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WIRELESS BROADBAND DEPLOYMENT - GENERAL

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1 P R O C E E D I N G S

2 MR. CURTIS: Thanks, everybody, for  
3 coming. Appreciate it. The first one of these I  
4 thought was pretty interesting and good  
5 discussion. Look forward to another round of this  
6 on wireless this time instead of wired this  
7 morning. First, if everybody could turn their  
8 cell phones off, would be fantastic, creates a  
9 little feedback. No wireless on the wireless  
10 panel.

11 I think what we're going to do is we had  
12 originally structured this as two back-to-back  
13 panels. I think we're just going to open it up  
14 and have, you know, one longer panel where  
15 everybody interacts. That format worked pretty  
16 well this morning. So I think that what we'll do  
17 is just go right around the table. I think you've  
18 all got, you know, I think three minutes on  
19 presentations. Give a little intro on yourself.  
20 You'll get a yellow light on the timer in front at  
21 two. You get red at three and please try to stick  
22 to the time.

1           And then I think, you know, the general  
2           format is after that goes through, we'd like to  
3           have a really open discussion so it won't be, you  
4           know, single question directed at someone, try to  
5           get a discussion going, kick things around the  
6           table. Really want to encourage different points  
7           of view, different thoughts about, you know, how  
8           to make things work, what barriers are and things  
9           like that. That's the general direction we want  
10          to head.

11           So with that, Stephen, if you want to  
12          kick us off and, you know, take us through your  
13          introduction.

14           MR. BYE: Well, I don't have a  
15          presentation so I'll just speak for a few minutes.  
16          Firstly, my name is spelled with Stephen, as an  
17          "e" before the "n." But thank you for the  
18          opportunity to come in and be on this panel. I  
19          think this is a very important topic.

20           Cox has been an innovative leader in  
21          communications and entertainment for some number  
22          of years. We were one of the first cable

1 companies to offer a facilities-based telephony  
2 service in 1997. In fact, we're the first company  
3 to offer a bundle of voice, video, data on a  
4 facilities based infrastructure back in '97.

5 We're at an exciting point of our  
6 development in that we're re-entering the wireless  
7 business. We were successful in acquiring AWS and  
8 700 megahertz spectrum licenses and are in the  
9 process of building out an infrastructure. While  
10 it's 3G, it's 4G ready. And we're also working on  
11 trials later this year looking at LTE and the  
12 viability of that technology to be commercially  
13 deployed in the spectrum and the licenses that we  
14 acquired.

15 Some might ask, you know, sort of why  
16 now? Why are we doing this? And why build? We  
17 have a very trusted relationship with our  
18 customers. We have a very -- a good customer  
19 base. To date about two-thirds of our customers  
20 are buying two products from us, about a third of  
21 our customers are buying all three, and we look at  
22 wireless as bringing sort of the mobility

1 component to voice, video, and data services that  
2 we offer today.

3 Our customers have expressed an interest  
4 in buying those services from us and we see  
5 ourselves as a total communications provider and  
6 being able to deliver and support those services.  
7 An interesting nuance is, though, we don't really  
8 talk about it as much as a quad play, as much as  
9 it is wireless as an aspect of the delivery and  
10 bringing mobility to those other products and  
11 those other services, and we think that's very,  
12 very important as we go from within the home and  
13 customers expect us to deliver and enable those  
14 services outside of the home.

15 And if you look at sort of why build and  
16 why now, we think we're at sort of a frontier, or  
17 a new frontier, with mobile broadband adoption and  
18 mobile Internet broadband access. And so we feel  
19 that sort of having spectrum, having the network  
20 assets and the infrastructure to grow and support  
21 the demand for those services, is very, very  
22 important and being able to control the customer

1       experience and deliver against the promise that we  
2       provide to our customers is very, very important.  
3       And as we look at building, you know, we feel that  
4       that gives us the control points.  It's  
5       complemented with the wholesale arrangements we  
6       have with other carriers that are very important  
7       to us to be able to deliver the service both  
8       within our markets -- because we are a regional,  
9       local facilities-based provider -- but also out of  
10      our markets, because our customers expect to have  
11      those services beyond our own footprint, and so we  
12      want to be in a position to be able to support  
13      that.

14                So, you know, we look at this initiative  
15      with the FCC, together with the NTIA and RUS, as a  
16      very important initiative that I think will  
17      advance sort of the country's economy,  
18      particularly through bringing broadband access to  
19      more people.

20                And so with that, I'm happy to be here  
21      to represent Cox, our customers, and our employees  
22      in this initiative.

1                   MR. CURTIS: Great. Thanks, Stephen.  
2 Jake?

3                   MR. MacLEOD: I'm Jake MacLeod,  
4 principal, vice- president and CTO for Bechtel.  
5 Bechtel is a 110-year-old private company,  
6 engineering company. We have 6 different business  
7 units, and our 2008 revenues were just north of  
8 \$30 billion. We do business all over the world.  
9 One of those business units is a communication  
10 business unit, and we have constructed and --  
11 well, we've built or modified over 110,000 cell  
12 sites around the globe, and so we approach this  
13 deployment in a very regimented way. Our  
14 processes and procedures are constantly challenged  
15 with Six Sigma efforts to ensure that we're up to  
16 speed on everything that we do.

17                   From the communication's sector, at the  
18 end of last year I sent out about three of my guys  
19 to a large city in the U.S., and we took readings  
20 on various technologies and tried to define the  
21 user experience in a very non-scientific way. I  
22 sent them to 6 different -- or had several

1 different technologies and we had 10 tests per  
2 technology and then we aggregated the average  
3 there. So you'll see on the next -- keep this  
4 slide for a moment -- but I just wanted to show  
5 you some of the applications that are driving the  
6 bandwidth in the United States, both wireless and  
7 fixed. You've got everything from the  
8 telepresence, which requires a full DS3 --  
9 dedicated DS3. You've got telepresence, you've  
10 got telemedicine now. There are devices that will  
11 allow you to transmit records, high-speed records.  
12 You've got distance learning. So, the average --  
13 it's estimated that the average household demand  
14 today is over 28 megabit.

15 So why do we need broadband? Well, this  
16 is just the tip of the iceberg. Let's go to the  
17 next slide please.

18 Okay, this is what I was talking about  
19 earlier where I sent the team out and we  
20 downloaded a 5 megabit file.

21 And you can see -- I can barely see the  
22 slide, so I apologize -- but back when GPRS first

1       came out, we thought that was smoking and that was  
2       a great technology, but look where we are now.  If  
3       we were dependent on GPRS to transport our data  
4       now, you know, we could have three generations  
5       waiting for that 5 megabit file to download.

6                So, this is a non-scientific comparative  
7       of the typical user experience in a large city in  
8       the U.S.  And I just wanted to put that forward as  
9       a platform from which we can speak because today's  
10      discussions are going to center around the  
11      broadband user experience.  Thank you.

12               MR. CURTIS:  Great.  Neville?

13               MR. RAY:  Well, good afternoon,  
14      everybody.  Thank you again for the invitation  
15      here today.  T-Mobile is very focused on mobile  
16      broadband and the deployment of mobile broadband,  
17      something we are very invested in and we look  
18      forward to the discussion today and the ongoing  
19      panels.

20               T-Mobile is in the middle of continuing  
21      to aggressively roll out its 3G network here in  
22      the U.S.  We launched 3G services last year in

1 2008. And in 2009, we are continuing to  
2 aggressively expand the reach of that network to  
3 more and more of the consumers in the U.S.,  
4 driving new competition and, we believe,  
5 obviously, a lot of innovation.

6 This slide talks to what's really an  
7 explosion coming at us in terms of wireless  
8 broadband. There are about 4 billion wireless  
9 users today across the world. About 10 percent of  
10 those today have mobile, web, or web-based  
11 services on their mobile devices.

12 This projection shows that number  
13 significantly expanding over the next two to three  
14 years where you can see mobile connections to  
15 broadband will outweigh significantly those from  
16 fixed network providers.

17 If we go to the next slide, one of the  
18 key issues that we see, both here in the U.S. and  
19 in other parts of the world, but specifically in  
20 the U.S., is that the ongoing deployment and  
21 success of wireless broadband deployment hinges on  
22 more spectrum being made available in a number of

1 bands. If you look at the penetration rates of  
2 spectrum that's available for commercial services  
3 today in the U.S., it's extremely high. The  
4 demand from consumers is ever- growing and  
5 ever-burgeoning on the wireless providers. As an  
6 example, the G1 product that we launched last year  
7 is consuming over 300 megabits per month. It's  
8 phone-like, you know, mobile web device, phone  
9 form factor, but driving extreme usage on the  
10 network.

11 So, new spectrum is critically important  
12 not only to improve the speed of service that we  
13 can deliver to consumers, but also the quality and  
14 capacity.

15 And last but not least, we need a  
16 significant slug of new spectrum to move into this  
17 opportunity.

18 The next slide, quickly. So technology  
19 evolution. I think the great story from wireless  
20 is that you see a massive amount of investment  
21 from both the carrier community around the world  
22 and the vendor community to ever increase and

1 enhance the capability of wireless networks.  
2 T-Mobile today is running on HSPA. That's  
3 supported by more than 250 operators worldwide.  
4 HSPA has a very, very rich evolution path. This  
5 year we will start the deployment of HSPA+  
6 services that will support throughputs north of 20  
7 megabits.

8 And going forward, LTE obviously, a  
9 great evolution path for HSPA and GSM-based  
10 companies. And the exciting piece here is the  
11 technology, I believe, is keeping pace on the  
12 wireless front with the ever-growing demand from  
13 the consumer.

14 So, I'm out of time. I'll wrap my  
15 comments. Thank you.

16 MR. CURTIS: Thank you. Tom?

17 MR. SWANOBORI: Good afternoon. My name  
18 is Tom Swanobori. I'm vice president of network  
19 planning and technology for Verizon Wireless.

20 Our company shares the vision of  
21 broadband availability for all Americans. Since  
22 2004, we've invested over \$80 billion both in our

1 wired and our wireless networks, and we're  
2 planning to make additional investments in fourth  
3 generation technology over the next few years.  
4 So, I'm pleased to be here in Washington, D.C., to  
5 discuss those plans with you and to assist the  
6 Commission.

7 Verizon Wireless has been at the  
8 forefront of an industry deploying wireless  
9 broadband data. We started with that back in 2002  
10 with our second generation IxRTT network and then  
11 quickly moved into our third generation network  
12 known as EVDO, or Evolution Data Optimized.

13 So that network today provides downlink  
14 speeds on the order of 800 kilobits per second to  
15 1.4 megabits per second and 5- to 800 kilobits per  
16 second on the uplink. Our network covers over 280  
17 million POPs and nearly 1.8 million square miles,  
18 so that covers both urban, suburban, and rural  
19 areas as well.

20 But now we're on the verge of deploying  
21 fourth generation technologies and we're deploying  
22 a technology known as LTE, or Long Term Evolution.

1 So, LTE is going to allow Verizon Wireless and  
2 other carriers to offer a really premium,  
3 high-speed wireless broadband with significant  
4 improvements in throughput capacity and  
5 performance. We expect that LTE technology is  
6 going to deliver in the 5 to 12 megabit per second  
7 average rates on the downlink with peak rates  
8 potentially in the 10s of megabits per second.

9 As with all wireless technologies, those  
10 performances are going to vary depending on your  
11 signal strength conditions, load, and mobility,  
12 but with our 700 mega spectrum, we expect to have  
13 a robust and broad deployment.

14 We have successfully trialed LTE  
15 technologies and are preparing for deployment in  
16 25 to 30 markets next year with an aggressive  
17 national roll out we hope to accomplish by 2013.  
18 Second slide please? Thank you.

19 LTE and other broadband technologies are  
20 going to have a significant impact on the way  
21 Americans work, live, and play. We think that the  
22 customers are going to achieve significant value

1 through mobility, through the ability to work  
2 remotely, move on the go, and access the Internet  
3 while on the move. By enabling consumers to  
4 access broadband with higher speeds and capacity,  
5 LTE and other 4G technologies will provide  
6 consumers with even greater value.

7 While these wireless networks will  
8 provide higher capabilities, they will not be able  
9 to match the kind of throughput you'll see on  
10 wired technologies such as our fiber optic network  
11 known as FiOS. However, we think that there's  
12 still complement for these, both technologies to  
13 exist, of the value of mobility and, in many  
14 cases, wireless broadband may be the only  
15 technology available so that this 5 to 12 megabits  
16 per second average will be more than adequate for  
17 today and the future applications for those where  
18 they don't have a wire connection.

19 But beyond people connecting people, we  
20 believe at Verizon Wireless it's important to  
21 connect -- to make multiple connections so that  
22 devices such as machine-to- machine, consumer

1 electronics, and other utility applications, for  
2 example, may be enabled in the future.

3 So, we're excited about the future of  
4 broadband. We're doing our part both on the wired  
5 and wireless side to expand that, and we look  
6 forward to your questions and comments.

7 MR. CURTIS: Thanks. Ed?

8 MR. EVANS: Thank you. Good afternoon,  
9 everyone. My name is Ed Evans. I'm the founder  
10 and CEO of Stelera Wireless out of Oklahoma City.  
11 We were founded a couple of years ago when we  
12 bought 45 AWS licenses across the country with one  
13 goal in mind and that was to go build rural  
14 broadband only networks. We don't offer voice.

15 To date, we are online in over 20  
16 communities, communities that are 20,000 people  
17 and below, true rural, and we go in as a true  
18 replacement or, in many cases, the first true  
19 broadband provider. Because we were a green field  
20 build, we were able to go out and start with HSPA  
21 at a higher level than what's typically seen in  
22 the U.S. today. We are out at 14.4 MIPs download

1 today and 2 MIPs up. We are seeing peak speeds  
2 above 10 MIPs on our network today and our average  
3 throughput on the downlink side is somewhere  
4 between 2 and 4 MIPs. We have enjoyed significant  
5 success in the very early stages. Our earliest  
6 markets have been online now for 15, 16 months,  
7 and we've seen household penetration rates above  
8 15 percent in those markets today. More  
9 importantly, we've seen our churn rate of less  
10 than 1 percent in those markets today with average  
11 revenues in the \$35 to \$45 range depending on the  
12 market.

