Constellations Podcast

Episode 84 – Microsoft Azure Orbital, Ground Station as a Service, and Dynamic Ground

Guest: Nora Zhan, Product Manager, Microsoft – 23 minutes

John Gilroy: Welcome to Constellations, the podcast from Kratos. My name is John Gilroy, I'll be your moderator. Today on the Constellations podcast, we will discuss Microsoft's recent announcement of their Ground Station as a Service offering "Azure Orbital" and what it means for the satellite industry. Azure Orbital is Microsoft's managed service that is designed to deal with the growing flood of data for Earth Observation and Internet of Things applications. The managed service lets users communicate to, control their satellite, process data and scale operations directly in Microsoft Azure. Microsoft's Ground Station as a Service takes a very different approach compared to traditional ground systems. Azure Orbital leverages key technologies such as virtualization, Software-Defined Networking, and cloud computing to enable customers to automate and scale operations across the globe.

John Gilroy: With us today to discuss Azure Orbital is Nora Zhan, product manager for Microsoft. Nora is involved in Azure space, satellites, and ground stations, and in bringing this new platform to market to provide satellite connectivity. Recently, at Microsoft Ignite, your annual conference for developers and IT professionals, you announced Azure Orbital. Nora, could you tell us a bit about this new offering?

Nora Zhan: Sure. I'd be happy to. Azure Orbital is a fully managed cloud-based ground station service that enables satellite operators to communicate with their spacecraft, to downlink and uplink data, to process data in the cloud, to chain services with Azure services, and to generate products for their end customers.

Nora Zhan: I know this is a little mouthful, but think of Azure Orbital as your pay-as-you-go service that gets you the connectivity with your satellites and the connectivity to the cloud. Any solution you need in between, we have them available on the platform for you to choose from. Essentially, Azure Orbital enables any satellite operator to focus on the mission and product data. And they don't have to worry about deploying or maintaining ground infrastructure anymore.

John Gilroy: Wow, that's a really big announcement. What was the driving force, from Microsoft's perspective, for developing this service?

Nora Zhan: I have two keywords for this one. And I will elaborate on both of them, data and the cloud. Maybe three words. But anyway, so we all know the space industry is a giant industry today already that generates millions of terabytes of data every year. The recent technical developments in the industry have made the barriers

to market entry way lower compared to even just a few years ago. So we have seen a lot more satellites being launched to space in the recent years.

Nora Zhan: At the same time, the commercial use cases for satellite data have already, and will continue to, significantly evolve with the advancement in data processing, data analytics, IOT, etc. All of those lead to one thing: significantly more data from space. At the same time, as Congressman Doug Lamborn pointed out in one of your most recent podcasts, and yes, I do listen to your podcast, ground station infrastructure developments are already lagging behind satellite developments. We simply don't have enough ground antennas to absorb all of the data from space, and we haven't seen any technical breakthrough in the ground station architecture for a while.

Nora Zhan: We at Microsoft see this as a great opportunity to meet the growing demand and to revolutionize the ground station operations. With the huge amount of data coming from space, cloud is essential to provide the necessary computing power and resources needed to process and store that data. Azure is already a major leading player in the cloud industry, and also one of the longest terrestrial fiber networks. So it makes perfect sense for Azure to leverage its cloud infrastructure to extend connectivity from Earth to space. We are confident with Azure Orbital, we can significantly reduce cost and increase efficiency and scalability for satellite operators. We can also enable them to directly and immediately ingest and process satellites in the cloud. Our ambition is for Azure Orbital to become the ultimate one stop shop for all satellites use cases and help shape the new possibilities of space connectivity.

John Gilroy: Nora, if you look at the market, I think it's like a $300 billion industry. The satellite industry is huge. And all kinds of priorities, you can juggle all kinds of different things within there, many different key markets. And so what are the key markets that you'll be focused on? And why did you choose those?

Nora Zhan: Based on our own research and the feedbacks and interest gathered from customers during our initial proof of concept to work, we have identified a few segments as our key markets. The first segment includes typical industry verticals like weather forecasting, remote mining, energy firms, oil rigs, and maritime. The second segment includes companies in earth observation, navigation, and the geospatial fields. We also target satellite communication providers like SES and IOT companies, integrating ways of satellites communication.

John Gilroy: Great. If you look at the data process and community and information technology, you think about this cloud. And could you just for our listeners maybe discuss the role of technology such as cloud computing, virtualization, software defined networking, and these all enable the Azure Orbital environment to automate and scale operations, don't they?

Nora Zhan: Yeah, of course. We already talked earlier that we're seeing significantly more data coming from space today. And cloud provides great compute power and resources to process and store those data. Cloud computing and virtualization allows pay-as-you-go computing and truly frees satellite operators from hardware maintenance and significant capital investment. Satellite operators can scale up or down any time as their operations justify it. Virtualization of the layers also enables flexibility, meaning each customer's unique needs can be met. For example, Kratos' software modems accommodate a bunch of different types of satellites wave forms and can be created or deleted on the fly. There's also this increasing demand for connectivity for everyone and from everywhere by leveraging Azure's software-defined network, satellite communication providers don't have to build or manage their own fiber network. They also have the flexibility to increase or decrease their network capacity without having to worry about the long-term commitment or long lead time for network expansion.

