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P R O C E E D I N G S

(9:30 a.m.)

MR. CURTIS: Thanks everybody for coming. I wanted to say a little bit about how this is going to go off this morning and then, we'll get to introductions of the panelists. And thank you guys in advance so much for coming. I know it's a large commitment of time. Hope it's productive for everybody here, actually.

Just a couple ground rules. If everybody could turn off or mute your cell phones. It causes feedback through the audio/web system. There will be a little bit about the way it's going to go.

I think everybody's got three minutes to do a quick, you know, overview on, you know, agenda, questions we've discussed, say a little bit about your background in, you know -- who you are, what you do in that period of time.

I'm not going to take the time to go through and introduce you individually.

There will then -- you know, we'd like

to have a pretty lively discussion from the staff folks on the panel as well as you all. It will be back and forth, questions, follow-up, pretty open dialogue. That's where we'd like to get.

There will also be two sorts of inbound questions. One from note cards from the audience, which I think are being passed around or you got when you came in. And there will also be questions coming in off the web, which we'll sort through and interject at the appropriate time.

There will be a timer on your opening. It will be, you know, adhered to pretty strictly. You know, the -- you'll see up there, there's red, yellow, green. Yellow will come on at two, red will go off at three. Please, please hold it to three. We got a lot we want to talk about.

So, why don't we get going? Dave, you want to kick us off?

MR. ARMENTROUT: Yes. Good morning. I want to first thank everyone for the opportunity to be here today to represent FiberNet.

My name's David Armentrout. I'm the

president of FiberNet. We are a CLEC that began in 1999. Our central office is in Charleston, West Virginia, so, we're in one of the most demographically challenged rural markets in America today. And we have approximately 35,000 subscribers, a mix of residential and business customers.

We have a little bit of uniqueness about us. We have about 3,000 route miles of fiber. So, we've spent 10 years building quite a bit of fiber throughout the state. Our perspective in the early days was, obviously, bandwidth is going to be a requirement in the future. So, we tried to lay a foundation that would support the next 10 to 20 years.

Couple of things that I would like to address to the FCC today to bring to their attention from our perspective and from our market. One of the things in -- since we've done quite a bit of fiber build-out is we would like to see some attention to the improved pole attachment and make ready process.

Over the years, it's been our experience that we can be anywhere from a 45-day interval to 19 months. Makes it very difficult in a competitive market to meet customer needs and demands based on timelines and intervals. Also, over the last four years or so, we've seen an increasing cost in make ready. For an example, years -- 4, 5 years ago, it would cost 3- to $500 for one pole replacement. Today, that's around $3,500. So, we've seen a significant cost increase.

The second thing I think that we would like for the FCC to consider would be the colocation access to ILEC remote terminals. Today, we do provide a variety of voice and data services to consumers, both residential and business, anywhere from 512K up to 10 gigabit. We do provide a 100 megabit per subscriber for business -- or for businesses, but we would like to see more access to the RT terminals.

Then we would like to look at the continued access to clean copper for ADSL, HDSL,

and copper -- Ethernet over copper. Clean access -- clean copper will provide the ability for companies like us to provide broadband to rural America.

And then finally, access to last-mile loop facilities that are purchased either via Section 251 unbundled network element or special access. We need these loops, so -- I'm out of time.

MR. CURTIS: Great. Right on the nose. Thanks. Dallas.

MR. CLEMENT: Sure, thank you, also. Thanks. My name is Dallas Clement, and thank you for having myself and Cox Communications participate in this.

I've been at Cox for about 19, 20 years: First 10 years in finance, FPNA, investor relations, MNA, et cetera; and then the last 9 years in strategy and product management.

Cox Communications covers about 10 percent of the homes in the United States, and over the last 13-plus years we've spent nearly $16

billion building platform infrastructure to offer digital video services, digital voice services, high speed Internet, or broadband services to both the residential and commercial markets. We're very proud of the success we've had, in particular in broadband, and the various awards that we've won from JD Powers, PC Magazine, et cetera.

If you narrow down onto broadband, we have about 9.3 million homes. We -- our network passes north of 99.5 percent of those homes, offering our full set of services, focusing on who takes those. It's a competitive market and between ourselves, DSL, wireless broadband, FiOS, our research would indicate just shy of 70 percent of homes in our footprint take the service.

Our research would indicate of those homes that don't take the service, the 30 percent that don't take it, 2/3 don't have a PC. And if you narrow down on the people that don't have a PC, 50 percent of homes that have income less than $20,000 don't have a PC. About 25 percent of homes less than 49-, $50,000 don't have a PC.

So, at least within our franchises, and we cover most all the homes in our franchises, the way to drive broadband will be to get more PCs in those demographics and in those homes. And that would be, at least from our perspective, how to focus on broadband.

And that's my comments. I'll give you some time back.

MR. CURTIS: Super, thanks. Anthony.

MR. DiMASO: Okay. Hi. I'm Tony DiMaso with Verizon. I have responsibility for our corporate strategy and development organization across the company. Prior background in AT&T and NEC, so a career primarily in the enterprise and small business space.

And so just talk a little bit about broadband. That is one of the cornerstone service offerings of the company, so we do appreciate the opportunity to speak on it today.

We've spent about $80 billion in capital since 2004 building out FiOS, fiber to the premises technology, and our DSL-based high-speed

Internet access. And we feel pretty good about that. We've had a lot of success with our fiber to the premises offering. Our target is to get that to pass about 18 million homes within the next couple of years, and that's about a $23 billion capital effort. So, the significant amount of money there.