13 We are in the process of building out 55  
14 communities around the U.S. today and that will  
15 complete phase 1 by the end of this year. And  
16 then next year, we will begin building out an  
17 additional 250 cities across the U.S. We have  
18 about 600 cities, 6 million POPs under our license  
19 today, and we expect to continue to build those  
20 out.

21 We are unique in that we don't really  
22 advertise a mobile solution so much as we do

1 position as being more nomadic. Our devices look  
2 like a traditional cable modem or DSL modem. It's  
3 a device that you take home and you set on our  
4 computer, your desktop next to it, or we do also  
5 offer a USB dongle connection if somebody prefers  
6 that, but 95 percent of our customers do look just  
7 like a traditional DSL or cable modem type of  
8 customer where they take the device home. The  
9 device has WiFi built into it, so in their house  
10 they have a wireless technology there. They then  
11 have our technology to go from the device out to  
12 the cell site, and then from the cell site we use  
13 long haul microwave, flat IP all the way through  
14 -- 150 to 300 microwave networks to loop around  
15 and go back to a large city. Once we get to the  
16 larger city, then we pick up long haul Ethernet  
17 connections and lease that back to our core in  
18 Oklahoma City.

19 We are a flat IP network today that is  
20 getting some of the lowest latency that we've seen  
21 on any wireless network of less than 90  
22 milliseconds across the network, so applications

1 such as Voice Over IP are working very effectively  
2 on the network today.

3 We have no intention of rolling out  
4 traditional circuit switch products. On the  
5 network, again, we are purely a data play and we  
6 expect to be able to continue and grow that pretty  
7 substantially going in for the next five years.

8 Thrilled to be here today and thank you  
9 very much for the invitation.

10 MR. CURTIS: Rowland.

11 MR. SHAW: Very good, thank you. And  
12 thanks for the opportunity to be part of this  
13 panel.

14 My name is Roland Shaw and I'm  
15 responsible then for our strategy for Ericsson  
16 here in North America. And the way I thought, to  
17 sort of at least get the discussion going for this  
18 panel, is to have a look at some of the  
19 fundamentals behind the business case, right,  
20 versus the speeds and feeds.

21 Now, my colleague Neville Ray showed a  
22 variant of this slide. Mine has bars and his had

1 -- his was solid. But nonetheless, I think -- I  
2 won't bore you with sort of the details because I  
3 think it was very well explained. Just a couple  
4 of takeaways. I think just notice the growth of  
5 the mobile broadband that is projected out to  
6 2014. That is starting to comprise at least 80  
7 percent of the overall market.

8 This is important in that in many  
9 markets around the world, this is going to be the  
10 only broadband access people have. So really the  
11 request here in our market is let's take advantage  
12 of the position we have today to be able to drive  
13 innovation such that these solutions and this  
14 capability can also be used in other markets.

15 So, I think that's what we'll stick with  
16 on that slide. If we move on to the next slide,  
17 please, we'll spend a little more time here.

18 What I'm wanting to address is a few of  
19 the fundamentals behind the business -- again, the  
20 sustainability of the business model. If you have  
21 a look up on the vertical axis, this is really the  
22 situation we find ourselves in today where we are

1 address predominantly people and we are providing  
2 more and more services, more and more  
3 converge-type services, i.e., driving the usage up  
4 the axes.

5           If one has a look along the horizontal  
6 axis, this is the exciting part, this is what we  
7 are seeing is the extreme innovation coming from  
8 all our leading carriers here in North America.  
9 We just heard the statements now from Tom just a  
10 minute ago, how getting into the whole machine-to-  
11 machine environment, going beyond the people, this  
12 is a very exciting space for us to be in and  
13 starting to open up an environment for many new  
14 applications where we can start to integrate  
15 enterprise business process with the communication  
16 model. This is also going to open up a new  
17 funding channel to be able to fund these services.

18           So ultimately, what we would like to see  
19 is how that little blob you see in the bottom  
20 left-hand corner, to move up in a diagonal  
21 direction, right? So you are driving usage, but  
22 then we're also driving a lot of innovation into

1 other markets. For example, the automation now of  
2 the electric grid in terms of the meter reading.  
3 These are just some sort of small examples of how  
4 we start to leverage the networks beyond people,  
5 right, towards some of our modeling that we've  
6 done, to 2020, globally expected 50 billion  
7 devices versus where we are today, connecting 4  
8 out of the 6 billion people. So this is an  
9 exciting space.

10 So, I think the way I would summarize  
11 and then the takeaway is if we can really just  
12 address standardizations to achieve economies of  
13 scale and not then have sort of barriers put in  
14 place by not using sort of commercial,  
15 off-the-shelf type equipment, particularly for  
16 things like public safety and utility markets.  
17 Okay?

18 MR. CURTIS: Thanks. Scott?

19 MR. ZIMMER: Well, good afternoon. And  
20 I, too, thank you for inviting me to this panel  
21 and look forward to your questions. I feel a  
22 little bit like a David among the Goliaths here.

1           We're a very small, fixed wireless, data  
2           only provider. The area that we serve is called  
3           the thumb of Michigan. If you look at the slide,  
4           you'll notice that there aren't any big cities,  
5           there aren't any interstate highways that travel  
6           through our market. We serve a population density  
7           of about 50 people per square mile. That compares  
8           to the state average of about 175, and yet we're  
9           doing a lot of the things that some of the other  
10          panelists talk about.

11           We've got, in Huron County, which is at  
12          the tip of the thumb, there are seven rural school  
13          districts that have distance education  
14          opportunities because of the wireless network that  
15          we've been able to build in Huron County. We've  
16          got telemedicine opportunities in these rural  
17          hospitals that are being deployed over our  
18          wireless network. And I think it's important to  
19          also state that we use an unlicensed frequency.  
20          We're in a very rural area. Interference is  
21          sometimes a challenge, but it's not as big of a  
22          challenge as it is in some of these bigger markets

1 that people talk about when they're talking about  
2 the unlicensed frequency.

3 We started our business in 2002. We've  
4 got about 4,500 customers on our market. We feel  
5 like we make a difference in these people's lives  
6 because they don't have other choices. They don't  
7 have DSL, they don't have cable available to them.  
8 We are in the truly rural market. People are able  
9 to telecommute because they have a broadband  
10 connection. They have cost-effective options to  
11 interact with other communities, other places in  
12 the world via the Internet.

13 One of my favorite projects is a  
14 Community Connect Broadband Grant that we were  
15 able to obtain from the United States Department  
16 of Agriculture Rural Utility Service. And quite  
17 frankly, without their help, without the funding  
18 that we get through the Rural Utility Service, we  
19 probably would not be in business today. But in  
20 the town that I grew up in, in Unionville,  
21 Michigan, there's a library there that -- this  
22 community has about 500 people. We put a

1 community center in that library as a part of  
2 Community Connect Broadband Grant and now over 300  
3 people a month enjoy free Internet access using  
4 those library facilities so that they can get on  
5 the Internet and interact with the world outside.

6 Education, we provide distance education  
7 services. There are currently about -- during the  
8 school year, about 17 classes a day that are  
9 shared among 7 schools in Huron County and a  
10 couple schools throughout the state of Michigan  
11 where they have the ability to get advanced  
12 placement courses and online college credits  
13 because broadband is available to them. Without  
14 the Air Advantage network or any wireless network  
15 in a rural environment, those services simply  
16 would not be available to them.

17 So I look forward to talking to you  
18 about that today and look forward to your  
19 questions.

20 Thank you again for having us on this  
21 panel.

22 MR. CURTIS: Thanks, Scott. Brian?

1                   MR. PONTE: Thank you, Rob. Thank you  
2 for the invitation to join this panel.

3                   I'm Brian Ponte. I'm from Lemko  
4 Corporation. We make a very innovative 4G network  
5 platform. I'll talk a little bit more about it in  
6 my presentation, but the four key points I want to  
7 talk about is the importance of mobile broadband,  
8 is the first point. The second point is the  
9 network architecture that ultimately will be  
10 necessary to support all this growth that you're  
11 seeing everybody talking about on their slides,  
12 and then maybe a little bit of a unique  
13 perspective in terms of how this architecture  
14 impacts rural carriers. That's the market base  
15 that we're really participating in today. And  
16 then the importance of the spectrum to rural  
17 carriers.

18                   So, the first thing I like to do is look  
19 at the term "smartphone." I really believe the  
20 term is a misnomer.

21                   You know, the iPhone, the G1, these are  
22 really computers with voice applications included.

1 And why do consumers value these devices? They  
2 value these devices because they provide always-on  
3 access to applications and information that's  
4 enabled by the Internet.

5 Earlier this year, a major carrier  
6 reported that percent of their direct sales were  
7 smartphones. And so I think with (inaudible)  
8 voice -- as we saw in the voice in the industry,  
9 consumers want to take the Internet with them  
10 wherever they go. Fixed broadband will always be  
11 an important element in the communications  
12 infrastructure, but consumers are voting --  
13 consumers vote with their dollars and they're  
14 voting for mobile. We're seeing five times as  
15 much growth for mobile access as we are for fixed  
16 access according to a recent FCC report.

17 To support this rapid shift in Internet  
18 access, the mobile networks need to converge onto  
19 the Internet. This goes beyond just the use of IP  
20 facilities to back all traffic to a converged core  
21 and say that we're Internet ready. In the true  
22 Internet model the wireless nodes, what we used to

1 call cell sites, will connect as peers on the  
2 Internet cloud and support truly mobile services.  
3 Without this distributed network architecture, the  
4 back haul requirements for all this data will  
5 increase as much as 10 times over previous  
6 generation mobile networks.

7 It used to be that the radio was the  
8 bottleneck in the networks. Now, with fast radio  
9 technology we're seeing that the back haul is  
10 becoming the bottleneck.

11 For rural carriers, this Internet-based  
12 network model is a double win. The first thing  
13 that it does is it helps pull the Internet cloud  
14 out into the rural communities and the second  
15 thing is that by virtually eliminating back haul,  
16 we can reduce the operating costs of their  
17 networks by 65 percent. Rural carriers now have a  
18 sustainable business model for delivering mobile  
19 broadband services to their local customers. Go  
20 to slide 2.

21 The second slide shows a side-by-side  
22 comparison of a 4G SAE that's for system

1 architecture evolution.

2 MR. CURTIS: Brian, if you can wrap in  
3 about 15 seconds, that would be great.

4 MR. PONTE: Okay, I'll wrap it up. So  
5 that it compares the two networks, it shows the  
6 back haul requirements in the phase 1, and what  
7 you really need to do in terms of getting a phase  
8 2 network architecture.

9 As a wrap-up, the need for the rural  
10 communities -- the rural carriers really is  
11 spectrum. Without spectrum it's difficult for  
12 them to serve their customers and the spectrum is  
13 available, it's unused, but getting access to it  
14 is their challenge. Thank you.

15 MR. CURTIS: Thanks very much. Thanks  
16 everyone for kicking us off.

17 As I said at the beginning, I think  
18 we're going to try to have a pretty open  
19 conversation. We'll go through some thematic  
20 questions, kick them around the room and see where  
21 things go.

22 I guess to set the table, you know,

1 we're focused on trying to figure out how to  
2 provide broadband, to be defined, to people that  
3 don't currently have broadband. And I guess, you  
4 know, at the forefront of everyone's mind, at this  
5 panel anyways, is the extent to which wireless is  
6 a solution to that problem. So why don't we  
7 start, you know, digging a little deeper?

8           And let's start with Ed and then Scott,  
9 and get your take on, you know, how you guys think  
10 about how far you can push wireless out into  
11 places that have really poor, you know, either  
12 straight-up density or linear density and how you  
13 overall see wireless networks competing with or  
14 being substitutes for at least the minimum  
15 broadband experience that you need to wire a  
16 network.

17           And then we'll just start moving that  
18 around, and my guess is we'll spend a fair amount  
19 of time peeling that onion back a little deeper  
20 into the different issues as we go along.

21           MR. ZIMMER: Well, I'll start off with  
22 that. As far as penetration, you know, when

1 people call us and say, hey, we have no broadband  
2 here, you know, what can you do for us? My answer  
3 to them is all it takes to get broadband to a  
4 customer is time and money and we've got the time.  
5 So, if you've got the money, we can make it  
6 happen.

7           With respect to spectrum issues, you  
8 know, it's interesting to me that many people  
9 think of Internet access as a utility. And when  
10 you look at your utilities as like your electrical  
11 service and your telephone service, your plain old  
12 -- you know, your POPs lines, those services are  
13 really provided by one carrier for all intents and  
14 purposes, at least in a rural environment.  
15 There's not a lot of choice. So, you know, if  
16 Internet is a utility and if it's so important to  
17 get Internet to every individual in America, then  
18 I think we need to really look at that spectrum  
19 issue and determine how we're going to split that  
20 up so that we don't have interference issues and  
21 you can cost-effectively bring it in a wireless  
22 environment. And I, personally -- I mean,

1 obviously, I'm a little bias, but personally we do  
2 think that wireless can be the answer, especially  
3 in the rural market.

4 MR. CURTIS: Let me dig a little deeper  
5 before we move on to Ed. So, when you think about  
6 edging out your network or building a new area, I  
7 presume you look at things like, you know, density  
8 per square mile, something around demographics on  
9 take rate. How do you think about that? How deep  
10 can you go?

11 MR. ZIMMER: Well, for us, density isn't  
12 as big of an issue because our model doesn't  
13 really depend -- I mean, obviously if you've got  
14 -- you put, you know, \$50,000 in equipment on a  
15 tower and you get 2 customers, it's not a very  
16 effective business model, but typically that isn't  
17 the case.

