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IBM.N - International Business Machines Corporation Presents at Build Smart and Secure Edge for the Future, Sep-10-2020 01:00 PM

EVENT DATE/TIME: SEPTEMBER 10, 2020 / 5:00PM GMT

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PRESENTATION

John Walicki

PRESENTATION

John Walicki

Edge developers, 5G architects, I'm really delighted to have you join us today for our for our Build Smart Build Smart and Secure Edge for the Future webcast. My name is John Walicki, and I will be your host and moderator for today's panel discussion. I'm an IBM developer advocate with deep expertise in [IO analytics,] open-source mobile, AI and bringing them together over the last several years, now edge computing.

In today's webinar, we will discuss the intersection of 5G and edge computing and listen to top speakers from the #1 mobile device manufacturer, Samsung; a leading mobile network provider in the United States, AT&T; and a leading open source systems management standard bearer, Red Hat. We've assembled a rock star list of industry experts for our panel. And in just a few moments, I will introduce you to Swalé Nunez from Samsung, Philip Coleman from AT&T and Susan James from Red Hat. Of course, I'll be along to guide the session and moderate the lively discussion.

Why are you here? As a developer or 5G architect, you are interested in how smart integration of new and emerging technologies like 5G or edge computing will help your business harness the next wave of digital change. Maybe you want to help your business transform the user experience for your customers, improve processes across a variety of industries such as retail, financial services, transportation, manufacturing, government or health care. Good for us developers, there will be a massive new set of devices to code AI now edge computing. models to build and APIs to improve processes Swalé Nunez from Samsung, Philip Coleman from AT&T bring together or edge computing to solve interesting and challenging problems. bring together

You might be wondering what skills you will need to take advantage of the upcoming intersection of these technologies. The panelists have some answers. Let's hear from them now. hear from

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Phillip Coleman

Hi, my name is Philip Coleman, and I work for AT&T. My focus in my role is on product development, specifically in the mobility space with 5G. And so today, I'm excited to talk with you about my perspective on both 5G and the edge.

So I read a quote recently that really resonated with me, and I wanted to share it with you. It says that creativity is thinking of new things, but innovation is doing new things. And I read that, I just really said, wow, because I think customers are in a mode today where they hear a lot, they read a lot, but they're very curious about how to get started. And I can say that AT&T has a history of doing when it comes to delivering connectivity for the enterprise, and mobility is no exception. So if you are looking at how to transform your business looking at how to transform your business and you want to take that first step in laying a foundation to position yourself for the future, then I'd like to take the rest of the time to offer you I'd like to take the rest of the time to offer you I'd like to take the rest of the time to offer you 3 clear examples of how AT&T is leading in this space.

The first example is 5G and how appropriate. AT&T was the first U.S. operator to deploy standards-based mobile 5G. And just this pastS. operator to deploy standards-based mobile 5G. And just this past 5G footprint. These represent important first steps on a long journey. And if you want a glimpse a long journey. And if you want a glimpse into what our 5G future might look like, you only need to evaluate our current 4G LTE network as a starting point. It's on this network that we've built a reputation or a brand of being what we call enterprise grade. So not only does AT&T have the fastest 4G LTE network download speeds measured by third parties earlier this year, but our network comes with additional development like dedicated packet cores just for enterprise and dynamic routing capable of prioritizing critical business applications with quality of service.

And finally, many of you probably know this, but we were also selected and awarded to build the first network dedicated to first responders with FirstNet. So as that quote says, we have been doing for a long time with a focus not just on consumer, but specifically enterprise. And not just with speed but other capabilities to better tailor connectivity to solutions businesses need. Our customers are already able to lay a foundation for innovation with our connectivity, and and the story will continue to evolve with 5G. Now the second example is the edge. And I'll start by talking about one of AT&T's edge solutions that's available today, and it's called multi access edge computing service. Now to explain what this is, I'll just use 2 words that I'm sure you've heard a lot about I'm sure you've heard a lot in the news, and they are private cellular. cellular. With this product, we deliver private cellular through largely 2 steps, the first being our customers work with AT&T to deploy what we call a cellular umbrella to the interior and exterior of their campus.

Now the second step is we extend the edge from a AT&T's core where it used to sit, all the way to the AT&T's core where it used to sit, all the way to the intelligence to the local area network.

