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<<Rich Valera, Analyst, Needham & Company>>

Good morning and welcome to the Needham Networking Communications and Security Conference. I am Rich Valera. I cover some of the communication technology names for Needham and very happy to kick off this morning with the management of ADTRAN. We have Roger Shannon, their CFO; and special guest appearance by Jay Wilson, their Senior VP of Technology and Strategy will also be doing the presentation with Rodger.

And with that I will left them to tell the ADTRAN's story.

<<Roger D. Shannon, Senior Vice President of Finance, CFO, Secretary and Treasurer>>

Well, good morning. Thanks, Rick. Thanks everybody for coming and getting up bright and early this morning. I'll get the – what's going here? One second. Okay, getting pass the customarily safe harbor statement. I'd like to just make sure everyone has an introduction to ADTRAN. So ADTRAN in a very broad sense, but also very important strategically is a broadband access provider. So what that means is that if you have internet coming into your house, you should have a service provider as some time be the cable company, telecom company or some other service like a Google Fiber that delivers broadband internet into your company and into your location. So ADTRAN is the provider to those service providers.

In the last year, we were about $667 million of revenue while we're top three of global end market of broadband access. We sell in 68 countries and we have over 500 new customers, unique service providers just this year. We started tracking what we call gigabit community several years back in 2014, 2015 and we stopped counting when we got to over a thousand. But as you may be aware, there is – in addition to the service providers, they're all sorts of entities like co-ops and startups that are providing and enabling gigabit communities that we're supporting.

So why is that important? And we believe that ADTRAN and the reason that we're here, the reason that we exist is that the internet is transformative in the lives of communities and the lives of people. Studies have shown that where Internet comes – the gigabit comes into new communities, they see over a 1% increase in their GDP. Studies have also shown this is from Carnegie Mellon study that where gigabit is added to neighborhoods to home values increased over 3%.

Well, we're seeing just a major transformative effect is in learning and online education. The Khan Academy is a great example of Sal Khan and just ability to deliver that gigabit service into the home has been transformative as far as remote education. And then finally, we think one of the biggest areas where there's an impact from the transformative

impact is in rural healthcare, but we think we're just at the beginning of being able to provide service and access to people, who might not otherwise be able to get the type of healthcare that we enjoy in the larger cities.

So what does that mean for ADTRAN? So our focus, if you think about what we're trying to do is enable communities and connecting lives necessarily the theme that that we see as vital and we see that can be accomplished through a broadband connection. So we're working day in and day out to advance what we call this gigabit society and bringing faster and faster speeds and greater, greater access and enablement to you, the customer, the customers of our customers. And we're trying – constantly striving to make the subscriber experience stronger, better and faster.

How are we doing that? We call it defining the future network. And ADTRAN is really in the forefront of innovation in technology and Jay will talk about that some about how we are pushing the envelope of speeds and access through accelerating the path to software defined access. You'll hear many companies, the leading Tier 1, particularly talk about software defined networking. Jay will talk about that some. So at ADTRAN each day, our goal is to build the networks of today as well as tomorrow.

So with that let me turn it over to Jay and let's talk about how we do that.

<<Jay Wilson, Senior Vice President, Technology and Strategy>>

Good morning everybody. Thank you, Roger, for the hand off. What I want to talk about is actually breaking down into a few categories of how we go about enabling communities and connecting lives, one just expansion of broadband. So the coverage of broadband is going to improve through two things. One is just rural communities that are not covered. I think United States is probably about 30 million plus homes that are either underserved or unserved.

And so if you look at the opportunity there for just footprint expansion and that's the one piece of our focus with our service provider customers. The other piece would just be increasing bandwidth and there's a sensational demand for bandwidth. All consumers, all businesses are looking for more and more. And so, there is another expansion opportunity there as where they're upgrading their speeds new technologies or upgrading speeds in general. The second big part of our focus about what we're – how we're going about this expansion into adjacent markets and particularly what we've identified is a move more into the cable access infrastructure.