18 In the rural markets that we serve,  
19 vertical assets are -- I'm not going to say  
20 they're readily available, but they're certainly  
21 available in water towers, grain elevators,  
22 communication towers, those types of things. So

1 when we roll out into a new area, we're not as  
2 concerned about density because we feel like we're  
3 providing that service in a fairly sparsely  
4 populated area already. We've built a sustainable  
5 model. It's working for us.

6 So our concerns are more, are the  
7 vertical assets available? What's the -- you  
8 know, is it in the middle of the woods somewhere  
9 where we're not going to be able to propagate --

10 MR. CURTIS: Propagation.

11 MR. ZIMMER: Yeah, so it's more of those  
12 types of issues as opposed to density. It's kind  
13 of like the "Field of Dreams," if you build it,  
14 they will come. That's typically been our  
15 experience.

16 MR. CURTIS: Got it. Ed?

17 MR. EVANS: Yes, I think we've  
18 demonstrated in the last 18 months that wireless  
19 certainly is a very viable part of the ecosystem  
20 when you talk about broadband. Our experience  
21 today where our average customer is using between  
22 2.5 and 3.5 gigabytes of throughput on a monthly

1 basis right now, and going into communities and  
2 how we look at that density is really what the  
3 variable costs are, and obviously the revenue  
4 stream to retire the cost of capital.

5 So, on a typical cell site for us where  
6 we put \$125,000 worth of hardware out there and  
7 then in a typical colo environment where you're --  
8 call it \$1,500 a month to rent space on an  
9 American Tower, one of those guys -- we need about  
10 60 subscribers on that cell site in order to make  
11 that thing turn to cash flow, break even.

12 Now, I think to Scott's point, one of  
13 the advantages of being out in rural America is  
14 there are a lot of vertical assets out there that  
15 are substantially less than \$1,500. We've been  
16 able to get on water towers for as low as \$100 a  
17 month. And on a 180-foot water tower with \$100  
18 worth of lease on that and then you're looking at  
19 a \$50 a month electric bill and the maintenance  
20 and licensing cost on the cell site stuff, we can  
21 make that work with as little as 20 or 30  
22 subscribers on it. And then we -- again, we

1 aggregate through microwave back to a single  
2 long-haul Ethernet connection, so you allocate  
3 \$200 or \$300 back to that cell site for back haul.  
4 But we can be very cost-effective in those areas  
5 and make that work. And I think that, to me, is  
6 one of the clear advantages of wireless, is versus  
7 trying to run a piece of fiber, a piece of copper  
8 out to that home, you're simply not going to be  
9 able to do that.

10 To your point, the customer experience  
11 isn't going to be the same as if I have FiOS  
12 running into my house. It's not. You know, the  
13 good news is there are plenty of alternatives for  
14 high-definition television out there between  
15 DirectTV and between Dish Network, that give them  
16 that piece that, frankly, I can't deliver today.  
17 But I can deliver a true 7-8 MIP broadband  
18 experience today that gets 95 percent of the  
19 consumers more than what they have in some of the  
20 cities around. I mean, I live in Oklahoma City  
21 today and am a customer of one of the guys up here  
22 on the panel, and I get about 6 MIPs on my

1 Internet connection, which, you know what, works  
2 great for me. I don't do much more than that.

3 So, knowing I can deliver that to Poth,  
4 Texas, where there are 1,800 people around there,  
5 I think has been an extreme positive for us. And  
6 we estimate currently that we can get about 600  
7 subscribers on a fully loaded cell site.

8 That's assuming a fully -- two carriers  
9 up with all the channel element radios we can put  
10 in there, which is -- you know, call it a 48 MIP  
11 pass-through bay station out there, we can put  
12 about 600 subscribers based on the data we've got  
13 today. That's a pretty compelling story for us,  
14 and, yes, it seems to work. I think we're pretty  
15 happy with it right now.

16 MR. CURTIS: Do you both find that you  
17 are over building on top of some other broadband  
18 technology some of the time, all of the time, none  
19 of the time? Or is it pretty much deliberately  
20 none of the time? How do you think about that?

21 MR. EVANS: It's varied for us. There  
22 have certainly been markets where there's been no

1 one around and, as you would expect, penetration  
2 of those markets -- we had three markets where  
3 there was no one there. These were cities of  
4 roughly 1,000 people. We went to 12 percent  
5 household penetration in less than 60 days.

6 And then in other areas we've overbuilt  
7 a DSL provider that covered call it 50 percent of  
8 the household coverage that we had. And, frankly,  
9 we've gone into cities where there was a cable  
10 provider there as well as a DSL provider, and  
11 while we certainly didn't see 12 percent  
12 penetration overnight, we've been very steady  
13 about picking up 6 to 7 percent penetration on an  
14 annual basis in that environment even.

15 So, we feel like we've sort of looked  
16 the lion in the face and have been okay.

17 MR. CURTIS: And are you seeing that as  
18 new customers to broadband or are you actually  
19 taking -- are you --

20 MR. EVANS: It's been a little bit of  
21 both. You know, while DSL is prevalent in a lot  
22 of rural markets, I mean, candidly, there's a lot

1 of bad DSL that's out there, and DSL that's  
2 advertised at 1.5 MIPs is the maximum throughput.  
3 As you get farther and farther away from that  
4 central office, we've seen DSL speeds that cap out  
5 at 256K. And those customers have been -- it's  
6 been very easy to cherry pick those guys off the  
7 edge of their network until you get closer to  
8 their CO where, you know, their speeds are closer  
9 to a MIP and a half. That's not as compelling a  
10 story for them to make the switch, but there is a  
11 tremendous amount of bad service out there. And,  
12 frankly, we've had a lot of luck with  
13 point-to-point guys that are out there that -- I  
14 think point-to-point technology, on its own, is  
15 pretty good.

16 It seems to work, but a lot of very  
17 small-scale providers out there that simply don't  
18 have the talent and resources to manage it and to  
19 manage some of the spectrum interference issues,  
20 with a pretty bad customer experience. And so  
21 we've been able to pick up a lot of that business  
22 as well.

1                   MR. ZIMMER: I would definitely agree.  
2                   You know, in our markets, we don't try to compete  
3                   with DSL and cable. I mean, quite frankly, we  
4                   can't do that. You know, we can't deliver what  
5                   they can deliver, but, again, in our rural areas,  
6                   we go where DSL and cable aren't. We go to those  
7                   areas where their plant ends. So, yes, we pick  
8                   off a few customers, but our focus is really  
9                   outside of those DSL and cable plants.

10                  MR. CURTIS: Nese, looks like you had a  
11                  question?

12                  MS. GUENDELSBERGER: Yeah, I actually  
13                  want to go back to what you were saying about a  
14                  huge cell site, how many subscribers you can  
15                  accommodate, and you gave numbers, about 60  
16                  subscribers, 600 subscribers, and how does the  
17                  number of subscribers and the amount of spectrum  
18                  you use, and the cost of providing service in  
19                  relation to the speeds you can provide to each  
20                  customer. And, I mean, what's the --

21                  MR. EVANS: Sort of the overall  
22                  relationship.

1 MS. GUENDELSBERGER: Yes.

2 MR. EVANS: I mean, obviously, you can  
3 go higher than 600 subscribers, but what we shoot  
4 for is an average throughput experience of around  
5 2 MIPs on the downlink side, is sort of how we  
6 model it. And so, when you factor that into 600  
7 subscribers, that would be taking a full 20  
8 megahertz of spectrum, so 2 carriers with HSPA+,  
9 and the 48 MIP, you know, capability that  
10 basically using those 2 carriers to get 48 MIPs of  
11 throughput and then using sort of a standard, you  
12 know, 10:1 or 20:1 over subscription rate that you  
13 would use with any other technology, those are the  
14 numbers that we come up with.

15 So, what we would -- that number  
16 represents is about 600 subscribers enjoying an  
17 average experience of about MIPs of downput.

18 MS. GUENDELSBERGER: And for the back  
19 haul?

20 MR. EVANS: Back haul. We don't have a  
21 problem with back haul because we're using 300 MIP  
22 microwave off of those cell sites, so I've got

1 plenty of back haul capacity to go back. So  
2 there's no issue there.

3 Really, my throughput issue right now is  
4 at the bay station and what I can get through the  
5 bay station.

6 MR. LEIBOVITZ: I have a question for  
7 Tom. So you had a chart out that showed Verizon  
8 Wireless footprint, 280 million POPs, which  
9 implies there's 20 million POPs uncovered. I  
10 assume a lot of that you just don't have license.  
11 But I guess my question for you generally is, what  
12 would it take for Verizon Wireless to go for the  
13 last 20 million POPs?

14 MR. SWANOBORI: Okay. So when I showed  
15 the chart, we do cover over 280 million POPs,  
16 actually closer to 284 today throughout the United  
17 States. We don't have licenses in Alaska today,  
18 so that's, I think, on the order of 4 million, at  
19 least with spectrum that we're allocating for  
20 EVDO. So, you know, we'll continue to look at  
21 that.

22 We do cover a lot of rural areas today.

1 I think the rate on there was quite prevalent  
2 throughout the United States. So we're continuing  
3 to look at those rural areas where it makes sense  
4 to deploy economically, look at the same factors  
5 some of the other panelists mentioned in terms of  
6 how can we economically get into these areas. The  
7 cost of equipment is getting lower, but there are  
8 still the issues of getting on to towers,  
9 economically having low rents, being able to get  
10 up there quickly, and also to be able to cost-  
11 effectively deploy back haul.

12 So those are some of the considerations  
13 that we're looking at in terms of expanding the  
14 footprint.

15 MR. CURTIS: So, on the back haul piece,  
16 we heard this morning, there's only about 10  
17 percent of cell sites have fiber back haul. Does  
18 that sound right to everybody generally?

19 MR. SWANOBORI: I'd argue it might be  
20 even less than that.

21 MR. CURTIS: Less than that. And then,  
22 question that, not surprisingly, the wired guys

1 didn't know the answer to this morning was any  
2 idea of the remaining let's call it 90 percent,  
3 how much has microwave?

4 MR. SWANOBORI: I don't know.

5 MR. CURTIS: You guys are the wireless  
6 guys.

7 MR. RAY: I wouldn't agree with the 10  
8 percent number.

9 MR. CURTIS: You think it's lower?

10 MR. RAY: No, I think it's becoming  
11 higher. And, you know, be that fixed Ethernet  
12 delivery in one form or another over fiber, over  
13 coax, whatever it might be, you know, we are  
14 seeing economic forces work in major metro areas  
15 where that is starting to change. So if I look at  
16 our 3G footprint today, we are certainly moving  
17 to, you know, a fiber back haul solution  
18 environment which is significantly greater than 10  
19 percent. And I think that competitive forces work  
20 in metro areas where there's a lot of fiber, be  
21 that from the utility company, from the cable  
22 company, from the existing, you know, telco

1 provider. So, I think market forces are starting  
2 to work there.

3           You know, those challenges do become  
4 tougher, much tougher, as you start to thin out in  
5 terms of POP density. So as you move to suburban  
6 fringe and rural areas, those opportunities are  
7 much tougher to find, but there are good microwave  
8 solutions, as Ed's mentioned, and some carriers  
9 are totally deploying their back haul solutions on  
10 a microwave basis. So, I strongly disagree with  
11 the 10 percent number.

12           MR. CURTIS: Okay.

13           MR. RAY: In terms of our sites.

14           MR. MacLEOD: Yeah, we're looking at  
15 more in the 16+ range, 16 percent plus, in the  
16 cell site estimation that we've done and with  
17 regard to fiber to the cell site. Obviously, a  
18 lot of the carriers now are moving to Ethernet,  
19 and wireless is definitely a solution, but  
20 typically only where you can't get fiber or  
21 high-speed Ethernet solution. So, consequently,  
22 the back haul issue is coming to the forefront

1 with the advent of LTE. So, as soon as you see  
2 LTE come on to the landscape, you're going to see  
3 all the carriers prepared, hopefully, for the back  
4 haul, because it will be a significant issue.

5 MR. CURTIS: Will microwave work for  
6 LTE, do you all think?

7 MR. SWANOBORI: There are microwave  
8 solutions of significant bandwidth which will  
9 support LTE and other fourth generation  
10 technologies.

11 MR. MacLEOD: But, again, the ultimate  
12 solution is fiber to the cell site. If you look  
13 at some of the foreign countries we deal with a  
14 lot, they're north of 90 percent fiber to the cell  
15 sites. And by "cell sites" you're also talking  
16 about rooftops, water towers, you know, things  
17 like that. And as we migrate more and more, the  
18 mantra with any engineering community within the  
19 site or the wireless realm now is get the signal  
20 in the ground as quickly as possible because your  
21 weakest link -- wireless is simply a wired system,  
22 and the only wireless part of it is between the

1 antenna and the user device. That's it. And  
2 that's the most unstable link in the entire  
3 budget. So, you want to get that signal in the  
4 ground, in fiber, as quickly as possible. And if  
5 you have to use wireless microwave to get there,  
6 do it, but do it in the most expeditious manner  
7 because that's the most unstable part of your  
8 entire system. That's what causes the problems  
9 and that's what limits your bandwidth as well.

10 MR. CURTIS: Great.

11 MR. PONTE: I'd like to just jump in. I  
12 mean, that's why, in Lemko's view, if you look at  
13 what will happen with SAE phase 2 implementation,  
14 you're actually bringing the Internet out to the  
15 cell site, so the back haul itself, in terms of  
16 the need to haul this traffic back to a central  
17 point, is really diminished. That's where these  
18 networks need to go, not do all the massive  
19 engineering and work to continue to haul all this  
20 data back to a core network point.

21 MR. CURTIS: Got it.

22 MR. BYE: And if I could add, in fact,

1 the network that we're building today is all  
2 IP-connected to every cell site that we're  
3 deploying, and within the market that we're  
4 building, we're essentially connecting most of the  
5 cell sites with fiber, but there are the odd  
6 exception even with our infrastructure where we  
7 would use microwave to pick up a couple of the  
8 cell sites. But it's essentially all IP,  
9 fiber-connected, and it allows us the scalability  
10 as the bandwidth grows. And as we move to 4G, we  
11 want to remove that bottleneck on the back haul.  
12 But it's still, you know -- there is still an  
13 issue around the spectrum and available spectrum  
14 capacity as that traffic and the data growth grows  
15 on that wireless last link.

