Podcast Transcript

EPISODE #112

Industrial Strength: Why Airports Don’t Use Smart Bulbs

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EPISODE SYNOPSIS

Ever wonder why an airport’s lighting never flickers while your home smart bulbs constantly lose connection? In this episode, Herman and Corn explore the rugged world of industrial automation, from PLCs to the "unbreakable" protocols like Bacnet that keep global infrastructure running. We also break down the "MacGyver-level" world of point-to-point wireless bridges—explaining how to beam internet over miles and whether those extra "hops" will actually ruin your gaming latency.

DANIEL'S PROMPT

Daniel

I've often wondered how building automation is handled in contexts like airports and museums, where the brittleness of standard home systems is unacceptable. Additionally, regarding point-to-point internet: if someone were to set up a series of nodes to share one connection between two properties, would it work effectively, or would the latency from multiple hops significantly degrade the connectivity?

TRANSCRIPT

Corn

Hey everyone, welcome back to My Weird Prompts! I am Corn, and I am so glad you are tuning in with us today here in chilly but beautiful Jerusalem. I am joined, as always, by my brother.

Herman

Herman Poppleberry, at your service. It is good to be here, Corn. We have a really fascinating set of questions to dive into today. Our housemate and friend Daniel sent over a voice prompt that honestly touches on some of the things I have been obsessing over lately. It is about the hidden systems that keep our world running and the lengths people will go to for a better internet connection.

Corn

Yeah, Daniel was asking about something I have definitely noticed. You know how our smart lights sometimes just decide they do not want to talk to the bridge anymore? Or how an update on your phone can suddenly make the whole house system go wonky? Daniel was wondering how places like airports or museums handle this. Because if the lights go out at an international airport because of a bad firmware update, that is not just a nuisance, it is a global news story.

Herman

Exactly. It is the difference between consumer-grade technology and industrial-grade automation. And being a donkey who spends way too much time reading technical manuals, I can tell you that the world of industrial automation is a completely different beast. It is built on a philosophy of permanence and predictability that we just do not see in the stuff we buy at the store.

Corn

I remember you saying once that most home automation is basically held together with digital duct tape. Is that what Daniel means by brittleness?

Herman

Precisely. Most home systems are built for convenience and low cost. They rely on your home wifi, which is already crowded with phones and laptops, and they often depend on a cloud server somewhere else in the world. If your internet goes down, or the company's server has a hiccup, your light switch stops working. In an airport, that is unacceptable. Today, we are going to look at the protocols and the hardware that make these big buildings rock-solid.

Corn

And then we are going to get into the second part of Daniel's prompt, which is some real MacGyver-level networking. He was asking about point-to-point internet. Like, if you wanted to share a single connection between two different properties using a series of nodes. I am picturing someone setting up antennas on rooftops to beam wifi across the city.

Herman

It is more common than you think, Corn! Especially in places where the big internet providers refuse to run cables. But Daniel's specific question about latency and multiple hops is the real brain teaser. Does the signal get tired the more times it has to jump from one antenna to another? We will break down the physics of that in the second half.

Corn

I love it. Let us start with the big buildings though. When I walk into an airport, I see thousands of lights, moving walkways, climate control systems, and security sensors. Are they using some kind of super-powered version of what we have at home?

Herman

Not really. They actually use systems that pre-date the modern smart home by decades, but they have been refined to be nearly indestructible. In the industrial world, the gold standard is something called a Programmable Logic Controller, or PLC. Unlike the little chips in our smart bulbs, a PLC is a ruggedized computer designed specifically for high reliability in harsh environments.

Corn

Ruggedized? Like, you could drop it or something?

Herman

It is built to handle heat, vibration, and electrical noise that would fry a normal computer. But more importantly, the software it runs is deterministic. That is a fancy word for saying that if you give it the same input, it will always give you the same output in the exact same amount of time. There are no spinning loading icons in a PLC.

Corn

That sounds like exactly what our house needs. Why do we not just have a PLC for our kitchen lights?

Herman

Well, for one, they are expensive. And two, they are not exactly user-friendly. You do not just download an app and tap a button to set them up. You have to program them using something called ladder logic, which looks more like an electrical circuit diagram than modern code. But the benefit is that they do not need the internet to function. They are local. They are air-gapped from the outside world.

Corn

So when Daniel talks about the brittleness of home systems, he is talking about all those layers of failure we have. The wifi, the cloud, the app updates. An airport bypasses all of that by using dedicated wires and protocols like Bacnet or LonWorks.

Herman

Right. Bacnet is a huge one. It stands for Building Automation and Control networks. It is a communication protocol that allows devices from different manufacturers to talk to each other. So the air conditioning system from one company can talk to the lighting system from another company without needing a translator. And it all happens over dedicated physical cables, usually something called RS-four-eight-five or industrial ethernet.

Corn

Wait, so they are still using cables? In twenty-twenty-five? I thought everything was going wireless.

