

USER FRIENDLY



What is the Intelligent Edge?

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Hanish Patel (Hanish): I'm Hanish Patel, and this is User Friendly, the show where we explore emerging trends in tech, media, and telecom and how they impact business, operations, and the world around you. Advanced connectivity, the Internet of Things, and artificial intelligence are all coming together to drive the next evolution of the digital world. Only now is it becoming physical, sensing, and intelligent. Joining me today are Sandy Shirai, Deloitte's Global leader for technology, media, and telecom, and Janice Zdankus, VP of innovation

for social impact at HPE, to explore the Intelligent Edge, what it is, why it's important, and how it's changing businesses. So let's just jump straight into it. It would be great if we could get a primer on the edge. So, Sandy, what is the edge, and how does it become intelligent?

Sandy Shirai (Sandy): Great, Hanish. Thank you so much for asking this question. There's a slightly different definition depending on who you ask. To a telecoms person, the edge refers to the network

locations; to a computer manufacturer, it's about the devices; and to a semiconductor company, it's about the chips. And you know, really, they are all correct. There are three important components. The first one is computational power; secondly, data storage; and then finally, you have to have high-speed connectivity. And all of this is located very close to end devices. Those end devices can be anything from the smartphone that you have in your hand or in your pocket, or in my case, in my purse; it could be a sensor on an oil

pipeline or a car—anything that's generating and consuming data. The edge is different from typical computing, because that data is sometimes thousands of miles from a data center, and with the Intelligent Edge, we're talking about a handful of miles or maybe even right on the premises, or the processing power is on the device itself, so data can be captured at the edge and quickly processed with very low latency. This is actually helpful for things that need high-speed or real-time response, like autonomous vehicles on public streets or drones flying through the air, or even cobots—cobots are collaborative robots, designed to interact and move around with people. So the Intelligent Edge minimizes the need to send so much data over networks and back to the core data center or cloud, and that lowers transmission costs. So the edge is becoming intelligent with the addition of edge AI. These are edge chips that are getting stronger, machine learning can run on them without continuous cloud support, and this enables fast decision-making on-site. And it's important to know that today's edge networks and devices are still typically connected to data centers or cloud. So the important elements, like metadata and the like, can be sent to the cloud, and the cloud can update the devices on the edge. So the cloud can do all the hard work around machine learning and algorithms, and the edge devices can do the inference on the data, quickly classifying and responding. So both the cloud and the edge work together, making each other stronger. It's very symbiotic, if you will, and it's sometimes known as edge-to-cloud.

Hanish: Perfect. Thank you, Sandy, for that explanation. So then, Janice, I want to move to you. Based on that understanding that we've got of the Intelligent Edge, why has the Intelligent Edge now become so important?

Janice Zdankus (Janice): Well, it's not that the edge is new, but it's actually becoming much more important due to advanced capabilities, connectivity, and the emergence of AI applied to it. So many industries are undergoing digital transformation, and as a result of that, there are three major technology needs that are emerging in the

market, which require advancement in the overall network capabilities, and those are the fact that there is tremendous growth in apps that are bandwidth-hungry, very data-intensive, and are immersive. And so, for example, in about four years, it's forecasted that the average data consumption per smartphone is projected to be 21 gigabytes per month, up from 5.6 gigabytes just two years ago, and video streaming is really what's accounting for that growth—at 480 percent growth; that's huge—and then increasingly, as things become more connected, they are generating more data, and the context in which the data is being generated, is being exchanged, across various devices, that means many, many more devices are connected worldwide, and I think the forecast is, in just a couple of years, 29 billion devices are expected to be connected worldwide. And then finally, there is an increase or a growth of use cases that is emerging that are mission-critical, moving data from the edge to the cloud use cases, and an example of that would be autonomous vehicles. So in a few years, autonomous vehicles will be uploading over a terabyte of data per vehicle with sensor data as well, and that's up from around 30 gigabytes from advanced connected cars just a couple of years ago. And so that means that our Intelligent Edge needs to actually address these areas by providing significantly more bandwidth with the ability to handle massively more devices and to be able to do that with ultra-reliable low latency.

