**NWX-DOC-NTIA-OTIA**

**Moderator: Sandeep Taxali**
**June 21, 2017**
**1:00 pm CT**

Coordinator:     Welcome and thank you standing by.  All participants will be on listen only

mode for the duration of today's conference.  This conference is also being

recorded.  If you have any objection you may disconnect at this time.  I will

now turn the conference over to Sandeep

Sandeep Taxali:   Great, thank you.  Well, good afternoon everyone.  Welcome to our webinar

on business model options for broadband deployment.  My name is Sandeep

Taxali.  I serve as a senior broadband policy and development specialist at the

NTIA and I will be the moderator for our discussion today.

I'm very pleased to see that we have over 145 registered attendees and so far

we're close to 100 so that's good news.  And hat number is great because the

value of our broadband USA program is really a function of the communities

and stakeholders that participate across all our programs, such as these

webinars, workshops, our one-to-one technical assistance programs, and the

various publications which we regularly release.  So I want to thank everyone

again for joining this session.

Now, we have four executives from the private and public sectors who are leading a number of closely watched projects across the country. They will each discuss the business model approach, which they believe best meets the needs and objectives of their communities while being financially viable and sustainable. Our four presenters include Tim Scott, the Director of Fiber Infrastructure for the City of Centennial, Elliot Noss, the CEO of Ting Networks, Brad Moline, the President of ALLO Communications, and Brett Hill, the CEO of FTS Fiber.

Now, this discussion focuses on the range of business models that involve public-private collaboration and our participants -- our panelists will cover three general topics. First, they will discuss the key external and internal factors that led to their chosen business model. Second, they will briefly share the successes and challenges encountered through the planning, deployment, and operation phases. Finally, they will discuss the key lessons learned and best practices that can be applied to your community.

Like all webinars, the quality of this discussion really depends on audience participation. This is especially true on gauging whether their models may be a good fit for your community. You can submit questions and comments via the question box on the right hand of your screen. Following the presentation, we will try to answer as many questions as possible.

Before I turn to our panel, I will briefly set the stage regarding the concept of a broadband based business model. So let's first define business model. So before NTIA, I had spent many years in the telecom industry, specifically working at corporate strategy. I have seen numerous definitions of the term business model. For the purposes of our discussion, I define business model as the set of choices and decisions with regard to such factors as technology, network design and scope, the targeted market and customer segments, the

types of services and products you offer, the funding sources, the financial performance requirements and thresholds, and the partnerships you make. And I'll discuss partnerships in just a minute.

The first box on the left shows the network based choices. Your business model may be limited to a wirelines network focused on last mile services and may be limited to a single community based on a greenfield or new infrastructure installation. Or you may use a combination of wireless and wireline technologies to build a regional middle million network, with the network assets including new builds, network upgrades, and long-term leases such as IRUs, similar to many of NTIA's Broadband Technology Opportunities Projects or BTOP.

Moving to the middle box, there are a myriad of possible market-based strategies. For example, a service provider may target the three main customer segments, which include residents, businesses, and community institutions. Or one partner may only target a residence and the other partners may target businesses and the community institutions themselves. Next, in terms of service delivery, a last mile network owner may directly offer retail services. Alternatively, it may be a carrier's carrier and offer wholesale services to other ISPs.

A middle mile network owner has a number of other choices to make as well and may offer only back haul to a major carrier hotel and may also offer long haul IP transit by banding with other middle mile operators in the region. In addition, it needs to determine its revenue model with regard to operating lit services versus dark fiber leases or both.

Finally, the next big set of choices involves the funding sources and financial returns required. Private firms generally turn to private equity and

commercial debt as well as internal financing. They may also need financial assistance from the government, especially for unserved and underserved areas. Such assistance may include subsidy support, government issued loans, tax credits, and other in-kind assets. A municipality can issue various types of muni bonds such as general obligation bonds that can be repaid through various sources of collected taxes, or revenue bonds tied to specific streams of revenue. The type of financial assistance dictates the required financial performance. A privately funded ISP will likely have a higher rate of return requirement and shorter payback periods. A municipality may be able to take a longer-term financial horizon. For example, many muni bonds are for terms over 20 years with interest rates lower than corporate bonds.

Now, let's turn to the heart of today's discussion. Business models especially for unserved and underserved communities often require varying degrees of collaboration between private firms and local and state government. For purposes of providing some structure, I categorized these into three high-level categories based on network ownership. I apply this ownership approach because ownership is perhaps one of the most important choices as it defines control and carries the responsibility of financing the network.

The three general approaches include, and I will say general, public owned and private enabled, private owned and public supported, and joint ownership. These arrangements can be also called public-private partnerships or public-private collaboration approaches. The first bucket addresses public owned and private enabled. The public entity may have a private firm design and build the network and either operate the network themselves or have a separate private firm operate and manage the network.

If the public entity chooses a private firm to run operations and market services, it may have an exclusive contract with the ISP or have an open

access network in which any ISP can purchase capacity and offer retail services.