I think that our view of the fiber optic technology is not just to have it as a platform for traditional services, as the Triple Play is today, but also to go beyond that, to be really the platform for the next generation for services and home health care and energy management, security services, things of that nature. So, we believe the platform is really being built for that next generation of services in addition to serving what's there today.

We have a lot of focus on the residences in our area, so we're going to fulfill that. We're on track to complete that program for 18 million homes and that will cover about 70 percent of our wireline footprint when we're done there.

Our overall broadband coverage today between DSL and fiber optics is just north of 80 percent. And so we're going to get fairly close to 90, we think, by the time we're done with this build.

So, clearly we're focused on ensuring that the economics of fiber deployments continue to come down, that we can continue to upgrade the speeds of DSL. We've made about 7.1 megabit service available to about 10 million homes and small businesses. And our goal would be, obviously, to keep driving down the scale costs of deploying the fiber optics so we can push it further and further out.

And would be remiss for not saying also that the wireless deployment for LTE in the next generation may be a tool for us to look at collectively, the FCC as well as the carrier community in deploying broadband access for residences and small businesses.

So, Rob, thanks very much.

MR. CURTIS: Okay. Thanks, Tony. Craig.

MR. MOFFETT: Good morning. And thanks to Blair and everybody else for inviting me this morning.

My name's Craig Moffett of Sanford Bernstein. This is my 20th year in the telecom business, most of it spent at Boston Consulting Group as the head of their telecommunications practice through much of the '90s. And now I'm at Sanford Bernstein providing equity research. So I'm in sort of the unique catbird seat of I don't have a particular horse in this race. I just get to observe and comment and try to make observations about the economics.

I am, I think -- the point I try to make in these forums most adamantly is that you have to think about the return on invested capital for the players. Because at the end of the day, unless they are earning an acceptable return on capital, then what we're doing as a country is not viable.

And just a couple of observations. The returns on capital of the cable operators today are not very good. The returns on the capital of

the telecom operators are not very good. The returns on capital on the broadband deployments, even in the dense markets, are truly awful. And so, there is a real problem in terms of earning acceptable return.

And a couple of threshold observations that I would just make as we enter this debate and think about how we noodle through this problem as a country. One is the cost of broadband is clearly inextricably tied to the cross subsidies that exist in the existing wireline infrastructure.

And I'm stating the obvious when I say that the wireline business is in real trouble, that the underlying costs that are borne by the telecommunications -- or for the telecommunications network that are borne, traditionally, by wired voice are being reallocated because the wired voice business is going away quite rapidly. That's a real problem.

Second, our work suggests that wireless, while it can certainly compete with terrestrial

broadband for speeds, has a real hard time competing with terrestrial broadband for throughput. That is, speed times duration times session frequency. And so there are -- the economics of wireless don't look like they are a fully viable substitute.

And then third, the economics of multiple competing networks are particularly problematic. You know, I do often ask the rhetorical question: When did we decide that it was a good idea to build two pipes into every home and then only use one of the two of them? And did we not expect that that was going to strand a significant amount of excess cost? And, in fact, the evidence suggests that in multiple competing networks, unless you believe that the first network on its own would be earning such egregiously high returns that it leaves room for another, it creates a real problem.

The last remark I would make is just to underscore the point that Dallas made a moment ago. And that is that the uncovered part of the

country, which is perhaps about 8 or 9 percent of the country, is a much, much smaller percentage of the part of the country that is covered, but doesn't use broadband service because of access to whether it is computers or the Internet or simply economic issues. But that is a three or four times larger problem.

MR. CURTIS: Great, thanks very much, Craig. Hunter.

MR. NEWBY: Thank you, Rob. Thanks, Marcus, everyone at the FCC. Special thanks to Michael Priard, Nance Levin, and all of you for coming.

My name is Hunter Newby. I'm the CEO of a company called Allied Fiber, which I started about a year ago. Before I tell you what we're doing, I'd like to tell you what I've done in the past. I was one of the founding members, chief strategy officer, and a director of a company called Telx. We started this company in the late '90s on the heels of the Telecom Act of '96.

Originally, we were a 214, but we

transitioned our business into that of physical layer interconnection. We started the business at 60 Hudson Street in New York City. I'm not sure if anybody knows what that building is, but it's referred to as a carrier hotel and it's a very important property in the grand scheme of things in the United States and the world.

There are probably eight buildings in this country that matter. In 2004, Telx acquired 56 Marietta Street, which is the main carrier hotel in Atlanta.

There are fiber routes throughout the United States that all go through these buildings. They are all tied to the sub-sea cables connect the continents and the world.

We built this business from nothing. It was a concept. And we brought into our facility, essentially an empty room, by the time we sold the business and exited, over 450 different networks, which include all the major networks in the United States, most of the internationals, a lot of the small rural guys and cable companies, and anybody

that could make their way to us.

And if you could get to our facility, you could access anything you wanted, at any price. We refer to that as carrier neutrality. And we've been doing that without any imposition from the FCC or anyone else for over a decade. So, it's interesting to see the rules that have come out regarding the broadband stimulus with certain respect to open access and non-discriminatory interconnection, which is something that we've governed ourselves by for years.