Hanish: Got it. So both of you mentioned a number of different areas. You talked about devices, autonomous vehicles, video consumption, data—I mean, that's a whole raft of areas. So with that in mind, how are businesses actually using the Intelligent Edge, and are there certain industries adopting the Intelligent Edge more quickly than others?

Sandy: We've seen an explosion of use cases across a massive number of industry sectors, just like Janice mentioned, and we're seeing explosion not only in major countries, but all around the world. Everyday consumers, for example, we see smart

refrigerators, cars, we see smartphones, people were even talking about smart diapers—I mean, come on, really? Everything is connected. For enterprises, we see health care, manufacturing, retail, government, significant use cases. For example, in health care, putting devices near or on patients enables better health monitoring. For manufacturing companies, they are using it to assist with automation, production, planning, preventative maintenance. Retailers are using it for inventory optimization and loss prevention. In transportation and government, the Intelligent Edge can be really useful when applied to equipment management safety and surveillance. I would have to say, though, that the industrial businesses are adopting these capabilities very quickly. They have had sensors and control systems in their operations for many, many years, and they are simply adding advanced connectivity and AI to the current infrastructure. We also see telecoms, they're building out greater Intelligent Edge capabilities because they know that 5G is on the horizon, and they are developing more robust micro-data centers to handle so many devices moving on and off their hybrid networks. Consumer-facing businesses are starting to leverage edge intelligence to deliver better and more personalized services.

Hanish: Listening to all of that, if I was an organization, or . . . any organization thinking about dipping their toe into the Intelligent Edge, what should I, or others, would be thinking about when we want to get started in this space?

Sandy: I can take a crack at that one, Hanish. So for businesses that are new to the Intelligent Edge, I would urge them to start small, but think really big. Companies should pick pilots that could have huge impacts on their business if successful, and this means that small starts should be highly scalable with measurable outcomes. Business leaders should be involved so that you can connect the effort from prototype to performance and, well, just like anything, a movement to the Intelligent Edge requires a bit of investment and

some experimentation, and oftentimes a business case, and where the business case is compelling, where there are significant savings in operational costs or revenue growth—or even mission achievement, like saving people's lives, right—we see an expansive use of Intelligent Edge, and many companies are using Agile-like approaches with quick releases, short development cycles, experimentation. It's the whole famous "fail fast, learn fast, scale fast" kind of mantra, and a common question I oftentimes do get is, "Do I need to wait for 5G? Should I wait for 5G and then start my Intelligent Edge efforts?" And my answer is, absolutely not. 5G will greatly expand the potential of networks and services while reshaping the way, but in that sense, don't wait, because a lot of the technologies that were built for 4G are easily upgradeable to 5G, so don't wait.

Hanish: Got it. That 5G topic that you mentioned, Sandy, I'm going to come back to that in a bit, but Janice, I did want to ask you: Hearing what we've just had, does it seem like another big shift in how businesses need to design and develop their networks and services as they move to the Intelligent Edge?

Janice: Well, these big shifts happen kind of in a generational way. So if you look back over the last four decades, a new generation, or a new "G," has been released for wireless communications technology, on average, about every 10 years. And since the first generation, every release after that has added new features and network capabilities to the communications experience, really leading to the point where we are today with 4G LTE with mobile data and video access to end users, with significant speed and low latency for enterprise applications. And so now, with 5G on the cusp here, it's really more than the next release of wireless communications; it's the technology that brings exponential capacity in the telecom network for connecting many more things and people than ever before and opening the door, really, to possibilities that we haven't even imagined yet for enterprises to innovate and to find new sources of revenue and to extract more value from their data as well.

So the possibilities really are analyzed, and businesses, we will start to design and take advantage of the new capabilities of the network functionality.

Hanish: So then, staying with that sort of advancement and evolution, how are networks truly evolving with the Internet of Things and Edge Intelligence?

