

Connecting IoT data with artificial intelligence at scale

Podcast transcript

- David: Welcome to the Microsoft Industry Experience's team podcast. I'm your host, David Starr. And in this series you'll hear from leaders across various industries discussing the impact of digital disruption and innovation, sharing how they've used Azure to transform their business. You can find our team online at aka.ms/indxp or on Twitter at IndustryXP.
- David: Hari Menon is one of the founders and the CEO of Symphony Industrial AI, a provider of AI enabled operations excellence solutions for asset intensive industries like oil and gas, chemicals, mining, and manufacturing. Prior to founding Symphony Industrial AI, Hari spent 20 plus years as an entrepreneur, product manager and a software engineer at various software startups and larger software companies in Silicon Valley. Hari, Welcome to the show.
- Hari Menon: Thank you, David.
- David: And we're also joined by Diego Tamburini, the Principal Industry Lead for Azure Marketing in the Microsoft Industry Experience team, where he focuses on developing technical assets to help manufacturing companies and software companies deliver their manufacturing solutions on Azure at scale. He also champions partners who deliver manufacturing solutions using Azure. Welcome Diego.
- Diego: Thank you, David, and thank you, Hari, for being here with us recording this podcast.
- David: Hari, I wonder if you could tell us a bit about the mission of Symphony Industrial AI?
- Hari Menon: Yeah, the mission of Symphony Industrial AI is to deliver a software as a service a SaaS platform and solutions, AI enabled solutions for improving or optimizing operations of asset intensive industries or equipment intensive industries that include mining, oil and gas, chemicals, or any of those industries. We specialize in productizing AI, and I'll get into that in the later part of this podcast. So that's Symphony Industrial AI's mission.
- David: So you have a SAS product that's AI enabled and presumably you have multiple customers. So does that mean you have a multi-tenant application?
- Hari Menon: Yeah, it is a multi-tenant application, but in the industrial sector, some customers prefer to keep their data in silos and so we support that as well for reasons of proprietary data and proprietary process, we support that model as well.
- David: And I understand that you build templates for specific industry and different customer types. You build templates for them for Microsoft Azure deployments. Is that correct?

- Hari Menon: That's correct. So we rely on Microsoft Azure for all of the what I would call as both infrastructure and application component capabilities, everything from IoT Edge, Azure IoT Hub, [inaudible 00:03:16], several of the components in fact we are as we speak we are experimenting with [inaudible 00:03:22] as well as [inaudible 00:03:24].
- Hari Menon: On top of that, we have our application lab and we built solutions on top of what we call an operational data lake. And the operational data lake is data that is collected on a real time or even in batch from equipment and processes and contextualized so you can run algorithms on top of it to do things like a real time condition monitoring, anomaly detection, prediction of failures or anomalies, and those kind of use cases.
- Hari Menon: We have something called asset and process templates. These are software templates that represent the performance characteristics of a particular machine, equipment, or asset, or a process. And we have template editor that allows you to create a template and then once it is deployed, the algorithms kick in once the data comes through the algorithms kick in, and you are able to see the product analytics. So that's how we go to market. That's how we productize AI and kind of compress the time to value for our customers.
- Diego: And David I think that what's interesting to highlight here is that this approach of templating they're basically, if I understand this correctly, they're connecting the dots between the raw IoT data and the machine learning models that actually do some sort of prediction or provide some sort of insight. That connection is where many people kind of trip because they say, "Okay, I know that machine learning can help me somehow. I know I have all this data, but I already know what I can do with this data. I don't know how to select the proper machine learning model and how to train it." And what Symphony does is connect those dots for their customers.
- Hari Menon: Very well described, Diego. Exactly that's what we do. So like Diego said, about one of the industry secrets, or maybe not a secret any more is that more than 85% or 90% of the data that's being collected today from equipment and processes, we're not even talking about the need to put new sensors and all that existing data that's being collected today is unused. To be able to get the power of definitely most people we talk in industry believe that AI can add value, but how do you make that easy. Right?
- Hari Menon: So being able to connect the right set of data with the equipment models and with the AI models so that we can deliver the values where we come in. So that requires combining some domain expertise or enough domain expertise with the data science expertise. So think of us as curating algorithms that are appropriate for certain types of machines or processes to deliver the results. So you're right on, Diego.
- David: Do the idea of curating algorithms, does that mean you select from a library of maybe both public algorithms and ones that you develop yourselves?
- Hari Menon: That's correct. So notion of a template is a combination of what are the algorithms that can predict failures or predict anomalies or do process optimization and what are the data limits and time series data or other data that is needed to apply those algorithms?

