REFINITIV STREETEVENTS

EDITED TRANSCRIPT

T.N - AT&T Inc at Barclays Global Technology, Media and Telecommunications Conference (Virtual)

EVENT DATE/TIME: DECEMBER 09, 2020 / 3:00PM GMT

REFINITIV

CORPORATE PARTICIPANTS

Scott Mair *AT&T Inc. - President of AT&T Operations*

CONFERENCE CALL PARTICIPANTS

Kannan Venkateshwar *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

PRESENTATION

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

All right. Well, good morning, everyone, and welcome to today's session with AT&T. My name is Kannan Venkateshwar, and I cover the North American cable, telecom and media sectors at Barclays. Very happy this morning to have with us President, Technology and Operations at AT&T, Scott Mair, with us. Scott, welcome, and thanks for joining us this morning.

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Well, thank you, and thank you for inviting me.

QUESTIONS AND ANSWERS

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

So COVID has obviously resulted in unusual data use patterns, to say the least. And it looks like initially, the network had to adjust to more peak data use away from the city centers and more two-way voice traffic, for example. Could you give us some sense of -- for the network architecture shifts that you had to make initially to cope with this, which may also have added some longer-term growth optionality for you? So maybe that's a good place to start.

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Sure. And Kannan, if you don't mind, I'm going to talk about our safe harbor statement just because some of my comments today are going to be forward-looking and probably subject to risk and uncertainties and so results could differ materially. So if people want more information, they can find that on our website or in our SEC filings. And also, I'll just mention that with Auction 107 just starting yesterday, I'm not going to be covering that topic today. So with that, I'll just jump in.

Yes. It's been an interesting year for sure, right? You think about what happened back in March, where in a matter of a month, we shifted from working in our offices across the country to working from our homes. And so I've been really, really proud of how well our network has performed and the work that our team has done, right? I mean, when we're in the mode we're in right now with the pandemic, connectivity is absolutely essential. And it's more now than ever, right? It's always important, but for first responders back in the spring, taking care of emergency hospitals and testing sites, and we've got millions and millions and millions of kids working from home -- or not working, but going to school from home and all of us are working from home. So the networks actually held up well. And if you think about it, I think it's really from our standpoint, a function of all the investments we've been putting in over the last number of years here. The last 4 or 5 years, we've been building a ton of capacity. And that capacity has really served us really well right now.

And so a function, as you think about it, that traffic shifted from urban areas to suburban and actually rural. We saw rural jump up pretty significantly. And so the ability to handle that with the capacity we had is working well. Backbone traffic, we saw it rise 20% kind of the Internet highway, if you will. And it's stayed there, over 400 petabytes a day in our network. And so web conferencing, like we're doing right now, that has jumped up, but

that's stabilized. The one that caught me off guard a little bit is the voice traffic actually jumped up really significantly as people were home, they're picking up the phones and they're calling. And so we were able to care for that. We had to put in some extra voice capacity very quickly in the first couple of weeks. But after that, it's been really good.

And one of the things that I was probably most concerned about is we had some really large commitments for our build. And we hit our 5G build midyear as we had planned. We achieved the FirstNet build as we had committed as part of our FirstNet contract in 80% of the square miles. And so that's been a very nice surprise for us. We thought we might have some more challenges on supply chain and such. And that turned out not to be the case. And so to build, to your point, in terms of long-term as we continue to build the capacity that we'll keep up with and evolving to 5G, it's going to serve us well. And we'll stay ahead of the curve because it's usually the surge that catches you. But once you're there, then it kind of has a tendency to flatten out, which is exactly what we have seen.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Got it. And is there any new areas or footprints, maybe suburban or rural that you initially had to expand to in order to cope with the initial surge and demand and something that potentially becomes a permanent benefit for you guys going forward?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

So because of the work that we've been doing for the FirstNet build and 5G, we've been touching all of those areas, including rural, and modernizing and putting our spectrum to work, so the vast amount of spectrum that we put in service actually is the capacity that we've been consuming here. And so there's not any additional work we need to do because we were ahead of the curve, driven by -- we're going to touch the tower anyway, so let's put our spectrum up. And that's given us the capacity that I've just referenced.