16 MR. SHAW: Got it. If I could just make  
17 a comment. According to my understanding, that is  
18 one of the key building points in the telstrip  
19 roll out that they're doing in Australia as well  
20 on their next G network is essentially to have a  
21 key focus on -- in the rural areas take the  
22 essentially Ethernet over microwave, but then get

1       it onto the fiber as fast as possible. So that's  
2       been one of the central themes of their build out  
3       is to have that back haul metric, in fact, taken  
4       care of, you know, the abilities and the  
5       capabilities that are going to be sought and are  
6       sought from the network.

7                   MR. CURTIS: Jake?

8                   MR. MacLEOD: One of the things that  
9       you're going to see in the future with regard to  
10      the LTE deployments is a much, much lower  
11      radiation centerline, which means the center of  
12      the antenna is going to be lower in order to get  
13      that antenna closer to the user device so that you  
14      can maintain some semblance of stability. So  
15      you're going to see migration from -- there's  
16      always going to be a need for towers, big boomer  
17      towers, but you're going to see more and more  
18      rooftops, street furniture, like lampposts and bus  
19      stops and things, that are going to contain  
20      concealed antennas. So you're going to see that  
21      more and more as we get higher and higher  
22      bandwidth transmitted through the system. That's

1 the only way is to shorten that wireless link.

2 MR. CURTIS: Got it. Pushing further on  
3 the wireless/wireline substitutability, I guess  
4 particularly for Tom, Neville, and Stephen, are  
5 you guys seeing in terms of the cross-elasticities  
6 of, you know, wireless, wireline? Particularly  
7 Tom in your DLS markets, are you seeing people  
8 drop DSL and going to, you know, 3G for broadband?  
9 And as your planning around LTE, what are your  
10 business assumptions around that?

11 MR. SWANOBORI: Okay. So with regard to  
12 the fixed versus the mobile, we are seeing -- you  
13 know, we have both DSL and fiber networks, so  
14 we're clearly seeing customers who still want and  
15 desire DSL capabilities. And I think one of the  
16 other panelists mentioned that they have DSL  
17 capabilities today, those serve most of their  
18 needs. Clearly when we have fiber optic  
19 offerings, those are preferred by many customers  
20 for the video capability as well as the broadband  
21 capabilities. I think, you know, the wireless  
22 mobile broadband really complements that, so

1 people -- most people want to be able to move,  
2 have their broadband on the go, to be able to be  
3 portable in their laptops and in their PDAs. So I  
4 think most of our customers utilize that as a  
5 complement, so they're using both.

6 MR. CURTIS: So, you don't get the  
7 feeling in your footprint that you're getting any  
8 substitution from your wireless -- or your DSL,  
9 let's call it your lower-end DSL, on to your  
10 higher speed wireless?

11 MR. SWANOBORI: I think it is starting  
12 to occur and it will probably happen more over  
13 time as these networks get more and more robust  
14 and, you know, in terms of both build out coverage  
15 and in terms of performance.

16 MR. CURTIS: Neville, do you have any  
17 sense as to whether you're taking lower-end wired  
18 broadband subscribers and moving them on to a  
19 wireless network?

20 MR. RAY: Yes, I mean, I think some of  
21 that is starting. I mean, if you compare the  
22 number of customers migrating for mobile data,

1 mobile broadband, compared to voice, I mean, it's  
2 a significant difference in orders of magnitude at  
3 this point in time. But if you look at the types  
4 of offerings that are now out there, be it net  
5 books, data cards, data sticks, I think you'll  
6 find there's a generational thing where a lot of  
7 younger people are perfectly happy and want a  
8 mobile data-connected device. That may not be a  
9 substitution argument, necessarily, but I think  
10 that's going to grow over time, especially as you  
11 see more and more capable wireless networks.

12 I mean, you know, the comment Ed made  
13 earlier on about, you know, mobile broadband can  
14 serve the lion's share of applications and  
15 services that customers demand from broadband.  
16 There's this, you know, higher end HDTV, those  
17 types of things, and there are a slew of other  
18 ways to get those types of services if you need  
19 them. But mobile broadband can satisfy -- and the  
20 mobile broadband we provide, others provide, can  
21 satisfy a significant amount of the consumer need  
22 for broadband.

1           So, I look to -- you know, we track some  
2 of the data ongoing in Europe, for example, and  
3 countries like Portugal you see a significant  
4 substitution of DSL-type services with wireless  
5 solutions. And it is ongoing in many European  
6 countries today where, you know, the DSL services  
7 today are okay, but the wireless services are as  
8 good, if not better, so you see that trend  
9 starting to grow and continue with momentum. And  
10 I think it will continue on, there's no doubt.

11           MR. CURTIS: Stephen, what are you  
12 seeing?

13           MR. BYE: Yes, I mean, it's a great  
14 question and I think, you know, as we look at it,  
15 there's really kind of three points to consider.  
16 One is the geography. I think there's a dynamic  
17 that happens within a metro market where there is  
18 clearly a choice that the customers can make. You  
19 know, a customer can choose to make it a  
20 substitute if they see the value in mobility over  
21 the effective raw bandwidth that you get now, sort  
22 of a cable modem service, and, you know, if

1 they're looking for a high speed, they can get  
2 that in the home. If they want the value of  
3 mobility, there's a premium associated with that  
4 today and they're willing to pay that.

5 I think -- so there's a customer need  
6 that drives that and we see it as, you know, for  
7 us at least, being in a position to service that  
8 need regardless of whether they see it as a  
9 complement or a substitute.

10 I think as you get further out, though,  
11 and you start talking about rural markets, there  
12 isn't necessarily a complement or a substitute  
13 argument because it may be the only way that they  
14 can get broadband. So I think it plays out a  
15 little differently across those dynamics.

16 I do think there's also, you know, in  
17 that sort of speed versus mobility, sort of an  
18 equivalency check. And I think what's interesting  
19 is if you look at the voice market and as that has  
20 approached saturation, it wasn't so long ago that  
21 there was a premium associated with the mobility  
22 aspect of voice. And as that premium has come

1 down and come closer to the sort of the wireline  
2 pricing model, it's clearly showing that, you  
3 know, customers are looking at that as a viable  
4 option to their fixed-line voice service. And  
5 perhaps over time as, you know, the capacity of  
6 the mobile broadband Internet access can grow, and  
7 depending on the pricing and the cost structure,  
8 you know, there may be an equivalency argument in  
9 the future.

10 MR. CURTIS: Anybody else want to jump  
11 in on this?

12 MR. SHAW: I would just support the  
13 statements that Stephen was making because if you  
14 observe in some markets where the price points  
15 have come down, what we have observed is not  
16 necessarily a substitution in the home, but it's  
17 more an extension in terms of the subscriber base,  
18 but driven out of the usage of net books, where  
19 the net book is now starting to be a human network  
20 interface out in the mobile environment. It's  
21 starting to become, actually, a primary interface  
22 that folks are using and there's some very good

1 examples in Sweden where, you know, there were, I  
2 think, some interesting price points that were set  
3 in the market to really stimulate and get the  
4 service going and where it has taken off and it  
5 can and has proven to be a real and viable  
6 alternative, usable alterative.

7 MR. CURTIS: Yeah, Jake?

8 MR. RAY: Just from a personal  
9 perspective. I've got four kids that don't own a  
10 landline, full stop. They never have, looks like  
11 they never will. So, you know --

12 MR. CURTIS: Who knew?

13 MR. RAY: But they live by that cell  
14 phone.

15 MR. PONTE: Yeah, I'll just add, I mean,  
16 we live in an information-driven society, I mean,  
17 and look at all the networking applications out  
18 there and people want to know what's happening all  
19 the time. What's happening with their friends?  
20 What's happening with their family? I mean, the  
21 dynamic of college kids taking phones to campus  
22 with them completely wiped out colleges having

1       wired telephones, and they talk to their parents  
2       four times, five times a day. I mean, if I talked  
3       to my parents when I was in college four or five  
4       times a semester, that was a lot, right? And so  
5       it's just going to be natural, just as with voice,  
6       that people are going to leave the house, leave  
7       their office, and they're going to want to have --  
8       it's been said -- 95 percent of what they can do  
9       at their desk or in their home to take it with  
10      them. It's just going to happen.

11               MR. LEIBOVITZ: I have to follow up with  
12      Ed on this point. I mean, you made a business  
13      choice to offer a device that is not a mobile  
14      device. It's wireless using a cellular network.  
15      I was wondering if you could maybe just talk a  
16      little bit about the drivers of that decision. Is  
17      it link budget? Is it just the offering you're  
18      trying to provide?

19               MR. EVANS: Well, yes, there were  
20      several factors that went into it. First and  
21      foremost is that there were six guys out there  
22      doing voice in just about every market. You know,

1 I just don't believe the world needs another voice  
2 provider. We've kind of got that figured out and  
3 everybody's doing a great job with it. So, we had  
4 spectrum that was sitting out there and we said,  
5 okay, what do we want to do? Well, what we wanted  
6 to do was provide broadband to rural residents who  
7 don't have it today, and if we went out there with  
8 a traditional high mobility, wireless product, we  
9 were very concerned that we were going to get  
10 lumped into sort of that wireless bucket. And  
11 until recently, the wireless mobile experience,  
12 broadband experience, hadn't been very good. It's  
13 getting significantly better now with the  
14 technologies that are coming out, but we were very  
15 concerned about being sort of lumped into that  
16 previous experience, you know, I tried a card here  
17 once and I didn't like the speed sort of thing.  
18 And, in fact, we found that going into the markets  
19 pretty early, we marketed under the name of  
20 Stelera Wireless initially when we went into the  
21 markets, and quickly found out that people were,  
22 in fact, lumping us back into sort of a

1 traditional wireless play.

2           So, in future markets we actually  
3 launched under Stelera Broadband and took wireless  
4 out for a couple of reasons. One was that the old  
5 cellular experience that people may have had on a  
6 data card, but we were also getting lumped in with  
7 the point-to-point microwave guys, which were a  
8 wireless experience that wasn't very good as well.  
9 And so by sort of taking that out and saying, no,  
10 we're not -- don't think of us as a wireless  
11 provider, we're a broadband provider that just  
12 happens to deliver over a pretty stable wireless  
13 platform, that was the thinking that basically  
14 went into it is we wanted to look like a DSL  
15 provider or a cable modem provider out of San  
16 Antonio. Even though you're in Floresville,  
17 Texas, which is 30 miles south and you don't have  
18 DSL and you don't have cable, here's a box that  
19 you're familiar with because you've seen it in  
20 everybody else's house and you saw how that  
21 worked. Well, ours does the same thing, you just  
22 don't have a coax or an RJ45 cable, RJ11 cable

1 going in the back of it.

2 MR. LEIBOVITZ: So is it purely a  
3 marketing choice --

4 MR. EVANS: It really was.

5 MR. LEIBOVITZ: -- or is there an  
6 engineering advantage to it?

7 MR. EVANS: Well, there is an  
8 engineering advantage in that we are flat IP all  
9 the way through, so we're long haul Ethernet on  
10 the microwave. We don't use any circuit switch  
11 connections whatsoever, so we are pure IP all the  
12 way through the thing from the beginning to the  
13 core. We've actually deployed what's called an  
14 IHSPA technology. It's a variant that is flatter  
15 and takes out some elements from the core. I  
16 don't have an RNC as an example, which improves my  
17 latency quite a bit.

18 So, it really was -- it was a technology  
19 choice because we wanted to look as much like a  
20 true DSL or MSO type solution as we possibly  
21 could. And then there was also a marketing  
22 element to that as well, that we wanted the

1 consumer to be somewhat familiar with the  
2 traditional ways of receiving broadband and  
3 accepting that.

4 MR. CURTIS: What would be the  
5 challenges of layering voice on top of the way you  
6 deliver the data?

7 MR. EVANS: You know, there really --  
8 there is no challenge today in delivering Voice  
9 Over IP. Now, when we originally deployed the  
10 network, the IHSPA variant wasn't available, so it  
11 was a traditional HSPA network that was out there.  
12 Latency was running 300 to 600 milliseconds across  
13 the network and so Voice Over IP solutions,  
14 irrespective of which one, would be a little  
15 choppy and really didn't sound very good.

16 Now that we're sub-100, those  
17 applications sound great today and they work fine  
18 and they're stable and they work, so putting  
19 Vonage or MagicJack or anything across the  
20 network, it's fairly thin. It doesn't take up a  
21 lot of capacity on the network and it seems to  
22 work very well.

1                   So by the end of this year we're  
2 actually working on -- we will deploy a Voice Over  
3 IP solution to compete with the local telephone  
4 companies, actually out in our markets by the end  
5 of this year.

6                   MR. BYE: Let me add something. I think  
7 it's interesting because, John, I thought where  
8 you were going was kind of the device. Because  
9 what's interesting is, is you drive higher  
10 bandwidth into a device, the battery consumption  
11 and the power consumption of the device goes up.  
12 And so if you look at a lot of devices today,  
13 running a sustained 10 megabit per second stream  
14 down to the device will chew through the battery.

15                  MR. EVANS: Sure.

16                  MR. BYE: And so, that is a  
17 consideration as we go forward if mobile broadband  
18 access is, is the device there, can it be fixed,  
19 do you have portability, where's the battery  
20 technology going, and can that keep up with sort  
21 of the demand for the consumption of data  
22 services. So I think that's a consideration that

1 oftentimes is sort of ignored as we talk about the  
2 network.

3 MR. EVANS: I think it's a great point.  
4 We've certainly seen that with laptops where we do  
5 have the data sticks that are out there as well.  
6 And those consumers have seen that when they go  
7 mobile on it, and they are pulling down 7, 8, 9  
8 MIPs, it starts chewing up some power. That's a  
9 great point.

