

MY WEIRD PROMPTS

Podcast Transcript

EPISODE #245

Bandwidth vs. Speed: Decoding Your Digital Plumbing

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EPISODE SYNOPSIS

In this episode of My Weird Prompts, hosts Herman and Corn peel back the layers of our modern internet infrastructure to answer a listener's question about the true meaning of bandwidth. They explore why internet service providers market "speed" while businesses demand "dedicated access," explaining technical concepts like oversubscription ratios, wavelength division multiplexing, and the Shannon-Hartley theorem. From the legacy of T1 lines to the cutting-edge potential of Wi-Fi 7 and 800-gigabit Ethernet, this deep dive provides the essential context needed to understand the digital plumbing that powers our world.

DANIEL'S PROMPT

Daniel

I'd like to discuss the concept of bandwidth in networking. ISPs typically sell connectivity based on speed, but I'd like to know how bandwidth is precisely defined and why it's rarely mentioned in the consumer ISP realm compared to enterprise service level agreements. How does bandwidth work in the fiber era with significantly higher speeds and aggregate demand from multiple devices on a network? Also, what are the different grades of bandwidth for aggregated connection points used by large businesses?

TRANSCRIPT

Corn

Hey everyone, welcome back to My Weird Prompts. I am Corn, and I am sitting here in our house in Jerusalem with my brother, watching the rain hit the stone walls and thinking about how much the digital plumbing of this city has changed. Herman, I remember when we were lucky to get forty megabits, and now we are looking at ten-gigabit fiber lines running right under the street.

Herman

It is a revolution, Corn. And I am Herman Poppleberry. It is great to be here. We have got a really meaty topic today, thanks to our housemate Daniel. He sent us an audio prompt asking about something we all use every single second but rarely define accurately. We are talking about bandwidth.

Corn

It is funny, because we use the word bandwidth for everything now. We use it to describe our mental capacity or how much time we have for a project. But in networking, it has a very specific, technical meaning. Daniel wants to know why internet service providers sell us speed, while big businesses talk about bandwidth and service level agreements.

Herman

Exactly. And he also wanted to know about the different grades of connection for those big companies—the stuff that keeps the world running behind the scenes. It is a perfect follow-up to episode one hundred and fifty-one where we compared mesh networks to wired connections.

Corn

I remember that one. But today, let us start with the basics. Herman, if I buy a ten-gigabit per second plan from Bezeq or Partner here in Israel, am I buying speed or am I buying bandwidth?

Herman

That is the million-dollar question. In common parlance, we use them interchangeably, but they are different. Think of a highway. Bandwidth is the number of lanes on that highway. If you have a ten-lane highway, you have the capacity to move a lot of cars at once. Speed, on the other hand, is how fast those cars are actually moving.

Corn

Okay, so if the speed limit is sixty miles per hour, but there are only two lanes, I can only move a certain number of people per hour. If I have ten lanes, I can move five times as many people at that same sixty miles per hour.

Herman

Precisely. In networking, bandwidth is the maximum rate of data transfer across a given path. It is a measure of capacity. Speed, or what we call throughput, is the actual amount of data successfully transferred. You might have a massive pipe—a huge amount of bandwidth—but if the server on the other end is slow or there is congestion, your actual speed will be lower than your bandwidth capacity.

Corn

So why do the ISPs focus so much on the word speed? Daniel mentioned that they always say up to one thousand megabits, or even up to ten thousand megabits now with X-G-S-P-O-N technology.

Herman

Marketing, mostly. Speed is intuitive. People want things to be fast. If you tell a consumer you are giving them high spectral efficiency or wide frequency ranges, they will tune out. But tell them they can download a four-K movie in five seconds, and they are sold.

Corn

But there is a bit of a trick in that up to language, isn't there?

Herman

A huge trick. This is the core difference between consumer internet and enterprise bandwidth. Most consumer connections are oversubscribed. In a modern X-G-S-P-O-N fiber neighborhood, the provider might have a single ten-gigabit line coming into a splitter that serves thirty-two or even sixty-four houses.

Corn

Wait, so if sixty-four houses each have a ten-gigabit plan, but they are all sharing one ten-gigabit line... the math definitely does not add up.

Herman

It does not. That is a sixty-four-to-one oversubscription ratio. The providers bank on the fact that you are not using your full capacity all the time. You stream a show, you browse a site, you stop. It is rare that every single person in the neighborhood hits the gas at the exact same millisecond.

Corn

This explains why my connection might dip during prime time when everyone is home. The actual available bandwidth is being split among more people, so my individual speed drops.

Herman

Exactly. Now, compare that to what Daniel was asking about regarding enterprise service level agreements, or S-L-As. When a big bank or a data center buys a connection, they are not buying an up to service. They are buying dedicated internet access, or D-I-A. If they pay for one hundred gigabits, they get one hundred gigabits. It is theirs and theirs alone. The provider guarantees that capacity twenty-four hours a day.

Corn

That sounds incredibly expensive.

Herman

It is. You are paying for the exclusivity of those lanes. And those contracts come with legal guarantees for things like uptime—often ninety-nine point nine nine nine percent, the famous five nines—and latency, which is the delay. If the provider fails to meet those metrics, they owe the customer a massive refund.

Corn

I see. So for us at home, we are sharing a pool, but for a major corporation, they have a private tunnel.