So the build will continue. And we always continue to invest in the network very, very heavily. Between that and fiber, we'll continue that focus going forward. So nothing I think in terms of new areas, it's just making sure that we had the capacity there. And if we didn't have the capacity there, like I mentioned in the voice back end of the network, we care for that very quickly with the way that we can add capacity nowadays.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

I guess one of the hot areas more recently or discussion points amongst investors is Open RAN. And there are a lot of deployments in Japan and Europe and Latin America. And the technology does seem to be easier to deploy and scale if you're building a green fleet network. And some of these operators are doing it globally, including the U.S. But could you help us understand if this can be an OpEx or a CapEx saving opportunity for an incumbent like yourselves? And what are the main constraints are to move into this direction?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Yes. So the answer is, yes, we believe that O-RAN is going to be a good benefit for us. And so -- and we actually plan to implement Open RAN in our network. I mean we think it's really a good technology that will become available. But it's just not going to happen overnight, Kannan. It's going to take some time as mature -- for maturity. And just a little bit of background on O-RAN. That organization, the O-RAN ALLIANCE, started back in the early -- I guess, early 2018 with only 5 operators and AT&T was one of those. That organization now has over 230 different organizations, companies, equipment manufacturers, universities, consulting companies as part of it. And it's starting to take on a lot of speed and a lot of importance.

And so if you think about what O-RAN does and why it's important, if you -- 2G, 3G, 4G, those were linear improvements in terms of the wireless network for speed and capacity and some incremental functionality. But with 5G, the new capabilities that come with 5G for massive connectivity on IoT, also energy efficiency on IoT, the key one is slicing capability, network slicing. How do you use the capabilities of the ability to manipulate resources within the 5G environment to architect new solutions? And so that's what's really different. And O-RAN is going to take the RAN network,

if you will, the radio access network, 3GPP standards-based and break it apart into components. And so it's not going to be monolithic like today's networks. It will be component parts that then interwork with each other through standardized interfaces. And when you do that, you unlock the capability that's in those components and inviting in innovation.

Today, a lot of those are proprietary stacks, if you will, proprietary systems. And so by opening it up and then getting the individual components, it allows innovators to come in and do what they do best, which is find solutions and create solutions to problem sets that we have. So that's really what O-RAN is. And as a result of that, we're going to do things like have the opportunity to instead of buy a full component set of capability from any one vendor, we'll be able to buy components and mix and match components within that and use the innovators instead of the proprietary -- just the proprietary stack separately. So that's a CapEx benefit.

OpEx benefits, things like the way we manage our network. Today, there's an element management system, a system that helps us operate the network. But you have one per vendor. And with O-RAN being able to open that up, we can then architect automation and operations capability on top of a single system instead of buying a bunch of individual ones. So there will be OpEx benefit to that as well in terms of how we operate the networks going forward. So yes, we think O-RAN is going to be really good.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Got it. That's interesting. And so when you think about these components, I mean, now that you're building the network slightly differently and there are separate components that you have to think about instead of a monolith in terms of architecture, to what extent are you actually starting with the kind of applications that you essentially have want to deploy in the future.

Because historically, when you deploy your networks, all the applications got the same quality of service versus a 5G world, where, like you said, network slicing and so on, some of these capabilities create different paths for building a network. So when you start building this network, to what extent are you thinking of applications first versus the way you used to design networks in the past?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Yes. So the applications are going to come. And so I'll share a little bit about how we're thinking about it. But the 3GPP standards for 5G really allows this to happen, as I mentioned. So it allows the flexibility in use cases. And when I say use cases, it's how do you use the resources of the network to bring about new capabilities. And so while the 5G standard -- 5G is standards-based, the applications are going to come now. And that's partly why O-RAN is important because the applications and the ability to drive uniqueness or differentiation is going to come as a result of the capability I just talked about on O-RAN.