10 MR. CURTIS: Steve, do you want to jump  
11 in?

12 MR. ROSENBERG: Yes, Neville, you said  
13 something pretty interesting a little while back  
14 about broadband being able to handle today's  
15 application -- wireless broadband -- and a lot of  
16 you have talked about the increases in speed that  
17 are coming with improvement in technology. At the  
18 same time, there's a little bit of a race going on  
19 as the usage requirements are likely to go up;  
20 unclear what those are going to look like. But if  
21 you take an example like telemedicine, where it's  
22 not hard to envision the desire to have a

1 streaming connection or large file sizes or both,  
2 as you think about the challenges that that  
3 presents to mobile networks or fixed wireless  
4 networks, how do you think about architecting the  
5 network differently? You can't obviously split  
6 cell sites indefinitely, so what do you think  
7 about your ability to serve those kind of uses?  
8 How do you think about the architecture  
9 differently? And what are the sort of things that  
10 could break that bottleneck?

11 MR. EVANS: Well, I think the biggest  
12 challenge that we have is the pricing model that  
13 we have in place. There is no other utility that  
14 we get, be it water, electricity, long-distance  
15 telephone service, where it's unlimited,  
16 all-you-can-eat for a fixed rate. Everything is  
17 metered. And, you know, it's a fact of life that  
18 it takes a lot of capacity to move these larger  
19 applications through. At some point in time,  
20 we're going to have to revisit what we charge, be  
21 it for telemedicine applications or -- it can be  
22 through DPAC inspection, it could be through a

1 number of different ways of getting there, but  
2 you're going to have to look at the amount of  
3 traffic coming across that network and be able to  
4 charge proportionally for it.

5 For guys -- you know, we have people who  
6 use a few megabits a month and pay the same thing  
7 as a guy that's using 10 gigabytes of throughput a  
8 month. That's probably not fair. But we do  
9 today, the way it's structured, and it is what it  
10 is today and we're not going to change it, but  
11 technology is certainly evolving where we are  
12 talking about HSPA getting to 14.4 MIPs a few  
13 years ago and thought, wow, that's really great.  
14 Now we're talking about 84 MIPs when you get to  
15 HSPA+ and going on, so I think technology  
16 continues to evolve. The various elements of  
17 getting the back haul through continues to evolve  
18 and, hopefully, that keeps up with it. But at the  
19 end of the day, there isn't an unlimited resource  
20 of capital dollars to be put into the ground and  
21 you're going to have to be able to charge  
22 disproportionately for the amount of bandwidth

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1 being consumed.

2 MR. CURTIS: To me that raises a broader  
3 question. I love the direction this is going and  
4 I guess a question would be strategies, things we  
5 should think about to maybe handle it. Can you  
6 guys talk maybe a little bit about the shape of  
7 your cost curve and how that's moving relative to  
8 the shape of your demand curve?

9 The sense is that, you know, as you're  
10 making the wireless broadband available, you're  
11 seeing a, you know, significant uptake in MIPs  
12 across your network. Just curious if cost to  
13 providing those MIPs is falling relatively  
14 consistently so that your supply-and-demand curves  
15 cross at the same point or if one's moving faster  
16 than the other and, you know, how you think that  
17 might affect your future and decisions you're  
18 going to make spend. Does that make sense?

19 MR. RAY: So, I mean, I think there are  
20 a ton of variables in terms of, you know, that  
21 cost curve if I look at our network today. And I  
22 don't think our network is dissimilar from the

1 other major providers in the U.S. I mean, one of  
2 the key challenges from a cost perspective is the  
3 back haul piece that we talked about. You know,  
4 if you look at incremental cost for serving, you  
5 know, more data, but just jumping back a bit to  
6 some of Ed's comments, the only piece I would add  
7 is the significant bottleneck I see out there over  
8 time is spectrum, and I think the industry, both  
9 carrier and vendor alike, has done, you know, an  
10 incredible job. Jake mentioned, you know, GPRS  
11 wowed our socks, you know, seven, eight years ago.  
12 We're talking about stuff now which is so capable  
13 none of us really -- if we all admitted, sat  
14 around here, this table, would say we even dreamed  
15 about 10 years ago. Somebody did somewhere. So,  
16 the capability from a radio throughput is immense  
17 compared to where we were.

18 If you look at LTE, IMT Advanced, and  
19 what's happening from there on out, so -- and  
20 we're doing that at ever reducing costs from an  
21 infrastructure perspective, so that is less of the  
22 worry, I think, from a cost perspective.

1           But if you look at key variable costs in  
2 the network, back haul today is a big challenge.

3           I think we're all attacking that in  
4 different ways. I mentioned the T-Mobile plan is  
5 to get fiber to everything we can because we think  
6 that future-proofs the network and moves us into a  
7 cost structure very early on which enables us to  
8 grow our customer base and that growing demand you  
9 mentioned, I mean, effectively over time. But I  
10 feel confident about all those pieces. But if I  
11 come back to Steve's question around, you know,  
12 some of these -- the ever burgeoning growth on  
13 heavy data-consuming applications, I feel good  
14 from a technology perspective, but I don't feel  
15 good from a spectrum perspective. And if you look  
16 at, you know, your available spectrum in the U.S.  
17 today, even, you know, in the 700 bands that we're  
18 not in as T-Mobile, there's not a lot of spectrum  
19 out there. And you compare and contrast that to  
20 other parts of the world, I think it's a  
21 significant issue for the U.S. economy and the  
22 U.S. consumer.

1           So that, to me, is kind of the gray  
2 cloud over the whole thing. You know, one of  
3 those that we need to move away, we need more  
4 spectrum to not just address capacity and  
5 applications and growth and so on, but back to one  
6 of the earlier discussions, if you look at rural  
7 America for us in the 1,900 megahertz, primarily  
8 -- primary operator, you know, 700 and 850  
9 megahertz spectrum is in a few hands in this  
10 country today. You know, there's very little of  
11 it. And if you look at, you know, the Telstar  
12 story, which I'm -- Roland mentioned, I'm very  
13 familiar with, you know, massive continent, 95  
14 percent of the POPs are covered there, you know,  
15 with 900 megahertz spectrum and some good  
16 technology. Great, but there is not enough of  
17 that spectrum available in enough hands in the  
18 U.S. today.

19           MR. CURTIS: Tom, what's your take on  
20 the spectrum cost curve/demand curve issue? So,  
21 more broadly, cost/demand curve and then  
22 specifically spectrum as a driver?

1                   MR. SWANOBORI: Right, so the demand  
2 curves are going up significantly, as we've seen  
3 both in Neville's slides and in others. And I  
4 think consumers continue to want to consume more  
5 and more bandwidth as there's more and more  
6 applications, there are more and more devices that  
7 are prevalent and so forth. As Neville and others  
8 mentioned, the cost curves for equipment are  
9 coming down, so there are still some other  
10 barriers or challenges in terms of, number one,  
11 the spectrum, and we are a 700 megahertz spectrum,  
12 but we still -- when you look far into the future  
13 and you see the insatiable demand that consumers  
14 want for these services, you do see, you know,  
15 that there's more spectrum needed.

16                   I think -- I don't know if was John or  
17 Steve, you asked a question about we're going to  
18 need to put more microcells and small cells into  
19 locations in order to be able to serve both, you  
20 know, the locations that people want to be able to  
21 utilize these services and to provide the  
22 additional capacity. So we're going to need

1 expedited rules. We can't -- things are getting  
2 harder to get towers in many locations, not  
3 necessarily in rural, but in many of the areas of  
4 urban and suburban where neighborhoods really just  
5 don't want those. So, you know, expedited tower  
6 rules, spectrum policies and flexibility there, I  
7 think are going to be key.

8 And then we're going to push, you know,  
9 with others as -- to get fiber to the cell site  
10 and microwave solutions. I think technology will  
11 keep working with the industry to help advance  
12 things as far as they can go.

13 MR. CURTIS: Okay, we have an online  
14 question from somewhere out there. "In a spectrum  
15 unconstrained world, to follow up on this theme,  
16 how much spectrum would be required to allow  
17 wireless to compete with wireline broadband?"

18 MR. BYE: I was going to say -- I'm not  
19 sure of the exact answer, but I do like to draw a  
20 contrast internally, at least, as we talk about  
21 spectrum and availability. As a holder of 700 as  
22 well as AWS spectrum, we only have 20 to 32

1 megahertz in each of our markets and, you know, as  
2 sort of a sanity check, we have 750:1 gigahertz on  
3 our cable plan. So, if you look at sort of the  
4 full suite of services, albeit including HD and a  
5 lot of other content that we provide down that  
6 coax (inaudible) to the home, you know, we have  
7 that order of magnitude. So if you look at 32 as  
8 a percentage of that, it's relatively small.

9           But, you know, coming back to a little  
10 bit of the comments, just to echo on the panel,  
11 you know, it's really kind of a tradeoff between  
12 how much spectrum you have available and how far  
13 you have to push the cell site down towards the  
14 home and, you know, you really need to tackle both  
15 of those. One is the spectrum availability and  
16 access. I think another important point as you  
17 look at the spectrum availability and access is to  
18 make spectrum available that is close to or  
19 adjacent to existing bands. Introducing new bands  
20 can create a challenge as you're deploying a  
21 network and you look at your grid sites and your  
22 spacing, so the adjacency to existing bands, I

1 think, is a benefit because we can leverage the  
2 ecosystem that exists around those bands as well  
3 as the existing infrastructure that we've put in  
4 place.

5 I think the other point is around sort  
6 of getting access to sites and sites quickly and  
7 the zoning and the permitting. And actually to  
8 Jake's comment earlier, you know, we're looking to  
9 get on utility poles and bringing the network down  
10 a layer so we're not so dependent on sort of macro  
11 sites, but that introduces another set of  
12 challenges. We look to pole attach and getting  
13 antennas onto street lights and the like. So, I  
14 didn't answer the question specifically, but,  
15 hopefully, I gave some context for that.

16 MR. CURTIS: Good. Jake?

17 MR. MacLEOD: To follow up with  
18 Stephen's comments, you know, everybody  
19 understands what NIMBY is -- Not In My Back Yard  
20 -- but there have been two additional  
21 organizations created. One is NOPE. It stands  
22 for Not On Planet Earth. And so if you get

1       helpless with that -- and the other one is CAVE,  
2       Citizens Against Virtually Everything.

3               So there's a lot of resistance to new  
4       builds of lattice towers and monopoles.  And I've  
5       spoken at numerous universities challenging them  
6       to come up with cellular art of some sort that  
7       would be -- or wireless art, that is a nice  
8       looking antenna structure that no one would object  
9       to.  And so we've got to move away from -- I've  
10      been in this business over 30 years and we're  
11      still building the same doggone lattice towers  
12      that we've been building -- we built back in the  
13      early days.  So we've got to move away from that  
14      and that's a national challenge, I guess.

15              MR. ZIMMER:  I'd like to comment.  In  
16      our rural area, we also see the, you know, the  
17      insatiable appetite for bandwidth, and as soon as  
18      we add more to our network it gets gobbled up as  
19      quick as possible.  But, you know, to say that  
20      we're going to put stuff on light poles and all  
21      that stuff, you know, in the middle of a country  
22      section where there's nothing but cornfields,

1       there's no light pole in the middle of that. And  
2       I think Ed has a little bit of a flavor for rural  
3       America because it sounds like he's delivering to  
4       some of those, but I would challenge that the rest  
5       of the panel really wouldn't be interested in the  
6       customers that we serve, and, you know, we don't  
7       have Verizon, T-Mobile, Cox Communications. None  
8       of those are available in a lot of the areas that  
9       we service.

10                So, we need spectrum management. We  
11       need to do it wirelessly because fiber just  
12       doesn't make cost-effective sense if you're going  
13       to bring it out to, you know, maybe 10,000 people  
14       in a county. So spectrum management is key.  
15       That's how we see the future of our business. I'm  
16       not naive enough to think that it won't be a  
17       mobile solution someday, but I think we're going  
18       to be a few years behind Washington, D.C., or  
19       Oklahoma City or even some of the larger cities.

20                So, I think those are real key issues,  
21       spectrum management and, you know, coming up with  
22       a wireless solution for truly rural America.

1                   MR. MOFFETT: I would like to follow on  
2                   to Scott's comments about spectrum out in rural  
3                   America because I think -- while I completely  
4                   agree that the country as a whole is in need of  
5                   additional spectrum, one of the concerns that I  
6                   have that's out there, that if we were to go on a  
7                   county-by-county basis and ask every carrier to  
8                   report where spectrum is actually lit versus  
9                   warehoused, I think it would scare the heck out of  
10                  us. Because I would argue that in a very large  
11                  geographic part of this country that is very  
12                  rural, a tremendous amount of the spectrum that we  
13                  have put out on the street is not being used and  
14                  is not available to those who want to use it.  
15                  Now, I would also argue that that's not the fault of  
16                  the larger carriers because when we began the idea of  
17                  economic areas and REAGS and large swaths of spectrum,  
18                  the idea was to give a carrier a chance to go in and  
19                  have a very large geographic footprint. It made  
20                  perfect sense. The unintended consequence of that is  
21                  that if T-Mobile -- and I'll use you as an example not  
22                  -- because they're good friends and I don't think

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1 they'll yell at me -- you know, if T-Mobile needed  
2 additional spectrum in San Antonio, Texas, they were  
3 required to buy a swath of spectrum down there in a  
4 REAG that covered an incredible amount of rural area  
5 that candidly, they probably are never going to build  
6 out.

7 Now, then you say, well, why wouldn't they just  
8 disaggregate that and sell that to me? Well, the  
9 average price of spectrum in the AWS auction was 47  
10 cents per megahertz per POP. I paid about 10 cents  
11 per megahertz per POP in my licenses because they were  
12 rural-specific CMAs that were out there that have much  
13 less value than what San Antonio would have to him.  
14 What would incent T-Mobile to sell me spectrum at 10  
15 cents per megahertz a POP when they spent an average  
16 of 47 cents? So, I completely understand where the  
17 large carriers are right now, but I would challenge  
18 the Commission that as we go forward and we put  
19 additional spectrum out there, we need to incent the  
20 larger carriers to trade or do something so that the  
21 stuff they're not going to use -- and their models  
22 don't work for that -- that's fine, let's get that in

1 the hands of somebody who will and give them access to  
2 stuff that they are going to use in the more populated  
3 areas. Because I think that is critical to long- term  
4 viability of wireless in this country, but we do have  
5 an extreme shortage of spectrum and we've got to find  
6 a way to do it.