So now with these 2 integrated pieces, we have a solution that can support not only AT&T consumer devices but also enterprise devices through its private cellular capabilities. And that comes in the private cellular capabilities. And that comes in the form of new levels of control, where our business customers can manage data routing. And it's available today for any business customer.

Now here's an example of how it can drive value. So take a warehouse or a plant that has a lot of machinery, a lot of equipment racks that, in some cases, needs to be moved around. And in other cases, these facilities need to fully reconfigure to respond to changes in the market. So that's a very challenging environment to make sure that the connectivity is in the right place and that it's available to facilitate the changes in the business. And coverage, access, uptime, the network itself will always be top priorities for all of our businesses.

Now we believe that the option of an all-cellular private network that brings a superior signal an all-cellular private network that brings a superior signal coverage and propagation is going to be more resistant to those changes in the business and can bring immediate efficiencies to position you well for the long term. And that's really what this solution does is it not only brings in the cellular connectivity, but it gives you control of that data to be able to route it and drop it off locally back into your land or into the backbone of your network. And this enables very low And this enables very low And this enables very low latencies because you're able to look at everything from that endpoint through our network into where your application is hosted and whether it needs to be processed locally or otherwise. Now this drives a lot of curiosity with our customers, and this is really the second example of what we mean when we say we're doing.

Now for the third and final example, I'd like to talk with you about a recent announcement between AT&T and IBM. The 2 companies are combining forces to deliver AT&T's 5G connectivity and the edge computing service that I just mentioned with IBM's Watson Works, altogether at the IBM Yorktown Heights Research Center. Now this is going to go beyond just the private networking that I talked about and all the way up the stack. Combining these technologies could create development of solutions in the areas of video analytics, robotics, artificial intelligence all over 5G.

Now developers will also be key in driving this -- all this future innovation as this partnership creates the opportunity for them to also have access and continue to be a core part of the ecosystem. So as as as you think about your businesses, the time can be right now. We really feel like we have the right product set that enables our customers to take that first step to building the foundation with 5G, with connectivity and the edge that sets you up for first step to building the future innovation within your business.

So now is when we'd like to invite you to have a conversation with the leaders in the

So now is when we'd like to invite you to have a industry, like in AT&T, like IBM and many [RER.] And through these partnerships, we really hope to bring value to our customers in the form of joint solutions, covering everything from the endpoint all the way to the application. And hopefully, this has been an illustration of our journey. We didn't just get here by talking about the future. We are in the middle of a great change, and it's exciting to see all these key technologies at a point where they are market-ready and living up to the vision.

Swalé Nunez

Hello, I'm Swalé Nunez, head of B2B developer relations for Samsung. And today, I'll be talking about 5G and how our partnerships are helping to bring innovation to the enterprise.

If we were to watch the history of how technology advances, especially as it relates to mobility to mobility but advances, especially as it relates at least up until at least up until at least up until now, the consumer has always dictated that progression. But with the advent of 5G, there's been a noticeable paradigm shift, where 5G, there's been a noticeable paradigm shift, where the momentum is swinging aggressively in favor of the enterprise, largely due to the fact that a lot of the technologies associated with industry 4.0 have the potential for full realization with have the potential for full realization with a more noticeable and significant impact in the enterprise. It will unlock experiences in edge computing, mixed reality, machine learning, AI, robotics, automation machine learning, AI, robotics, automation machine learning, AI, robotics, automation and predictive maintenance. As machine learning, AI, robotics, automation 5G continues to expand beyond the networking labs and is disseminated into the real world, I can't machine learning, AI, robotics, automation help but be anxious about the possibility of innovation and its potential across the spectrum of industries. There's been interest in implementation of private 5G networks and factories across manufacturing. The technology is helping and establishing a new benchmark, minimizing equipment downtime, improving safety and security, reducing defects and increasing manufacturing flexibility. Government entities are also exploring 5G for their facilities. Innovation is happening, and the defects and increasing manufacturing flexibility. Government entities are also exploring 5G for their

To introduce new, innovative ideas and use cases cases to some of the industries that need it, like education and health education and health care. But the deployment of this magnitude requires an ecosystem to enable it. A collective effort. Samsung's story has always been an end-to-end one, especially in the 5G conversation, most notably, our 5G-enabled devices but also networking equipment and semiconductors. What should also be considered as a part of this story is the openness of our platform and our focus on partnerships with industry peers alike. Whether it's our collaborative partnership with IBM that includes a joint platform, leveraging leveraging AI capabilities and Samsung's suite of mobile offerings. We're exploring several industry 4.0 use cases, putting importance on the relationship of all the data captured, including video and audio analytics and using AI learning to make meaningful associations with the operating performance of equipment.

