Podcast Transcript

EPISODE #80

Why Your Smart Home Isn't an Airport: Industrial Reliability

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EPISODE SYNOPSIS

In this episode of My Weird Prompts, Corn and Herman Poppleberry tackle a question from their housemate Daniel: why don’t massive buildings like airports and museums use the same smart home tech we use? While we struggle with flickering Zigbee bulbs and Wi-Fi drops, industrial systems rely on "boring" but unbreakable protocols like BACnet and DALI. Herman explains the high-stakes world of deterministic communication and PLC "tanks," while a grumpy caller reminds us that sometimes, a simple clicky switch is the ultimate reliability. If you’ve ever wondered why your smart fridge needs an update but an airport terminal stays lit for decades, this deep dive into industrial-grade automation is for you.

DANIEL'S PROMPT

Daniel

"I have a question about home automation. We’ve previously discussed Home Assistant, and while I appreciate the ecosystem, it isn't very user-friendly and requires significant technical skill. I’m curious about the automation paradigms used in commercial or industrial contexts, such as museums or airports, where reliability is paramount. What technologies do these institutions turn to? Do they use the same components familiar to home hobbyists, like Zigbee, MQTT, and Mosquito, or is it a different playing field entirely?"

TRANSCRIPT

Corn

Welcome to My Weird Prompts, the podcast where we take the strange, technical, and just plain curious questions and try to make sense of them. I am Corn, and look, usually I am the one moving at a snail's pace, or a sloth's pace I should say, but today my brain is actually buzzing. We are sitting here in our house in Jerusalem, and our housemate Daniel sent us a prompt that really hits home because, well, we have a lot of smart gadgets in this house that don't always behave.

Herman

And I am Herman Poppleberry. I have to say, Daniel's question is one I have spent many late nights thinking about while I am resetting our router for the fifth time. As a donkey, I am known for being sturdy and reliable, and that is exactly what today's topic is about. Reliability.

Corn

Right, so Daniel was asking about the gap between what we do at home and what happens in the big leagues. We have talked about Home Assistant before, which is great if you want to spend your entire weekend coding your light switches, but what about an airport? Or a massive museum? They cannot exactly have a guy standing there rebooting a Raspberry Pi because the foyer lights won't turn on. Daniel wants to know if they use the same stuff we do, like Zigbee or MQTT, or if it is a different world entirely.

Herman

It is a different universe, Corn. A completely different playing field. When you are looking at the Louvre or Heathrow Airport, they are not looking for user-friendly apps with pretty buttons. They are looking for something called industrial grade automation and Building Management Systems.

Corn

Okay, but before you go full professor on me, is it really that different? I mean, a light bulb is a light bulb. You send a signal, it turns on. Why can't an airport just use a bunch of high end consumer stuff?

Herman

Because if your smart bulb at home fails, you stumble in the dark and maybe stub your toe. If the lighting control system in a terminal fails, you have a massive safety hazard and millions of dollars in potential liability. The biggest difference is the physical layer. Most of what we use at home is wireless. Zigbee, Z-Wave, Wi-Fi. It is convenient because we don't want to tear open our walls to run cables. But in an industrial context, wireless is often the enemy. It is prone to interference, signal drops, and security vulnerabilities.

Corn

Wait, I have to stop you there. I use Wi-Fi for everything. My laptop, my phone, my smart fridge. It works fine ninety-nine percent of the time. Are you saying these billion dollar institutions are still using wires like it is nineteen fifty?

Herman

Yes. Absolutely yes. They use something called twisted pair wiring or dedicated Ethernet. The gold standard for decades has been a protocol called BACnet. That stands for Building Automation and Control networks. It was developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers back in the nineteen nineties. It is not flashy, but it is incredibly robust.

Corn

BACnet. Sounds like something I would find in a dusty basement. But if it is from the nineties, how can it handle modern tech? Surely there is something better by now. I feel like you are being a bit cynical about modern wireless tech. We have Mesh networks now, Herman.

Herman

Mesh networks are cute, Corn. They really are. But when you have five thousand sensors in a building with steel beams and thick concrete, a mesh network becomes a nightmare of latency and "where did that packet go?" Industrial systems use protocols like Modbus or LonWorks. These are designed for what we call deterministic communication. That means when I send a command, I know exactly how many milliseconds it will take to arrive and I get a guaranteed confirmation back.

Corn

Okay, I get the reliability part. But Daniel mentioned MQTT and Mosquito. I know those are used in professional settings too. I read an article saying that big factories are moving toward MQTT for the Internet of Things. So maybe the gap isn't as wide as you think?

