S03E05: In Conversation with Honeywell: Smart Energy Solutions for Smarter Buildings

Chris Ladas (00:02):

A fully autonomous building or campus, is one in which it's balancing comfort with energy, together with safety and can do that without a human involved.

Kyle Fox (00:28):

This is a Smarter World Podcast focusing on breakthrough technologies that make our connected world better, safer, and more secure. I'm host, Kyle Fox. Each episode we introduce bright minds in their approach to a more sustainable world. We discuss the opportunities and challenges they face and how technology can change the world for the better. Today, we're talking building energy management.

(00:48):

According to the International Energy Agency, buildings operations contribute to 30% of global energy consumption and 26% of global energy related emissions, meaning that decisions made today will significantly impact future energy use and potential savings. Today's smart energy solutions increasingly leverage machine learning and data analytics to enhance building's autonomy and energy efficiency which is where our guest today comes in. We're joined today by Chris Ladas, the chief technology officer for Honeywell Building Management Systems.

(01:19):

Chris leads research development and engineering efforts for several prominent commercial building automation brands, including of course Honeywell. I think we're all familiar with Honeywell, but to set the stage, Honeywell is an integrated operating company addressing several powerful megatrends including energy transition, and the future of aviation and automation. And speaking of automation, NXP and Honeywell recently announced a collaboration at CES 2024 to help optimize the way commercial building sense and securely control energy consumption, which is why I'm so excited to talk to Chris about this as well as other trends he's seeing in building management systems and smart energy solutions. Welcome, Chris.

Chris Ladas (01:57):

Thank you. Good to be here.

Kyle Fox (01:58):

I've been so looking forward to this. So Chris, before we start, could you tell our listeners a little bit about yourself and what you do at Honeywell?

Chris Ladas (02:04):

I've been with Honeywell about 14 years. On the last two I've been the chief technology officer for our building management solutions business. So that's a global business that serves commercial; meaning government, private, institutional buildings. Prior to that, I served within our industrial automation group, working closely with pharmaceuticals and other process solution automation businesses.

Kyle Fox (02:29):

Amazing. Buildings are increasingly relying on data and the ability to control operations via automation to make them more sustainable while operating more efficiently. But from a consumer standpoint, it has never been more important to increase that sustainability and comfort of our smart buildings. So Chris, how is Honeywell tackling that?

Chris Ladas (02:46):

So firstly, we have been doing this for a long time. This is not a new for Honeywell in the area of energy savings, particularly in the commercial building space. What's interesting now is there are additional technologies available for us and more integrated technologies, especially between things at the highest level of the cloud all the way down to the edge and on premise within a building.

(03:11):

As you pointed out, 30% and you can hear numbers in regions that are higher really is a big deal. We spend most of our lives in a building of some form or another, whether a brief period at home or if you're at school, a hospital going through an airport or entertainment. So it's a very, very important part of our lives that we have the ability to control. Honeywell is doing a couple of unique things, one, leveraging these technologies and integrating them, but more importantly, partnering with additional people more than we've done before.

(03:44):

And the NXP is one example of that. While we're leaders in our space within building automation, we are now partnering with and continue to partner with people in elevators, lighting, all types of other energy consuming systems within a building to get a more optimal outcome while balancing comfort for the user.

Kyle Fox (04:04):

Wow, you know I never really realized that we are in buildings all the time. It's hidden in plain sight and I'm in one right now. It now makes sense to me why we are consuming so much energy as a part of those structures that are such a vital part of our life. And we talk a little bit about smart buildings, and Honeywell is leading the way and finding ways that we can decrease some of that global energy consumption. And so I've got to imagine that as a CTO for Honeywell's Building Management Systems, you have a strong opinion about what does a smart building mean to you? How do you envision the future of building management operations? I guess what's really more important is are there more opportunities than we actually realize for conserving energy in these structures?

Chris Ladas (04:44):

Absolutely, and I'll touch on a couple new ones that we've just launched in the last year that tap some unknown areas or what we call phantom power consumers within a building. So if you looked at a stack of where the energy is being used in a building, largest parts have been heating and cooling, and we've done a lot over the last several decades to optimize that to be more efficient together with the equipment manufacturers, those who actually make the heating and cooling equipment, the automation suppliers like Honeywell, and then also integrating in other systems like an IT input on occupancy or a security input system on occupancy, things to have a better determination of what and when to take advantage of automating a system and controlling comfort versus the energy savings.