We see that this issue exists in the last mile. So Allied Fiber, which is my current company, is working with Norfolk Southern Railroad to build new fiber throughout the United States. We're building a long haul system in conjunction with, in our three ducts, a second duct for middle mile, intermediate access. That duct is meant to be cut every 3,500 feet for a handhold for lateral access to wireless towers, data centers, libraries, schools, whatever.

By giving people access to fiber, to an intermediate regeneration point on a 60-mile basis, they can get access to long haul fiber and get back to those carrier hotels. And they could be free, and that will enable wireless speeds, sessions, durations, use of broadband. That will actually enable service providers to go out into the field and create a business based upon underlying cost structures that they can live with because they'll be able to own their own fiber.

Thank you.

MR. CURTIS: Great. Thanks very much. Marcus.

MR. WELDON: Hi, I'm Marcus Weldon. I'm the CTO of the Wireline Networks Product Division, Alcatel-Lucent. You probably have no idea what Wireline Networks Product Division is, so it's the part that makes DSL and fiber equipment as well as home networking, which I'll touch on as well.

So, Alcatel-Lucent is a company, of course, is a large telecom equipment manufacturer both in the wireless and the wireline space. Also

has a services business and an applications business. I'll just talk about the wireline piece and, frankly, the access piece of which I'm the chief technology officer.

So, we have more than, I think, 200 customers through our global operators for our access-type equipment: The DSL and PON equipment. So, we are very experienced in the access space across the globe: Asia, Pac, and North America and in Europe. And, in fact, I've been spending quite a bit of my time talking to the European regulators and Australian regulators, in fact. So I will try and bring some of that perspective to my comments here.

One of the things that seems consistent across those different regulatory bodies, including in North America with the FCC, is actually the idea that the best form of competition occurs at the lowest layer in the network. If I think about what Ofcom even says -- and they are clearly an advocate for some kind of open access -- they are only an advocate for that

when competition at the lowest layer has failed.

In other words, infrastructure or facilities-based competition is the common thread in most regulatory bodies. And the other forms of access higher up the hierarchy are only advocated when competition at the facilities layer or infrastructure layer is not possible.

So, I think actually that somewhat applies in North America. There's a very strong competitive infrastructure or facilities-based competition in North America, and that should continue. And that's certainly Alcatel-Lucent's position is that between the cable MSOs and the telcos and satellite providers and wireless 3G services providers, that sort of competition is healthy and should continue and serves a large part of the addressable market.

It certainly serves the market-driven part of the market, which is where, essentially, there's a lot of reasonable return of investment. It serves the risk-driven part of the market, which is where there's an opportunity to make a

reasonable business case, but the market is a little more challenging.

The place where a little more regulatory or public funding -- public sector funding is required is in what the EC or EU calls the white areas or the policy-driven areas, which are those underserved areas or areas where -- which are rural. And there we do see that a combination of some private sector funding and public sector funding is appropriate. And to combine with that, I would like to touch on the fact that the PC -- in a rollout of PCs into these underserved areas as well as help setting up the home network, which is the other part of that connectivity is an important point.

MR. CURTIS: Great --

MR. WELDON: Okay?

MR. CURTIS: Thank you. Let's kick off a little bit of an open-ended discussion. Let's start with back haul.

And I think -- I'd just like to, in the scheme of things, start with David.

Lot's of comments have been made about the availability, not availability of relatively inexpensive back haul when you go build out on the edge. What's your point of view on that? Is that deterring/encouraging entry for you?

MR. ARMENTROUT: Well, it's an encouraging entry. I mean, we have -- just in our market we have over 350,000 miles of fiber strand miles. So when we build 3,000 route miles of fiber, we build large fiber counts.

So in our markets today, there is sufficient back haul fiber available. As many of you are well aware, technology today, you just change the blade on the fiber to increase the bandwidth. We have 40-10 gig circuits lit today.

So, one of the things that I'm concerned with is, with the issues of building last -- middle mile network, you have the pole attachment process, the make ready. You have H poles that creates, you know, other problems. But I think the biggest thing is with the rust finding and some other things that we see out there today.

We're -- it looks like a lot of folks will be going after middle mile build-out, which is just a parallel or an overbuild to existing network. And I think the money could be better spent for last mile.

MR. CURTIS: I just -- part -- to Craig's point, right? It becomes difficult to get a return on that capital when you've got, you know, multiple runs on these routes, you know?

What's your take on this, Hunter? Is back haul a problem?

MR. NEWBY: Yes, clearly it is. It depends on where you're sitting out there in the middle of America. But, you know, as Craig pointed out regarding wireless, a lot of that can't be supported unless there's fiber to the tower.

There is less than 10 percent of the towers in the U.S. have fiber. And there is no plan -- it's all, you know, one-off build assessments off of maybe a metro of regional ring, but there's no national plan for that

architecture. And also, in regards to RLECs and cable companies and others, regional carriers, they have pockets where they have fiber. But then everything in between, there's nothing.

So you can't develop there. And they even have a hard time connecting to themselves without gaining access to, you know, incumbent special services, which cost a lot of money because, in many cases, they're the only thing that's there. And in some instances, if you're referring to wavelengths and DWDM, which is the most efficient way to carry transport overlight, sometimes incumbent facilities aren't available at those speeds.

So, there's a whole different cost structure as it relates to if you want to call it back haul or middle mile. Very difficult to make the case in certain spots. Again, a national plan is required to make that effective.