And so, traditionally, ADTRAN is now over 30 years old and we've been focusing on primarily the traditional telco operators. More and more these days, those networks look very similar in the cable MSO space. And so, we've identified that as a strategic area of focus for us to expand. The second would be as we see more and more wireless use in the network. And so, use cases for wireless are expanding. It's not just for access, but also for connectivity backhaul between MDUs things like that. And so we see adjacencies in the wireless as a big focus.

And then finally, the piece that I think is most interesting, but it also take the longest to play itself out is what we call evolution of the service delivery platform. And what I mean by that, the network is effectively the service delivery platform and is evolving more and more to being software centric as they move network functions into software. They're going to evolve how they go about delivering service end to end, two reasons for that.

One is because they want programmable network services and they also made the short in our service intervals. And so if you need to change the platform by which you're delivering those services in order to achieve those things. I'll spend time on this, but I did want to highlight the breadth of our broadband access portfolios quite large. We do offer today different types of technologies over different types of medium including now from wireless driven through partners where we're offering picture wireless through partners and we're tying the common management framework or a common services framework and the relationships with the customers.

One of the things that we've really focused on in the last year or so has been setting the correct market perception around 10 gigabits. And it's hard to believe we're sitting talking about 10 gigabit today, but more and more we're seeing use cases where 10 gigabit is actually something that's an increasing demand. And so what we've done is across the broadband access portfolio of ours, whether it would be in the DSO domain with vectoring and super-vectoring or whether it would be in G.fast, certainly in Fiber Access we're seeing strap. We're putting in place strategies to address this increasing demand for more and more speed. One of the things recently broadband trends published a survey where there is a familiarity survey of market leaders and talking PON a little bit more about that we're probably coming on top of that.

Speaking about PON more specifically, we're really going through an evolution in that space to not only there are broadening number of applications that can come into before with PON because of the speeds and because of the maturity of the technology that we're embracing is moving really from a hardware based and sort of legacy service models that you have stock network doing different, whether it would be residential or business services, mobility services over different types of networks and largely closed architectures.

We're moving across the CASM now more and more into software base, modern service model and open architectures. And so one of the things that we've embraced is this, trying to be proactive and really even disruptive and helping carriers move towards this newer business model for PON. A lots of different alphabet soup of technologies that are available and it depends on which operator and what they're trying to achieve, but by and large think about it the same way, whether it would be 10-gig EPON, for the cable MSOs or XGS-PON for the most of the Tier 1 telcos or certainly even NG-PON 2 is the ultimate end game multi-wavelength PON. There's different ways to accomplish it, but the same two business models would apply, the old versus the new.

So why 10 gigabit broadband? If you think about thinking about, well, who on earth would need 10 gigabit in their home? And the answer is probably not very many people today if anybody, and certainly it's not a market that you build an expensive network to try to address. However, if you look at the convergence of services onto the same access network, this is where it gets to be really important because by combining, as I mentioned earlier, the residential business and mobility service delivery over the same network, there's a lot more need for bandwidth in that case, but there is also need for services separation across the network.

And so, what we're also looking to do a 10-gigabit broadband or carriers we're looking to do is multi-gigabit customers. And so, initially it's a big marketing push and the technology network operators would say, well, we really don't even have a need for gigabit. But as you know, there's probably in community in the United States today and if you go around the world and other developed communities where gigabit broadband is not available and certainly with investment in MSOs more recently in 3.1 upgrade, you're saying gigabit become much more pervasive, not just in their marketing campaigns but also in the available services that they're offering. So as you have now customers signing up, whether they could be a community anchor institutions or that could be residential users or business users or mobile backhaul type applications that's going to be cases where multiple gigabits that are going to be delivered.

The other is these are tenured business cases typically, so they're looking at TCO models that are well over three to five year traditional and more towards a decade or even longer. And then doing so with the projected traffic growth that they're seeing, not just downstream but also upstream, you see realistic cases where GPON might actually be something that gets out straight. Certainly DOCSIS 3.1 can be out strip. And then finally if you look at capacity support for things like businesses and the explosion of the use cases that are going to come with the 5G in the network for any haul, backhaul, mid-haul, cross-haul types of application and taking a little bit actually has a use case that make sense for us to start talking about.