Herman

You are half right. MQTT is actually a great bridge. It started in the oil and gas industry for monitoring pipelines over satellite links, so it is very efficient. But here is the thing, in a museum or a hospital, they use MQTT for data logging and analytics, not usually for the core mission-critical control. They won't use it to trigger the fire suppression system. For that, they want a physical, hard-wired relay.

Corn

That seems a bit overkill. We are talking about light switches and thermostats, not a nuclear reactor. I think you are falling into that trap of thinking that because it is expensive and professional, it has to be complicated and old-fashioned.

Herman

It isn't about being old-fashioned, it is about the cost of failure. Let's talk about the components. You mentioned Zigbee. Zigbee operates on the two point four gigahertz frequency. Do you know what else uses that? Microwaves, Bluetooth, and every single person's cell phone in that airport. In a crowded public space, the noise on that frequency is deafening. An industrial system will use something like DALI for lighting. Digital Addressable Lighting Interface. It uses a dedicated pair of wires to talk to every single ballast and driver.

Corn

DALI. Okay, I have heard of that. Is that why when I go to a fancy art gallery, the lights fade so perfectly?

Herman

Exactly. It gives you granular control without the jitter of a wireless signal. And if one controller dies, the rest of the loop keeps working. It is built for redundancy.

Corn

I still think you are underselling the modern hobbyist gear. I have seen people build incredible things with Home Assistant and ESP-thirty-two chips. It feels like the line is blurring. I mean, if I can buy a ten dollar sensor that does the same thing as a five hundred dollar industrial one, why wouldn't a budget-conscious museum take that deal?

Herman

Because the ten dollar sensor has a mean time between failures of maybe two years. The industrial one is rated for twenty. Plus, who supports the ten dollar sensor? If the company goes out of business or changes their Cloud API, that sensor is a paperweight. In an airport, they demand ten to fifteen years of guaranteed support and parts availability.

Corn

That is a fair point. I forgot the "cloud" aspect. Most of our home stuff breaks because some server in Virginia goes down. I assume these big buildings are entirely local?

Herman

Entirely. They might have a gateway to the outside world for remote monitoring, but the logic lives on-site in a PLC. That is a Programmable Logic Controller. These things are tanks. They don't have operating systems that need weekly security patches or decorative widgets. They just run a loop, thousands of times a second, forever.

Corn

A PLC. I have seen those in those satisfy-the-brain factory videos. They look like gray boxes with a lot of blinking lights. But wait, if they are so great, why don't we use them at home?

Herman

Because they are a pain to program! You have to use something called Ladder Logic, which looks like an electrical schematic from the nineteen twenties. It is not intuitive. It is not "user-friendly" as Daniel put it. It is designed for engineers, not for someone who wants their hallway light to turn blue when it starts raining.

Corn

See! That is what I am talking about. There has to be a middle ground. We are stuck between "it breaks all the time but it is easy" and "it works forever but you need a degree to change the timer." I think we need to hear from someone who probably hates both options. Let's take a quick break for our sponsors first. Larry: Are you worried about the upcoming solar flares? Or perhaps you are just tired of your neighbor's garage door opener interfering with your thoughts? You need the Lead-Lined Luxury Cap! This isn't just a hat, it is a personal Faraday cage for your most precious asset, your brain. Crafted from genuine simulated lead-fibers and lined with premium polyester, the Luxury Cap blocks out ninety-nine percent of all unwanted frequencies, including Wi-Fi, radio waves, and your mother-in-law's opinions. It is stylish, heavy, and comes in one color: Dull Gray. Warning: may cause neck strain and a slight metallic taste in the mouth. Lead-Lined Luxury Cap. Stay shielded, stay silent. BUY NOW!

Corn

Thanks Larry. I think I have a headache just thinking about a lead hat. Anyway, we were talking about the massive gap between home tech and the big industrial systems. Herman, you were saying it is all wires and old-school logic, but I am still not convinced it is that rigid.

Herman

It is changing, but slowly. There is a movement toward what they call Building Internet of Things, or B-I-o-T. But even then, they are using industrial versions of things. Instead of regular Wi-Fi, they might use Wi-Fi six-E with dedicated slices of the spectrum.