(05:34):

Once you start going into an IP technology, which is where most building technologies are evolving quickly and you're touching the IT organization, whether that be the tenant or the owner operator, especially if it's a government or a critical infrastructure like a hospital, there's a lot of concern about cyber. So that is a key part that just goes with the territory. But when you say what a smart building is, we've been smart with buildings for a long time.

(06:00):

We have intelligent controllers with very advanced microcontrollers embedded in their smart sensors and thermostats all working very much together. The place where we'd like to go in the future is autonomous control. And that solves a couple things. One, we want to have the intelligence that is better than what we have today because people still get involved, not to the degree that they did in the past, but if you're a facilities manager of a large campus, for example, you will be likely involved or have some alerts looking at time of use data on your electric rates, looking at your occupancy unplanned events that may be taking place on a weekend, for example, when you would think it would be shut down.

(06:40):

So there's certain things that people get involved with. We can now apply additional intelligence from both historical and future things to improve upon what that outcome and reduce the amount of human input. And that's really important because most of the world is facing an aging workforce and the amount of very talented people, whether it's basic operation or having to troubleshoot when something breaks and mechanical things do wear out and break, that requires people that we just don't have the deep reservoir of that we had in the past. They're retiring.

(07:16):

So now the goal is how do you make it easier for that owner operator or tenant to balance that comfort and energy without people? And that's where the smart building comes in, something that can be almost autonomous.

Kyle Fox (07:30):

Chris, you mentioned plug power. Unpack that for me.

Chris Ladas (07:33):

So plug power is what people term phantom or unused power, that is everything plugged into an outlet in a building. So think about the big things we control. We turn off lights, we manage the HVAC, we manage elevator operations. Everything in the building is managed except we have up to 20% of a building's power now through plug.

Kyle Fox (08:00):

20%?

Chris Ladas (08:00):

That's because lighting has come down significantly with the introduction of LEDs and so has HVAC with advances in automation. But we're putting more and more plug power devices in more powerful monitors, bigger monitors. Sometimes people have two of them at a station for example, together with all the other incidentals that are plugged in. We've come up with a solution that automates that, advances the schedule and works in concert with the BMS either remotely or via the cloud. And this is the next frontier for taking a further 5%, 10% out of a building's overall energy consumption.

Kyle Fox (08:39):

Those are significant numbers. So it makes perfect sense that you want to focus on that. I'm actually looking at the two 90-inch monitors that are literally right in front of me as we do this interview and they're plugged in right now, but they’re not turned on. They've got to be taking

a little bit of power drain right? Waiting for me to turn them on or whatever status they're trying to maintain, right?

Chris Ladas (08:59):

When they go into a standby mode at night and on weekends, which is a significant amount of time, they're still burning a lot of power, especially if there's a little device at the bottom that you plug in other things to and that phantom power adds up.

Kyle Fox (09:12):

Oh yeah, that phantom power definitely adds up. I'm just now envisioning all the conference rooms here that are all drawing a little bit of phantom power. It definitely adds up. So Honeywell is going not only just for the internal wiring and the controls and the autonomy of the systems, you're going all the way to the plugs.

Chris Ladas (09:27):

Exactly.

Kyle Fox (09:27):

Interesting, because on this podcast we've talked a lot about autonomy. So, in cars, trucks, drones, smart home via Matter integration, but we really hadn't tackled the question around autonomy in a building. And I never really considered that the people that specialize in some of this, we may not be able to rely on that talent pool. And it would be fair to say that even with that human expertise that if I just imagine a super complicated large installation that's considered a smart building, would it be fair to say that there's more data to crunch and more things to do than any one human or even group of humans could actually tackle? Is that where the automation needs to come in?

Chris Ladas (10:05):

Absolutely. We have the ability today to proliferate a building with a lot of sensing technology that we couldn't do cost effectively in the past, measuring temperature, humidity. We're now measuring things we didn't measure a decade ago, volatile organic compounds, carbon dioxide. Those are all being measured today in buildings. And part of that is to improve the quality. So I mentioned comfort and energy savings.

(10:30):

The other leg of the stool is having quality indoor air, and that's very important for a lot of owner operators because they're trying to get people back to work. We did not consider the volatile organic compounds that come out of just the materials. The chair I'm sitting in, the

carpeting on the floor. All these things gradually emit hazards in particulates, dust for example, or mold. And so being able to measure those, we can actually do things to improve the amount of outdoor air that's coming in or even potentially block it if there's, let's say, smoke coming from fires or something in the distance.