MR. CURTIS: Craig, do you have a point of view on what's required to stimulate, you know, cell sites? We've heard the same thing other

places. Clearly difficult to build fiber, you know, dig the trench, lay the cable for a cell site, unless you project very high volumes. How do you think -- how does anybody think about that in terms of, you know, the plan that would be required to get a decent return on that particular kind of investment?

MR. MOFFETT: Well, as far as we can tell, the carriers themselves -- at least particularly when you're talking in region. So, if you think about AT&T and Verizon as at least the first two aggressively -- we'll come to Clearwire in a second -- aggressively deploying 4G networks, the 4G plan obviously carries with it an expectation of providing more than T1s in and out of the towers. And, undoubtedly, that will come first in region because the extensions from the existing terrestrial plant are the most cost-effective there.

To the point that I'm not even sure -- and you can correct me if I'm wrong -- but I'm not even sure that they -- that at this point it makes

sense to sit and do a cost benefit analysis for -- on an individual tower as you're planning LTE as to whether or not you bring fiber. It's a foregone conclusion you're going to have to bring fiber.

And it's a question of due to the pace at which you do it. The bigger question becomes not just for -- as you get outside of -- let's think about it for Verizon, out of region, and then for AT&T out of region, and then collectively for everybody else everywhere. How do you think about the special access conditions associated with back haul to and from hotel towers and -- that's a much knottier problem. I think that's perhaps slightly outside of the purview of this panel, which as I understand it is a little more focused on the last mile. But it's -- then special access. But --

MR. CURTIS: That's a can of worms I think I'm perfectly happy to open up. You know, I think to the extent that second mile is a clog on the deployment of last mile, that's something, you

know, we're quite interested to talk about.

MR. MOFFETT: Well, I would just leave a parting comment that I guess, to some extent, the question about tower back haul, at least hinges on whether or not you believe wireless is a substitute or an addition to the terrestrial broadband network.

And, you know, if you think about the physics of wireless networks, you know, it's a pretty well understood set of physics, right? And what I think -- we've done a disservice by focusing excessively on the speed that you can get out of a wireless network and not enough about the throughput you can get from a wireless network.

And that if you think about throughput, that is the speed of the connection, but then multiplied by the session duration and the session frequency, you can't support this anything like the kind of oversubscription levels in a wireless broadband network that you have today in a wired voice network. And therefore, you need a radically smaller radii anyway in order to support

a large number of simultaneous users and the cost structure of the network would expand exponentially.

At least for the foreseeable future, that means that for very high bandwidth applications, you're likely to see usage caps on wireless networks that -- because you simply can't charge enough to make it economically attractive. So instead, you'll try to manage the other side of the equation, which is try to limit the usage on wireless networks when you're coming -- when you come to very high bandwidth applications.

And therefore, I think, realistically, we're looking at a period in front of us where the wired network is going to be the real workhorse rather than the wireless network for broadband.

MR. CURTIS: So I realize this is the wired panel and we're having a wireless very soon. But it invites the question: Does your view change if, you know, considerably more spectrum was thrown at the equation?

MR. MOFFETT: Well, spectrum's part of

the problem. Yes. I mean, if -- spectrum's part of the problem.

You still have -- and Clearwire, they're -- because of it's enormous spectrum depth, therefore, it has an interesting position in all of this. But it has to be the right spectrum and it has to be adjacent and it's not sort of the -- sort of you throw spectrum at the problem and that solves it.

MR. CURTIS: Clearly, yes. Got it.

MR. NEWBY: It doesn't take away from the fact that you still need the fiber. But, you see, if you start at the physical layer and the way we look at it, it's the OSI model and you have to go down to one, like what Marcus said, it's got to make sense there or nothing else in the stack makes sense.

Our plan is to build a long haul fiber cable, very high count -- a 432 minimum, could be an 864 -- with the second duct having buffer tube cables that can pull off of a 216 -- 12s or 24s at the base of towers.

And we believe that it's the combination of fiber and microwave, which for back haul from towers that don't have fiber can cover a much larger swath of the country along this right of way. I mean, the railroad itself has over 4,000 towers on the right of way, none of which have fiber today. We're combining the duct, the towers, and the colos -- three separate, very successful businesses in the communications field combined in one. And that's where you start.

Now, our model is replicable and scalable. I mean, FiberNet could do it in West Virginia on their loops. And other regional metro networks could do exactly what we're doing and tie into us and we'll be the loop around the country. And then from there, you could begin to solve problems. But it is without a doubt a marriage between the two technologies.

You can't get -- first of all, mobility. That's it. You just say the word and then, you know, wireless has to play a role. But then how do you aggregate the LTE from a tower that doesn't

have glass? Like Craig said, it won't work.

MR. ARMENTROUT: And a concern that I have is, from the wireline perspective, obviously more and more of the towers will require fiber back haul. Well, that back haul is going to be going over the wireline pole infrastructure today. And the concern that I have is that if we launch too much wireless because it is speed to market -- put an antenna up, you know, advertise, and you're selling -- the problem that creates is, it requires a certain amount of dollars annually to keep the wireline plan healthy. But if you lose 25 or 35 percent of the revenue to wireless, now the pole owners and everybody on the poles are upside down. And that's the concern that I have.

MR. CURTIS: Yes. Dallas, you want to jump in.

MR. CLEMENT: Yes, I'll maybe be a little contrarian here for a second.