Corn

Right, so it is the same tech, just with better "stuff" behind it. But before we get deeper into the tech, we have a caller. I think he has been waiting for a while. Jim from Ohio, are you there? Jim: Yeah, I am here. This is Jim from Ohio. Listen, I have been listening to you two talk about these fancy systems and airports and whatnot. You guys are missing the forest for the trees. My neighbor, Dave, he bought one of those "smart" thermostats. Spent three hundred bucks on it. Two weeks later, he is over at my place because his house is forty degrees and the thermostat is "updating." Updating! In my day, a thermostat was a bimetallic strip and a mercury switch. It worked when the power was out, it worked during a hurricane, and it didn't need a password.

Corn

Hey Jim, thanks for calling. I mean, you are right about the simplicity. But don't you think there is a benefit to, say, a museum being able to precisely control humidity for a thousand-year-old painting? You can't really do that with a mercury switch. Jim: Oh, don't get me started on museums. I went to a museum once in Cleveland, and they had these motion sensor lights in the bathroom. I was sitting there, minding my own business, and the lights went out! I had to wave my arms like a crazy person just to see the toilet paper. Is that your "industrial reliability"? Because it felt like a prank. Also, it is humid as a swamp here in Ohio today. My tomato plants are looking pathetic. But seriously, why do we need all this complicated junk? Just give me a switch that clicks.

Herman

Jim, that is actually a great point about the motion sensors. That is usually a case of bad commissioning, not bad hardware. In an industrial setup, those sensors are often tied into a central bus. If the sensor fails, the system is supposed to fail "on," not "off." But people get cheap, even in big buildings. They buy "commercial-lite" gear which is basically home gear with a metal case. Jim: Cheap is the word for it. Everything is cheap now. You buy a toaster, it breaks in a year. You buy a smart light, it wants to know your email address. I don't give my email to my toaster. I don't give it to anyone. Anyway, I gotta go, my cat Whiskers is trying to eat a rubber band again. You guys stay safe in Jerusalem.

Corn

Thanks Jim. Good luck with Whiskers. You know, he has a point. The "updating" thing is the bane of my existence. Herman, do industrial systems update?

Herman

Very rarely, and never automatically. You would never have a PLC decide to update its firmware at three in the morning on a Tuesday. An engineer has to physically go there, or at least initiate a controlled rollout on a test system first. That is the "technical skill" Daniel mentioned. The user-friendliness of Home Assistant is actually its biggest weakness in a professional eye. It lets you change too much, too easily.

Corn

Okay, let's talk about the hobbyist who wants that industrial feel. If I am Daniel, and I am tired of my Zigbee bulbs dropping off the network, but I don't want to learn Ladder Logic, is there a middle ground? Is there "pro-sumer" gear that uses these industrial paradigms?

Herman

There is. You look at things like KNX. Have you heard of KNX?

Corn

Vaguely. Isn't that a European thing?

Herman

It is huge in Europe and gaining ground elsewhere. It is a standardized protocol for home and building control. It is a green cable that runs to every switch, every sensor, and every light. It doesn't need a central brain to function. If the main controller dies, the light switch still talks directly to the light relay because they are all on the same bus. It is decentralized.

Corn

Now that sounds cool. But wait, if it is a wire, I have to pull that through my walls. That is exactly why people love Zigbee. I can just screw in a bulb and I am done. You are telling me the only way to be reliable is to get a drill and start making holes.

Herman

For true reliability? Yes. I know you hate the effort, Corn, but wireless is a compromise. It is a compromise of convenience over stability. Industrial systems don't make that compromise. If they must use wireless, they use something like LoRaWAN, which stands for Long Range Wide Area Network. It is very slow, but it can go through miles of concrete and it is incredibly hard to jam.

Corn

LoRaWAN. I have heard of people using that for tracking cattle or weather stations in the middle of nowhere. It is not really for turning on your kitchen lights though, is it?

Herman

No, the latency is too high. You would press the button and the light would turn on three seconds later. That is the "sloth" speed you are used to, but most people would hate it. This brings us back to Daniel's core question. The technologies are different because the goals are different. Home automation is about "cool" and "convenient." Industrial automation is about "uptime" and "safety."

Corn

But surely some of the software is merging? I mean, I have seen professional dashboards that look a lot like Home Assistant.

Herman

Oh, the visuals are definitely merging. A lot of modern Building Management Systems use web-based front ends now. They use HTML-five and CSS, just like we do. And some are even starting to use things like Sparkplug B, which is a specification for MQTT to make it work better in industrial settings. It adds a layer of "state awareness" so the system knows if a sensor is actually offline or just hasn't sent an update in a while.

Corn

So we are meeting in the middle. The professionals are taking our nice interfaces, and we are... what? Are we taking their wires?