John Gilroy: Nora, if you keep up with the satellite community, you see this explosion, this tremendous growth in capabilities and capacities of small satellites. And the number of ground station as a service providers have emerged to provide dynamic service offerings. So what makes the Azure Orbital offering unique? What's the secret sauce?

Nora Zhan: We believe we have some strong differentiators and competitive advantages. First of all, Azure Orbital is highly focused on a partner-led approach. Our goal has always been to build a vibrant ecosystem of partners to jointly create more value for both our partners, as well as our customers. Think of it like a coral reef. Everyone relies on each other and everyone benefits from this one platform. We truly intend to empower our customers to achieve more and build systems with our highly scalable and flexible platform.

Nora Zhan: Digitized RF is also a unique selling point for Azure Orbital. With a fully digitized signal available from the antenna, including up to 500 megahertz of wideband, customers have complete control and security over the data coming from their satellites. Software modems from our partners, such as Kratos, are integrated into the platform for seamless use. We do anticipate certain customers to bring their own modems, for example, in a mandatory application. And we support those use cases by delivering digitized RF at the end point of customer designation. Some of the other differentiators I already touched on earlier, like our low latency global fiber network and all available Azure cloud solutions. Essentially, once customers downlink their data to antennas in Azure regions, customers can immediately ingest those data to Azure cloud. And when that happens, customers can leverage all currently available Azure solutions, such as Compute, IOT, AI, Machine Learning, and Analytics to further process their data and generate products for their end customers. This enables customers to chain

together with their workloads in one environment and truly provides them with end-to-end solutions.

John Gilroy: Nora, we have a wide range of listeners to this podcast, people from all over the world. Of course, people with sophisticated knowledge, maybe people's knowledge of different aspects of this industry. Just for the benefit of the wider audience, can you walk us through how Azure Orbital works at a high level from digitization, signal processing, recording, and then storage?

Nora Zhan: Sure. Azure Orbital is a very simple three step process from customer perspective. Step one, you register your satellite. So here you input all the basic information for your satellites, such as TLE and licensing information. Step two, create a contact profile. In this step, you include the center of frequency and bandwidth requirements for each link. You also provide other details such as minimum elevation and autotrack requirements. Step three, schedule the contact. This is super easy. Just choose a time window and a ground station location. Once all of those steps are done, during the pass, the RF is streamed in real time to the cloud. This is possible by digitizing the RF signal at the antenna. The RF upstream is sent to the cloud and processed using software modems. The data is then handed off into an end point of customer's designation. The customer can then choose to store the data or process it further based on their staff size payload workload.

John Gilroy: Nora, Microsoft is known all over the world for working with its partners in a very close relationship. In fact, partners play an important role in Azure Orbital. Nora, can you discuss some of the capabilities they bring, especially from a satellite infrastructure perspective?

Nora Zhan: You are absolutely right, John. Our partner ecosystem is an essential part of Azure Orbital. As I already mentioned earlier, a tightly integrated partner ecosystem is a competitive advantage for Azure Orbital. We already have a group of diversified partners today. As we move forward with our journey to space, we will definitely be adding more partners to our ecosystem. We will always be partner-led in our approach, as we build Azure Orbital. Today, we've partnered with KSAT, Viasat Real-time Earth, and US Electrodynamics to leverage their existing global ground infrastructure. Those partnerships give Azure Orbital a unique advantage by providing our customers with broad global coverage upfront. Customers have more options on ground station location and more contact time with their satellites.

Nora Zhan: At the same time, customers get to enjoy the same benefits of the highly integrated Azure Orbital platform and Azure's global fiber network. We've also partnered with software modem providers, such as Kratos, to bring their software radio processing capabilities in the cloud as part of our platform. Those capabilities have been specifically upgraded, to adopt Azure platform

accelerations like FPGA and GPU based compute. This enables customers to process the radio signal in real time at high throughput and bandwidths. Another option for customers is to deploy those software modems from our customers in their own virtual networks. This way, they can have more granular and closer control on signal processes. Other partners such as Kubos will integrate their fleet operations management and the telemetry tracking and control functions in our platform to fully leverage an end-to-end solution.

John Gilroy: Nora, 10 years ago in my wildest dreams, I would never have dreamt of all the satellites that are up there now. And Microsoft having a marketplace, Microsoft Azure Marketplace, and this supports this offering to make it easier for our customers. It's really a breakthrough, isn't it?

Nora Zhan: Yes. Please do forgive me for repeating myself again here, but I just cannot emphasize this enough. A highly integrated and diversified partner ecosystem is a very important feature of Azure Orbital. Azure Marketplace is the digital platform that we leverage to make this ecosystem a reality. From a very high level, partners publish their solutions on Azure Marketplace as offers. Those offers include satellite specific solutions, such as software and modems, and TT&C solutions. They also include non-satellite specific solutions, such as data analytics and machine learning. All those offers are visible and available to any Azure Orbital customer via Marketplace.