But things like low latency or real-time services were not possible in 3G and 4G. But with the way that 5G is architected, we'll be able to get at some real-time capabilities. And let me just give you an example. So we've talked a lot about autonomous car driving and things of that nature. But in order to do that, the need within a vehicle is very different, right? I mean if you think about the sensors and the real-time nature of sensors in a vehicle that is autonomous driving, that needs to be very real time. And we want it to be real time, right? It needs to be there. But at the same time, in that same service, you have a host of other things that could be delivered, such as video into the car, also telematics, just on how the car is performing. And each of those individual capabilities have different needs from the network.

And so we'll be able to prioritize capabilities and architect capabilities within that service itself for autonomous car. And so that's -- those applications are coming. And when you think about where we're focused at manufacturing use cases, health care use cases are pretty key. We're looking at how do you actually energize gaming with real-time capability. Those are all use cases that are early on. But I think we're just at the early dawn of what is going to be enabled with 5G.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Got it. So it sounds like in a lot of these cases, as you design the network and you're thinking through applications, you're also working with application vendors and providers in the process. And to what extent does the 5G network architecture need to open up to some of these third-party infrastructure providers, say, Google Cloud, for example, or AWS, you do have some of these tie-ups, in order to truly realize the capabilities like edge compute? To what extent do you depend on some of these external vendors?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Yes. So I think the need to open up for 5G, I think, is not specifically tied to 5G itself. I think the need to open up is really a function of the capabilities that are inherent within it and the evolving architecture of the 5G network. One of the capabilities that are being created are, as I mentioned, low-latency services. And for that, you need edge cloud, which means you need to be able to move the compute closer into where the customer is. You can do other things and get efficiencies out of that edge cloud capability by actually potentially moving workloads off of smart devices, right?

We carry a lot of power in that device that we all carry in our pockets. But some of that capability you could move into the network to potentially even get better efficiencies in devices in terms of size, weight, battery drain. And so to the degree that we need edge cloud capability, that can be done in a number of different ways. And we feel really good at AT&T about how well we're positioned, right? You need real estate. You need technical spaces to put edge compute capability. And we literally have thousands and thousands of those locations across the country. And so where you have that edge capability, you can implement it in any type of cloud. You really can, it can be public and it can be private. So yes, some of the hyperscalers will be playing in that. And we welcome anybody that can help bring efficiency to compute and storage and help us serve our customers.

So we have really, from the way we look at it, 2 different types of cloud capabilities. One is what we call multi-access edge compute. And that really is really a function of what a business needs to support their individual capabilities. So think about it as a private LTE network on site. Many customers want to use wireless technology within the domains in which they work, manufacturing plants or administrative offices and such and they have different needs. But they don't necessarily want that traffic to leave their network, leave their firewalls. And so with that, we can put in a MEC unit and service what that customer needs and allow them to care for their own wireless traffic within their domain and then also use the Internet for the other traffic that they need, leave it in there. So that's what MEC is for us.

The other one is what I call NEC, network edge cloud. So that's the traditional things that I just mentioned. Nearby, I have a node that offers low-latency services and capabilities for normal network functions, maybe it's that offload of smartphone capability that I talked about and other application services. So at the end of the day, opening up the network, and yes, cloud players will play and they can play in the space of application development or actually providing compute and storage for people that are building applications.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Got it. And I guess a broader question around 5G is, given the kind of applications you're working around, given the third-party vendors that you're working with, in the past, it has been very clear when you said a particular generation of technology was deployed in a particular city, what it meant. I mean you deployed a coverage layer on a macro cell and you were, I guess, more or less done. But today, given the kind of applications you're working with and the density of small cells that you need, especially for things like millimeter wave, at what point is 5G fully covered in a given city? How do you define what 5G coverage truly means today?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Yes. So 5G for us is basically it's a coverage layer. So really, our ability to deliver our 5G nationwide was done on our macro network. So think about traditional cell sites, and so that sub-6-gigahertz spectrum that we've talked about is the way that we got that. So that's the way you're going to get coverage. And the capacity will come from the other spectrum bands.