Kyle Fox (11:06):

I want to unpack a little bit about the particulars. That's fascinating to me because when we think about things to measure, anybody would normally think that measuring dust, carbon dioxide levels being too high or too low, are for sure things to measure as part of the overall health quality of a building. But I never considered outgassing from something as simple as furniture and carpet. I'm looking around the room I'm in right now wondering what else is coming in because some of these carpet installations might be 40 years old.

Chris Ladas (11:34):

Yeah, and even new ones. Outgassing, that's a byproduct and then you have dust and depending on climate, you can have mold. So those are very critical aspects. But we've talked about lots of data that can overwhelm humans. We have developed applications at Honeywell that are cloud-based and we've now been able to look at all the information that the building management system can see.

(11:55):

So it can get input on sensing of all those parameters, temperature, humidity, CO_2, etc. It gets occupancy. Is this part of the building or these large conference rooms used or not? We can get forward-looking information, scheduling. Not from the BMS, but from the IT systems of the tenant. If they're willing to share that they can do it. We can look and see is a person actually there even independent of whether or not we have sensing technology in the room.

(12:23):

We can use Wi-Fi access and know that people are on their laptops in that room, for example. So there's a lot of information that can now come in security. I mentioned previously people badge in and out. So that's one thing and that's I'll call real-time information. But in addition to scheduling, we can also take external events and that's a big variable for controlling building energy and comfort – from the morning when the sun comes up till it goes down, time of year, where you're located.

(12:51):

Phoenix is going to be very different than let's say the northeastern US or the northwest. So we actually in some of our systems subscribe to up to five different weather forecasting, right

down to real-time. You actually can determine if a cloud is coming over and will impact, for example, your solar and now you're going to have to go off the battery. But what if your battery didn't get to fully charge because you were at peak rates and do those kind of automatic calculations to optimize your energy consumption. And that again, becomes part of what a smart building is. And it's all done autonomously.

Kyle Fox (13:24):

No human could do that. I imagine you could have a smart system that says, "go get my best electricity rate based on battery stacks, and current load", that sort of thing. But what it wouldn't be able to do is exactly what you said because you're talking about external factors that cannot be predicted like cloud cover coming in, or if you're basing this on occupancy that is related to are people coming into a conference room and they're all connected over Wi-Fi and use that as people do and being able to count people from just those connections. The amount of data just in that scenario alone would seem overwhelming to a human. And you would need to basically have what amounts to perhaps a nervous system that's controlled by a brain inside of a smart building.

Chris Ladas (14:04):

And that's some of what we almost term it. The BMS effectively becomes a brain for managing this. Interfacing with all these disparate systems, lighting, security, IT, wireless access points, for example, even your devices. And then with external systems as well. So the weather forecasting, electric time of use rates, power management systems, which Honeywell provides as well, which can tell you is that battery charged up? And how does that compare with the time of usage that's planned and contracted? So there's a lot of variables that come into play.

Kyle Fox (14:37):

That makes sense. And it's all about form-fitting that curve of energy usage. What you're describing to me isn't as simple as, "Is there somebody in the building or not? Let's turn off the air conditioning." It's much more subtle than that and much more broad. It'd be fair to say that smart buildings are being built with all these new technologies now, but what about the existing ones? What if someone comes to you and says, "Hey, I've got a very large factory, very large office building that isn't smart. We built it 50 years ago and it's a big part of our business". In that case, how is Honeywell tackling - I guess the right word is legacy buildings - and bringing them up to speed to be smart?

Chris Ladas (15:13):

Yeah. There're two different scenarios. The Greenfield, you're building a brand new building or on a campus or downtown somewhere. They're going to put a lot of investment into the

actual building. You're going to have different types of windows. You're going to even have the architectural design to optimize or not optimize for sun. But the biggest opportunity is a legacy building. That 40-year-old campus or government building in the Northeast or other part of the country or Europe. Those are the biggest opportunities because you're not going to go in and replace everything within that infrastructure. It's cost prohibitive. You're not going to shut down hospitals, for example, for extended periods of times to do that.

(15:53):

So the key is to be able to update and optimize. So a big focus within Honeywell, not just within buildings but other areas is how do you do this with minimal impact? And two, how do you do this when you don't have the labor or prohibitively expensive? So a lot of the focus is on tools in the software domain to minimize both the design and then when you actually do the install and commissioning, how can you make it simple for someone. Everything from the wiring to setting an IP address to a cluster of controllers so people don't have to go up and down on ladders with walkie-talkies, which is how they did them in the past.