All of that is templated. It's software enabled framework that allows for example, take the case of a rotary compressor. We have a template for a rotary compressor. So when we go into a new customer if they have three rotary compressors, you accentuate those, connect the data streams to them, and you're able to start seeing results very quickly.

David: Are there unique challenges working with time series data?

Hari Menon: Yeah, there are. The nature of time series data is very different from your standard transaction data or other kinds of data, because you have time along the x axis and then you have a measure, which is in different frequencies for different kinds of data. For example, for [inaudible 00:07:52] data is kind of high frequency, whereas something like [inaudible 00:07:56] might collect only once every minute or so. And then being able to kind of use that in algorithms to store, to retrieve, and to search for certain patterns within time series requires different set of data store, data retrieval approach than a [inaudible 00:08:18] or even a text based data.

David: I understand that Symphony Industrial AI is a Microsoft partner. What does that mean and what do you get from the relationship?

Hari Menon: I can put the value that we get from our Microsoft relationship in two buckets. One is even though we are a well-financed startup, we are still a startup. Trying to go into market with a SaaS cloud-based solution. It's a lot of questions Microsoft's credibility and Microsoft Azure's credibility gives us a backstop in terms of a lot of questions that get asked around the scale security and things that come from the idea organization. We are able to leverage the Microsoft partnership in addressing those.

Hari Menon: Because our partnership also allows us to tap into the Microsoft customer base, Microsoft is actively working with us on identifying customers and channels where we can sell our solutions to. Then the third one where our engineering team benefits quite a bit and our product and engineering team benefits quite a bit from this. We can focus on like we talked about building assets and process templates and deploying them versus worrying about the underlying infrastructure. Everything from database to how do you scale [inaudible 00:09:44] models, how do you scale that? How do you deploy that? All of that we rely on Azure infrastructure for a lot of that. So our engineering can focus on what is core to our organization.

David: Along those lines of partnership, I remember from a previous conversation with you that you are helping Microsoft improve their machine learning pipeline in Azure.

Hari Menon: So we're working very closely with Azure ML team so that we can provide feedback on how we can accelerate the deployment of it is everything from model tuning to model motion control to things like that, which is extremely important for adoption of this AI base solutions because as you probably know that you can build machine learning models but the models might drift after a while for whatever reason and now you have to kind of tweak the model. So how do you do that in an automated fashion and those

are things that we are working very closely with the Microsoft development team on providing our feedback so that they get the real world feedback on the product.

David: We need more people like you so that we can give you exactly what you need. That's great. So you've said also in past conversations that Azure lets your people focus on the business rather than on infrastructure. How's that so?

Hari Menon: In a SaaS and more and more in the new world we built a complete platform on Microsoft business based approach. It'd be everything from orchestration of the components of our platform using [inaudible 00:11:35], using [inaudible 00:11:42], Azure IoT hub is kind of data in just capability, Azure IoT Edge is any deployment of algorithms at the Edge.

Hari Menon: So lot of the infrastructure automation, all of that, we can count on Microsoft. As well as the ML model capabilities, as Microsoft enhances ML, the ML Library, and the ML tools and deployment capabilities, we as a team can then focus more and more on what we learn from the market how to enhance our product to meet new verticals, new customers, et cetera instead of worrying about the underlying infrastructure.