While our work together with edge computing and Samsung joining the ecosystem around IBM's edge allocation manager, which runs on open source technology from Red Hat, [great] in broadening our understanding of the potential of augmented reality for factory field for factory field for factory field engineers who conduct preventative maintenance. Smart assistance offers a video streaming collaborative service that empowers on-site field service workers. These workers use smart assistance to connect with remote experts who can see the situation on the ground and walk employees through a solution, whether an AR, industrial IoT or robotics, computing power and wireless connectivity are the energy packs the propel technology into the future. The 5G network is delivering on its promise and further enabling computing on the edge, empowering intelligent machines to make split-second decisions instead of a dependence on human intervention. Future digital factories will leverage these groundbreaking technologies to deliver unprecedented efficiency in manufacturing operations.

But how are companies testing the viability before investing in ways to scale? Samsung's 5G innovation zone, located at Samsung Austin semiconductor, is a test bag for such experiments. It is the joining of forces. Samsung's ecosystem of 5G-enabled hardware and AT&T's wireless technology, the innovation zone evaluates where and how the digital factory can integrate cutting-edge technology with focus on understanding of the potential of augmented reality streaming collaborative service that empowers for factory field enhanced its promise and further enabling communication, industrial for factory field IoT, robotics, into the future. The 5G network is augmented reality. The results for factory field intervention. Future digital factories will leverage to make split-second decisions instead can improve efficiency, safety and security and operational performance.

As great as this is, manufacturing like many other industries are being directly impacted by the active pandemic. And we're all being forced to find creative waste, not only cope, but also to be productive. We need to adjust to new realities with innovation and agility. Samsung is doing just that

with solutions to do our part. We immediately started designing solutions based on the need of our customers. That includes remote work and remote education, digital health and social distance. This is an ongoing effort and something we're committed to and continue to deliver on. Progress continues to happen, even during crisis. The world is changing all around us. As we're adapting, we can agree that we can go faster and further together.

John Walicki

Welcome. My name is John Alike, and I'll be your host and moderator today for the Build Smart and Secure Edge of the Future the Build Smart and webcast. I'm really delighted to have with me today a rockstar panel of industry experts. I would like to introduce you to Swalé Nunez from Samsung, Philip Coleman from AT&T., Susan James from Red Hat. The panel will discuss the intersection of 5G and edge computing, bringing AI workloads to the edge and transforming a whole variety of industries. Really want to focus on how developers and technologists can embrace these developers and technologists can embrace these technologies from IBM, from Samsung, from Red Hat and from AT&T. Let's get started.

QUESTIONS AND ANSWERS

John Walicki

So please, Philip, Swalé, Susan, introduce yourselves. Philip?

Phillip Coleman

Yes. Phil Colman, AT&T. Really happy to be here. I think these are really timely conversations to be having with the industry, with our partners as these technologies have reached a great state of maturity. So looking forward to it.

John Walicki

And Susan, please say hello.

Susan James

So it's Susan James. Yes, I'm really happy to be here. I think it's a great time to be talking about how 5G will impact sort of edge and the opportunities it brings to developers and industries at large. Really delighted that you could join us today.

John Walicki

Really delighted that you could join us today. And Swalé, please say hi to the

Really delighted that you could join us today.

Hi, everyone. Swalé Nunez from Samsung, fellow developer advocate. I'm actually excited about the possibilities of 5G and what it can do across industries. So I'm happy to be here to have that conversation and speak to how us as developers can kind of take advantage of this.

John Walicki

And that's a great lead in, Swalé, because I wanted to jump straight to a developer question. I've to jump straight to a developer question. I've prepared a variety of questions, but developers are the audience today. So I wanted to thank everyone the audience today. So I wanted to thank everyone for joining. But my first question to the panel, and we'll do this as a round-robin is developers are really interested in how the deployment of 5G and edge computing is really driving new innovation. And I wanted to know, from your perspective, what skills will these developers need in the future as 5G will and edge computing come together? Swalé, would you like to take that first?