So when I think back haul, I think middle mile, which we talked about. I think back bone, back bone through the -- in sort of the

dot-com explosion in the late '90s, 2000, a lot of national fiber was built. And since then, the technology -- the throughput on that national fiber has increased such that it's much more efficient to use that.

And to Craig's earlier point in terms of return on capital, you've got companies like Quest and others who are trying to sell that business because it's slowing. And they're having a hard time selling it and sort of earning their cost to capital.

So, I'm not sure that -- I'm not sure there's a glut in backbone. And for Cox, and growing our residential business and our commercial business, we haven't found the backbone back haul to be a problem.

In terms of the middle mile, I would tell you that because we've been offering video, voice, data services for years and years and years, we're able to upgrade where necessary in the middle mile, sort of the metro core. And technology advances have also allowed us to

leverage the fiber that we have available there.

I'll further tell you that relative to residential usage and commercial usage, the business scaled wonderfully up until about two years ago because you were adding -- the rate at which we are adding customers and, therefore, revenue was outpacing the rate of utilization of the network. Today, you're seeing the rate at which you're adding customers slowing and the rate at which those customers that are on the network growing their utilization of broadband with more streaming media, et cetera. So, it's not scaling quite as well. And so, you know, five years from now it'll be an interesting sort of conversation relative to the scaling piece. But from where we sit, that's -- we're not -- I wouldn't say we're at a red in terms of our business. Maybe a slight yellow.

When you talk about back haul for wireless, I go to where Craig was talking and, you know, I guess in terms of sort of public good -- in part maybe it's this panel and other panels --

the FCC has to determine what's the goal of wireless broadband. Is the public good, the public goal as an alternative to wired solutions or is it another competitive alternative to wireless -- to wired solutions. And I'll leave that for, you know, the panel and whatnot to discuss.

MR. CURTIS: What's your point of view on that?

MR. CLEMENT: Well, you know, I mean I think it's been said. I think the -- so, in our networks, the top 3 percent of customers use 50 percent of the bandwidth. Those customers aren't going to ever get a satisfying experience on wireless. Never going to happen.

But how many of us have this wonderful little device here? That won't work over a wired network, sorry. So, I think that it depends on the usage. And you'll see some people move to wireless because that's their usage model. You'll see some people stay with wired because that's their usage model. And you'll see some go to

both.

Relative to wireless back haul from cell sites, again, depending on sort of public good and sort of competitive piece, I'll tell you that in our commercial business it's a growth area. We're getting calls in our franchises from wireless providers who are preparing for their 4G networks and they're looking for lower cost alternatives for back haul. And because we're there and we can do sort of spurs off of our network, we feel as though it's a big growth area and we're deploying capital to that area to be able to satisfy that demand.

You know, with the intent -- back to Craig's point of earning our cost to capital -- you know, on that.

MR. CURTIS: That's a good thing.

MR. CLEMENT: Absolutely. Absolutely. So, you know, and I think earlier there were comments on pole attachments and rights of way. And, you know, I'm not sure that's a red. That's probably a yellow. There's not consistency in

those rules. There's not consistencies on is it -- is the bits going over it a residential bit, a commercial bit, a voice bit, a video bit, a data bit? You know, we have a whole host of folks that sort of think about that and worry about that. And I kind of think of myself as a smart guy, but I never understand it, so.

MR. WELDON: So if I may?

MR. CURTIS: Yeah, absolutely.

MR. WELDON: I just -- I agree with many of the comments made. I just wanted to make a couple of observations.

One is from the physics standpoint. I wanted to put some numbers on the wireless piece. A typical 10 megahertz of spectrum -- the typical Shannon limit of information capacity is 8 megabits per second without MYMO network, MYMO and things like that. So, that right there confirms the point. That's 1A DSL connection, right? And that's meant to be shared by hundreds of users within that cell site. So clearly, spectrum doesn't solve the problem. You'd need to throw so

much spectrum at the problem that it's not going to solve the problem.

So, I agree with the comments made that I just wanted to put some numbers on there.

Now, on the other hand, when you look at that, that argues for very, very small cell sites that would be, for example, femtocell-type architectures, which is where you start coupling wireline with wireless, which, again, brings it back to the wired part of this. Is -- for a femtocell -- of course, 8 megabits per second within the home is actually a very reasonable wireless experience. And then a larger macro cellular handoff as you roam is -- will perhaps provide an acceptable service combination because you get the high bandwidth wireless service over the wireline connection. And then as you roam, you sacrifice some of the bandwidth, but you still get that mobility that you so seek.

The other part of coupling wireline and wireless is increasingly wireline networks like access networks are being used to wire -- to back

haul cell towers. So the two couple in that dimension, too, meaning fiber architectures are being looked to back haul 3G and LTE deployments, for example, or the next generation of PON is being looked at as an LTE back haul architecture. But DSL is often used to enhance cell site back haul over copper. So the two couple in those dimensions and we should not forget that.

So I do agree with the point that wireless will not solve the problem, but wireline and wireless couple in the femto domain and also in the back haul domain. So, that middle mile is no longer just a middle mile into an abstract transport network. It's actually often coupled to the same access network that is deploying residential services.

MR. MOFFETT: Can I just add one last point to that?

MR. CURTIS: Yeah.

MR. MOFFETT: Because it is -- for the people that are still skeptical about that point.