Diego: David, if I may, this actually highlights precisely our general strategy when it comes to industry solutions and specifically IoT solutions. Right? We are a platform company, as part of that platform we have IoT services and ML services and analytics and time series insights. But we cannot go as deep as a partner like Symphony can go with specific use cases industry use cases like Hari was mentioning, a template for a compressor. I mean we don't have the bandwidth or the knowledge or the depth to go there. Right? So that's where we rely on partners. Partners in turn they leave all the solution plumbing if you will to us and the basic IoT services that they care of. Connectivity, scale, security, and all that stuff so they can concentrate on the actual industry IP.

David: So speaking of customers specifically, I understand you have a customer in oil and gas, where you were able to use Internet and things to report a lot of information to the organization that helped them refine their operations. Can you describe that a little bit?

Hari Menon: Yes, so we focus on the downstream refineries within oil and gas sector where you have compressors, pumps, cooling towers, et cetera as part of the refinery's infrastructure. The equipment that is used within the refinery. For example take the case of pumps. You could have a refinery with more than 500 pumps. Now each one of them might not by itself be that expensive, some of them have sprayers, et cetera, but the health of these pumps are critical for the functioning of the refinery in an optimal manner.

Hari Menon: So the continuous monitoring of these pumps and being able to detect failures ahead of time and being able to provide the signals that allow them to maintain ahead of time so that you don't have breakdowns in operation is one of the biggest values we provide. And not only that, if these pumps are not operated and in their optimal thresholds, then you also have higher than normal energy consumption. So about 85% of their refinery's energy consumption comes from the pumps that are used within that refinery. So that's where we provide value.

- David: AI and ML in predictive maintenance is kind of all the rage in manufacturing discussions right now. And you just brought it up yourself. Can you speak a little bit to how this is done? And maybe some of the challenges involved in predictive maintenance models?
- Hari Menon: AI and ML has huge value in the predictive maintenance arena. The biggest challenges are I would say three-fold. One is [inaudible 00:15:28] connecting these assets so that you can collect data on either real time or even frequently enough to be able to do any kind of algorithm and prediction on the condition of that equipment. So one is the data collection part and the data integration part where Microsoft offers us capabilities like IoT Edge and IoT hub.
- Hari Menon: But you still have to sometimes if there are very old facilities you have to put in sensors et cetera. Luckily for us there are enough factories and refiners and chemical plants where the data is being collected so as a startup we have focused on them first so that we are hoping that the others will get up to speed with the sensorizing by the time we get there.
- Hari Menon: And the second part of it is how do you handle this large volume of data. It is a big data problem, but it's not just a big data in a [inaudible 00:16:28] space or in another space. It is a lot of this data that is coming in as time series data and being able to kind of find patterns within this time series that can then help you predict the failures, that's where we specialize in.
- Hari Menon: And then the third part is okay, how do you instead of custom building it for each customer, how do standardize or templatize some of it so that you can deliver it as a software solution then a one-off consulting agreement. So those are areas that we focus on from a product development perspective so we can make it much easier for our customer to derive that value and predictive maintenance is the AI part of predictive maintenance is very interesting in that like I said it has a lot of promise but you also have to have real explanatory power of the explanatory nature of these algorithms have to be exposed. Right?
- Hari Menon: So you cannot provide a black box and say this is going to fail in two weeks. You have to say what are the primary reasons for it to fail? Right? So for example not all algorithms from a user perspective, you have to have good data visualization. We have our own data visualization but we enhance that with Power BI where needed when you have to create new custom data visualization to support some of the algorithm.
- Hari Menon: I think I gave you a few challenges here and for the end user to adopt this AI enabled capabilities it is a combination of the above. It is automation, it is data visualization, it is picking the right algorithm so that it has enough explanatory power. All of that is critical.
- David: And Diego, I know that you've been producing some articles and other collateral around predictive maintenance. Do you have anything to add?
- Diego: Yeah, sure. I mean the predictive maintenance is one of the applications of machine learning models that train with IoT data that has been gaining more visibility and

popularity and it's one of the great applications for IoT and ML. what people probably often fail to realize is that it's not just a matter of identifying a machine learning and deploying it somewhere and turn it on and it starts working. Right? I wish it worked that easy. Machine learning models, not only do you have to identify the right one, but you also have to train them with data and data can give the machine learning model an indication of when something is about to fail.