Swalé Nunez

Yes. I mean every time we think of this question,

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Yes. I mean every time we think of this question,

Yes. I mean every time we think of this question, it's always focused on, specifically technology, right? I actually take it from a different lens. For right? I actually take it from a different lens. For limitations no longer exist, where they're so minimal that we have to kind of reengineer our minds to kind of focus on, hey, how creative can I be now that there's not any limitations? How can I take these existing I take these existing I take these existing technology, add creativity to it and then bring innovation across the spectrum of the enterprises, right? So for me, the focus is -- I would tell my fellow developers to, hey, kind of approach it a little different. Take creativity, lead offer creativity, and then the technologies will follow because we're at a point now where 5G has enabled a because we're at a point now where 5G has enabled a lot of these technologies to see their maximum potential.

John Walicki

I absolutely agree. So Susan, do you want to talk about developers?

Susan James

Absolutely. I think Swalé hits the nail right on the head there. And you can see it is in transition of see it is in transition of see it is in transition of see it is in transition of technology over time. It's see it is in transition of not the -- the limitation stop you up to a point. Once you sort of remove those, really, it's about creativity. And it really brings so many more opportunities to solve problems in a different way, whether that be sort of industrial use cases, whether it be in sort of logistics, even in medical. I think in the current times, we see a huge transition to lots more digital services, and that will just continue as we sort of march onto 5G and those capabilities just become natural. So it's more about freeing up your creativity rather than saying, okay, now I have this capability, what will I do with it?

Matthias Funke

Thank you, Susan. Philip, what would you say to developers?

Phillip Coleman

Yes. I tend to agree with the panel. I really feel like it is a mindset shift that will happen today and continue to sort of progress over time. So essentially, developers have had to really develop and program around the network in the past. And so understanding that the ecosystem will be coming together over time to deliver more integrated solutions and platforms, I think developers are going to be able to go in eyes wide open, have more

predictability, more visibility into the other layers like the connectivity layer of the platform layer as they're coding. And so I think that's going to really bring a lot of energy and open up a lot of innovation and opportunity over time for developers.

John Walicki

Completely agree. And so now what's happening with 5G, lower latency, faster speeds, edge devices becoming more powerful, AI model is becoming more intelligent. So really, the question which becoming more powerful, AI model is becoming more intelligent. So really, the question which industries are going to be most affected by this this combination of 5G and edge computing coming together? Swalé?

Swalé Nunez

Yes. For me, I live in the enterprise space, right? I'm a B2B guy. And the reason for me is (inaudible) is because I think there's opportunities there to have significant impact on how the world moves. It is -- we can solve real-world problems and get the opportunity to bring innovation to the enterprise. And I see that in health care. I see that also in -- when you talk about first responders, I've always (inaudible) the individuals only talk about 5G and the potential of it is you don't understand the power of it is you don't understand the power of it is you don't understand the power of it is you don't understand the power or how important a second is until you have conversations of it is you don't understand the power of it is you don't understand the power the potential with first responders, with first responders, right, when you know life is on the line. So I'm excited to see what the technology is going to do for those particular industries. But I've seen significant impacts in manufacturing as well as supply chain as well. Yes.

John Walicki

Yes. you just touched on some really important topics. And so Philip, you've been really close to first responders and FirstNet. Do you want to talk to first responders and FirstNet. Do you want to talk AT&T are helping?

Phillip Coleman

Yes. I'll say Swalé hit it on the head, is who today is actually measuring their performance, measuring their outcomes based on latency, based on jitter based on uptime, I think FirstNet is probably at the front of the line because you do have lives at stake, you have sort of the responsiveness of these first responders. I'll also pivot to auto manufacturers, the semiconductor space. Look at Samsung, where if you can say seconds or even milliseconds or have lower latency, they can actually translate that very quickly into a reduction in waste or higher production. So I think those are the industries that are -- that we're those are the industries that are -- that we're talking to right now just from a foundational connectivity and sort of the -- our edge computing solutions. But very quickly, those conversations turn into use cases where we need to pull in kind of a broader community to connect the dots between just the connectivity and the actual the connectivity and the actual workload. So it's going to start in those pockets, but then I think as other industries start to take advantage of some of the more interactive type use cases, everybody loves the things that artificial intelligence can do or the promise of augmented reality, those use cases are going to be pervasive. And they're going to benefit as well from not only the predictability in the connectivity and in the network, but also from the -- just the experience overall.

John Walicki

Right. Enterprises are becoming really important here. So Susan, you've got some enterprise perspective. What industries do you see becoming most impacted?