Nora Zhan: Customers can subscribe to any of those offers within their existing Azure subscription. Because of this, customers can chain together all workloads in one environment, and have a true end-to-end solution. One thing to emphasize, all of those marketplace solutions are deeply integrated with and optimized for Azure Orbital platform. It's like a VIP shopping experience for customers. They just need to get on the platform and put anything they need to achieve their goal into this one shopping cart. All of the items they put in their cart have already been specifically customized and upgraded to meet their unique needs and to integrate with the overall capabilities of the platform. As a result, as soon as they check out, they will have the data from their satellite in the exact location and format that they desire.

John Gilroy: Nora, you're very lucky. You're right in the middle of this whole process. You've been there from the beginning, and as a product manager at Microsoft. From the perspective of participating in this launch, has there been any interesting insights or lessons learned from developing this service in the satellite industry?

Nora Zhan: Yes. By working with our already proof of concept customers, we learned that no two space missions are the same. We realized very quickly that we do need a highly flexible and extensible platform to fulfill any unique customer needs. This is why we build Azure Orbital platform to deeply integrate with diversified partners and to fully leverage cloud computing and virtualization.

John Gilroy: Nora, there's a comedian here in United States that talks about how to name names. And so what I'm asking you to do is to name some names. Do you have any early adopters that will be using the service? And can you tell us why they chose Azure Orbital?

Nora Zhan: We are very proud to share that SES has selected Azure Orbital to augment their ground network needs for their next generation new communication system, O3b mPOWER. As part of this launch, we will be co-locating new dedicated ground stations for SES in Azure data centers. We will also interconnect existing SES ground stations with Azure global network. As a major satellite communication provider, SES has always faced the challenge of having to spend a lot of resources to manage their ground infrastructure and having to contract with a lot of different local transit providers to patch together a global network.

Nora Zhan: With Azure orbital, they won't have to worry about those anymore. We will take care of those so that they can focus on launching their next generation constellations. At the same time, SES can fully leverage the cloud based virtualized modems provided as part of the Orbital platform. This way, they can get out of significant capital investment and hardware maintenance. SES has also been trying to provide more value adding services to their customers. Now, with Azure Orbital, they can bundle other Azure services and build managed services for their customers, such as security services, SD-WAN, edge compute, 5G mobility solutions, and many others.

John Gilroy: Nora, when I hear the word marketplace, I think of some easy business transaction. And so give us a little story here or scenario. How does a customer get onboarded to your service and how long does it usually take them to get connected?

Nora Zhan: So the actual customer onboarding process to Azure Orbital is the three step process that I described earlier. Very easy. Register your spacecraft, create a contact profile, and schedule the contact. But as many of us in the industry know, regulatory issues are one of the most complicated aspects in the field. We sometimes joke inside the team that regulatory issues are not any easier than the actual rocket science. But Azure Orbital's team will help our customers through each step of the regulatory process and apply for the license on their behalf, if needed. The actual processing time will depend on the location and the local regulatory requirements. But rest assured, as soon as we have the license, customers can start scheduling the contacts right away.

John Gilroy: Nora, this is a rather exciting development here. And I'm sure there are people who are listening to this podcast and they want specifics. They want more and more specifics. And so how many ground systems does Azure Orbital have online today? Where are they located and do you have any plans for the future?

Nora Zhan: Our first ground station co-located with Azure data center in Quincy, Washington, is going to be live in just a couple of weeks. In the next six to 12 months, we're adding another five ground stations across the globe. The tentative locations are Singapore, South Africa, Chile, Dubai, and Sweden. As mentioned earlier, we've also partnered with KSAT, Viasat RTE, and USEI. Their global ground stations will be available to our customers through the Orbital platform very soon.

John Gilroy: Given technology changing all the time, it's hard to predict what's going to happen in the future. But because you're a product manager, that's kind of what you're responsible for. So Nora, how do you see Microsoft's ground station as a service offering evolving in terms of capabilities and markets over the next few years?

Nora Zhan: We will definitely focus on expanding ground infrastructure capacity, growing partner ecosystem, and increasing our global coverage. We will aim to make the platform highly flexible, adaptive and extensible. The goal is really to make Azure Orbital a platform of choice for any customer looking to connect with their satellites and to the cloud. We will also be closely watching the markets and we're always open to the feedbacks from our customers and partners.

John Gilroy: People are listening to Microsoft ground stations as service information here, and they want to get more information. So where can they get more information about this new development?

Nora Zhan: Yeah, you can learn everything by visiting Azure Orbital product page and Azure Orbital documentation page. You can also do a keyword search on Azure.com or on Bing.

John Gilroy: Great, great, great. Nora, you did a fantastic job here giving our audience a better understanding of a quite complex topic. I'd like to thank our guest, Nora Zhan, product manager at Microsoft.

Nora Zhan: Thank you.