A useful way to think about it is, you

know, Tony's company is building fiber to the premises with FiOS. And I often hear people in my daily work, investors, who will say, well, that's clearly the future and what's required is we need to have fiber to the home. And then, in the second half of a conversation, they will say, well, LTE or wireless will be a substitute. And with 30,000 towers today in the United States or thereabout, you know, we're talking about a fiber to every 1,000 homes. So, which is it? Is it a fiber to 1,000 homes or is it a fiber to every home? But whether the end point is wireless or not, that math can't change, right? We're still talking about how many homes are going to be served by the fiber connection.

MR. CURTIS: Yeah. It probably depends on the segmentation, right? I mean, you've got very different usage profiles and demands for people. Some people are happy with 500 kilobits, some people are happy with 25 megabits.

Doesn't -- possible wireless competes with wireline with lots of spectrum for low usage

people?

MR. MOFFETT: Sure.

MR. CURTIS: Yeah. It's clearly -- as you increase usage, that's our (inaudible) problem.

Tony, any comments or thoughts on --

MR. DiMASO: I'm having a great time.

MR. CURTIS: -- on back haul?

MR. DiMASO: But -- no, not at all. I mean, I think a lot of good points are raised. The fact of the matter is, it's a -- there's no magic bullet, right, to the issues that we have. I think there's a lot of benefit to building the fiber infrastructure across the country. There's a lot of benefit as we deploy fourth generation wireless.

I think at the end, who's going to make the choice? The customers will make the choice based on the applications that they require.

I think we've found that we might have excessive capacity for some period of time, which may cause certain companies a lot of grief and

aggravation. But, in the end, in aggregate, we end up using it for one purpose or another.

So, we rarely waste the deployment of capacity in the networks. Right? So, we do see extra spectrum as part of the equation, we do see significant fiber capacity as part of the equation.

We like to keep money flowing into Alcatel-Lucent as often as we frequently can to keep their employment numbers up. So, we do see that capital spending going on.

And I think each of these, you know -- the question is, coherently, to Craig's point: How do you balance these exploding opportunities from the user perspective? Particularly, again, there's enormous video opportunity, still, voice and data. But now you're looking at, you know, these integrated ecosystems, like the home and the, you know, smart buildings and smart cities, et cetera, where fundamentally networks will be the enabler of the smarter devices that are going to be the end. What is the capacity required?

What are the security issues? What are the issues of ubiquitous availability or on demand availability?

And so, I think at the end, the deployment issues we're going to always use what eventually comes. The question is, how long -- you know, how far along the line?

And to Craig's point, which is valid, you want to make sure you don't get too far ahead of the curve, that your return on invested capital ends up killing the business case and then you -- all of a sudden, you stop.

And that's what -- you know, the balance with FiOS has been that. We are on the edge with the deployment. We feel like there's a lot we can gain out of it. But a lot of the, should we say, the intelligence of the investment will be on, can we leverage it above and beyond the traditional triple play services? So a lot of our thinking is about that next generation.

So, I think all of these pieces are part of the equation. And the question is,

sequentially, which ones do we focus on first?

MR. CURTIS: Yes. No, I think that makes sense. Hey, before we leave back haul, somebody threw out 10 percent of the cell sites --

MR. NEWBY: Yes.

MR. CURTIS: -- have fiber. Any idea what percentage of those are covered with microwave of the remaining 90?

MR. NEWBY: That's a good question. Well, I could tell you based upon the information on most of the microwave equipment vendors' websites, they will start by saying fiber is without a doubt the best. But in absence of fiber, let's use microwave.

And then there's all sorts of different, you know -- DragonWave, Acadian, Alvarion, everybody's got something.

And I don't know what their density is, but it's just a practical reality that that's going to have to work together in conjunction with the fiber or we won't get to the speeds and the densities. Our geography is our issue today.

Whereas in other countries -- you know, that's a point I'd like to make regarding that, by the way.

I think that it's wrong that the United States is ranked 11th or 15th on a list of countries for broadband deployment. It's wrong because we are a very large country being put up against South Korea and Japan. South Korea is the size of Indiana. I was just there for 10 days the beginning of the month and it's true, the kids there have full duplex video phones. I've seen them. It's pretty amazing. I think, wow, you know. Here we are in this country and CEOs don't have them and over here, kids have them.

But they have an advantage today. And that is that their geography is much smaller. So they can make the business case, cost of capital to have towers. I saw them everywhere. And I was deep in the south of South Korea.

And to build fiber to those towers. It's very easy to roll out LTE and high-speed applications over mobile devices. And it makes sense and there's a perfect marriage and it's like

a Petri dish. And then the United States of America is a very large place. We have coasts, and we have pockets, and we have very large capital issues to resolve those problems.

So, it won't work without microwave combination.

SPEAKER: You've got it.

MR. ARMENTROUT: Yes. And just to add to a couple of the comments. We provide, in our markets, a considerable amount of fiber build out to towers. And my thoughts are that the majority of the towers in our markets are T1-fed today. Any ones that are microwave are the ones that are very remote, and they can't get access to even copper.

But to the point that was made earlier with LTE and some of the other technologies, T1s are out --

SPEAKER: (inaudible)

MR. ARMENTROUT: So it's either going to be fiber or it's going to be microwave, yes.

MR. CURTIS: Yeah, got it.

MR. ROSENBERG: Hunter raised a good point there with regard to the United States and the geographic disbursement of the population.