When you think about other unique capabilities, millimeter wave technology, right, the millimeter wave provides unique characteristics in terms of bandwidth and speed. And that is going to play a part. But the millimeter wave and the propagation properties of that, take your pick anywhere, 200, 300, 350 yards, is really not going to fulfill a coverage layer need for 5G. So 5G in terms of coverage and when you get a 5G on your phone is really going to come from the more traditional side of the wireless networks.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Got it. And one of the other things that's slightly different, I guess, about 5G, although you did have some components of this in 4G as well, is the way spectrum is used, right? And CBRS has some constraints, which make it probably less interesting for you than maybe C-band. But the spec sharing model itself seems to be becoming something that the FCC and the government is more keen on to deploy. And it also seems to be something that is a model others around the world are keen on.

And you use, of course, Band 14 and FirstNet for commercial use based on prioritization framework. So as you look at the road map for 5G, there are technology integration paths laid out, such as WiFi with IEEE standards with 3GPP, for example. Do you think spectrum exclusivity by carrier or even use case could become less important as a network differentiator over time?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Yes. I think it's really good question. And with respect to shared spectrum from my point of view and AT&T's point of view, it absolutely has a place in wireless access, it does. And we particularly think that when it's paired with what I call licensed spectrum or managed spectrum, right, it provides good capability. In fact, today, we use that technology in the band -- what's called license-assisted access, the 5-gigahertz band. We pair up LAA with our license spectrum. And it gives us a big boost in capacity in areas. But yet, you can rely on that licensed spectrum to maintain a very stable connection on the control side. And so that -- it actually really works well. And the shared work will work -- or shared spectrum will work in certain use cases.

You mentioned that FirstNet. So it comes -- sharing comes in many different forms. You think about what we do with FirstNet, it's a shared asset between the FirstNet traffic and our commercial customers. And so with that sharing though, it's all within the same network framework. And so that gives us the ability to manage that traffic, both for performance and also the movement of traffic across the RAN infrastructure. So that's a different type of sharing versus unlicensed spectrum, like LAA or CBRS GAA spectrum. And so there's uses for all of it. And any time the FCC brings spectrum to the table for consideration by the industry, we absolutely take a look at it. And as I mentioned, we're actually using it today.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

I guess another band which has generated obviously a lot of interest in the 5G context is millimeter wave. And deploying millimeter wave, I guess the most obvious conclusion people come to is the densification of the network itself. But it also requires a wholesale shift in how you build networks, right, from the switches that you use to the volume permits that you need to ask for and so on.

And a lot of this, of course, we, on our side, don't really see. But the organizational focus from a network building perspective needs to change. So could you help us understand how the organization has changed to manage this deployment or will manage this deployment going forward? And how is this different from past deployments?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Sure. So just on millimeter wave, just to talk a little bit about how we're using it, so we use millimeter wave and we call it 5G+. But again, it's just millimeter wave solution sets. And for the most part, it's enterprise use cases and maybe what I would call venue-specific use cases that we're using it for at this point. So we have it deployed in 36 cities and we continue to build out nodes to those cities to densify the network. And it's the things

that we've been talking about. Entertainment districts and stadiums, health care and manufacturing plants are kind of the business side, if you will, the enterprise side, with a lot of promise. And in those areas, I mean, the economics work really well, dense traffic specific use cases.

For the deployment, it's a good question as well on that. Deployment, it is a little different. In some ways, it's different, in some ways, it's the same. And I'll explain a little bit about what the differences are. When you think about millimeter wave, and it's basically a small cell, if you will, it gets hubbed back to a central location called a hub. And so in a cell site environment, you basically had a 1:1 relationship. I had 1 cell site, 1 set of equipment and 1 fiber. And it was all self-contained. In the millimeter wave or even LTE C-RAN capability, it's a hub and node structure. And so now I have a one-to-many relationship. I have 1 centralized processing point but a lot of different radios out across the city. And so that means you've got systems automation that needs to be changed. You have certainly the permitting volumes, right, because the number of nodes is a lot higher.