(16:31):

How do you move all of them to an IP network from the legacy RS-45 or very serial networks that were very low bandwidth. You need the higher bandwidth for a lot of these advanced applications and there's just more data to move around. And so there's opportunities here that we've been rolling out for quite a bit now to reduce that install barrier so that you can start going. Then you take the advantage of advanced controls and advanced sensing technologies without having to completely rip up a building.

Kyle Fox (17:02):

Will the trend, IQ-500 system be an example of how you might propose that as a solution for a legacy building?

Chris Ladas (17:08):

That's a great example. It brought several new technologies to the forefront when we launched it last year. One, it has a very advanced application processor, the NXP-i.MX family. That brought a neural processing unit along with it. So we're able to demonstrate and start to introduce new type of edge AI capabilities or machine learning capabilities that [inaudible 00:17:30] we're always in the cloud.

Kyle Fox (17:31):

Always in the cloud

Chris Ladas (17:33):

Now, they're not as powerful as in the cloud because you need that larger data set but scaled down they can do things on-prem without having the connection. So for example, if you lose the cloud or lose a connection, and as we all know from the last couple weeks, IT problems do happen.

Kyle Fox (17:46):

They do happen.

Chris Ladas (17:47):

So you don't want your building to all of a sudden not heat or cool or do anything when that happens. So now you can do balances on-prem, which is a very big thing. Another big feature that we introduced is we have what's called two-wire ethernet connections based on the T1L standard, which is an IEEE standard. This is a new media for ethernet. You don't need to use the old RJ-45s that people are familiar with all wires that have to be crimped in there.

(18:14):

Use the existing wiring that you had in your previous BMS system. So if you had a controller up in the ceiling that controlled a damper actuator and that talked to another set of controllers or peripheral devices, previously, you'd have to rip out and replace with Cat 5 or Cat 6 cabling. That's expensive. It's more disruptive to facility. Think of the hospital example. Here, you can run Ethernet level speeds of 10 megabits per second up to distances of almost a kilometer with multiple stubs and taps.

Kyle Fox (18:47):

Wow.

Chris Ladas (18:48):

So now you get the communication at broadband speeds without having to do a rip and replace of all the existing wiring.

Kyle Fox (18:54):

That's so significant. Running cat 5 into a building can, using the hospital example. Well, it’s like heart surgery because there's areas of the building that are nigh on impossible to get into, or at least extremely difficult especially if the building has to stay open while you’re upgrading it. So you're sidestepping that problem altogether.

Chris Ladas (19:11):

Absolutely, and often many of these older buildings with these 30-year-old automation systems, they're not well documented.

Kyle Fox (19:19):

Oh, of course.

Chris Ladas (19:20):

You don't know necessarily what's happened, additions, things change. You don't know. This gets around that issue.

Kyle Fox (19:26):

I never even said that, but you're right. You use the example of a 40-year-old building. There may be systems in there that the original creators of that system, well frankly, are no longer here, right? Your system means that they don't have to change anything from that legacy installation that they literally may not have somebody alive left to be able to maintain it.

Chris Ladas (19:45):

Exactly. And the third technology we introduced in the building sphere is a universal wiring capability. So try and make it simple, even for the technician who has to physically do the wiring of input and output signals. It just makes life much easier for them. The software can configure what type of output it is. And so that's another advantage to minimize that barrier to actually going and upgrading a system.

Kyle Fox (20:08):

I recommend to our listeners to go check out the Honeywell site. I mentioned the IQ 500 system, well Honeywell and NXP announced some collaborations at CES 2024 that help do everything that Chris has been talking about. I've been checking it out and it's all very well-designed and it makes just a lot of sense on how this complicated stuff connects together seamlessly.

(20:28):

We've been talking about smart energy and smart buildings, and the role of a CTO is quite involved and quite broad. I want to talk to you about that role. I'm assuming you're doing it because it's a very rewarding job because you get to experience groundbreaking technology firsthand and you help drive that into the business. But take us on a day in the life of a CTO.

Take us through that. What do you work on? Who do you work with and what's your favorite part of this job?

Chris Ladas (20:53):

Well, the day is varied. It's just constant change working with sales, customers, engineering, finance, marketing, the leadership within Honeywell and some of our customers. So it's never a consistent day from that perspective. What really turns me on, what gets me up on a Monday morning to come in is something in my last role. And I'm starting to see the fruit of that now in buildings.