The next structure involves a private owned and public supported network. The public entity can support the private partner in many ways. For example, it can help facilitate access to rights of ways, government controlled conduit, as well as facilitate access to poles and easement. The public entity may also provide financial assistance such as subsidies and loans or it may provide in-kind assets such as government owned conduit and fiber.

Finally, the public sector may help with the revenue side of the equation through a variety of demand aggregation approaches. It may commit to a large volume of broadband services. Alternatively, it may commit to providing financial assistance if the total demand falls below a certain threshold.

The final structure on the right involves joint public and private ownership. Such a partnership can also reflect different approaches. The partnership can be designed around a market based approach in which the public entity serves community institutions and the private entity serves businesses and the residents, or it can be designed around a network approach in which the public entity owns the middle mile network and the private entity owns and controls the last mile network.

Again, these are just some of the main approaches for public and private entities to design a partnership. Now, let's turn to the presentation. We'll first hear from Tim Scott, who represents the City of Centennial. Centennial is deploying a dark fiber network across the city for use by the city itself and community institutions and to facilitate other economic development initiatives. Tim?

Tim Scott: Thanks, Sandeep. Good afternoon everybody. If everybody can hear me, I will continue and if there's any problem with the audio, perhaps one of the panelists could send a chat message because I can certainly see that. So assuming everybody hears me well, I'll begin and start with some background on the city of Centennial. I think what's unique is that we're a very new city, only incorporated back in 2001. Population of around 107,000 and I think the other statistic that's quite unique is very few full-time staff, very much a contract city, particularly for the size of the population that we have.

So if we could move on to the next slide and we can show you sort of where the city is located. So this is the boundary of the city of Centennial in the dark grey, kind of unique city in terms of how we incorporated within Arapahoe County. Southwest of Denver and growing rapidly, and really why I wanted to share this slide, just first to show a little bit of the strange layout of the city. We often refer to it as the dumbbell where we have an eastern ring and a western ring in the city. But what's important here is basically that we have an existing or we had an existing conduit map of city-owned facilities and fiber that was deployed, and this shows back in 2013, primarily for the purpose of serving our traffic signaling system within the city.

Obviously, that's not something that's necessarily particularly unique to Centennial but it's important as we talk through the planning stages from 2013 through to today. So you'll see a similar map as we move through the presentation. So next slide please. So some people may not be familiar necessarily with Colorado. We had some of our own challenges, and policy decisions, and steps that we had to take over the years. We won't go through all of these, but this is just a little bit of history. We have our own sort of restrictive SB 152 issue that was put out in 2005 I believe. It was placed on the ballot in 2013 to the citizens of Centennial to see if they felt it was

applicable that our local government in the city of Centennial could take some ownership and control of considering and improving Internet options within the city. And as you can see that overwhelmingly passed with 76% back at the end of 2013.

Obviously, that was the very first important step to take and you can see the next step that we took as part of that and build upon that after 2013. The one that we'll really sort of focus on is the development and adoption of what we call our fiber master plan, which was sort of concluded and adopted in early 2016. And that really took a lot of the steps that we had taken prior to that where we reviewed our existing assets, and then we looked through and spent a long time really trying to figure out what it was we actually wanted to be, utilizing the existing conduit that the city had, and trying to determine the right sort of business model. So we'll talk about that in the next slide.

So currently, we're in the implementation of this fiber master plan that was passed at the start of 2016. So next slide please. So as I mentioned, it was crucial the passing of that fiber master plan by our council and I want to just take a few minutes to sort of talk about what we did as a city prior to that. So the city had a fiber steering committee, which existed, of three current council members at that time and really during the period of 2015 and through to this passing of the fiber master plan in 2016, we really looked towards this fiber steering committee that worked with some consultants to really figure out the best approach for the city of Centennial and have identified sort of what we consider the key elements that fed into the fiber master plan that was then passed by our nine person council in March 2016.

So we really, after spending at least a year on this topic -- we really focused on considering fiber as critical infrastructure for the city. And once you make that decision and you understand that we believed our city's role was to

consider dark fiber as critical infrastructure, it really changes the way that it can be funded and it really changed the way that you have to then look necessarily at business models that obviously have different levels of capital required, right. So we spent a lot of time considering that our approach within the city of Centennial should be to build critical infrastructure. We were going to stay at the dark fiber level and we were going to fund it as infrastructure so we took the same approach to dark fiber as we would take to building roads. This would be funded by -- as infrastructure from the city and there was no specific requirement that that cash would necessarily be paid back.

So basically within our fiber master plan, the decision that was proposed was that we would fund the nearly $6 million for dark fiber backbone out of existing city -- out of our general revenue funds -- actually out of the capital reserves but basically cash in hand. The other key step was that we wanted to create essentially what we would call like sandpit that would provide a foundation for competition. So we wanted to create the right environment for that competition. So when I say the right environment, what I mean for that is that it really needs to be carrier grade. It needs to be built correctly. It needs to be documented correctly and we need to be able to demonstrate that it is "carrier grade." And we need to be able to provide all that information as we sit down with potential private parties to say this is why we think the infrastructure that we're building in our city can be utilized by the private sector.