As we shift in thinking a little bit from, say, middle mile and back haul to the last mile -- and I want to address this to the panel overall -- curious how you think about ensuring ubiquitous coverage, which, of course, is part of the Recovery Act, for the broadband team here at the FCC to help figure that out.

Obviously, you've got a lot of challenges. You've got the dispersion of the population. You've got the need to hit costs of capital, Craig, that you mentioned. You've got the problems of fiber access in large portions of the country. And so the back haul implicitly coming into that conversation as well, how -- and I'm going to start by asking this of, I think, Verizon and Cox and Tony and Dallas, as you think about it.

Dallas, I think you -- Tony, I think you mentioned percent roughly now, 90 percent overall

in the future, under your future build out plans. How do you think about building out that next 10 percent and the next 10 percent after that?

MR. DiMASO: Okay, fair question. I think, you know, when we take a look at a deployment of our new technology -- and certainly the fiber to the premises is a good indicator -- what you're trying to do is get the most bang for the buck in terms of how many customers can you get to as rapidly as possible. And hope -- and our experience has been that this comes to pass in many cases that as you scale it, you know, the cost curve per unit comes down. And so the real -- a lot of the questions are how rapidly it does come down and how far you can push it.

The other element of it is, do you have the technology available for specific issues or locations geographically? So, for example, we didn't have a fiber solution for multiple dwelling units for some period of time.

There was a technology solution. But also, there was a building-by-building,

landlord-by-landlord slog, you know, getting deals in place, et cetera.

So I think that in some cases, there are answers that, you know, just doesn't come down to, we'll make money here. Our goal is that, ultimately, the scale is a huge component of the overall picture, so we can get to a lot of customers.

And it does come down to where you normally will run into that last 10 or 12 percent, right? Where the issues are, is, you know, rural geography is where frequently you have "wireless solutions." For example, in video you have much more penetration of satellite services in many of those areas.

In the urban locations for us, the answer for us was the MDU technology and moving into the MDU. So that's not really a -- now a technology issue. We have the technology there, but not the issue is, what is the arrangement building-by-building with each landlord? So I think that's more timing than anything else.

By the time you're done, again, I think to the point that either Craig or Dallas mentioned, there is, for us, a much bigger issue, is the homes we pass where nobody's adopting the technology because of economic concerns. You know, they can't afford computing devices, at least, you know, because they've kind of flattened at 3- or 400 bucks, which is still significant; or they're elderly people, they're kind of afraid of the technology; or, you know, they're just concerned about security and all those other issues. So, that's a piece for us to think about.

We look at education and things of that nature. And that's a role, I think, the FCC and the government can play in terms of that. It's going to be particularly important, particularly for elderly people, when we look at the platforms for home health monitoring and, you know, chronic reporting of any issues in the home security, et cetera. But I think the other portion of it is, what is the appropriate technology?

If we give it enough time, you can get a

particular technology everywhere. But it's forever out, right? So the question is -- you know, and this gets to the point we're talking about before about wireless -- what role does wireless play in solving multiple issues?

One is providing mobile broadband capability to extend your home or your work, et cetera. But fundamentally, the second question is, what role may it serve to facilitate the availability of a broadband capability at one megabit or higher to everybody, that it's harder to get to and particularly in rural locations, things of that nature?

So, I see -- that's the way we're thinking about it. Steve, I think at the end of the day, our view is that we have -- we need to invest in a rage of technologies that fundamentally, then, could be fit sooner. Because if we had until 2025, I could tell you that fiber will get there. All right? That's not the goal. The goal is sooner.

MR. CURTIS: Before we go to Dallas, let

me vent just a little bit on that. And obviously, all these issues are related and overlapping. But if you can do your best to kind of pry apart the big levers.

SPEAKER: Sure.

MR. CURTIS: In terms of getting, you know, fiber out further faster, is it more an equipment, CPE is really expensive because we haven't hit scale yet? Is it more a linear density problem that's, you know, not going away any time soon unless, you know, capital prices fall dramatically?

Or is it more of an adoption problem, that even if we pass the homes in these particular areas, we're not going to get enough take to make it work, kind of no matter what, you know, any reasonable view of CPE looks like?

MR. DiMASO: Yes. I think -- you know, I would -- the adoption issue is important. But I wouldn't put it as a key in the equation, right? Because ultimately if we look at, you know, there's a lot of dense areas where if you don't

have the take rates, that's a different issue, right? It still makes sense for you if you're going to do the deployment to do it at a certain point in time. You know, to construct what you have to because of the economics of doing that.

Clearly, I think there are some linear density issues, right? Because, you know, the way we look at our deployments isn't which ones can we serve, which ones we can't. The question is, how do we hit the most customers, past the most customers with the most rapid plan possible? And so at the end of the day, that comes down to really looking at the geography.

You know, one of the challenges we've had early on is, you know, how do we get to these MDUs? They make up 25 percent of our homes past in our footprint. How do you get to them if you don't have an MDU solution? Until that technology is available, right, we don't have a solution to that. So you're sitting there with a nice chunk of our market that we couldn't get to. Now, we're looking to accelerate that component to catch up

with some of it.

If you look at the highly dense suburban areas, we're real good at that. That hasn't been a problem. We've been able to get to that, we had a technology solution.

So I think a part of it is the characteristics of the particular physical geography, like MDUs. Part of it is, fundamentally, even with a $17 billion annual capital program, you can spend it all and still not get to everybody physically you can get to in that point in time.