The other thing about this is there's a margin of false ad, if any I was just reading an email this morning from one of our aggressive sales people saying, hey, I want to go after a particular market, particular customers with an XGS-PON solution as competitive with EPON. I don't want to see it stuff wise, I want to see to move straight ahead. So the capacity and capabilities of 10-gig PON versus traditional GPON are meaningful, but the cost also is now shrinking to the point where there is nothing.

The other thing that's important to point out is this is – if you look at a multi-year, PAM, for PON, and this is really addressing just the two primary markets that ADTRAN is focused in, so if you look on a global basis and be more pronounced and the stocks would be higher, but looking at the North American market and the EMEA markets, the PON evolution is taking place before hiring, if you will, the darker blue, which is starting to trail off beyond 2018 and you see is the GPON. And so that's where the bulk of the market is today or within the circle, what you see is the various 10 gig technologies are

going to not only make up the primary growth of this market, is going to be more than the traditional GPON market by really 2021 or so and approaching it even in 2020,

And so while the overall market is growing at a double digit pace. The 10-gig market is actually growing at nearly 100% CAGR over that period of time. So, it's actually a pretty compelling. And just look at the market forecasts and again, we're proud across the survey that all categories. We were actually rating this the highest and this I realized this is a market perception, this is, but it's based on a survey of different operators around the world and their perception against our competitors in the space of 10-gig PON. So, this is a good position for us to be in.

I think it's important for us to recognize though that there, while there are a lot of commonality between these technologies and how they're going to be used, there also are some unique aspects to how the characters need to implement. So, we've got a broad portfolio to address that.

One of the things I'll zero in on a little bit because it's an interesting success story for ADTRAN is in the cable MSO space. And primarily today we did do a couple of product line acquisitions from CommScope a couple of years ago and from Sumitomo, in the last year. And what we're seeing as a good return from that, so both from an inorganic acquisition, but also from the organic development of what we call [indiscernible], the best thing in EPON. We're seeing great traction and success and why we don't have, because we don't disclose it publicly, we don't have the numbers expressed on the chart there.

You can see probably a good progression and it gets to be where it's becoming a material part of our business. The other thing I'll touch on beyond really just the 10-gig PON or the PON technologies I want to touch on the MDU application use case in particular. As most of you probably know and many of you actually are living in a multi dwelling space in the United States in most other developed countries is at least about 33% to 35% of the population lives in MDU. So the demographics of that are different than they are in the traditional single family home.

And so one of the things you have to think about is if you're trying to connect those users, the business case is different because one of the demographic changes is the turnover averages about 21 or 22 months. So they don't stay for 10 years or 15 or 20 years. They actually go up to a point. They're also looking to be able to connect to the fastest Internet connection that they can get and they don't want to have to wait for 90 days or something like that to get their connection or so.

So, those use cases make it pretty interesting. For the service providers, one of the things we recognized is that that roughly a third of the population in MDUs looking at technologies that are best suited to leverage those users or those subscribers, potential subscribers and one of the things you recognize is the MDUs are not all being built right now.

And so all, almost all of them have existing infrastructure, either twisted pair or coax infrastructure. And so rather than the disruption that will be required, you certainly want to go fiber to that building basement. But actually go fiber all the way up to each of the living units is quite expensive and disruptive. And so what we see is the application of the technology led you that fast and like what I was describing in 10-gig PON, we recognized that early on and have been investing and making sure we're positioned ourselves with leading innovation and standardization and interoperability and multiple chipset support, but also in supporting overall portfolio across the large customer base.

We've been proud to at least discuss and I think there's awareness about activity we have going on in each of three continents: North American and Europe and also in Australia. Now we have anchored customers that are the marquee customers in each of those regions in G.fast with ADTRAN.

So, the last piece I'll touch on and hand it back to Roger is software defined access. He mentioned that in the opening, the opportunity is here are really around helping operators evolve their networks to deploy access in a way that allows them also to achieve two important initiatives. One would be, again, programmable network services. The other would be shortening their service intervals.

And so, we're at a point where – if you are familiar with Clayton Christensen in his innovative dilemma, remember our founder handing that book around to as many years ago, making it was required reading book for us at ADTRAN, but recognizing that we're at this period of discontinuity, where the traditional approach ultimately will be overtaken by the new approach and we're at a point where now it depends on your situation, if that's the case or not. And the reality is if you want to embrace data center architectures and principals to get the cost for delivering a gigabit down in your network, then you're going to have to embrace some of these principles to get there.