And then the other decision that we made is that this would be a citywide build. It would go down all the core streets. It would pass as many of our community anchor institutions as possible and it would go as close to the key commercial sites and potential residential areas as possible. But I do want to

reiterate that it is a dark fiber backbone infrastructure. We weren't connecting directly to any specific premises.

So next slide please. So this is just a snapshot of where we are today. This looks kind of similar to the fiber map that we looked back at in 2013; however this is the infrastructure that we're in the middle of building. The central area -- the sort of multicolored, the green, the yellow, and the teal colors -- that is what we call our central ring and that will be completed by the end of this summer. And then we have really what we call our sort of Eastern and Western loops, which are primarily the loops that go out through our residential areas, both on the west side of the city and on the east side of the city.

Again, what's important, the reason that we built this new fiber backbone -- this is all 432 dark fiber backbone -- was through our process from 2013, this is -- a lot of this is an existing city conduit that we have owned and verified and where we have gaps through the process is after 2013. Obviously, we're boring and creating new conduit. Another key point is we are not utilizing any of the existing ITS fiber that was deployed. Obviously, that was deployed with a single purpose, which was to be a connection platform for ITS signaling. It doesn't mean it's "carrier grade" and applicable as we talked about earlier, from a backbone perspective, and able to have those conversations with private sector carriers.

So we're actually, in many cases, actually pulling our own fiber, the own fiber backbone past existing ITS fiber. So that's approximately about 50 miles of backbone fiber that we're building and deploying across the city. It will change a little bit but a lot of that sort of what we could call desktop engineering has been completed and as I said, we're well on our way with the

central ring as you see there in the multicolor, and should be completed by the end of the summer as it relates to the city's backbone infrastructure.

So next slide please. So just a couple of points that I think are applicable here. Just as you would maybe select a GC for the building if you were building a new home, city selected what we call an owner's project manager and really their job was to engage and work with the city, and help us complete those final desktop designs, and really provide what we would call sort of oversight within the field with various contractors that are building the infrastructure. So that's been going on now for close to a year. So they're in charge of sort of quality control, 50 that happens within the city, providing final as built reviews and that say an all given back to the city that we review and approve, and pay off in invoices as we complete construction.

Currently, our backbone construction, as I said, we'll continue through 2017 and into 2018. The map that you saw is all backbone 432. We will build other laterals as we look for what I would call sensible lateral opportunities and we will build that off the backbone infrastructure. I think one of the key things that we have learned during a process is to sort of demonstrate early wins and maintain that communication back with council as often as we can so we provide regular council updates back to council in terms of the progress that we've been making on our backbone infrastructure.

Next slide please. So just some quick lessons learned. I know Sandeep has got some good questions so I'll move through these very quickly. I think we've sort of touched on the importance of asset inventory and tracking. That was a key part of our process and our ongoing process. We've worked very hard to set expectations correctly within the city. Of course, everybody wants fiber to their premise and we have to explain to them that from the city's perspective, we're building a critical backbone infrastructure that enables

others to come and potentially build fiber to the premises. So clear and consistent policy direction, leadership around that has been really key.

I think one of the key things that we do often is that fiber master plan that I referred to that was passed in early 2016. Because we took that approach and we passed that fiber master plan, it provides an easy reference point both from a city policy perspective, back to others that want to understand what the city is doing. So we maintain that and we make that available and we ask people to read it and understand it, and ask questions.

So really, the last point I think is most key and I hope will be a good handoff to Elliot at Ting. So the decision that I think is most important that Centennial made was that we went through a process. We decided that for our city, which is not an underserved city situation, that we needed to focus on fiber as critical infrastructure, critical infrastructure that could serve some of the city's needs, could serve some of our community anchor institution's needs, but we would make our infrastructure as attractive for others to potentially lease and use, and then come to the city and make that bet that they could invest private sector capital dollars and build fiber to the premise.

We don't have fiber to the premise as really an option within Centennial. We do have two incumbents. So as I said, it's not an underserved issue that we were trying to fix. It was really a fiber issue -- how does the city have control of a critical fiber infrastructure both for now and for the future in terms of smart cities and other areas that the city might want to explore. Without having control of that critical fiber infrastructure, we came to the conclusion that it would nearly be impossible to consider those paths.

So we made the decision to build a core backbone infrastructure, have that as an option to both serve our city and serve key community anchor institution

partners and make it available for the private sector. One of the early partnership opportunities that we've had is with Ting, who you're going to hear from in a minute, who is going through the process of the valuation of the city of Centennial. I think they've had a really great response from both the resident sector and the business sector for potential fiber to the premise opportunities and our role, the city of Centennial's case has been to make our playground as attractive as possible. And again, what I mean by that is the right levels of documentation, being responsive, passing permits quickly, being able to execute things like IRU agreements quickly.

So that's how we consider partnerships with the private sector. So with that said, I'm going to pass it back to Sandeep and see if he wants to go straight forward to Elliot or whether we're doing questions here. Thank you.