7 MR. PONTE: I'd like to jump in on that,  
8 too. We've had a number of our customers in the  
9 rural markets tell us that the rule change in this  
10 secondary market ruling in 2004 to tighten down  
11 leasing for spectrum actually had the unintended  
12 consequence of making spectrum more difficult to  
13 get versus under some of the spectrum manager  
14 agreements that were made prior to that, that  
15 that's actually made it more difficult for rural  
16 carriers to get access to spectrum from the major  
17 carriers who wouldn't necessarily be deploying in  
18 these areas.

19 MR. CURTIS: John, I think you had a  
20 follow-up?

21 MR. LEIBOVITZ: Actually, my question  
22 was along those lines. I was just wondering if --

1     you know, what your experience has been with the  
2     secondary market's rules? Are you leasing  
3     spectrum? What have been the barriers? That's  
4     your point, there's a lot of spectrum out there in  
5     rural America right now.

6             MR. EVANS: There is, but it's a very  
7     difficult capital markets proposition to go to  
8     market and attempt to raise capital. And I've  
9     raised \$5 billion on Wall Street in the last 10  
10    years with a couple of public companies, but to  
11    walk onto Wall Street and try to raise money when  
12    your core asset is being leased from a third part  
13    makes it very difficult. You're not going to be  
14    able to go have free access to capital, build  
15    those markets out, when the core asset around that  
16    simply isn't yours, you're renting it from  
17    somebody. You have to have ownership to that, you  
18    have to have the ability to lever that asset as  
19    you go forward. You should try it in unlicensed  
20    markets.

21            MR. LEIBOVITZ: Then nobody owns it.

22            MR. ROSENBERG: Another challenge that

1 we've had pointed out with respect to rural  
2 broadband, especially -- and this comes, again,  
3 from online -- is about the terrain in rural  
4 areas. So while some parts of the country are  
5 pretty flat and open, you can put up a big tower  
6 and reach a lot of people, in other areas you've  
7 got a lot of hills, mountains, and woodlands that  
8 affect propagation pretty strongly. Particularly  
9 as some on the panel are talking about lowering  
10 antennas down, how do we think about reaching  
11 those people cost effectively with a good  
12 solution?

13 MR. EVANS: We've been pretty surprised  
14 in -- because we're building Colorado and Texas.  
15 Texas, you know, 200 feet, you stand on a box and  
16 look north, you can see the back of your head.  
17 It's flat. There's no issue there. Colorado is  
18 significantly different where we are building off  
19 the western slope; Grand Junction down to Montrose  
20 is online now. The good news is that most of the  
21 cities and the populated areas are actually built  
22 down in valleys and so you are able to cover

1 those. And the AWS spectrum has been -- if  
2 there's one benefit to it, because I need more  
3 capacity and in a smaller footprint, I cover  
4 densely populated areas, my ability to reuse the  
5 frequency over and over again with AWS is actually  
6 pretty good.

7           So, when you get up wooded areas, trees  
8 are a problem. I'm all for the elimination of  
9 trees in order to cover it. But trees are a  
10 different issue, but the topography itself hasn't  
11 been that big of an issue because we tend to build  
12 the communities that we're trying to serve on  
13 relatively flat areas. They're not built on the  
14 side of the mountain. So the treed areas have  
15 been more difficult, no doubt.

16           MR. MacLEOD: The comment about the  
17 lowering radiation center line on the antennas was  
18 specifically for dense urban areas as opposed to  
19 rural. Obviously in the rural areas you've got to  
20 put it on a stick as high as you can get it and  
21 illuminate as big an area as possible, but then  
22 you have the talk-back link that may be the

1 limiting factor there. So, it's an engineering  
2 effort that you have to take into consideration  
3 when designing rural service areas.

4 Second thing is that the use of the POP  
5 per square mile is somewhat -- you have to really  
6 be careful using that definition of a rural area  
7 because the population is not usually uniformly  
8 distributed and you would -- it just kind of has  
9 an innate sense when you think of POP per square  
10 mile uniform distribution. There are clusters of  
11 communities and when these guys are going out and  
12 putting in systems, they're not going to put one  
13 out in some cornfield where you've got two people  
14 per square mile. You're going to put it in a  
15 community where your population density for that  
16 community is much, much higher than the  
17 surrounding area. So you've got to be careful in  
18 the use of that demographic in your analysis.

19 MR. RAY: You know, the only thing I'd  
20 add is that, you know, spectrum again, obviously.  
21 If you want to address topography issues and high  
22 tree line and so on, I mean, the lower in the band

1 you are, the more the stuff's going to carry. And  
2 so there is a big difference between an 850  
3 carrier and -- you know, you've got guys now  
4 building out on 2.5, cell densities and reach are  
5 going to be massively different. So, that lack of  
6 700, 850 spectrum in enough places, in enough  
7 hands, is part of the challenge.

8 MR. CURTIS: Picking up on that a little  
9 bit, would that affect your behavior more in, you  
10 know, metro urban areas where you're already  
11 largely built out, or would that actually cause  
12 build out in places where you're not currently  
13 built?

14 MR. RAY: For us, primarily the latter.  
15 I mean, we would be able to more aggressively go  
16 after rural areas around San Antonio and be very  
17 cost-effective doing that if we held 800, 900 or  
18 700 spectrum. We don't today.

19 MR. CURTIS: Got it.

20 MR. LEIBOVITZ: Yeah, well, speaking of  
21 low frequency spectrum, we have another online  
22 question from Mark Lufquist. The question is, "Is

1 anyone exploring TV white spaces right now as a  
2 way to pull out broadband?"

3 MR. ZIMMER: We actually are looking at  
4 that a little bit. The challenge that we have  
5 right now are the regulations that are out there  
6 right now. And I can't cite what they are,  
7 unfortunately, but you know, the -- I think it's  
8 less than 100 feet that the access point can be  
9 for propagation and the end user has to be lower  
10 than 25 feet or something like that, and that  
11 makes it extremely challenging in a rural  
12 environment. I hope that the Commission will take  
13 a look at that and maybe make that a little more  
14 user friendly, especially in a rural environment  
15 because that really plays to what we talked about  
16 lowering antennas.

17 In a rural market, you're not going to  
18 get that interference and especially if you go  
19 with 3.65 license light -- what's the right word  
20 -- the way that that's being doled out. I mean, I  
21 think that if you look at the white space the same  
22 way, I think that the white space can be an

1 effective tool, especially in rural America.

2 MR. CURTIS: Steve, you got anything you  
3 want to talk about? Charles?

4 MR. MATHIAS: Thank you. And maybe to  
5 take the conversation in a slightly different  
6 direction, but keying off of the point about the  
7 white space, is I was curious if anybody on the  
8 panel had a perspective on or whether they were  
9 seeing any storm clouds on the horizon that might  
10 affect the pace and -- of innovation. We talked  
11 about equipment prices going down, maybe the  
12 equipment companies would have a perspective on  
13 that, but anything that is a trend that you can  
14 foresee that might impact the ability of wireless  
15 actually to achieve the things that we've been  
16 discussing right now.

17 MR. SHAW: Let me take a crack at that.  
18 As we go through, you know, each generation, so  
19 the efficiencies are built into the systems,  
20 inherently built into the systems, a lot of reuse  
21 ability is built into the systems as they become  
22 more and more software capable. But I think as

1 sort of major trends going forward -- sorry, let  
2 me just -- if I could just -- this will just take  
3 a second to collect my thought on that one.

4 MR. BYE: I just come back to the  
5 comment I made earlier about sort of the  
6 technology and the device. And, you know, as  
7 we're looking to -- as customers are looking to  
8 download more and more content and the richness of  
9 those applications continues to grow, there needs  
10 to be a device capability and an ecosystem, quite  
11 frankly, with enough scale that keeps that unit  
12 cost down so that it's affordable for customers.

13 I think, you know, as you look into the  
14 future and, in fact, you see this on the wired  
15 broadband side, is availability of PCs in homes as  
16 a limitation for adoption, perhaps, of broadband.  
17 And I think there may be parallels to that that  
18 exist as we see more (inaudible) broadband  
19 adoption going forward as well. And so, you know,  
20 with the advent of net books and other mobile  
21 computing devices, making sure that people can get  
22 access to that at a reasonable price point is

1 going to be critical.

2 MR. SHAW: Sorry, if I can just pick up.  
3 Sorry about that. If we -- when we, from an  
4 analytical point of view, look at the overall  
5 environment and we see the exponential growth of  
6 the traffic across the networks, of course, this  
7 is a very exciting development which helps  
8 stimulate the innovations. But what we also  
9 observe when we have a look and aggregate from  
10 around the world from an operator perspective,  
11 revenue growth, we don't see that they're trending  
12 in the same way. So, of course, this starts to  
13 then open the whole question, well, where is the  
14 revenue going to come from really to make the  
15 whole ecosystem more and more viable? And this  
16 is, in fact, why I put up one of the slides, if  
17 you remember, about the two axes, how we see the  
18 market going, particularly in the  
19 machine-to-machine type context where you can  
20 start to bring in other forms of revenue into the  
21 system coming from other sources, from other  
22 industry types, because I think we need to maybe

1 just take a step back and look at a lot of the  
2 conversation that we've had amongst the panelists  
3 today. We're talking about extremely high  
4 bandwidth applications the whole time, but there  
5 is also a plethora of applications which are more  
6 mission critical, which actually in many respects  
7 can command a lot more value into the system. So  
8 we need to take these things into account.

9 So looking from a train point of view,  
10 we need to see the trains going out of what is  
11 actually going to be needed from the networks,  
12 types of traffic, what is the value insides of  
13 these traffics, and also, then, how do we get to  
14 the overall revenue growth component again across  
15 the whole industry to stimulate that healthy  
16 innovation?

17 MR. MacLEOD: Charles, I see a few  
18 things on the horizon that could stymie  
19 innovation. First of all is battery technology.  
20 If we can't get the batteries -- the new  
21 technologies issued that will allow the higher  
22 processing speeds, we're going to be limited, but

1 that's being worked on now.

2 Second, and this has to do with the  
3 government, is overregulation. If we seriously  
4 don't take into consideration the entrepreneurial  
5 spirit and the innovative spirit that resides  
6 within the U.S. engineering communities,  
7 scientific communities, if we over regulate, we'll  
8 stymie the innovative aspects. So we have to be  
9 very, very careful when writing this legislation.

10 Lastly is the environmental issues. We  
11 do need to ensure that all devices, whether  
12 they're network devices or they're UE devices,  
13 user equipment devices, their end of life planning  
14 for them from the very start. What are you going  
15 to do with those 4 billion keypads and displays  
16 that are out there now? Can we grind them up and  
17 use them for pavement or cement or something? But  
18 there's got to be end of life planning for all  
19 that. And then along with that, the environmental  
20 issues having to do with new tower construction.  
21 That's tired and old designs; we've got to have  
22 wireless art for antenna support structures.

1           MS. GUENDELSBERGER: I guess it's close  
2 to -- in terms of the network or user devices and  
3 the spectrum, are there any multimode user devices  
4 that could be used for broadband and for LTE and  
5 700 or in other -- in PCS band or (inaudible)?  
6 What's the trend going forward? Are we going to  
7 -- are you seeing as a carrier combining spectrum  
8 that you have not necessarily adjacent to, for  
  
9 example, what you have in 700 or what you have in  
10 1.9, but what's the technological developments out  
11 there?

12           MR. RAY: I'll take a stab at that. I  
13 think multimode, as they define today -- but it's  
14 there today. I mean, obviously, you know, WiFi  
15 offload is big. It's something at T-Mobile we've  
16 pioneered a lot in in terms of voice over today,  
17 so WiFi is somewhat constrained because of, you  
18 know, terminal costs in mid- to higher, you know,  
19 tiered terminals, but, you know, utilizing various  
20 sources of spectrum I think is something the  
21 industry is always looking at.

22           If you look at standardization going

1 forward in kind of HSPA and into LTE, I think we  
2 do start to see the opportunity to combine  
3 spectrum from different bands, to support, you  
4 know, greater throughput and bandwidth, that  
5 activity is going through standardization now, I  
6 think. And so that will come, but it's a little  
7 out, you know, two to three years, I think. So  
8 the industry is certainly looking at all those  
9 types of opportunities. And I think over the next  
10 two years you'll see more of those types of  
11 opportunities come to be realized, but you, again,  
12 come back to the device challenge and, you know,  
13 you look at the -- we've talked all over this now.

14           Stephen's points were very well made  
15 earlier on, but if you look at that battery  
16 consumption, you know, the number of bands that  
17 we're trying to stuff into these devices now, I've  
18 lost count of how many HSPA bands there are  
19 worldwide. I mean, it's a very, very significant  
20 number. And so you want harmonized spectrum that  
21 supports use both within the U.S. and outside the  
22 U.S.

1           You know, so there are a lot of  
2 challenges in the terminal space and obviously,  
3 you know, combining spectrum and spectrum use  
4 within a terminal is another level of challenge  
5 that we need to work on. I think the network is  
6 getting there, terminals again, it's going to be  
7 another bridge to cross.

8           MR. LEIBOVITZ: So, kind of extending  
9 the point when you think about sort of the  
10 bookends of spectrum -- talked a lot about  
11 spectrum -- how, from a commercial market  
12 standpoint, how high is practical to go and how  
13 low is practical to go? And I would distinguish  
14 between sort of fixed and mobile form factor  
15 devices perhaps, keeping in mind, I guess, antenna  
16 length as a consideration in this whole  
17 discussion. But, you know, when you look from a  
18 practical standpoint of people who actually deploy  
19 networks, you know, how wide should our field of  
20 vision be when we look at spectrum?