So, we're at a point where we feel like you need to catch the next wave and evolve the Search and Delivery platform. So again, software defined access, user driven service lines, automated operation, service orchestration, speeding time to market and lowering costs. All things that operators need and want to do. But this is what software defined access strategy comes about.

So what's you'll see from us, hopefully you've seen from us already, but what you're continuing to see from us is as we deliver these new technology, we always have to have the latest technologies available and be competitive in those, but at the same time we need to make sure that we're checking these boxes as well and the only way to really do that is to embrace some of the architectural principles that we've helped us identify and software defined access.

The other thing that comes from that is, who is going to make all this work together is the question, because many of the traditional service providers, if you look at, if you look at the large cable MSOs, they're not, they don't view themselves as video service providers anymore necessarily.

Traditional telcos don't be themselves, certainly as voice providers anymore. I was, I was a little bit surprised, probably shouldn't have been to, actually hear the other day that Charter is the largest voice support provider in the country and who would have known know, typically everybody would've guessed AT&T or Verizon, I'm sure. And so, in that all of them consider themselves broadband service providers.

And so what's going on here is they also have a challenge with high cost, the highest fixed cost is going to come in their head count for them to be competitive and running the networks, if they can get programmable networks, they can get automation, leverage machine learning and AI, they can get the cost of their operations down, but they have to reduce their headcount and do that. So, while they're reducing headcount, they are reskilling their employees and upscaling their employees to be competitive and be knowledgeable in these new technology areas. But someone has to make all this work for them.

And so we see a unique opportunity for us just like we've done in services in the past several years, services has been a big growth engine for ADTRAN. The first step for us in services will be our network implementation. And so the logic behind that was pretty straightforward. They needed to get the networks built. We liked it when they got them built, so we're going to help them build them. That means planning, engineering, actual network implementations and installation and commissioning, we'll do that.

In the new environment where software-defined access is going to take some what we refer to as solution integration, and so we have got a lot of components coming from open source. No service provider is going to deploy an open source solution on their own uninhibited. And the reason is because someone has to triage the issues, someone has to actually test it end-to-end for interoperability, someone has to actually integrate it with either proprietary components supplied by a particular vendor, standardized components provided by a vendor, there may be some things that operator develops on their own, there will really be open source components, both hardware and software by the way. And integration of that is really important.

So one of the things that we did is we made a strategic decision to get involved as the only access focused supply chain partner in ONF, or Open Networking Foundation. And for those of you who are not familiar with ONF, they actually reconstituted their strategy earlier this year that got either the leading operators around the globe involved, including AT&T, Deutsche Telekom, and Comcast and Google. And what they've done is they've pulled together a community of partners with the mission of trying to accelerate this pathway, software-defined access. And so we're proud to be involved in that as well as with other organizations pushing those initiatives by broadening that pooling.

So if you look at the actual echo system to wrap this up on my part, traditionally hardware, software, network equipment actually starting to also provide leveraging open solutions around open – I'm sorry, around control management. And then ultimately we can become, just like our mission statement I said, we want to be a trusted provider,

whether it'd be a provider of hardware, provider of software solutions, provider of services, or all the above, as a solution integrator, we want to be a trusted provider to our customers.

I think hopefully the value of open networks is understood and well-known. I think they have been very vocal about it, but if you think it becomes the de facto standard. So standardization takes a little bit longer to develop, there's a lot of opinions about how things happen, but embracing open source both hardware and software is important for many reasons.

We're proud of a Mosaic in the sense that Mosaic is our brand around our software solutions. We've got – it's really made up of three different components. One is a cloud platform that can serve as an orchestration solution for access our multi-vendor, concluding multi-vendor. We've been recognized as the most awarded SD-Access solution in the market, and as well we're the only one that actually supports both our own solutions plus third party solutions at any follow open standards. And so as you see evolution, whether it be in a cable network, or virtual CCAPs, or and the telco network, of integrated virtual BNG, you can look at the wireless networks with virtual EPC, all these things come into play. And Mosaic strategy is pretty straightforward. If you need to do this now and you want to adopt an architecture that follows where the future is going, then you can put that in place today and it works and it's available.