Janice: So there's really a digital transformation underway for both enterprises and cloud service providers, CSPs, on their own journeys, and there's at least one parallel that can be drawn between the both of them, and that is that they're building up intelligence at their own edges or the Intelligent Edge in order to produce real-time insights and then deliver digital services and results. So on the one hand, enterprises are really becoming more data-driven, connecting more IoT sensors and devices, building up their IT infrastructure really close to those devices. We call that the enterprise edge, and that enables them to process and analyze their data faster, obtain real-time insights, and that Intelligent Edge will be the bridge that brings 5G features into the enterprise. And then, on the other hand, the CSPs are also undergoing their own digital transformation, first by virtualizing their core data centers into the cloud—and that delivers network functions—and then by building up the IT infrastructure where it's closest to the edge and closer to the users and mobile devices, and that's called the telco edge. That will enable them to process data closer to the user, extend the new 5G features from the core, and then, more importantly, to allow them to offer IT services to enterprises through their infrastructure and in a way that's converged with the connectivity that their networks are providing. So in both digital transformation trends, the Intelligent Edge is playing a critical role to enable data processing, delivery of the digital services, applications of the connectivity much closer to the user.

Hanish: So then, tell me a little bit more about maybe some of those challenges that the networks are having, particularly in remote or in unconnected areas.

Janice: Especially in an area that I'm personally investigating and working on for innovating with social impact, I would say, we are really trying to understand the reach and access for connectivity into rural areas. In a use case of world hunger and ag tech, for example, being able to reach where crops are grown and harvested and immediately processed requires the ability to have access to the data that's happening out on farms, for example, and there are variety of technologies out there—Landsat, low-latency capabilities, cellular technologies—but the sophistication of equipment that is now being brought into the far areas really does require greater bandwidth, and that is causing the need for broadband reach into many of these areas or the ability to set up local networks that are serving in your local access right there on the farm and then the need to return that critical data back into the core or the enterprise, where additional insights will be applied. And so, you know, you have to be able to transfer sensor data, but that is typically very slow, it can be expensive, it can be insecure, and the edge bandwidth can actually provide security and lower cost of processing that data when it's placed deep at the edge.

Hanish: Well, that's fascinating that something like Intelligent Edge is working its way to solve world hunger, which then, I guess, moves me on to the next topic that I said I'd come back to later, which I keep hearing that will solve many a thing, and that's 5G. So thinking about 5G—and both of you, Sandy and Janice, mentioned it earlier—is how will it truly impact intelligent action, is it truly necessary, and does it really have the potential to reshape industries, or is it a little bit more just incremental?

Sandy: So 5G is an enabler. 5G provides faster speeds and greater throughput. 5G enables a huge increase in capacity. An example is, while 4G connects thousands of devices per square mile, 5G can connect millions of devices per square mile. 5G makes it easier for large networks of edge devices to communicate effectively and quickly. With 5G, enterprises can use software to virtually set up and manage their networks from the device to edge

computers and all the way back to the cloud, they can segregate a slice of their wireless network to deliver the security speed and quality of service required for mission-critical, time-sensitive applications behind remote health care and industrial robotics . . . You know, I mentioned cobots, which are collaborative robots—these are robots intended to interact with people—and autonomous vehicles that require ultra-reliable low-latency communications.

Hanish: I just absolutely love that, “cobots.” I’ve never heard of it before, but I’m definitely going to use that more often and look out for that. So then, let me put it another way. To both of you, with the wealth of experience that you guys have in the technology space, and in particular with the Intelligent Edge, you must have come across some really interesting case studies, so with that, what are the ones that really stand out for you, be that consumer or enterprise or at an industrial level?