Herman

We are starting to. Look at Power over Ethernet, or PoE, for lighting. That is becoming a thing in high-end homes. You run one network cable to the light. It gives it power and data. No more Wi-Fi pairing, no more batteries in sensors. It is stable, it is fast, and it is secure.

Corn

I actually like the sound of that. One cable to rule them all. But I bet it is expensive.

Herman

It is. A PoE light switch can cost four times what a regular smart switch costs. And you need a beefy network switch in the closet to power it all. But that is the price of not having to reboot your house once a week.

Corn

Let's talk about the "museum" aspect Daniel mentioned. I am curious about the logic there. If a museum has a leak, I assume they don't just get a notification on their phone saying "Water detected in Gallery Four."

Herman

They might get that, but the system will also automatically shut off the main water valve for that wing, ramp up the air circulation, and alert a twenty-four-hour security desk. And here is the kicker: all of that logic happens at the "edge." It doesn't go to the cloud. It doesn't even necessarily go to a central server. The water sensor is hard-wired to the valve controller.

Corn

That is the "if this then that" logic, but built into the hardware. It is like a reflex in a human body. You don't have to think about pulling your hand away from a hot stove, your nerves just do it.

Herman

Exactly! That is a perfect analogy, Corn. Home automation is often like a brain that has to think about everything. "Okay, the sensor said water, let me send that to the cloud, the cloud says tell the valve to close, let me send that back down." Industrial automation is the reflex. It is fast, it is dumb, and it is reliable because it doesn't have to think.

Corn

So, to answer Daniel's question, it really is a different playing field. They have the same players sometimes, like MQTT, but the way they play the game is much more disciplined. They use wires where we use air. They use PLCs where we use Raspberry Pis. And they use protocols like BACnet that are older than some of our listeners.

Herman

And they pay for it. The cost of an industrial system is not just the hardware, it is the "commissioning." That is the process where engineers spend weeks testing every single possible failure point. They pull a wire and see what happens. They cut the power and see if it reboots in under ten seconds. We don't do that at home. We just hope it works.

Corn

I don't even "hope" anymore, Herman. I just expect to have to toggle the light switch twice sometimes. But I think I am learning that I could make my life easier if I stopped chasing the cheapest, flashiest gadgets and looked for things that have a "local-only" focus.

Herman

That is the first step. If it requires an internet connection to work, it is not industrial grade. Period. If you can't control it when your ISP is having a bad day, you don't own that device, you are just borrowing it from the manufacturer.

Corn

That is a bit dark, Herman. But true. So, takeaways for the "normal" people like me who aren't living in an airport?

Herman

Number one: Wire what you can. If you are renovating, run Ethernet everywhere. Even to your light switches if you can afford it. Number two: Look for local control. Use protocols like Zigbee or Z-Wave over Wi-Fi, because at least they don't have to talk to a server in another country just to turn on your lamp. And number three: Keep it simple. The more "if-then" statements you have, the more places the logic can break.

Corn

I would add a number four: Don't let Herman Poppleberry design your house unless you want it to look like a server room from nineteen ninety-five.

Herman

Hey! My server room is very organized. The cable management is a work of art.

Corn

It is a lot of green cables, I'll give you that. But seriously, this has been eye-opening. I think we often assume that because our phones are so powerful, the same tech should run a skyscraper. But a skyscraper has different problems. It doesn't care about a "user-friendly" app; it cares about staying standing and keeping the lights on for the next fifty years.

Herman

Precisely. And while we might see more MQTT and more web-based tools in that world, the core will always be about redundancy. Two of everything. Wires for everything. And no "updating" screens when you are just trying to go to the bathroom.

Corn

Well, I think we have covered the ground on this one. Daniel, I hope that answers your question about why the Louvre isn't running on a bunch of off-the-shelf smart plugs. It is a world of BACnet, DALI, and very, very long wires.

Herman

It was a great prompt. It really makes you appreciate the invisible systems that keep our world running while we are busy complaining that our smart speakers didn't understand our song requests.

Corn

Before we go, I want to remind everyone that you can find My Weird Prompts on Spotify, or visit us at our website, myweirdprompts dot com. We have an RSS feed there for the subscribers and a contact form if you want to send us your own weird prompts. We love hearing from you, even if you are as grumpy as Jim.

Herman

Especially if you are as grumpy as Jim. It keeps us on our toes. Or our hooves.

Corn

Right. Well, that is it for this week. I am going to go see if I can find a way to hard-wire my coffee maker so it stops asking for a firmware update.

Herman

Good luck with that, Corn. I'll be in the basement checking the bus terminators.

Corn

Of course you will. Thanks for listening, everyone!

Herman

Goodbye