In other words, we have a – I mean we have I hardened and deployable solution to that. At the point at which if you are not there now, at the point which let's say an SDN controller becomes ready for deployment and hardened in your opinion, you can remove our SDN controller, put in on our ODL controller and it works just fine. So there's no forklift changes, there's no redoing everything, you just remove that component. So that's the logic behind Mosaic.

The second piece is the operating system itself and the operating environment what we're going to do is make sure that the network elements that are being deployed they have an OS that can run on our equipment, which of course we want to have hardware that runs at a higher performance with their own OS. But at the same time, if you want to leverage the white box from a large ODM supplier or for whatever reason, it can be a switch, it can be a LLT, it can be as G.fast view, our software will work on that white box, which is worth. And so if you want to provide – just if you just want to buy the software from us, if you want to use us as a solution integrator, you can do that. But ODM or the white box can be the hardware supplier, that's what you sell through today.

The third piece is important as well because the hardware that we're providing needs to be SDN-ready. And so one, it may not be required to be SDN as a critical path implementation choice, it needs to be SDN-ready. And so you need to have a modern network interfaces, things like Netconf, and YANG on the network element, so that it can be managed by those future modern management network for proprietary existence.

We've also got subscriber suite, subscriber experience suite, Mosaic subscriber suite. And so lots of different applications activate device manager, Wi-Fi, Subscriber Insight, these are tools that we're making available to our customers to help them reduce their operating expenses and increase revenue.

So the key takeaways here, we definitely see 10G PON as an area where not only it's a growth strategy for us, but it's a growth strategy for the operators, not just for bandwidth, a lot of people will associate that only with the bandwidth upgrade, the thing I'll point out is actually it allows you to converge your networks and address a lot of other used cases as well.

The other thing is that the world really is moving towards software open architectures. And so we can stand back and drag our feet on that, but our view is we have a lot more to gain less to lose the most in this space. And so we're embracing it and actually serving it as a disruptor in doing that. Okay.

I'll hand it back to Roger.

<<Roger D. Shannon, Senior Vice President of Finance, CFO, Secretary and Treasurer>>

Thank you, Jay. I'll just wrap up with some financial perspective. And alluded on what we see going forward. ADTRAN has historically provided – proud of the fact that the balance sheet that we've had is a very strong balance sheet cashflow. We still remain in that position. We had a significant amount of capital return to shareholders, which I hit on it as well. So the last five years we have returned a $92 million in dividends and repurchased over $220 million in ADTRAN stock. As of the last quarter end, we have cash investments of over $240 million, very minimal levels debt and just 26 in total assets of about $650 million. These are probably known well to anyone who follows ADTRAN and has done research in your models.

Our revenue had been growing consistently up through 2017. Gross margins kind of hanging in the mid-40%, ADTRAN has consistently taken pride in our ability to manage OpEx. We're probably the leading access provider to market and our ability to maintain and control our cost and be able to pass those lower costs onto our customers.

And you see the growth in the GAAP and the non-GAAP EPS, I'll point out that $0.90 at the end of 2017, you see a footnote there, it's probably everyone knows well there was a tax reform that went into effect at the end of 2017. So we did adjust that for the one-time event, just about every company had as a result of implementing the tax cut.

So in 2018 we did – we have had a backup in the year 2018. We had a large Tier 1 customer that we're doing a multi-year vectoring project roll out with, that went through a merger. And as a result of that but most if not all of their projects on hold and that certainly affected us for the year 2018, starting at the end of the fourth quarter of last year and through this year.

We have been able to consistently grow our revenues quarter-over-quarter, starting with Q1, into Q2 and Q3, the latest quarter as you can see in the purple bar. A lot of that growth has been through our continued strength in the EMEA markets with large Tier 1s. In Europe as they continued their super-vectoring roll out and accelerated that as well as the beginning of shipping our G.fast product into the Asia-Pacific region.