Susan James

So as you've touched on already, I think industrial enterprises are going to be ones that are particularly beneficial. But I was just thinking, as Philip and Swalé were talking, I also think that education will still be transformed. We're seeing kids, particularly small kids, really struggle with engagement, if it's not sort of very immediate. So I engagement, if it's not sort of very immediate. So I think those sorts of industries will still continue to be transformed, particularly for those younger kids that have a difficult time focusing. And it's also not just about those sort of low agency use cases. It's also about being able to have further reach. So I think cost of production comes down with 5G. So we're still going to see a lot more reach 5G. So we're still going to see a lot more reach 5G. So we're still going to see a lot more reach of mobile broadband being able to connect communities that haven't been connected. So I think there's a whole range of things that will come in as well, not just those very specific millisecond use cases.

John Walicki

just those very specific millisecond use cases.

John Walicki

just those very specific millisecond use cases.

John Walicki

So my next question is about use cases. And I wanted to hear from the panel as we talk about various enterprises and industries, what are some of your favorite use cases and demonstrations of 5G and AI and edge computing coming together? Philip, you've talked about this.

Phillip Coleman

No, thank you, John. I'll say there's a class of use cases called [new vision] systems, anywhere where you have a camera, a 5G network and artificial intelligence, integrated together to create a intelligence, integrated together to create a package that can complete a package that can complete a task. So I think of a factory line where maybe for inspection of finished goods, you have a camera that's taking snapshots or video of sending it to sort of a software stack to be analyzed and then help the business understand if there's any deviations from sort of the product requirements. We're also with return the product to work being to work being to work being to work being such a big topic right now, being able to use a similar sort of setup to do face mask similar sort of setup to do face mask detection or to determine social distancing. So these are examples of using cameras, using sort of the examples of using cameras, using sort of the connectivity and artificial intelligence to complete a repeatable task that is going to be done with greater accuracy than if a human had to do it. similar sort of setup to do face mask So great examples of So great examples of where technology is sort of assisting the human out in the workforce. And you can really create in any vertical, take sort of this standard package and then just drop it in somewhere else, train the artificial intelligence to do something that's important for either health care, retail or otherwise. But definitely in favor for me.

John Walicki

Fantastic. And Swalé, Samsung touches both consumers and enterprises. What do you see happening? Well, I mean, kind of just going back to the question around different use cases and then this idea of consumer and enterprise. I remember when augmented reality was introduced. It was such a consumer technology, right? Everybody was using it to kind of create either from these (inaudible) gains or anything around just to kind of get the consumer excited. But then there was this shift that happens where I started -- where at Samsung, we started to notice that it can actually be used in the enterprise space. And one of those scenarios is for remote workers, right? So field workers, and then using augmented reality to be able to send video content and have them be in areas that are completely remote, need them access to to a particular problem, almost touchy feel, right? And it allows the senior techs to be multiple places at one time. So what we did at one time. So what we did And it allows the senior

techs here is just kind of leveraging technology, augmented reality in augmented reality in particular, to be able to kind of do remote solving of problems and resolving of issues in a much rapid fashion.

John Walicki

Yes. Perfect. Susan, do you want to talk about some of your favorite use cases?

Susan James

I'm just listening to Phillip and Swalé and all this stuff is coming into my head. In real estate,state,state,state,state, I don't have I don't have to find the house I want. I can walk around it in my own living with augmented reality. And Philip reminded me of some of the work we've been doing recently with some of the smaller AI companies like [Percepta Labs] that are doing exactly the kind of video training to make sure that you have enough space between different people, or if you're looking at the video analysis over time, you can plan how many staff you need to have on in different places. So there's just -- every single conversation will trigger different things. And I think that's will trigger different things. And I think that's exactly what we're talking about, depending on what you're interested in, depending on the problems that the problems that you have to solve, there's just so many possibilities that sort of pop into your mind that you can solve. So I think the whole video thing is whole video thing is really exciting. But there is also processing huge volumes of data. So there's use cases around the amount of data that you collect from jet engines. And most of that data is not useful, and it's just sort of finding those few small anomalies in the data that becomes information. So going from masses masses of data to getting to information, then being able to act on it and take decisions. And I think getting to that point of automation so you can take to that point of automation so you can take see the patterns. They can't make, collect all of those varying inputs and make the right kind of decision. So I think getting to the point where we're able to process that information and make much better decisions, I mean, that's what it's all about in. And that's how I see 5G and AI, really. It's about making better decisions. making better decisions.