Sandy: I’m aware of a project where a country in South America, the government has reached out to a university to help them understand what crop seeds and traits they should be planting in a food desert to help them be more productive in their yields and actually in the biodiversity of crops that they plan. So what the university has done is created a controlled environment phenotyping facility where they study particular microclimates and put particular varieties of plants through a constant analysis in the weather kind of simulation, and they use very sophisticated equipment and hyperspectral imaging to measure plant traits like chlorophyll levels, for example, and other things, and that particular process generates, right there in the facility at the edge, around 1.2 petabytes a week, and it’s an example of something that could not be done out in the field, could not be done in all the food deserts around the world, but it is something that could be done in this controlled environment, and then offer recommendations and advice to local governments that are facing hunger challenges with what they should plant, rather than going through trial and error in their own environments. So that’s a pretty

significant advancement and a lot of data that has to be handled and filtered at the edge in order to come up with meaningful recommendations. Another one is the advanced manufacturing area, and this case is where I think many of you know that when computers are produced, for example, there are a lot of configurations and options that can be selected by potential customers, and we have, for example, at HPE, an advanced partner of ours that assembles our products, and it’s quite a challenge to be able to ensure that all these different variations are actually assembled correctly, and so there’s a quality assurance process that needs to occur. And in the past, that was done with humans, with people that would look at if the cables were plugged in correctly for the test, if the memory options were installed correctly, and so recently, one of the vendors that we work with has installed cameras to actually have very, very high-definition analysis of what’s been assembled with the application of machine learning and training of the machine learning algorithms to understand when something’s been placed in the right place or not. That’s really what we would call bringing together operational technologies, or OT, and information technologies, IT—so the convergence of OT and IT happening in the manufacturing space—and that has resulted in a pretty complex set of IT system quality assurance inspections that have reduced costs, reduced time, and improved quality overall, so that’s another example.

Hanish: That’s fascinating. I’m just blown away by even the prior example of just over a petabyte of data. That’s such an immense amount of data, which I can only imagine that—to your point earlier—that if it wasn’t for the Intelligent Edge, that would just be very cumbersome to send and process all of that data somewhere centrally to get the answers back out to the edge, where they need to be. That’s incredible. Going back to something that both of you mentioned just around autonomous vehicles and just the amount of data that’s at the edge potentially being passed back and forth, it would be remiss of me if I didn’t ask about just how secure is this data, and is Intelligent Edge actually making things more secure, or has

it actually opened up the opportunity for things to be less secure or less private? And I’d love to get your thoughts on that.

Sandy: Yeah, Hanish, this is a very important question. I hear it all the time from our clients. Well, with all the devices, millions of devices out there, certainly there is a concern about security, whether the bad hackers will get in there and affect and impact the devices, there’s more portals, there are more openings where bad people can get in, but there is a point of view that by having the information on the device itself, it can help make things more secure, and that point of view is, instead of sending the data out to a data center or a third party, the analysis can be performed at the location where the data is collected or generated. So the notion here is, not only does this mean that the analysis can be performed more quickly, but it also decreases the likelihood that the data will be intercepted or otherwise breached. You could take the data and do an analysis on the device and only send the metadata, so subsets of the data, to the cloud or advanced processing. Now in terms of privacy, we’re seeing more laws and regulation about where the data can be stored and transferred. For example, some countries won’t allow companies to send their citizens’ personal data outside of their borders. When the data is processed at the edge instead of in a public cloud, it’s easier for companies to comply with some of these policies, and therefore it can make it easier for them to adapt to the new regulation. So it’s an interesting debate. I encourage people to think about this, because it is an important aspect of the Intelligent Edge.

Janice: And I would add to that, Sandy, that the ability to do the analysis, the data capture, the normalization, the analysis of that data and transfer of the metadata that you described really takes a level of compute and storage capacity that is just not available in today’s gateways. It really needs to be in the Intelligent Edge devices that are better placed on the edge.

Sandy: Agreed.

Hanish: Fantastic. Thank you, both of you, for covering that really critical, critical topic. I mean, it's quite clear that we're really starting to see the next phase of global connectivity and computation, making things more networked, the sensing and intelligence of it all, and it's exciting to see where it's heading, how things are going to be reshaped, what businesses can do with these capabilities as they continue to evolve and be adopted by the businesses. So with that, I want to thank both of you for joining me on the pod today and helping us understand the Intelligent Edge.

Sandy: Well, thank you for the invitation to participate in it.

Hanish: And until next time, happy listening.

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