As I mentioned, the backup and revenue that we saw from the policy, the Tier 1 certainly had an impact on our gross margins over the course of the year. ADTRAN is somewhat unique in the sense that we are one of a few access providers, maybe the only that's has the ability to manufacture ourselves as well as through partners. And we do that depending on the lifecycle, the stage the product where it's more economic to produce it ourselves or go through partners.

But certainly scale when you talk about scale for some number of quarters and years has an impact on that. So we did see a backup in our gross margins in Q1, those volumes trailed off. We've been doing many things over the course of the year or two to streamline our cost inputs and you can see the result of that as gross margins have steadily increased as the volume has increased. From an OpEx perspective made significant improvements and controls an OpEx to get back to a level of profitability. Up until this last downturn, ADTRAN had never had an unprofitable quarter.

And that's not a place where we want to be. That's just not how we manage the company. So we've taken every practical step and continue to do so to return to profitability. We'll focus a lot – too much on this, but this is a breakdown of our operating segments as well as our categories. We segment into product and services, you see that the services had been growing, as Jay said, growing part of our business up through last year. There was a large services component with a project that was put on pause and then services have begun to increase again.

I know in the interest of time, again to touch on the gross margins, the interest of time, I'll end up by saying that for we have given guidance for Q4, expect to be in the range of $135 million plus or minus five. This is significantly better than the historical seasonality trends that we typically see in Q4, which tends to be down more than 10%.

We've given guidance for gross margins in the 40% range and we continue to keep our OpEx well controlled at about $62 million area for the quarter. For tax finally, we've done lots of work over the past year or so. You've probably seen tax benefits for certainly in the last quarter, first quarter of the year. We expect to get a tax benefit again of about 20% in this last quarter.

So with that, I'll wrap up. Again we appreciate Needham and Rich having us. And it was a pleasure to get to speak with everyone.

Q&A

<Q – Rich Valera>: Can you take a couple of questions?

<A – Roger D. Shannon>: Sure.

<Q – Rich Valera>: If I could finally start things off, kind of on a forward-looking bent here, I'm looking out into 2019, if you could maybe highlight some of the programs that you see getting the revenue, kind of back up to maybe historical – just driving the revenue. And I guess we could in particular comment on programs you have with some of the big carriers. I mean, the rise in GPON and then AT&T G.fast program which has been much discussed. If you can give any thoughts on how those might impact 2019? Thank you.

<A – Roger D. Shannon>: Yeah, sure. So first, obviously this is the first quarter, the quarter we're in now – the first quarter, we will have a challenging comparable from the CenturyLink situation from last year. Going forward, I mean I do think we certainly understand what the new normal and that account is still very good customer for us. And there's a lot of initiatives going on, we expect that will be a full year of sort of a new normal from essentially that's the first sort of a foundational piece.

The other piece that's important for us and then our top European customer continues to expect in fact us all with their earnings came out I guess yesterday or today. And they talked about a very bullish perspective on broadband in general and continue on with their plan. They're one of the best that we see in the industry in doing what they say they're going to do and we expect that to continue in 2019, as it relates to some of the big projects.

We've talked about Tier 1 operator in Australia. We talk about some new opportunities in Europe I think and we will also talk about the ones that you just mentioned in the U.S. We feel good about those. Those will have also the mix there or the cable MSO. And so, cable MSO got through the largest cable MSOs in the world to the largest in the United States that we're working with. We continue to see strength in each of those opportunities where we haven't pulled back, I would say, in one case of a new application here, we've been a little bit disappointed with progress of that has nothing to do with us at this point. We've delivered the solution and it works and that’s available, the services has been sold and it's just been challenges with implementation in my opinion, that'll pay that, so it remains to be seen how they'll push that apple and will help them any way that we can and those are certainly factors into next year.

On a broader basis, I would say, this gigabit communities and particularly in the areas like municipalities and metropolitan - United States, there are a number of different RSP or we call Regional Service Provider activities from the Tier 2, Tier 3 operators and across Europe as well. And so Europe has really embraced this gigabit society push. And so we're going to see strength, more strength I think even in that area both in the U.S. as well as Europe. And so that's the part of big element that I think that people may tend to overlook a little bit sometime. We have a broad base in the United States and we have a building base in Europe. Those operators that are doing broadband networks that are quite nice for us and so we expect that to continue.