John Walicki

I wanted to explore return-to-work scenarios in use cases. The combination of 5G and edge as we try to adapt to this new pandemic normal will be really critically important. So let's talk about 5G and how it can help the return-to-work scenarios. Swalé, would you like to go first? Then we'll go to Philip and then Susan again.

Swalé Nunez

we'll go to Philip

I think with the active pandemic, the approach is a

I think with the active pandemic, the approach is a little different now because you go from having a little different now because you go from having a few people -- a few -- a limited percentage of the general public working from home to now it's on a massive scale. So we're figuring out ways to kind of take these workers and in making their home environment, their office. And I think we do a great job of that with [Dex.] It transforms your mobile device because more than likely everyone has a mobile device But not necessarily at-home PC. So what Dex does, it transforms your mobile device into an actual PC, right? It gives you that PC look and feel. And it takes your -- if you have at-home PC. So a monitor or even a TV with [Miracast,] you can now have that PC experience, that working-from-home experience and transforming your TV into an actual desktop. And it gives you that feel of being an office, even though you might have your kids running around having 2 gives you that feel of being an office, even though small girls. It's interesting for me, but I found small girls. It's interesting for me, but I found small girls. It's interesting for me, but I found ways to work and using technology as efficiently as possible to be able to achieve that.

John Walicki

No. Thanks, John. So as it relates to return to work, I am going to reference something that within reference something that within reference something that within the news this past summer, and that's going to be an announcement between IBM and AT&T to collaborate on the build-out of kind of a 5G and edge environment. And so AT&T is going to bring in our 5G connectivity, our multi access edge computing service with IBM's Watson Works into the Yorktown Heights research center. So this is a great example of 2 partners collaborating for sort of an of 2 partners collaborating for sort of an of 2 partners collaborating for sort of an of 2 partners collaborating for sort of an end-to-end platform service that can really care for of 2 partners collaborating for sort of an connectivity, the edge and the cloud. So really excited about that, and it's really built all around return to work, which is really the topic of this discussion. And so I think discussion. And so I think a lot of industries are going to be looking at social distancing, trying to understand what touchless means, whether it's retail, whether it's in a distribution center or otherwise, and being able to have an environment where some of these things can be tested and potentially create it ahead of finding their way into the market is going to be very important for the short and the long term.

I'm also going to tip my hat to something that Susan said, and it's -- I think a lot of business happens indoors. But then also there's a huge tremendous opportunity outdoors as well. And I'm actually opportunity outdoors as well. And I'm actually opportunity outdoors as well. And I'm actually opportunity outdoors as well. And I'm actually opportunity outdoors as well. And I'm actually reminded, I just had my roof inspected for some hail damage. And so I was really amazed to see that the inspector used a drone. So he set out in his truck, and I looked at my window and saw a little drone flying overhead and taking all the photos. And I know that one thing that we hear from insurance companies is using cellular connectivity for non line-of-sight communications. And so being able to take that inspector and move him or her her to take that inspector and move him or her her to take that inspector and move him or her her further and further away even being in the office, I mean, those are really some of the promises where as we want to social distance as maybe the business doesn't really require a touch point, how can technology or what role can technology play? And just creating more options where the business can drive more value more efficiently.

John Walicki

Fantastic. And Susan, do you have some thoughts on return to work?

Susan James

return to work?

Susan James

Absolutely. And again, the great use case. I think I come back to that in making better decisions, having more information. So I think that is one thing that as we go back to working, how many other people have entered our building, all of these sorts of things, I think, are information that people we'll start to look at more closely. So I know in other countries that have much more apps around countries that have much U.S. now, we'd see the mobility up to the rates it U.S. now, we'd see the mobility up to the rates it was nearly pre pandemic. So having that information to people to know where they can or can't grow, I think, is really good for people to know that. But as -- also the need for everyone to do that has certainly diminished. I was talking to one of the the local telecom techs in the Street that we're asking that we're asking that we're asking that we're asking that we're asking that we're asking and asking, have they been really slammed? Or what was the impact on them? And I said, they've come up with some really creative ways of being able to do installations now where they don't necessarily have to go into the home, where they can still stand outside and give instructions to people in the home outside and give instructions to people in the home to be able to do the that we're asking that we're asking installs. Jobs that always will require you to go into an office or into a data center or into a call center and do things, they've all become remote. So yes, lots of people have to go back into those environments. And I think we're coming up with more and more creative ways to make coming up with more and more creative ways to make it safe for them to do so. But I just think that the number of people that will end up in an office again will certainly diminish. So I think there's going to be a combination of things. And finding new creative ways to do things together remotely, I think, is going to be something that we're going to continue to work on going forward.