21           MR. RAY: Well, you certainly see 450 in  
22 international markets outside the U.S. It's not

1 uncommon. You know, there are some significant  
2 challenges with 450, but certainly in the 700 to  
3 800 range is a great spot to be both for the  
4 device and for the network. I think the answer  
5 comes down to, again, somewhat where you're  
6 deploying. I think 3.5 gig in, you know, rural  
7 environments for broad area coverage is extremely  
8 challenging, but in a metro urban Manhattan or  
9 Brooklyn/Queens, it may have great application.

10 MR. LEIBOVITZ: Can you speak a little  
11 about -- you mentioned 450, the challenges. Can  
12 you expand on that a little bit?

13 MR. RAY: Antennas. You know, it's a  
14 big challenge and it's a challenge in the device,  
15 too.

16 MR. LEIBOVITZ: That's presumably for a  
17 mobile device, a big challenge; less so if you  
18 have a (inaudible).

19 MR. CURTIS: Ed's solution presumably  
20 was.

21 MR. RAY: Something built in.

22 MR. BYE: I think the other point, and

1       it comes back to the earlier discussion, is as you  
2       look to the number of bands and as we talk about  
3       adding new bands, I think it was Scott that said  
4       time and money solves everything, but the devices  
5       are, today, getting very, very complex. Even with  
6       the number of bands that are in the U.S. today and  
7       trying to support every variation of LTE, DO,  
8       RevA, RevB, you know, HSPA, I mean, it's a very  
9       complicated, convoluted. And so I think, as we  
10      look at sort of bands -- and I come back to my  
11      earlier point, the adjacency to existing bands I  
12      think is going to be very important. And I think  
13      we also have to be careful that we're not trying  
14      to build a device that does from 450 to 3.5. I  
15      mean, that's -- just the antenna complexity and  
16      the -- is going to be very, very tough. And so I  
17      think, you know, harmonization and adjacency are  
18      going to be very, very important.

19                   And really, a lot of that is to get the  
20      device ecosystem big enough that you can get a  
21      price point on a device and a chip set that's  
22      feasible that you can put it into a device and

1 make it cost-effective.

2 MR. LEIBOVITZ: What's the minimal scale  
3 you look for when you -- what's the sweet spot of  
4 how many devices that either you're selling or  
5 global market, you know, where the prices really  
6 hit the mass market?

7 MR. BYE: Good question. We're a very  
8 small player and very challenged in terms of  
9 scale. You know, we are not big enough to see the  
10 scale volume that, you know, other people would.  
11 And, quite frankly, from our cost perspective, we  
12 look at sort of where the industry is going and  
13 basically follow where they're going to be able to  
14 take advantage of those economies.

15 MR. EVANS: Just to follow on that,  
16 while he thinks he's small, he needs to come see  
17 what I've got.

18 MR. ZIMMER: I was thinking the same  
19 thing.

20 MR. EVANS: Yes. Yes, we basically had  
21 to commit to something around 10,000 to 20,000  
22 units in order to sort of get started and we had a

1 device that was made specifically for us by HTC  
2 out of Taiwan, who put that together, and anything  
3 less than -- and even that was like pulling teeth  
4 to get anyone to do that. But, you know, it was a  
5 commitment we had to make in order to get going.

6 So that -- my pricing, frankly, if I  
7 were to buy 100,000 or half a million units would  
8 be 20 to 30 percent less than that. So it's a  
9 significant driver. And, frankly, one of the  
10 reasons we ended up with HSPA was that the  
11 ecosphere was so much larger and there were so  
12 many carriers supporting (inaudible) devices,  
13 because I'm not crazy enough to think I can drive  
14 where HSPA is going. It had the ecosphere that  
15 was out there that would support what we wanted to  
16 do and so it worked out for us.

17 MR. RAY: That's a great point. I mean,  
18 if you look at the success of GSM as a global  
19 technology, there are almost 3.7, 3.8 billion GSM  
20 users today, so that enables countries like, you  
21 know, India and so on to bring to market very  
22 low-end, low-cost terminals. And the more we can

1 harmonize around spectrum and technologies, I  
2 mean, the stronger those ecosystems can prove to  
3 be. You know, we've obviously chosen an HSPA path  
4 for much the same reasons Ed's just mentioned. I  
5 think there are 1,400-odd devices out there today,  
6 so this is not an embryonic new technology, it's  
7 pretty well established. But you need those --  
8 you really need global volumes to drive cost  
9 efficiency on devices. Without that it's a tough  
10 road, really tough road.

11 MR. SHAW: I support that statement  
12 exactly from Neville in that on a global scale we  
13 have to look for harmonization. We have to find  
14 that scale across as many markets as we can. So  
15 this becomes a very important driver, particularly  
16 as we're starting to see the price points become  
17 at these real threshold levels. As the complexity  
18 continues to increase, we have to find the volumes  
19 from a vender perspective. It's critical.

20 MR. CURTIS: Steve's got a follow-up  
21 along these lines?

22 MR. ROSENBERG: Yes, if you project

1 forward and think about when we're going to have  
2 the combination of fully deployed LTE networks and  
3 LTE devices around the country, each of you coming  
4 at it from different perspectives, when do you  
5 think that's going to be available in say the top  
6 25 markets? And when do you think that's going to  
7 be available ubiquitously around the country?

8 And then sort of as a follow on to that,  
9 what are the things that can be done by the people  
10 in this room, both operators, equipment makers,  
11 and the Commission, to spur that development to  
12 happen maybe a bit more quickly in rural areas  
13 than it might otherwise happen?

14 Tom, I'm going to start with you because  
15 you've been a little bit quiet, but also because  
16 you started in your opening slide with something  
17 about Verizon's plans for your LTE deployment.

18 MR. SWANOBORI: Right. Well, we talked  
19 about it in my opening remarks about our plans for  
20 LTE, and our plans are to launch 25 to 30 markets  
21 by the end of next year. So sometime next year  
22 we'll be bringing those markets online. And our

1 goal is to have a national rollout by the end of  
2 2013, and that's obviously going to depend on the  
3 economic situation and our investments and so  
4 forth. Over time, I think the device technologies  
5 are going to get more and more robust, so you're  
6 talking about USB sticks and data cards and moving  
7 to smartphones. And then, you know, it's going to  
8 take time, but I think we want to really encourage  
9 innovation and investment. So I'm not sure what  
10 the government and the Commission can do with  
11 regard to that, but we really want to spur that  
12 kind of innovation. I think have flexibility in  
13 terms of what the vender can do with devices and  
14 developing chip sets.

15 I think they're going to be looking at  
16 that global scale. They're going to be looking at  
17 the Verizons and the other big carriers, frankly,  
18 who lead in the deployment of technology and  
19 seeing that it's really developing quickly and  
20 then come on board with developing chip sets, more  
21 and more devices, innovative applications. I  
22 think there's opportunities in consumer

1 electronics. I mentioned some things like  
2 machine-to-machine, the utility, the smart grid  
3 thing is starting to take off. I think there's a  
4 lot of different opportunities, some of which are  
5 going to have global requirements in terms of, you  
6 know, a smartphone you're going to want to roam  
7 with globally, others you're going to require  
8 maybe a U.S. band only because it's going to be in  
9 a meter that's going to be fixed and not moving  
10 around.

11 But again, we're going to need to  
12 understand those spectrum policies and those  
13 spectrum decisions because a lot of the vender  
14 community is going to be, I think, anticipating --  
15 trying to anticipate what is the right time, when  
16 are we going to have enough of this defined in  
17 order to get on board.

18 Clearly you're going to have some  
19 technology leaders who will step up to the plate,  
20 but I think in order to get a more robust  
21 deployment, it requires a building up of the  
22 ecosystem.

1           MR. EVANS: Just, I think, an  
2 interesting dynamic to watch in the next 24 months  
3 is that CDMA carriers today, clearly LTE is, for  
4 the bulk of them, sort of the path that they're  
5 heading down and getting there, but there are a  
6 tremendous number of guys that are on HSPA today.  
7 And when you look at the HSPA roadmap getting up  
8 to HSPA+, getting up to 84 MIPs, I think you're  
9 going to see a significant number of carriers that  
10 are going to stay with HSPA until such time as  
11 there is a compelling reason to make the change.

12           Now, every BTS that I've put in the  
13 field today is a module away from being LTE. The  
14 stuff that we've bought can be upgraded and we can  
15 do that. However, then I've got to go rip devices  
16 and switch devices out at the consumer level and  
17 all that stuff. And frankly, if I can put devices  
18 out there that are capable of 48/84 MIPs in rural  
19 America -- and granted those are peak speeds, not  
20 average throughput speeds; I understand that --  
21 but do I really need to go to LTE at that point in  
22 time when at least today, from my perspective, the

1 HSPA ecosphere is substantially larger? So until  
2 I see that ecosphere grow by a lot of carriers and  
3 that becomes sort of the predominant one, I'm  
4 probably sticking with HSPA for a while.

5 MR. RAY: Yes, and I totally agree. I  
6 mean, I challenge the question in that I think  
7 that the end vision needs to be around mobile  
8 broadband. And I wouldn't necessarily put a  
9 wrapper around that with LTE because if you look  
10 at (inaudible) HSPA+ and its capabilities, I mean,  
11 it's going from 84, 168 is on the books now, and  
12 all the reasons we talked about that device  
13 ecosystem. I mean, LTE devices, it's going to be  
14 a tough, touch place for a while. Excuse me, Tom,  
15 but it's a tough place to pioneer. They're not  
16 alone, but companies like us are going to  
17 obviously leverage the investments we've made, you  
18 know, the technology developments on those  
19 investments we've made, which are very, very rich  
20 and positive for the customers that we serve, and  
21 at the right time look to move into LTE.

22 I think the other piece that -- I'm

1 going to say it again -- spectrum, right, I mean,  
2 for us as a mobile carrier in the U.S., if I  
3 looked at that LTE opportunity, what would  
4 accelerate my drive and desire to move to LTE if  
5 there was a large amount of LTE spectrum available  
6 and I could really get to a 40 megahertz  
7 deployment of LTE, which is what you really need  
8 to start to bring in the real spectral efficiency  
9 and trunking efficiency benefits on the technology  
10 because in small deployments, it's pretty similar  
11 to HSPA and HSPA+.

12 MR. ZIMMER: I'd like to offer a little  
13 bit different perspective. With many customers  
14 we've been working with, specifically as a result  
15 of the broadband stimulus bill, there are pockets  
16 of rural operators that do have 700 megahertz  
17 spectrum and they're very excited about the  
18 opportunity to deploy LTE in that spectrum. And  
19 we will have a 700 megahertz LTE solution by the  
20 middle of next year, but they have had a  
21 difficulty, frankly, getting through this first  
22 round of applications. The timeframes that were

1 introduced -- I know this isn't a stimulus meeting  
2 -- but the timeframes that were introduced, and  
3 the rules are just too complex to sort through and  
4 certainly in this short a timeframe. So one of  
5 the things that could be done is for the second  
6 window try to have some clarification and  
7 simplification of the rules, because there is a  
8 lot of 700 megahertz spectrum in rural areas. You  
9 know, we've heard that that's better for coverage,  
10 which is true, and certainly rolling that out by  
11 the end of next year is, I think, very doable.

12 MR. CURTIS: Jake?

13 MR. MACLEOD: Yes, one last thing. And  
14 recognize in the history of the wireless since the  
15 advent of cellular, every generational change we  
16 fell flat on our face, with the analog to IS 136,  
17 IS 136, to GSM. And so the carriers, and rightly  
18 so, when they do deploy it's not going to be a  
19 step function change. You're going to deploy  
20 several cell sites in the middle of a city, maybe  
21 20, 30 cell sites, put friendly users on there,  
22 and then learn how to operate this new OFDM

1 system. And until they get comfortable and  
2 identify a lot of the frogs that are going to jump  
3 out of there, and be able to fix those things,  
4 they're not going to put it out there for wide use  
5 in the consumer arena. They're going to very  
6 carefully manage their entry into the OFDM arena,  
7 because the worst thing you can do, and we've done  
8 it before in this industry, is go gangbusters, get  
9 it out there, and then it stinks. You know, so  
10 this isn't going to be a step function change.  
11 It's going to be a gradual, slow, methodical  
12 change into LPE and that's the right way to do it.

13 MR. SWANOBORI: I just wanted to add one  
14 thing to that is, you know, we've rolled out new  
15 technologies in the past and we have experience  
16 with that, and we understand the challenges of  
17 deploying new technology, so we're going to make  
18 sure that we do it right and we make sure that  
19 it's optimized and it's working well. And I think  
20 leads to your earlier question, we're going to  
21 launch with multimode technology devices, so our  
22 intent is to add LTE to existing devices so that

1 we can fall back to EVDO as we're rolling it out  
2 so that customers can experience the benefits of  
3 LTE, but also be able to utilize our 3G network as  
4 well.

5 MR. SHAW: Just possibly a quick comment  
6 from myself. From a vender perspective we also  
7 work incredibly hard with a number of the leading  
8 customers around the world, operators around the  
9 world, to design systems and that are optimized to  
10 be able to be deployed in these types of contexts  
11 which reuse old technology where possible, but to  
12 create platforms which are also upgradeable into  
13 the future.

14 There are other innovations such as  
15 something we call a tower tube. These are now --  
16 these are environmentally friendly, fairly  
17 sophisticated structures for being able to mount  
18 antennas out in rural areas.

19 So, we work very hard focusing the  
20 efforts in order to make, at an entire system  
21 level, the capabilities to be able to do these  
22 types of deployments. Absolutely.

1           MR. CURTIS: Let me change directions a  
2 little bit, talk about network sharing a little  
3 bit. It's a trend that's going on a lot in  
4 Europe, India as well. Question, really three  
5 parts. Is that something you guys see on the  
6 horizon? Do you think that's something that would  
7 be helpful? If you think it's something that  
8 would be helpful, you know, how should we think  
9 about that?