<Q>: Okay. A high level question. At least in the U.S. it seems that every quarter for the last many, many years, the traditional telco operators are losing broadband subscribers. So my question to you is why do you think they're not investing in 1 gig or 10 gig? Seems to me without knowing the details like you do there it's not strategic to them or the cost is too high. Otherwise, why continue to release?

<A – Jay Wilson>: Yes, it's good observation. I would say, the fiber builds are priority for all of them. I think they recognized us the end game they want to get to. The challenge really is expensive. It is expensive, but it also takes time. And so it's not something that's a step function that really almost any operator be looking at what AT&T has done with their 12.5 million homes passed objective. They're going to be able to have the capacity to do that about as fast as anybody. Could you imagine that? It's still been done a long time.

And so what is the time aspect and so how will they manage their investment to the point where it starts to have make a material impact. We've been pleased to see actually a partner with Windstream for a time, but now they just reported their third straight quarter. I think broadband net adds, whereas conversely some of the others continue to have some challenges with that. And so I think it's a good observation.

My sense would be for them to strike the balance of the time and the investment required to do fiber with being able to figure out ways to drive their revenue growth. And in the case of Windstream, they of course sold the data center business and put a big investment into the network that spurred that. So it's not a fiber to the home completely, they did some gigabit community, but it's more of a fiber deep into the network and leveraging some of the latest technology and that's been paying off for them. And so I think that the transformation that we have to see in the outdoor space is going to perhaps, continuing there is going to be a balanced strike.

<A – Roger D. Shannon>: Yes. And then just expand to on that, I think the conversations we've had with Andrew where they see subscriber growth. And if you look at the Tier 2 that Jay just mentioned, they break it down between speeds. They're actually able to increase subscribers where they're offering speeds of 20 meg or greater. They talk about this sweet spot of kind of a 50 meg to 80 meg or 50 meg to 100 meg, where they're able to retain or attract subscribers and where they're losing subscribers is below that. So there are kind of across the spectrum with the carriers in the U.S., we're having those conversations about where it makes sense to continue to use vectoring, even super-vectoring which delivers speed up to 300 meg and 350 meg or particularly Gfast, where fibers run to the basement and we're able to deliver gigs speeds over existing infrastructure.

So it's an excellent point you make. I think they are seeing that. And there are different ways of going about it, whether it be a full fiber to the prem or some type of enhanced ultra-broadband, copper or HFC strategy.

<Q – Rich Valera>: And just to kind of dovetail on that question. You guys have obviously transitioned quite substantially from being primarily a teleco focused supplier to a focus on cable on themselves. How much retooling of your sales and marketing organization does that require? And what kind of impact has that had on you? And also have you broken out any revenue data on MSOs or the contributor? Can you give us a color there?

<A – Roger D. Shannon>: We have not broken out. And just to answer your last question first, we've not broken out any specific number on cable MSO. At call I'm sure you've listened in on too, we talk about it kind of in scale and in some context we've not broken that out yet. We had a chart to try to give some order of magnitude audit. You can see the kind of exponential growth in it, but we haven't given specific numbers.

Jay, you want to talk about that?

<A – Jay Wilson>: Sure. One of the things we're able to get the tariff came with one of the acquisitions so they came over including some sales with people. That was a nice documentation for us. So we've reapplied several of our people were relationships and things like that may have existed even in account management can be done. We've brought some in within organic investments that we've made. We've added another that are specific in this place.

And so from a sales and marketing perspective, there is a dedicated focus and dedicated team. And the marketing messaging is very tailored to that. We've been increasing our presence in investments and events that are focused in the cable space in particularly participating in cable lounge, participating in lots of different initiatives there that are getting us input. And so, but as far as impacting the P&L, I think we've had to manage that in the scheme of everything else we're doing.

<<Rich Valera, Analyst, Needham & Company>>

Maybe now we're going to have to wrap it up.

<<Roger D. Shannon, Senior Vice President of Finance, CFO, Secretary and Treasurer>>
Thank you.

<<Rich Valera, Analyst, Needham & Company>>

Thank you very much. I appreciate it.