Sandeep Taxali: Thanks, Tim. We'll do questions at the end. Now, we'll hear from Elliot Noss. So Ting Internet has deployed a variety of business models from privately owned networks to public owned and private operated, to a recently announced partnership with the city of Centennial as Tim talked about, in which Ting will build a last mile off of Centennial's dark fiber network.

So Elliot, love to hear about your variety of your business approaches.

Elliot Noss: Sure, thanks Sandeep and thanks for that lead-in, Tim. I think the place that I would start is at Ting, we view ourselves as an operator first and foremost. Our core strategic work is done in owning the customer relationship. We look at ownership of the fiber network itself as something that's tactical, not strategic, and as we look at it through the filter of how we want to deploy the capital in our business.

So a good way to think about that is we will have some amount of capital we can deploy. That's obviously of a limiting factor at some level as it is for every business. But with pure public-private partnerships like our model in Westminster, which I will talk about in a minute, we have a near infinite capacity. Cities are building -- one of the ways that I describe this often to people is we do view, as Tim talked about, we do view fiber as critical economic infrastructure and if all of the USA was one large open access network, we would love that and we would offer service nationwide.

So I say that just to sort of help understand the way that we think about it. Now, we do have a range of models. We are in -- currently, we're taking orders in three markets today. In other words, we're live and you can order service. That's Charlottesville, Virginia, Westminster, Maryland, and Holly Springs, North Carolina and we have two announced markets that we're deep in consideration with. That's Centennial as Tim was just talking about and Sand Point, Idaho.

And then we also have a range of business models inside of that. In Charlottesville, which was our first network, we completely own it. We have no relationship with the city. We bought a small fiber footprint and we built out that network our self. Now, there is no ownership model where there is not some relationship with the city so course, we have to work with the city around permitting and sometimes poles, things of that nature. And in addition, when we're looking at, as the city is, digital divide issues, that's something you're always going to be working with the city or you should always be working with the city hand in hand.

At the other end of the continuum is our network in Westminster, Maryland. In Westminster, the city has built and owns the network and we light it up. So we are at this point the sole operator on that network. The city built a full

fiber network in Westminster, passing every home as they do. Right now, they are on I want to say the third stage. They built a little trial market of about 300 homes and then they built a next large neighborhood, about 1,800, and they're on the third neighborhood that they're building out in that city. They own is completely.

We will be moving after a couple years of exclusivity -- will be moving to open access in that network and we'll see if open access works. But that is the other end of the continuum. City owns it. We simply pay them a monthly amount for home passed and home lit. Somewhere in the middle is the relationship with Centennial, which is similar, by the way, to our relationship with Holly Springs and Sand Point. In each of those cases, the city has built their own fiber assets and those fiber assets make it easier for us to partner with the city. It lowers our barrier to building out deep into the neighborhoods.

Now, one of the questions -- we're meeting with city officials all the time. The folks who run the pipeline and I, we're meeting with at least one or two cities a month and we're always asked to take them through the various options. The way that I like to describe it to the city officials that I interact with, and Tim may remember us saying this to them at some point in our Centennial discussions. Because this is probably the most important piece of economic infrastructure for the 21st century, if you are able to own the network end-to-end, that is the strongest possible position to be in. But it's also extremely difficult.

It has complications obviously economically. You need the money and you need the budget room. So every city has obviously lots of competing demands for their capital. So a city really does need to have a very strong

balance sheet and be in a strong financial position to be able to build and own the network themselves end-to-end.

Second, politically. There are many, many cities in the country where public ownership of what is seen as a private asset is simply anathema. And so politically, public ownership of the fiber network won't fly. That is obviously, again, a city by city determination. And third and probably the one that's least thought about is operationally. Even simply building, owning, and maintaining the dark fiber portion of the network still requires some administration, some bureaucratic skills. And again, it's a city by city analysis as to whether a city has the wherewithal and capacity to be able to do that.

I've said for a couple years now, there are nearly 20,000 cities and towns in the United States and there's going to be nearly 20,000 different stories around how those cities get to the other side of moving to fiber assets. There's one more point I want to make as we're thinking about that public ownership versus private ownership -- well, actually two. The first is that the more successful models that are out there in the country today have very, very often extended from having a strong local municipal utility.

I think that once you unpack that, it's obvious why. You have people who already are driving around in bucket trucks and going up poles. You have billing and relationships and therefore back office. It's just a lot easier to get from A to B. The second point I want to make is one around perception. When I talked about the perception around a public entity owning private assets, I think very often we -- people, humans are fighting the last war and the last time there was an infrastructure buildout like we're just starting to undergo with fiber was with the cable build-out in the '70s, '80s, and early '90s.

That was fundamentally different. That was the buildout of television infrastructure, of entertainment infrastructure, but it was the last similar build-out. So very often, when people are looking at the fiber build-out, they're looking at it through that lens. And we have a view that the internet and the fiber infrastructure that facilitates it is fundamentally different and obviously much more than just simply entertainment. So that's something to kind of keep in mind.

And I'll close there. I think there are a lot of bites that might be unpacked. I'll close there to really encourage each city to get started in their process of figuring out how they get to the other side because it is clear that the cities and towns that build out fiber earliest and best, whether that's owning it, whether that's partnering, whether that's finding all private capital, those are the ones that are going to prosper. Thank you.