Diego: And then when you have a working machine learning model that is predicting a way you also have to maintain it, not that you just deploy it and forget about it. You have to train it with new data because the conditions may change. And so you have to identify the right machine learning model, you have to find the right data to train it, and you have to keep them up to date.

David: That leads me back to a question for Hari, because you mentioned that many of the organizations you work with have what I'll call brown field data, or data they've been collecting maybe even for years. Is that sufficient to train your models? Or do you need more current data?

Diego: The historical data is very useful in training the models, but you still need to test it with like any other machine learning model, you need enough training data sets. And not algorithms, but most algorithms require enough training data sets. And usually in industries with alcohol and gas and chemicals have used something called data stores called historians. We are able to get enough data out of the historians to be able to train our models.

David: So in this discussion of time series data, it often comes in a stream of data. Right? Continuous stream of data from sensors. What sort of Azure resources are you using to hook up to those streams of data so that you can get real time analytics and insights from them.

Hari Menon: So we, from a data in this point we are using IoT hub for connectivity. We use Kafka, it's not an Azure specific thing but it allows us to scale capital really well within Azure. As a primary messaging framework and our in-stream algorithms use Kafka as the input and output where the streams come from and where we write the results into.

David: Kafka being an open source event bus, right?

Hari Menon: Right.

David: I just have to mention when people go to the Azure market place, Kafka is one of the things that they can just install with very little trouble or very little challenges.

Diego: I like to highlight something that is very common among our ISP partners developing on Azure, is that often they use other platforms and open source resources on the messaging side or their story side. I mean we hear also like in their visualization they use things like Grafana, which are open source visualization that in a sense you could argue that it competes with our Power BI. So what I'm trying to say is that this combinations of

open source and Azure platforms are very common and we welcome them with open arms because we believe that give our partners the flexibility to pick and choose the right tools and they all play nice with Azure.

Hari Menon: That's what we really appreciate about Microsoft's approach here is that and I hate to say this but unlike Microsofts of the past where everything had to be on Microsoft technology, here we are allowed to mix and match. Where for whatever reason our architects [inaudible 00:22:45] and we picked an open source component and we can bring that to leverage on Azure.

David: So lastly I'll ask about your product a little bit more. You said that sometimes for different visualizations than you provide you bring in power BI. What kind of visualizations or reporting does your product provide?

Hari Menon: We provide like every one of our [inaudible 00:23:12] templates, or our process templates have a standard for that particular template, it has a standard data visualization whether it is any kind of of anomaly visualization or anomaly and in their trend. Things like that. But the customer, when we go in to certain customers, they are used to seeing data in a let's say in a different visual paradigm. And then we use Power BI as an additional data visualization capability. [inaudible 00:23:45] with an RUI, so it's pretty seamless to the customer.

David: I want to thank both, Hari and Diego, for being on the show. You guys are in a fascinating line of work. And I appreciate both of you and your time on the show today.

Hari Menon: Thank you, David. Thank you, Diego. It was a real pleasure to be on this podcast. And I hope after a few more successes, we get to come back and talk about that.

David: That would be great. Love to hear some ore customer stories.

Diego: Likewise. Thank you, David and Hari.

David: Thank you for joining us for this episode of the Microsoft Industry Experience team podcast. The show that explores how industry experts are transforming businesses with Azure. Visit our team at aka.ms/indxp. And don't forget to join us for our next episode.