And so that has been a constraint actually within the industry. But we're getting -- I'd say the industry is getting better and better at that. And certainly, the more of the municipalities that we have to deal with because it's unanticipated volume for them. But then you also have a lot of coordination that happens, a lot higher level of coordination. You've got power you need to coordinate through that particular pole or site. You have fiber that needs to be there. You have different hardware configurations to be deployed. And so all of those things play into the deployment of millimeter wave nodes that are different than, for instance, just deploying a cell site per se. But again, we're really good at processes and automation. We've got a lot of that all cared for at this point. And volumes are coming along very nicely from my point of view. We also have a spectrum and that always counts, right? We've got really good millimeter wave spectrum through the last couple of auctions.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

So we just have a couple of minutes. But maybe we could touch on some of the cable companies and the partnerships that they seem to be seeking. And they seem to be more willing to partner with wireless companies on things such as strand mounted small cells. And cable companies also have power deep in their networks and backhaul infrastructure. So as you build out your networks, to what extent do you think cable companies can be useful partners from your perspective in accelerating the build? And what sways you in one direction or the other while making this decision?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Yes. I mean for shared infrastructure, we absolutely believe in shared infrastructure. And there's different business models available in the industry right now. And they're continuing to evolve. So it's an interesting space right now. For me, it's all about what's the business model. If the business model is right, shared infrastructure is absolutely the right play, especially if we're all going to be in the same spot, for instance. And so there's -- and we do some of that today, even in the way we architect the network today.

So when we think about how we go about our building of fiber, for instance, right, that's -- within our footprint, we have a very deep fiber footprint in 21 states. And we use that footprint with the way that we plan fiber for providing infrastructure for the wireless consumers as well as business. But there's also other people that come to us to provide fiber for their services. Maybe they need fiber to a cell site. So there's a big business relationship across the industry on shared infrastructure in different ways. So out of footprint -- so in footprint, we're good. Out of footprint, we actually own a lot of fiber outside of our footprint from [one spot a day], the different merger and acquisitions that AT&T has done. So we use that out of footprint.

And we do a build versus buy analysis, right? If we have fiber nearby and we can easily extend it and it makes good economic sense, we'll do that. Otherwise, we'll lease fiber, right? And we'll turn around and lease it. Out of footprint, where we don't have fiber assets, and this is not new, we lease fiber. And we lease it from literally hundreds of both large and small companies across this nation. And so that ecosystem is very strong, right? There's people that buy from us and we buy from them. And so there's an ecosystem there that allows for business models to be put together about shared infrastructure. And we continue to look for opportunities to do that, right? Cable companies and others have fiber assets and power at different places. And so I think that's going to continue to evolve within the industry.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Got it. I think we are almost out of time. But I have to ask you one question because as a technologist, my guess is your perspective is different on 5G and what it really means in terms of exciting use cases versus what all of us think about. So from your seat, what do you think are the most exciting applications? And what are the most realistic applications versus all the hype that we hear about?

Scott Mair - *AT&T Inc. - President of AT&T Operations*

Yes. So I'm going to go back to something I mentioned earlier. I think the combination of edge nodes and 5G capability and opening up the capability so allow innovation to happen is pretty key. And some of the things that will come out of this, the real-time applications that I mentioned, right, that's going to allow us to do things that previously were only relegated to the home or business. But that's going to open up capabilities to perform those functions, real-time gaming, real-time video, real-time capabilities that allow us to perform our work or lives in a much different way. So real-time capabilities, I think, are pretty key.

Secondly, entertainment becoming more immersive and portable, right? We can do some of those things at home. But when you get to near real-time, AR and VR become very possible. So we're on the early stages of that. But I think that's going to provide great capabilities. And just back to the flexibility in the architecture of 5G is something we have not had. And I think that is going to be the key to unlocking things, just the way we saw happen in LTE earlier this decade. LTE came and all sorts of new business models and applications popped up because new resources were available, faster speeds. Same thing is now going to happen in 5G. And so we're on the early stages of that curve. But it's going to be an exciting time. And I'm very, very confident that 5G is going to be that next wave of innovation that I just referenced.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Got it. That's all we have time for today, Scott. Thanks so much for joining us. This was very insightful. I hope to speak to you soon.

Scott Mair - *AT&T Inc. - President of AT&T Operations*

All right. Thank you very much, appreciate you asking me to be here.

Kannan Venkateshwar - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Sure. thanks.