10           A rush to the microphone. Ed?

11           MR. EVANS: My feeling is that what I  
12 manufacture is airtime on my broadband network.  
13 And so to share my manufacturing capabilities, you  
14 know, to another marketing arm, if I'm struggling  
15 with my marketing side, maybe that's something I  
16 would look at doing, but, effectively, I'm  
17 enabling a competitor on my same market. I don't  
18 have any problem competing against other  
19 facilities-based guys that are out there, but I  
20 would be less inclined to do that just because  
21 that's what I make. That's my brand that's out  
22 there. And so I'm not a big fan of it.

1 MR. CURTIS: Not a big fan.

2 MR. EVANS: No. I haven't been.

3 MR. SWANOBORI: I think at Verizon we  
4 feel the same way. We take a lot of pride where  
5 -- buying spectrum at option and licensed  
6 spectrum, we're deploying infrastructure, we're  
7 optimizing using our own talent and resources and  
8 leveraging that of our suppliers, and we pride  
9 ourselves on engineering and building and  
10 operating and maintaining as some of my peers are,  
11 their own -- you know, our own network.

12 And we view that as part of our  
13 differentiator both in terms of coverage and  
14 quality and reliability, and I think each  
15 carrier's got the opportunity and the right to  
16 sell that service and we're not considering  
17 network sharing.

18 MR. CURTIS: Got it.

19 MR. RAY: I think every carrier is going  
20 to give you a similar answer, so it's a tough area  
21 to talk about. I think if you look at some of the  
22 European models that have surfaced in recent

1 years, I mean, mainly driven by cost challenges  
2 that we talked about earlier on. So, you know, we  
3 roam today, right? I mean that's network sharing  
4 in a sort --

5 MR. CURTIS: That's exactly a form of  
6 network sharing.

7 MR. RAY: It's similar type of  
8 proposition, but if you're talking about, you  
9 know, deeper sharing of radios and bay stations  
10 and so on, I think as long as we have a -- you  
11 know, the growth in the U.S. in this space has  
12 been extremely strong. We see, you know, I think  
13 we're touching the tip of the iceberg right now.  
14 This is an industry with a tremendous future going  
15 forward. And with that type of growth then,  
16 hopefully, we don't face some of the significant  
17 cost challenges that have occurred in other parts  
18 of the world on these networks, which I think has  
19 been the primary driver on network sharing.

20 MR. CURTIS: Scott.

21 MR. ZIMMER: I think the common theme  
22 here has been from the smallest provider here to

1 some of the biggest is spectrum. And to Ed's  
2 point, you know, we manufacture space on our  
3 network and if we don't have unlimited  
4 manufacturing capabilities, i.e., spectrum, then I  
5 think that becomes very difficult to share that  
6 and it becomes a challenge, even in rural America  
7 when mom and pop put up a little -- you know, like  
8 us, put up a tower somewhere and now all of a  
9 sudden we're fighting interference or whatever.  
10 So, I think we're all pretty covetous of our space  
11 and we're all out to make a buck and that's what  
12 we're trying to do.

13 MR. LEIBOVITZ: A follow-up on that.  
14 Scott from Roshmi Doshi, who's in the FCC's office  
15 of Engineer Technology commenting online. "What  
16 other policy changes would you like to see about  
17 for unlicensed spectrum?"

18 MR. ZIMMER: I'm sorry, what?

19 MR. LEIBOVITZ: For unlicensed spectrum.

20 MR. ZIMMER: What was the first part of  
21 the question?

22 MR. LEIBOVITZ: What changes would you

1     like to see? So, we've mostly -- I think most of  
2     the discussion's been about licensed spectrum,  
3     maybe implicitly, what would you --

4             MR. ZIMMER: I think the 3650 or the  
5     3.65 model is a good model. You know, you  
6     register your spectrum and, you know, then I would  
7     challenge the FCC to patrol that or to police it  
8     because it's one thing to register and to say that  
9     you have, you know, exclusive rights or whatever  
10    to it, but in the area that we serve, it's tough  
11    to justify buying those licenses. If you look at  
12    that 3650 model, I think that can be a workable  
13    model. That's one change that I would like to  
14    see, especially in the white space, as that  
15    becomes available.

16            MR. CURTIS: Charles?

17            MR. MATHIAS: Could you -- 3650 is a  
18    little bit of a hybrid. Could you operate your  
19    business, do you think, as effectively in  
20    completely unlicensed spectrum?

21            MR. CURTIS: We are in completely  
22    unlicensed spectrum. I mean, we've got less than

1 probably 50 of our users on 3650.

2 MR. MATHIAS: Oh, okay.

3 MR. CURTIS: So, yes.

4 MS. GUENDELSBERGER: I actually have a  
5 follow-up question in terms of I think one of the  
6 presentations was saying no utility company  
7 actually out there has -- we have one utility  
8 company if you think about Internet access as a  
9 utility then you may want to think about one  
10 provider. Are there anywhere in the U.S. any  
11 geographically or otherwise you can think about  
12 you need one provider or maybe a consortium of  
13 carriers could actually build up a network but  
14 share it?

15 MR. ZIMMER: I think we could do it in  
16 our area. I mean, there's not that many users, so  
17 I think that's a -- for us, I think it's a  
18 workable model.

19 MS. GUENDELSBERGER: That's, again,  
20 follow-up to network sharing question. It sounded  
21 like network sharing in itself wasn't something  
22 appealing, but is there any place it might be

1 appealing as a model, and actually not one  
2 carrier, but a consortium of carriers somehow  
3 build that to share and make it more economically  
4 viable?

5 MR. ZIMMER: I think it could work,  
6 again, in that rural area. I'm not sure, you  
7 know, in the markets that these guys serve, I'm  
8 not sure that would be as viable, but I think in  
9 the truly rural markets, I think it could work. I  
10 mean, am I interested in doing it? Not as much,  
11 but I do think that it could work.

12 MR. EVANS: I'll make no apologies for  
13 being a diehard capitalist. No, I don't want to  
14 do that.

15 MR. RAY: I think we shouldn't forget  
16 that we do share stuff, right, so we build our  
17 common systems, you know in airports and metro  
18 systems and so on that we all utilize and work  
19 together on. So don't think of us as all being  
20 totally anti -- when the right solution is to  
21 build common infrastructure -- we absolutely do  
22 share towers. So, those opportunities are out

1       there.

2                   MR. CURTIS:  I guess last topic of the  
3       afternoon, probably.  Give us some thoughts about  
4       how we ought to think about the value of -- the  
5       unique value of mobility.  What do you see coming  
6       on the horizon that makes the mobile broadband  
7       experience distinctively valuable, you know, other  
8       than the obvious, than the fixed broadband  
9       experience?  And I guess really what we're looking  
10      for is, are you seeing in the pipeline value added  
11      applications coming through, coming online that  
12      are distinctively mobile?

13                  MR. MacLEOD:  One that comes immediately  
14      to mind is the telemedicine.  There is a group out  
15      in California now that has developed a Band-Aid,  
16      so to speak.  It's a large Band-Aid that you put  
17      on various parts of your body and it connects  
18      Bluetooth to your device, and then the device,  
19      like an iPhone, can tell whether you're resting  
20      horizontally, standing, what your heart rate is.  
21      If you have heart arrhythmia, then they can  
22      correlate it with what's going on in other parts

1 of your body, and if your blood pressure starts to  
2 rise, you can get a text message that says  
3 whatever you're doing, stop.

4 So, a lot of innovative things like that  
5 are just on the cusp to where this fellow's  
6 doctor, if he's in Albuquerque, New Mexico, the  
7 doctor may be in India, and if he exceeds certain  
8 thresholds or this guy is being monitored for  
9 arrhythmia, the doctor can correlate the issues  
10 with the circumstances that he's in. It's just  
11 phenomenal concepts like that that are coming  
12 about.

13 MR. CURTIS: That's great. Any other  
14 examples like that? Love to hear them.

15 MR. EVANS: I think there are thousands.  
16 In fact, I think what excites me even more are the  
17 things that we haven't even thought about. My  
18 15-year-old son is sitting in the audience and  
19 when I think about the things that he's going to  
20 see that we're not going to get to see in this  
21 room, the ability to transfer information  
22 seamlessly at any time and in an entirely mobile

1 environment is going to revolutionize the planet,  
2 not just our lives, but everybody's life across.  
3 And while anecdotally there are thousands of  
4 stories like that that are out there, things that  
5 we're going to be able to do, the reality is, it's  
6 very simple. It is going to be the instantaneous  
7 transfer of real-time information seamlessly,  
8 anywhere, and that solves 95 percent of the  
9 world's problems if you can move that information.  
10 It's just -- it's incredible to think about.

11 MR. RAY: If I think about -- obviously,  
12 I'm a strong mobility guy in my role, but if I  
13 think about the Internet, right, then I think  
14 we've all been awed, you know, the generation  
15 we're in, what's happened with the Internet. I  
16 think it's reached a tenth, if that, of its  
17 potential and, you know, you cover that additional  
18 ground through what's happened by -- or what will  
19 happen as you take it mobile. And the Internet is  
20 one example, I think.

21 I'm hugely optimistic. I've said it  
22 already, I think we're at the tip of the iceberg.

1 I think, you know, mobile broadband will transform  
2 the way we live. I think it will transform how  
3 people work, how communities support each other,  
4 education, health care, you name it. I mean, I  
5 think there's an endless list of opportunities  
6 that will come through mobile broadband.

7 If you look at just the last year and  
8 the way in which we've seen, you know, early  
9 adopters of mobile broadband solutions in, you  
10 know, GIs, Apple iPhones, whatever it might be,  
11 the number of applications and the ways people are  
12 connecting, communicating, not just sending data,  
13 but communicating where they are, what they're  
14 doing, it's incredible to watch. And I think that  
15 that's an extremely rich future for the industry  
16 and also for the consumer.

17 So, I'm very excited about the  
18 opportunity and there's something obviously unique  
19 about being able to take that information and  
20 connect everywhere you want to, whenever you want  
21 to.

22 MR. PONTE: I'd like to add that I

1 always get a little -- I'm a mobile bias guy,  
2 obviously. I always get a little bit frustrated  
3 with the mobile versus fixed comparison because,  
4 you know, they really do serve many different  
5 purposes. But the one thing I'll say is that I  
6 can use -- Neville won't like this -- I can use my  
7 G1 at home on T-Mobile's network, but I can't  
8 bring my DSL modem with me. And I find actually  
9 at home more and more I use this device and I go  
10 to the airport, I don't even pop open my laptop  
11 anymore. Why? Because when I open my laptop I've  
12 got to figure out what the SSID is, and is it  
13 something I've got to pay for, and so forth,  
14 because there's a big part of mobility on the  
15 business side that says, you know, I could use  
16 this anywhere in the world where they have 3G  
17 coverage, automatic, it's on, it works. That's a  
18 big, big component to mobility that I think is  
19 often overlooked even though it's not specifically  
20 an application, you know, in the narrow sense. In  
21 the broad sense, I think that's what it's really  
22 all about.

1                   MR. MacLEOD: I think the biggest next  
2 wave that's going to come is the  
3 machine-to-machine communications and they're  
4 going to be -- with the advent of IPv6 and the  
5 availability of addresses, it's just going to be  
6 phenomenal.

7                   I was looking at a magazine called  
8 Wired, which is quite a good magazine, and the  
9 last page of every issue they have artifacts from  
10 the future. It's my favorite thing. And they had  
11 this beer bottle from 2014 called "Coors Over  
12 Clocked," and on the label you could set the  
13 temperature of your beer either up or down. And  
14 this girl happened to be drinking the beer and  
15 every time you'd take a drink, it measures your  
16 blood alcohol level. And so the beer bottle sent  
17 a message to her phone saying you've exceeded the  
18 blood alcohol level that's safe to drive, so we've  
19 disabled your Toyota Prius.

20                   (Laughter) And then it said and  
21 we've also disabled the list of old  
22 ex-boyfriends on your phone.

1 (Laughter)

2 You know, it's a lot of fun to think,  
3 but that stuff's coming. You know, we've got some  
4 goofy people out there that come up with some  
5 great applications and it's all  
6 machine-to-machine.

7 MR. SWANOBORI: I think people were  
8 thinking about things like that, the connected  
9 car, not necessarily, I hadn't thought about that  
10 application, but I think I mentioned consumer  
11 electronics, things you could -- say you have to  
12 connect your -- in many cases you have to connect  
13 your camera to upload your pictures. I think in  
14 the future streaming video, machine-to-machine,  
15 the utility space, the medicine applications you  
16 talked about I think are ripe for development. So  
17 if you can get some kind of smart device that will  
18 allow a doctor to look at your test results  
19 remotely, give you a diagnosis so you don't have  
20 to go see him or her in person, I think there's a  
21 lot of good opportunities out there that are going  
22 to develop.

1           MR. BYE: The only thing that I'd add  
2 is, sort of cable and wireless, is if you look  
3 back 10 years to '99 and where the Internet  
4 industry was in '99, and you look at where it is  
5 today, I think it's a good proxy for the next 10  
6 years, and we went sort of from dial-up to  
7 broadband to now, you know, 50 to 100 megabits per  
8 second to a home. And I think there's a promise  
9 and a future out there that gets unlocked as you  
10 enable this capability that none of us can  
11 imagine, that none of us could have imagined back  
12 in '99. And so I think it's a tremendous future  
13 ahead of us.

14           MR. CURTIS: Great. Well, I think it's  
15 time to call this a wrap. I want to thank you  
16 guys very much for coming down, taking, you know,  
17 probably the full chunk of your day to do this.  
18 Very instructive for all of us. I hope it was  
19 interesting for you. In all likelihood, would  
20 love to reach out and spend more quality, you  
21 know, one-on-oneish time with you guys and learn  
22 more in-depth about a lot of the issues we talked

1 about today. Thank you all for coming as well.

2 (Whereupon, the PROCEEDINGS were  
3 adjourned.)

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