John Walicki

Susan, I want to come back to you on this next question because it's really about the role, open question because it's really about the role, open play in this coming era, in this coming era, 5G and edge computing. So really, the interoperability across these ecosystems and openness becomes really important. Would you like to share your perspectives?

Susan James

Absolutely. And I think some of my favorite examples of open source are actually not to do with the sort of things that we do at Red Hat. It really comes back to that creativity and diversity of input. And one of the stories that Red Hat has a video stories that Red Hat has a video around, a movie around, is around line replacements. And how a movie around, is around line replacements. And how do you -- that you do you -- that you now can create artificial lens by 3D printing. And one of the biggest problems to tackle in that is actually the concept of grasping, tackle in that is actually the concept of grasping, how do you get the get the get the -- what they are like for grasp. And they've been able to solve that problem by taking sort of things like how you used to harness washes to create even grip. And without sort of diverse communities coming together with lots of different interests, to solve that problem would take years if you just had 1 group of people working on it. So I think open source becomes really important in solving the big problems. And again, with -- looking at viruses, solving the virus, the amount of sharing that's going on in that medical community is much, much greater. So I community is much, much greater. So I think being open creates this environment for creativity and solving problems faster. But unless we solving problems faster. But unless we can solve it on mass, where everyone can participate, we're really not solving the problem. We're just creating these pockets of capabilities. So I think what we're looking at with 5G is democratizing access, democratizing information and then to be able to do democratizing information and then to be able to do that in an open way becomes absolutely key. So I'm not sure if that really answered the question, but I think, as I said, the pace of innovation and a pace of adoption becomes really important. So working together through the handset providers like Samsung, through the infrastructure providers, through the AT&Ts and the rest of the service provider communities, I mean, the reason why communications has taken off is the fact that you can call anyone regardless of which service provider they use, regardless of which handset you use. So I think that's been the whole premise think that's been the whole premise of the communications industry for 100 years running.

John Walicki

Yes. So that leads us straight to

Yes. So that leads us straight to Philip in AT&T. I would love to hear your perspectives on open to hear your perspectives on open to hear your perspectives on open to hear your perspectives on open to hear your perspectives on open interoperability, Phillip.

Phillip Coleman

Yes. And I'm going to just kind of step back and take a perspective view from what I've been hearing with this panel. And we hear a lot of use cases. And I really I really almost can put customers in 2 broad categories at 2 extreme ends of a spectrum. And one of a spectrum. And one being the customers that want to just use the service, so whether it's a customer that wants to use a Samsung smartphone and now use a Samsung smartphone and now use a Samsung smartphone and now use a Samsung smartphone and now use a Samsung smartphone and now use a Samsung smartphone and now use a Samsung smartphone and now they want to use they want to use tethering because their employees are working from home, or someone who needs a hotspot for school districts or things like that. So they don't generally care about all the things that are happy generally care about all the things that are happy in the back end. They just want to be able to use it. They want to use it in a cost-effective manner, and they want it to work. I think we need to be very mindful of that as we kind of build to scale.

And on the other end of the spectrum, there are going to be the types of customers that want more customization, a little bit more integration into their network. And so that's an entirely different type of sales motion, different type of approach. And I think we've kind of heard that, that side is covered as well, whether it can be built and integrated from the connectivity all the way up to the cloud and the applications. So I just wanted

to kind of give that context and then say, from an AT&T perspective, our goal, our desire to have more open frameworks open out kind of your favorite open kind of standard, is so that we can bring in the best-of-breed. Our ability to mix and match either within our network or within our product set really brings value to customers because we know that things don't stay static for very long in this industry. It can be 6 months but very long in this industry. It can be 6 months but over the course of 6 months, things can look very differently. There can be breakthrough technologies, and we want to be able to be agile enough to bring those in for our customers. So I think we sort of deal with that complexity across our partners, across our network so that we can then make it either easy for customers to go and buy and consume, or we can bring those capabilities in where there's more integration and sort of a different conversation. over the course of 6 months, things

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John Walicki

over the course of 6 months, things

Swalé, it would be great to hear your perspective on open ecosystems and open standards.