Herman

Wireless is getting better, but in a museum or an airport, a cable is still king. A cable cannot be jammed by a microwave or interfered with by a thousand passengers all turning on their hotspots at once. When you are protecting a billion dollars worth of art in a museum, you want to know that the humidity sensor is going to report back every single second without fail.

Corn

That makes sense. I guess being a sloth, I appreciate things that are slow, steady, and reliable. But what about when things do need to be updated? Does someone have to go around with a laptop and plug into every light pole?

Herman

They have centralized management, but the updates are handled with extreme caution. In an industrial setting, they use a sandbox. They test the update on a mirror of the system first. They do not just push it out to the whole airport at once. They might update one terminal at three in the morning and monitor it for a week before doing the rest. It is a culture of risk-aversion.

Corn

It sounds like a lot of work, but I guess that is why my flight usually takes off in a well-lit terminal. Okay, so that covers the big buildings. But Daniel's other question was about a much more personal kind of networking. Point-to-point internet.

Herman

Yes, this is where it gets really fun. Daniel mentioned his first job at an industrial internet of things company and talking to a CTO about transmitting wifi over miles. This is a real thing. It is often called a wireless bridge.

Corn

And Daniel's hypothetical was about sharing one connection between two properties. Maybe his house and another one nearby. He was worried about the latency from multiple hops. If the signal has to go from house A to a pole, then to another pole, then to house B, does it slow down?

Herman

That is the big question. Let us think about what a hop actually is. In networking, a hop is when a packet of data moves from one device to the next. Every time a packet arrives at a node, the node has to receive it, process where it needs to go, and then re-transmit it. That takes time.

Corn

Like a relay race? If you have more runners, it takes longer to get to the finish line because of the handoffs?

Herman

That is a perfect analogy, Corn. But the question is, how much time? In the old days of mesh networking, every hop could cut your speed in half because the radio had to use the same frequency to listen and then talk. It was like trying to have a conversation where you can only speak after the other person finished, and you have to repeat everything they said to the next person.

Corn

That sounds exhausting and very slow.

Herman

It was! But modern point-to-point hardware, like the stuff companies like Ubiquiti or Mikrotik make, is much smarter. They use multiple radios and directional antennas. Instead of a signal that goes out in all directions like a lightbulb, these antennas are like lasers. They focus all the energy into a narrow beam pointed exactly at the next node.

Corn

So it is a literal beam of internet?

Herman

Pretty much. And because the beam is so focused, it can travel miles. I have seen setups where people get high-speed internet across twenty or thirty miles of open space. But Daniel's concern about latency is still valid. Even with the best gear, every hop adds a tiny bit of delay. Usually, it is less than one or two milliseconds per hop.

Corn

One or two milliseconds? That sounds like nothing.

Herman

For browsing the web, it is nothing. You would never notice. But if you are a professional gamer or doing high-frequency trading, those milliseconds add up. However, for Daniel's hypothetical neighbor who wants to share a connection across the street, the latency would be virtually imperceptible. The bigger issue would actually be signal interference and something called the Fresnel zone.

Corn

The Fresnel zone? That sounds like a French bakery.

Herman

I wish! No, the Fresnel zone is an elliptical area around the line of sight between two antennas. Even if you can see the other antenna with your eyes, if there are trees or buildings partially blocking that elliptical zone, the signal will bounce around and cancel itself out. It is one of the most common reasons these point-to-point links fail.

Corn

Fascinating. So you have to be really precise with where you point these things.

Herman

Exactly. It is a bit of an art form. But before we get deeper into the physics of multiple hops and the legality of beaming wifi across neighborhoods, let us take a quick break for our sponsors.

Corn

Good idea. We will be right back. Larry: Are you tired of your neighbors knowing exactly what you are doing online? Are you worried that the government is reading your thoughts through your router? Introducing the Signal-Sweeper Three-Thousand. The Signal-Sweeper is a revolutionary lead-lined umbrella designed to catch stray wifi signals before they can escape your property. Simply open the Signal-Sweeper in your living room and feel the peace of mind as your internet speed drops to zero, ensuring total privacy. It also functions as a very heavy, very dangerous hat. We do not offer a warranty, and we are not responsible for neck strain or sudden isolation. The Signal-Sweeper Three-Thousand. Because if you cannot see the internet, the internet cannot see you. BUY NOW!

Herman

Alright, thanks Larry. I am not sure I would recommend a lead umbrella for anyone's neck health, but he certainly has enthusiasm.

Corn

He really does. Anyway, back to Daniel's prompt. We were talking about point-to-point internet and the idea of multiple hops. Herman, you said the latency is actually quite low with modern gear. So, if Daniel set up five nodes to get internet to a remote property, it would actually work?

Herman

Theoretically, yes. If each hop adds two milliseconds, five hops only adds ten milliseconds of latency. To put that in perspective, the time it takes for a human to blink is about one hundred to four hundred milliseconds. So ten milliseconds is almost nothing. You could stream high-definition video, hop on a video call, and never know the difference.

Corn

So why do more people not do this? If I can just beam my internet to my friend's house three miles away, why are we all paying separate bills?