(21:18):

In my last role in industrial automation, we transformed the process industry and we were able to reduce the time it took to bring up and install a automation system by over 40%. And it was done through a lot of innovative technology. So if you're bringing up a new farmer or a new chemical plant, the last person after all that big capital investment has been laid out is the people bringing up the automation system before they turn the whole site up. And they're often the ones who were delaying everything.

(21:48):

I was at a customer site just by coincidence a year ago, and the head of one of the major petrochem said, "You guys did this and this. You saved us 40%. We're copying this plant design now in four other places." And it felt very rewarding that we had such an impact. We improved their energy efficiency, their sustainability, and we're able to do it faster. The only downside was it took about eight years to do that because that's a very slow industry. It's a long cycle business.

Kyle Fox (22:13):

It's a long cycle.

Chris Ladas (22:14):

Here in buildings, it's much faster. We can do things very quickly applying very similar type of technologies and concepts. The pleasure I get is I get to work with some very bright people. Within Honeywell, we have some terrific engineers and scientists. I get to work with some fabulous customers. The best customer is one who tells me their problem. Not necessarily the technology they want to use, but here's my business problem, here's my operating problem. How can you help us?

(22:40):

And that motivates a lot of the engineering and other teams to come up with a solution, not just for them, but something that can scale for everybody else as well. And when you get that rolled out successfully, that's fun.

Kyle Fox (22:50):

That would certainly get me up in the morning. You know, the ability to look not only deep into a piece of technology, but also being able to take the broad view of it all. You mentioned earlier a lot of your AI and machine learning work that you do is up in the cloud and that collaboration with NXP and others is now pushing that down on the edge. The picture that comes into my head is that from your perspective as CTO when we start talking about smart buildings and also legacy buildings, you're looking across the whole planet of all different types of shapes and sizes.

(23:19):

And it occurred to me that having the data learning on how a smart building working in the eastern seaboard, let's call it in New York, might be different to a similar building that is operating down in California. So if you're able to look at not only the individual installations of the technology you have, but also understanding how you can apply those learnings across the world. I'm assuming that's a big part of your role.

Chris Ladas (23:41):

It's a big one. And an area where we actually have a unique advantage within Honeywell is we have a business that serves a lot of multi-site consumers. So think of everything from big box, retail and warehousing all the way down to small retail that could have 900 stores across the United States or restaurants, drug stores.

(24:03):

So the data that we get on the operations and maintenance, many of those have service contracts with Honeywell or even our partner, that helps us create a larger data lake to be able to look at where and how we can optimize. I don't think we fully tapped all of that or untapped everything that's available to us, but that's the fun part of the job. We're looking at how we can leverage that going forward.

Kyle Fox (24:24):

Absolutely. At the end of every episode, we always ask our guests the same question, and I'm so excited to hear your answer, Chris. So my question for you is this: how do you envision a greener world 50 years from now? Walk us through what comes to your mind.

Chris Ladas (24:40):

That's a tough one. I think a fully autonomous building or campus, if you want to scale it up, is one in which there's very little human intervention. It's balancing comfort with energy, together with safety that looks at the entire ecosystem around it. Outside of the building, how is power? How is commuting? How is everything going? And can do that without a human involved. And that's the trick if that can be done. We're getting there. We've made tremendous strides in a few years, and I think we're going to see it accelerate in the next few. It may not take 50 years.

Kyle Fox (25:15):

Right, and it's so worth it. This is something that can have a huge benefit. Even small incremental improvements seem to have a scale factor improvement across every installation. So it's absolutely worthwhile to do. And it's interesting when I draw the parallels in my mind, between how autonomy will play out in different sectors and how it's all interconnected. So in the automotive world, and not just cars, but also logistics and moving goods and now autonomy in buildings. All of that links together and it paints a very bright future.

(25:48):

Well, Chris, it has been an absolute delight having you on, and I think that there is so much more we didn't unpack in this that I would love to invite you back on the show, call it a year from now, to see what your progress is and how some of the concepts that we introduced today have played out within the market and just get an update on how things are going.

Chris Ladas (26:04):

Thank you, Kyle. We'd love to share updates in the future.

Kyle Fox (26:06):

That sounds great. Well, for our listeners, thank you for joining us in this conversation with Chris from Honeywell. If you're interested in smart energy, the future of technology and bringing smart buildings to life, then definitely go check out Honeywell. They're doing some amazing work and helping us make a more sustainable planet. So, Chris, thank you for being on the show.

Chris Ladas (26:23):

Thanks, Kyle.

Kyle Fox (26:25):

Thank you for listening and we'll see you on the next one.