Sandeep Taxali: Thank you so much, Elliot. Next, we'll hear from Brad Moline of ALLO Communication. ALLO offers fiber to the premise services. ALLO designs, deploys, operates, and finances their last mile networks and often is a second or third ISP offering high speed services. ALLO will explain how their overbuild strategy can be sustainable while offering competition and choice. While they don't require public financing, Brad will discuss the importance of collaboration with communities. Brad?

Brad Moline: Thank you, Sandeep. ALLO Communications -- go ahead and move to the next slide. ALLO Communications was founded in 2005. So we were one of the early companies doing fiber to the prem, even back that long ago. And we always had a philosophy of once you start building in a community, you build the whole community. So currently, we're in six communities that are between 1,500 people and 25,000 people and those are all older communities that we started literally as a 100% competitor, zero market share and today,

we read range between 40% and 60% market share in the residential side and between 50% and 75% on the business side.

And then our newest market is 275,000 population in Lincoln, Nebraska and it's a very unique city, about 5.5 million linear feet of all underground and I'll talk about that a little bit. We're a full-service provider. We do our own engineering design, have our own PEs on staff. We do much of the construction operations ourselves, sales, marketing, installation, network operations, back office system. Have a full marketing plan in order to be an operator and go ahead and move to the next slide.

And as an operator we -- I'm sorry -- something went weird on my screen here. Okay, as an operator, not only do we pass 350,000 people, we have 450 employees and we deploy these people doing aerial underground. And today about 40% of our employees are focused on construction. And so we push through the markets very quickly. Again, primary focus is one, if we build an inch of fiber, we're going to build the whole town. And number two, we're going to build it as fast as we can, not in a reckless manner and safe. But our belief is if you're under 50,000 population, we can quite often do from start to finish of the build in one build season, assuming a nine to ten month build season. So we do move pretty fast in that.

Next, we use proven technology. It's all the same names. I don't have a problem putting them on the page largely because that is really the special side of our business. We use Calix, we use (Infinera), OFS, full operations staff. We have 25 people in our network operations center in Highlands Ranch, Colorado. Again, full OSS, BSS systems and less than a half percent of monthly churn to our competitors. So we do a good job of taking care of our customers and offering good services.

We really offered two Internet speeds, 100 meg up and down and a gigabit up and down to the residential, but we also offer a full suite of products to the business MPLS layer two I guess 10 gig circuits around the country. Our core backbone that operates between Denver and Omaha is a 100 gig backbone. So we do things at some pretty reasonable scale. We also have a very proven marketing and market share program. We always budget to get about 40%, 45% market share. We plan on getting much better than that of course and are very focused on the marketing.

So if you move to the next slide, when we think of the public-private partnership, it's really interesting, in six of our markets I think earlier one of the speakers said something about you have to work with the city. I'll turn it differently. One of our real values as a company is to be local. So when we partner with the city, no matter what the level of city investment is -- Lincoln, Nebraska for example had 300 miles of conduit and so we leased that. So we're very tightly coupled. But in some of our other markets, we work closely with efficiency of permitting all of the right-of-way pole attachments but also how we work with the economic development groups and the public groups. We always do different programs to give away free Internet to the nonprofits and also embrace the low income areas of the communities because we believe we're changing the ecosystem of the community. So we go to the lowest income, the highest income, the single-family home to the largest apartments, government, small business, large business. That's our focus is to change the ecosystem.

The first six markets that we did roll off and didn't operate it and that's one piece. Then in Lincoln it became a little different operation. Lincoln is rather large, about 5.5 million linear feet of fiber will go into that town, again, a fully ubiquitous approach. We'll get the entire town built in about two years. Currently, we're doing about 65 miles of in-town, backyard, behind the home

construction a month, which is rather large. Again, it's 100% underground. And we're passing about 6,000 entities a month. So it's moving pretty rapidly.

We expect and target our sales to be a couple thousand a month and it's a very active process. We work closely with the mayor, the fiber people in town, et cetera, et cetera. We're also working on a lot of smarty city projects with Lincoln and the other communities and so that's kind of where we're at.

So many people in the industry think that we will only do 100% funded, 100% owned projects. Those are our active ones right now. There will be a few other cities announced in that model yet this year, as well as some where ALLO will step in operate municipally owned assets. Again, we have the NOC, the product set, et cetera to do all those things. Whether it's municipally owned and we lease it -- in other words, guarantee the bond. We were talking to a couple of communities there as well. And then we work with some third-party owned networks as well, where we'll either wholesale portions of our service platform, NOC, or other products.

And so we'll really participate no matter how the city wants to play. We can adapt accordingly. If you go to the next deal, this is a picture of our office in Lincoln. The University of Nebraska is here as well so we do a lot of work with the state government, et cetera. But about a year and half ago, the majority of ALLO was purchased by Nelnet and Nelnet is a large public company. They traded on the New York Stock Exchange, et cetera, and it's a great partnership. Combined we have about 4,500 employees and we have the scale and infrastructure to support virtually any build. There's currently a big push in Lincoln, but again we cut our teeth and we enjoy the towns from 5,000 to 150,000 as well.