Herman

Well, that brings us to the second part of Daniel's question. How long before a knock on the door comes from someone wondering why you have an unauthorized transmission station?

Corn

Right, the legality. Is it illegal to beam wifi to your neighbor?

Herman

It is a gray area, but it usually comes down to two things: the terms of service of your internet provider and the regulations of the Federal Communications Commission or the local equivalent here in Israel. Most internet contracts have a clause that says you cannot reshare the connection outside of your primary residence. If they catch you, they can just cut your service.

Corn

But would the government actually show up?

Herman

Probably not for a simple wifi bridge. Most point-to-point gear operates in the five gigahertz or sixty gigahertz bands, which are unlicensed. That means anyone can use them as long as they follow the rules for power output. If you start using massive amplifiers and interfering with weather radar or emergency services, then yes, someone in a very official-looking van will definitely come knocking.

Corn

So Daniel’s friend with the bed and breakfast property across the road is probably safe.

Herman

Most likely. In fact, many people use this exact technology to connect barns, guest houses, or remote offices on their own land. It is often much cheaper than digging a trench and laying fiber optic cable, which can cost thousands of dollars just for a few hundred feet.

Corn

I remember Daniel mentioned that in some parts of the world, especially in remote communities, the internet providers are actually community-driven. They use these point-to-point links to build their own local networks.

Herman

That is one of the most inspiring parts of networking technology. There are places in mountains or rural plains where big companies refuse to go because it is not profitable. So the locals get together, buy some high-end wireless gear, and build a mesh. They might have one single high-speed fiber connection at a school or a library, and then they beam it out to every house in the village using these hops.

Corn

That is amazing. It is like a digital barn-raising. But what happens if one house in the middle of the chain turns off their router? Does the whole village lose internet?

Herman

That is the big risk with a linear chain of hops. If any link in the chain breaks, everything beyond it goes dark. That is why professional community networks use a mesh topology. Instead of a straight line, they build a web. Every house might be connected to two or three other houses. If one goes down, the data just finds another path.

Corn

Like a detour on a road trip.

Herman

Exactly. It adds a bit of complexity to the routing, but it makes the network much more resilient. This actually brings us back to Daniel's first point about airports. Resilience is the goal. In an airport, they have redundant cables. If one gets cut by a construction crew, the system automatically switches to the backup.

Corn

It is interesting how the goals are the same whether you are an airport manager or a guy trying to get wifi to his guest house. You want it to work, and you want it to keep working even when things go wrong.

Herman

And that is the heart of the matter. The brittleness Daniel talked about is really just a lack of redundancy and a reliance on things we do not control. When you build your own point-to-point link or when an airport builds a dedicated lighting network, they are taking control of the infrastructure.

Corn

So, for the regular people listening, what are the practical takeaways here? If someone wants to make their home less brittle, what can they do without hiring an industrial engineer?

Herman

The first step is to look for local control. When you buy smart home devices, look for ones that use protocols like Zigbee, Z-Wave, or the newer Matter standard. These are designed to work locally within your house. If your internet goes out, your light switches should still work. Avoid devices that are cloud-only, where every command has to travel to a server in another country just to turn on a bulb three feet away from you.

Corn

That is a great tip. I know we have been moving our house toward that. It makes a huge difference in response time, too. No more waiting for the cloud to wake up.

Herman

And for the networking side, if you have a big property and your wifi does not reach the garage, do not just buy a cheap extender. Look into a dedicated wireless bridge. It is a bit more work to set up, but the stability and speed will be vastly superior. Just make sure you have a clear line of sight!

Corn

And watch out for the Fresnel zone! I am going to remember that one.

Herman

It is a good term to drop at parties if you want people to think you are a networking genius or if you want them to stop talking to you. It works both ways.

Corn

Well, I think we have covered a lot of ground today. From the heavy-duty systems at the airport to beaming internet across the street. It is all about making the invisible visible, right?

Herman

It really is. Most people never think about the protocols running behind their walls until they stop working. But understanding how they work gives you a lot of power to build a more reliable life.

Corn

I feel a lot smarter now. Thanks for breaking all that down, Herman Poppleberry. And thanks to Daniel for the great prompt. It really got us thinking.

Herman

It was a pleasure. It is always fun to nerd out on this stuff. I am already looking forward to whatever Daniel sends us next week.

Corn

Me too. For everyone listening, thanks for joining us on My Weird Prompts. We hope you learned something useful today, or at least found the idea of a lead-lined umbrella as funny as we did.

Herman

Please do not actually buy a lead-lined umbrella.

Corn

Yes, please do not. You can find us on Spotify and at our website, myweirdprompts.com. We have an RSS feed there for subscribers, and if you have a weird prompt of your own, there is a contact form where you can get in touch with us. We love hearing from you.

Herman

We really do. And remember, the year is twenty-twenty-five, and the technology is only getting more interesting. We will see you in twenty-twenty-six for our next episode!

Corn

Thanks for listening to My Weird Prompts! Stay curious, and we will talk to you soon. Bye!

Herman

Goodbye everyone!