Swalé Nunez

Yes. I mean I've always taken user first or kind of human center design approach. The idea of like Philip kind of mentioned, just the customer experience, right? What can we do as these major entities to make the experience of our customers even better, right? And when I think of this -- we live in a world where there's this heterogeneous pool of technology, right? But for us to see this to its full potential, there's a convergence happening and a convergence needs to happen. And I'm noticing that from a technology perspective, but also, I think -- and Samsung, we're aware of that. So we're mindful of the partnerships we kind of engage and then how can we take our technology to kind of create a relationship where this joining forces makes a better experience for our customers. And we've done that in our at our we've done that in our at our we've done that in our at our semiconductor lab with our in 5G innovation zone, where us and AT&T, we partner to kind of bring innovation to the to the to the to the enterprise and to manufacturing, in particular, right? The idea of how and where we can introduce innovation into the enterprise. And we have several different use cases around kind of artificial intelligence, robotics. But the idea here is being humble enough to know that for this technology, for us to see that the maximum potential of the technology requires partnerships, right? At least we take pride in the partnerships that we've done to take pride in the partnerships that we've done to take pride in the partnerships that we've done to this point and how we this point and how we this point and how we this point and how we are open to collaborating to help drive innovation that is not necessarily solely Samsung, but it is -- that the end result is for a better experience and better support of our customers.

John Walicki

It leads me straight into my next question. You've heard heard us all talk about partnerships and open ecosystems. And so I wanted to ask the panel today, ecosystems. And so I wanted to ask the panel today, what you see is the most important aspects of IBM and Samsung and AT&T and Red Hat working together to solve some of these problems? Let's talk about the partnership as a group. Susan, would you like to address that?

Susan James

Well, I think you pointed it out. To solve any of these issues, not 1 company, not 1 person can solve is. It's always going to be a collaboration. And I have a panel coming up in a couple of weeks at 5G con that looks exactly like this. It is an ecosystem event to solve any of these issues. You need to have the devices in place. You need to have the networks in place. You need to have the systems integrators us to see that the Samsung and AT&T and Red Hat working together solve some of these problems? in place. You need to have the applications and the underlying infrastructure in place. So to solve any of these issues, whether it be coverage, whether it be specific industrial applications, you need a you need a you need a you need a collaboration across that whole ecosystem. So I think it's something that we have to work together,for our own mutual benefit. But also in -- as consumers ourselves, it's in our interest to work as consumers ourselves, it's in our interest to work as consumers ourselves, it's in our interest to work as consumers ourselves, it's in our interest to work together so that we get the best product at the end of the day.

John Walicki

Right,

Right, right. So AT&T and right. So AT&T and Phillip what is your perspective perspective on our partnerships?

Phillip Coleman

Now I kind of go back to when I've had the opportunity to talk with C levels on the business side. And many times, they're very focused on their side. And many times, they're very focused on their long-term road map, their 5-, 10-year view. And so they're looking to understand or they actually already do understand what their technology needs to do to sort of support their success. And so they're often going to be looking for the right partner. So they look at what is the DNA of an AT&T? Is that a good fit? So I think many times and especially going forward, our ability to work across partners and sort of act in that integrator role becomes very important. I think even situations, situations or conversations like this is evidence of our mindset. And AT&T or partners who are business partners who are business focused and not just a sort of a (inaudible) from a consumer view, I think that's also important to a lot of the innovation that will happen over time and how those innovation that will happen over time and how those partnerships add value to businesses. So I think it's really just that focus and making sure that we're pointed in the right direction of where the industry needs to go. And many times, it's going to be partnerships and collaboration that's going to get us there.

John Walicki

I'd love to hear Swalé's perspective from Samsung.

Swalé Nunez

Yes. No. I think just piggybacking off both Susan and Susan and Phillip's comments. And specifically, Susan, you brought the word, and brought the word, and I think that explains it all, right? There's this idea of this life cycle that needs to happen And an end-to-end == delivering an end-to-end solution requires multiple parts. And you cannot isolate the hardware from the services, from the software, from the technologies as it relates to the the network. So all of them come together. It's a joining of forces, and that is the reason we're able to kind of deliver 5G in its truest form, right? I think if you take out any one of those components,and we're not going to see 5G live to its potential, right? The idea of what 5G was or Susan, you

I'd love to hear Swalé's the story that it sold us we will never be able to truly achieve that if either one of these parts were to be removed, I think. And you're only as strong as your weakest link. And I think when you have a powerhouse of companies like AT&T and Red Hat and IBM, from a consumer standpoint,

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