So that's the ALLO story.

Sandeep Taxali:   Thank you Brad.  Finally, we'll now hear from Brett Hill, of FTS Fiber.  FTS Fiber is building a regional middle mile network that traverses Maryland, Virginia, Washington, DC, and Pennsylvania.  And their project was enabled by a partnership with Kent County, Maryland where they have connected over 100 community institutions.  That was sort of the anchor county if you will and so Brett will talk about that middle mile project and all of the last mile strategy around that in Kent County as well as other last mile partnerships that he's considering.  Brett?

Brett Hill:   Thank you, Sandeep.  Yes, FTS Fiber is working a fairly significant, approximately 600 mile fiber ring through the Mid-Atlantic area, surrounding the Chesapeake Bay.  The primary drive of that network is to provide connectivity from Ashburn, Virginia to Virginia Beach for long-haul transport of international traffic on subsea cables that are coming to Virginia Beach between the end of this year and the coming years.

The long-haul new construction model is very difficult and what we found in trying to meet the needs of our anchor tenants for that traffic out of Virginia Beach was that we needed to bring more to the table and create a model partnership and work into the rural communities that we're passing to provide a means to fund the build.  Kent County issued a network proposal about a year and a half ago and their county happened to overlap with our project coming out of Virginia Beach.  And their request was to provide a dark fiber network for the county to serve the county's anchor institutions with a drive to economic development in the county, to bring broadband options to the residents.

Our response back to the county offered a three phased approach.  We proposed a core network of 110 miles for them with 100% underground

construction everywhere possible. There are a few areas of the county where we're in historic districts that date back to George Washington and we're tied because of the sidewalks and the history from being underground. So we have less than 2% but a small portion of the network that is forced to be aerial.

Our fiber that we're installing is using the latest in optical technologies for low loss low latency and we created a model where we're able to operate as a wholesale dark fiber operator in the county and allow multiple ISPs to come in and serve the residents through both fiber to the home and wireless options. Our original approval was slated to deliver a network within two years and included redundant connectivity to all county anchor institutions and optical gear for the county with redundant paths so that they had a resilient network, and that the providers that would be laying that network for the residents would have access to a resilient dark fiber network.

Next slide please. The benefits of dark fiber and this ties very much into Centennial's project, was providing a neutral environment for carriers to operate in. The biggest value that we've seen in what we created was not just having a wholesale network but also all new construction, we were able to offer lower latency glass to enable new technologies, higher bandwidth applications, and we're leaving the county ready for the next generation of technologies, including 5G cell service. We are engineered for small cell and fiber to the homes so that as new technologies evolve, what is a very rural county can move into a state-of-the-art footprint.

Next slide please. Our dark fiber model looking at Kent County serves in the county itself, your municipal opportunities, your e-rate, and enterprise but our larger footprint actually ties in international traffic. We're bringing in other carriers, ISPs, content providers. And this whole mix together really creates a model where our ISPs are really given an incentive to come in and work in the

county and take on those residential and small business customers because not only do they have the footprint to penetrate Kent County, but our regional network provides them direct connectivity back into Ashburn, Virginia and has access to the content to enable their networks to provide a greater value to the residents of Kent.

Next slide please.  The map I have on the screen shows the overall FTS footprint.  The southeast corner is Virginia Beach.  To the northwest is Ashburn, Virginia.  You can see that's one nice large loop of 601 miles.  IN the northeast corner, there is a drill into Kent County where you can see that network extends out throughout the county footprint.

Next slide.  This is a zoom into Kent County itself.  The county's network enabled us to have a fiber footprint within two miles of every home and business in the county.  We have actually funded laterals by the county that take us out into the southern reaches area.  You'll see there are five or six laterals that come off of the core backbone that put us right in the neighborhoods that if the county was not behind the project, an ISP wouldn't be able to draw the market base to serve.  And the county leveraged their 54 institutions, the type of those institutions on the right hand side of the slide, including your schools, hospitals, fire departments, police stations, all the way down to the Humane Society.  And by bringing all those institutions in and taking the operational budget of a communication internet expense, they were able to leverage the long-term operating funds into a short-term capital project to take on an IRU and partner with us to build this network.

Next slide.  In this last slide, I have at the bottom of the screen depicted in light blue the network that was subsidized by the county where their core county traffic passes.  And from there, this is -- in the dark blue -- is one of my ISP laterals, which ends up serving 225 homes in a small waterfront

community that if that county network was not in place, fiber would've never been able to get out there and those residents would be stuck with Hughes Net because that was the only provider serving them through satellite.

So really, through this partnership, created a unique blend of both long haul traffic and our larger network traffic, the local traffic within the county that was anchored by the county itself, taking all the connectivity between their buildings, which then enabled, in this case, example of think big networks to come in and reach fiber all the way up to the house and think big, much like ALLO just mentioned is deploying a calyx environment and they are 1 gig up and down all the residents of Kent County.