Herman

Right. And that brings us to how bandwidth is actually defined. Back in the days of copper, bandwidth was literally the range of frequencies available for the signal. The width of the frequency band. In the fiber era, we use wavelength division multiplexing, or W-D-M.

Corn

Like a prism, right?

Herman

Exactly. We send multiple signals at different colors of light down the same glass strand. Each color is its own stream of data. If you want more bandwidth, you just add more colors. This is how we have scaled from megabits to the eight-hundred-gigabit and one-point-six-terabit Ethernet standards we are seeing in data centers today.

Corn

Daniel also asked about the different grades of bandwidth for these large businesses. I remember hearing about T-one lines. Are those still around?

Herman

They are the ancestors. The hierarchy is actually fascinating because it shows how we scaled. The basic unit was the D-S-zero, which was sixty-four kilobits per second—just enough for one voice call.

Corn

Sixty-four kilobits. That is like a dial-up modem on a good day.

Herman

It really is. Then you bundle twenty-four of those together to get a T-one, which is one point five four four megabits. In the nineteen-nineties, a T-one made you a tech god. Then came the T-three, which was twenty-eight T-ones bundled together, giving you about forty-five megabits.

Corn

And then we moved to fiber and the O-C ratings, right?

Herman

Yes, the Optical Carrier levels. O-C-three was one hundred and fifty-five megabits. O-C-forty-eight was two point five gigabits. And O-C-one-hundred-and-ninety-two was ten gigabits. For a long time, that was the backbone of the internet. But today, the industry has moved to carrier-grade Ethernet.

Corn

Why the shift?

Herman

Simplicity and cost. The old systems were designed for voice traffic where timing was everything. Ethernet was designed for data. Now, a big business just orders a ten-gigabit, one-hundred-gigabit, or even a four-hundred-gigabit Ethernet port. If they are a hyperscaler like Google or an A-I training cluster, they are looking at eight-hundred-gigabit links.

Corn

That is an insane amount of data. It makes our home connection look like a straw compared to a water main.

Herman

It really is. And Daniel mentioned aggregate demand. Think about all the devices in our house. We have Wi-Fi seven now, which can handle multi-gigabit speeds wirelessly, but that bandwidth is shared by your laptop, my phone, the smart fridge, and the security cameras.

Corn

So if the security camera is uploading high-def footage to the cloud, it is eating into the total bandwidth available for my gaming session?

Herman

Yes. And it is not just the fiber coming into the house; it is the airwaves. Wi-Fi seven uses the six-gigahertz band to cram more data in, but it is still a shared medium. If you want the best performance, you still want a wired Cat-six-A or Cat-seven cable. That gives you a dedicated ten-gigabit lane directly to the router with zero interference from the microwave or the neighbors.

Corn

I want to go back to the Shannon-Hartley theorem. I know you love your theorems, Herman. How does it fit here?

Herman

It is the fundamental law of the universe for us nerds. Claude Shannon defined the maximum rate at which information can be transmitted over a channel of a certain bandwidth in the presence of noise.

Corn

So it is the physical speed limit of the universe for data?

Herman

Exactly. Capacity equals bandwidth times the logarithm of one plus the signal-to-noise ratio. It tells us there are only two ways to get more data: use more bandwidth—meaning more frequencies or colors of light—or make the signal cleaner. In 2026, we are doing both with better lasers and cleaner glass, but we are always chasing that Shannon limit.

Corn

That is a humbling thought. Even the internet has to obey the laws of physics. So, for Daniel and everyone else, what should they look for in a plan beyond just the big number?

Herman

Look at the upload speed. For years, connections were asymmetric—fast down, slow up. But with video calls and cloud backups, you need symmetry. Fiber usually gives you that. Also, look at latency, or ping. For gaming or real-time A-I applications, a one-gigabit connection with ten-millisecond latency is much better than a ten-gigabit connection with one-hundred-millisecond latency.

Corn

It is about the quality of the connection, not just the quantity.

Herman

Exactly. It is the difference between a massive public bus and a high-end private car. The bus has more total capacity, but the car gets you there faster and more reliably.

Corn

That is a perfect analogy. Herman, this has been a great deep dive. I feel like I understand the plumbing of our digital lives a lot better now.

Herman

It is always fun to look under the hood. Thanks to Daniel for the prompt—it was a great excuse to talk about Shannon-Hartley.

Corn

I knew you would get that in there. If you are listening and have your own weird prompts, head over to myweirdprompts.com and let us know.

Herman

And please leave us a review on your favorite app. We have been doing this for two hundred and forty-five episodes, and your feedback is what keeps the lights on.

Corn

Absolutely. Thanks for listening to My Weird Prompts. We will catch you in the next one.

Herman

Until next time, keep asking those weird questions. Goodbye everyone.

Corn

Bye for now. You know, Herman, if bandwidth is the lanes, what is jitter?

Herman

Jitter is like the cars in front of you constantly tapping their brakes for no reason. It ruins the flow even if the highway is empty.

Corn

That sounds like driving in Tel Aviv.

Herman

Exactly. That is why we need those S-L-As.

Corn

Alright, let's get out of here before we start talking about packet loss.

Herman

Deal. See you in episode two hundred and forty-six.

Corn

Take care, everyone.

Herman

Bye.