

Debian changes from Bookworm to Trixie (Video):
https://www.youtube.com/watch?v=PCmJtBIKKpM&t=7s

Trixie (Debian 13):

Better Hardware Support: Trixie generally includes newer drivers and firmware for WiFi 6E devices, making it more likely to work out of the box with newer WiFi 6E hardware.

Up-to-date Kernel: Trixie uses a more recent kernel version than Bookworm, which can be important for hardware compatibility and performance.

Testing Release: Trixie is the testing release, meaning it includes newer packages and features that haven't been fully tested for stability, but are often more up-to-date with hardware support.

Example: If you have an Intel AX211 WiFi card, Trixie will likely have the necessary firmware and drivers installed to support it, while Bookworm might require manual installation.

-- Bob Primak -- Monday, May 26, 2025 -- 10:20 PM EDT --

Now all I want to do is make this into a few slides which should carry limited information based on the two AI summaries and my pown notes from my experiences.