Kent County as of last year was the lowest ranking county in the state for broadband availability. There were 23 out of 23 counties in Maryland and now they're in the position as we're closing out 2017 to be number one I the state with 1 gig available to all residents. So thank you very much, Sandeep.

Sandeep Taxali: Thank you, Brett. Very informative. So it's now Q&A time. While my colleague, Elaine, looks at some of the questions that are coming in, I'm going to start with just a few questions to get the discussion going. So my first question is to Elliot Noss. So you're a partner in the Westminster network project. Dr. Robert Wack recently noted that he's in the long-term horizon business, comparing the network to a water treatment plant that has a useful life of 40 years or more.

So as a publicly traded private MP, what's your timeline though in partnering with him with regard to any number of metrics such as breakeven of becoming free cash flow positive?

Elliot Noss:        We talk about -- most people will say you can pass a home for call it $1,000 to
                    $1,400 you've got an install from there.  You might even be able to do better
                    than that.  We talk about 20% take rate in the first year, 50% in five years.  So
                    you're lighting up a home for $2,500 to $3,000 and we believe we generate --
                    and so far so good -- about $1,000 in gross margin a year a home.  So now,
                    that's gross margin.  You're not covering any of your OpEx but that's a 2.5, 3
                    year back before your operating costs.

                    So now, you've got to be pretty efficient on the operating side.  Look, as a
                    public company, I have the benefit of having two large cash generating
                    businesses that are allowing us to invest and start to build up in the fiber
                    business.  Dr. Wack is of course right.  Fiber a long-lived asset.  I think it will
                    actually be north of 100 years.  I think you see some copper networks that
                    have lasted 120, 140 years.  Fiber should last longer on that basis, but it's the
                    particular competitive situation in the U.S. and the unending demand for
                    faster, more reliable bandwidth makes it a pretty good investment in any time
                    horizon.

Sandeep Taxali:   Thank you for that.  Next question is for Tim Scott.  So Tim, you mentioned
                    that your approach was really not about solving a problem about being
                    unserved or underserved, but just building fiber and making a sandbox for
                    future economic development and innovation.  How did you counteract -- I
                    imagine some folks on the city council said, well, we have incumbents
                    offering broadband and they eventually will start building their own fiber.
                    How did you counteract that point?

Tim Scott:         It's a good question and I think it really comes back to timing and the city of
                    Centennial had a few strategic directions in place and we really felt that that
                    meant being in a situation where we controlled our own destiny a little bit
                    maybe earlier than some of the potential promises that might have been made

by some of the incumbents.  So in our case, it was really a matter of, again, understanding the core assets that we had in place, which in our situation was existing conduit, how we could leverage that existing conduit to build backbone that became attractive both for community anchor institution partners and for private sector partnership discussions with Ting and stuff that they could potentially leverage.

So it was really just wanting to be in that situation where we could build and control that long-term asset, fund it as critical infrastructure, and making that decision to fund it as critical infrastructure meant we didn't have a business model that was -- let's say if we had done fiber to the premise, it would have been $150 million plus.  So obviously that creates a very different business model that you have to put in place to try and recoup that.

Sandeep Taxali:   Thank you.  Next question is for ALLO Networks.  Brad, you mentioned that you have secret sauce, which really involves a very efficient CapEx and operating cost structure.  Can you share with us at least a few of those ingredients?

Brad Moline:   Well, simply working with the city, we want to  -- it's very important that they have good GIS information, pull data, those types of things so that we can efficiently move through the process, not a lot of delays, those types of things.  That helps improve things and we also think our internal capabilities make a big difference.  And so those things combined allow us to say yes to more projects when others might say no.

And I probably won't go in any deeper than that because that might be intellectual property, but it isn't that we take any shortcuts or use any different materials.  It's just we so many capabilities internally and we've been at it for a dozen years.  That helps as well.

Sandeep Taxali:     Thank you for that.  Got a question from the audience.  So I'll just read the question and then we'll figure out who should answer it.  What are the key data you look for perhaps in an RFI or city study in order to understand a potential new community -- population, median income, existing 477 subscriptions, a muni fiber map?  So let's turn that maybe over to Brett and maybe you can sort of think through what your last mile provider partner was thinking about.

What exactly are they looking for in terms of saying, okay, this business case makes sense as far as being an over builder?

Brett Hill:     Well, I think the greatest factor for us is looking at areas that are truly underserved and especially where we're located out here on the East Coast. We either have an all or nothing scenario when you're looking at the Baltimore-Washington markets that are heavily saturated and have multiple providers and multiple options, but from the commercial and residential space to moving 50 to 60 miles away, you get into environments where there is a monopolistic provider or possibly no real landline-based ISP available.  And looking at those footprints seem to be the best targets because where there is the greatest need, there seems to be the greatest support from the community and from the municipalities for change and partnership to bring something together versus and area where you have greater than 50% of the population served, the outliers seem to remain the outliers.

Sandeep Taxali:     Okay, thank you for that.  There's a question from the audience.  It says ALLO claimed uptake rates of above 50%, north of 50% for residential and even higher for enterprise, which seems well above average.  What uptake rates are typically necessary to make building and/or operating a new fiber network profitable?

So I think you kind of touched on that, Brad. Can you get back to that?

Brad Moline: We don't exactly publish where our breakeven is, but we model and get sufficient returns at about 40%, and I'll let us define what sufficient returns are. But we fully expect and historically have produced far better than that.

Sandeep Taxali: Great. Question for city of Centennial, Tim. So there were several companies interested I think in your last mile business plan, or the RFI or RFP that you put out there. So did you consider an open access requirement either for the short-term or for the long-term like Westminster did?

Tim Scott: Yes, I think the way to answer that would be as we went through with our fiber committee what is it we wanted to be and we had this range of what we call the A to Z scale where A is sort of do nothing, accept the status quo, spend nothing, and Z is spend city dollars, build fiber to the premise, and even perhaps be the city service provider and obviously, spend significant money. That was what I was explaining was probably a 12 month exercise that we went through until we settled on, well, what is it we wanted to build and we wanted to build this critical dark fiber infrastructure and have it as backbone only.

So our decision to build that provides the opportunity for Ting and others to potentially come leverage that backbone and then spend their dollars to extend it to build fiber to the premise. But we had no expectations that they would build that, spend their money, and then that we would require that fiber infrastructure that they were building with their dollars to be open. We don't have, again, in our fiber master plan, any goals that set a certain amount of service providers that we want to get onto our infrastructure. We want to make it as attractive as we can. We think we've done that through how it's

been structured and the policy decisions and stuff that were taken. And the
first to market is hopefully going to be Ting. And we'll make that sandbox as
attractive for them to come and be successful in the city. But if the next guys
comes along and says he wants to do the same thing with the same terms, he's
entitled to come and do that.

But I think this concept where you have multiple fiber over builders building
in the access space doesn't really materialize and in our case, again, we're
building this infrastructure, providing it as a core opportunity for the likes of -
- for Ting to come and spend their dollars and make a success in the city.
Considering it's already a competitive environment, so again it wasn't -- we do
have two existing providers that are there today. We have others that are
close to our sort of interstate corridor that will build fiber to certain big
businesses that can spend a certain amount of money to do large attachment
fees or connection fees, but that doesn't expand over to the medium-size
businesses or the SMB market.

So that's sort of how we got to that decision.

Sandeep Taxali: Okay, just a couple more questions. Elliot, how do you react to some critics
who argue that most Americans do not need fiber based service or dig
connectivity today or for the foreseeable future?

Elliot Noss: I like to do that on two levels. First, in thinking about today currently. I've
been in the ISP business since there was an ISP business, going back to the
early dial-up days and from the beginning, it was just never bet against the
pipe. People always want more. Applications will expand to fill up the
capacity allocated to them. That's kind of a Murphy's Law of the Internet and
I don't think that's stopped. We have particularly in the U.S. had a fairly

stagnant market. You do see the overall data of the average home going up quite dramatically in the last five years.

But boy, if you look at the median and not mean, it's a very different set of data and so I think that people can especially today as we start to finally see the breakage in the old content model around the cable business, people want faster but that's half the issue when it comes to today. It's also more reliable. Fiber is the most reliable and by reliable I mean lowest latency, I mean least buffer bloat, I mean best operating characteristics overall and anybody who has spent considerable time on a fiber network just finds it a fundamentally different experience and never wants to go back.

A few years back, Koreans would come to the U.S. They would describe it as coming and being on a vacation without the internet. Some of us will go into an island in Caribbean with no connectivity for a week. They would come to the U.S. because moving from pure fiber to the home all over the place to what the U.S. held at internet at the time felt like that.

And when you talk about the future, we're just at the cusp of a revolution in data analytics, in flow computing, in AR, in VR, in Internet of Things. So I mean we haven't even seen the demands start to be placed on the network. And the more folks like us, and ALLO, and others are building this out, the more you're going that stuff on the application side quickly, quickly fill it up.

Sandeep Taxali: Thank you, Elliot. That's very eloquent. Does anyone else on the panel have anything more to add to the question about the need for connectivity, or at least be building out a network that can support via connectivity. Hard to top Elliot on that response.

Okay, we'll it's 3:05 here Eastern Standard Time so I think we're going to wrap up. So first of all, I want to really thank the four panelists for your time and effort in preparing for this. Really appreciate it. I think the responses you shared with the audience about your business model, and the objectives, and the lessons learned, and so forth are very, very relevant to so many communities that we feature here at NTIA that are sort of either trying to overbuild or, in many cases, they're just underserved and they want broadband.

And so again, I think you educated the public very eloquently and this webinar is recorded and I imagine we'll have a lot of traction as far as people coming back and listening to your comments. So thank you. Just last slide, moving forward, there is a webinar on July 19. The title is how broadband is transforming agriculture and so we look forward to your participation again. And again, thank the panelists. You can all clap at your homes or offices and we'll wrap it up.

Back to Elaine.

Elaine Sloan: Thank you. We will end the webinar now.


END