And you do have to work on the back haul components, you have to work on the backbone Internet. You have to meet the regulatory requirements of the FCC and the local PFCs for things that still have to be maintained in the copper plant, et cetera.

So, when you look at that budget every year, you're looking at how do I cover the most customers with the most advanced services as rapidly as you can? And just eventually, you hit

the 17 billion. And that's --

MR. CURTIS: That's where it stops --

MR. DiMASO: You know, it's not what it used to buy anymore. You know? So.

MR. CURTIS: As you think about edge out, you know, I should know this probably and just don't. You know, what's the -- what's your relative intensity on fiber edge out versus DSL edge out going forward? Are you thinking about going DSL any places anytime soon or are you pretty much new places are fiber.

MR. DiMASO: I think do places with fiber. I mean, you know, we don't rule out anything. But I think that our goal would be to upgrade where we have DSL to higher speeds. Right? Because we've got, you know, sort of -- if you got 1 megabit --

MR. CURTIS: Increasing blades, but not shortening loops?

MR. DiMASO: Well, yes.

MR. CURTIS: Okay.

MR. DiMASO: And in some cases, you can

shorten loops. But again, you know, how do you again spend the money most effectively? So in many cases, what we're getting is not demand for additional DSL so much as, hey, can I go from, you know, 1 megabit to 3 or 3 to 7.1? Which is, you know, we've moved up.

So, part of it is fundamentally enabling to the optimization of the speeds within the existing technology. But the other component is we truly do believe that the next generation platform -- which is a fiber to the prem -- there's so much going on in the health care area, as we know and the energy management area and the security area, et cetera. So we find that every time we keep coming back to that platform issue, it comes down to be a fiber and wireless kind of combination of services that meet that ecosystem, whether it's the smart home, the smart business, the smart city, the smart campus. And so from my perspective, from a strategy perspective, it seems to come with those elements.

And as some of our engineers on the DSL

side, they can always squeeze out more capacity, you know. And the discussion always is, yes, but to what end? Ultimately, what are we trying to do for the customer.

And so, that's some of the tradeoffs you see.

MR. MOFFETT: Let me just put some numbers around that for a second, though.

MR. CURTIS: Yes.

MR. MOFFETT: Because, I mean, it helps to sort of put it into context, right?

So, Verizon is spending -- in the only large-scale fiber to the home deployment that's going on in the U.S., Verizon is spending $18 billion net. That's about $23 billion total, but about $18 billion net. And passing 18 million homes with that network. So, that's math even I can do that you get to $1,000 per home passed for all and including the connection cost. $1,000 per home passed. And their own goal is to get to 40 percent penetration with that network. So, $1,000 divided by 40 percent says it will cost them

$2,500 per connected home to build that network.

By the time you add in customer acquisition cost, and you add in the set-top boxes, which are outside of that number, you're not far from about $4,000 per connected home to build that network.

The capital markets today are valuing roughly equivalent networks, cable networks, at about $1,000 per connected home. So, the capital cost alone of building this network is four times what the market is valuing these networks at today when there's only one of them. And saying in markets where there's one, there -- we think they're one- quarter as valuable as Verizon's cost to be the second.

MR. CURTIS: Correct me -- I'm sorry, yes, go ahead.

MR. MOFFETT: If I just scale up the Verizon numbers -- and Verizon is probably the most efficient operator and has the densest footprint and some of the most attractive geographies. But if I were to just scale up to

what Verizon's doing, I'm talking about $300 billion-plus for the country. Scaled for sort of geographically adjusted, I'm at probably a half a trillion dollar project or somewhere in that range, maybe more to do something like that.

So when you get to the edge of the network, the other point -- I'll just go back to something I said in the opening remarks. When you get to the very edge of the network and realistically building fiber out to the very remote premises that are at the very edge of the network in the rural, unserved markets today is not likely to be an option to do what Verizon is doing.

That's the point I was making before about this is extraordinarily intricately tied to the underlying health of the wireline network. I mean, if you look at the problems that someone like Fairpoint is having today -- and now, granted, they have a lot of debt, but Fairpoint in Vermont and New Hampshire and Maine is under real stress. And the idea that Fairpoint's going to

be, you know, building out at the edge of the network is probably not the top of their daily priority list.

And that is an issue that is a very real issue. Because if we were -- at a time when we were losing 5 or 6 percent of the access lines every year, and that's still the number that in some of the more rural markets we're still seeing, numbers like that, you're getting enough DSL -- incremental DSL penetration that your revenue per remaining subscriber may be growing 5, 6 percent a year. You're able to shed some workforce associated with the loss in volumes on the wireline customer relationships. Your labor costs are rising at about the same rate as you're shedding. And so all in all, you've got a roughly stable business with a roughly stable margins.

Once that number goes from 5 or 6 percent to 10 or percent, you got no shot. You got no shot. And then these businesses start to wind down really quickly and those costs get reallocated. And what's left in these businesses

is, I think, a potential crisis for this country and for this commission, is to figure out what do we do when those costs get reallocated across relatively small bases. And we're trying to burden those businesses with the costs of building broadband.

MR. CURTIS: Craig, before we leave you, and as a lead in to Dallas, so we got the roughly 4,000 per home take on FiOS. How does that compare on a green field build to cable? I know these two will have different points of view about whether that's an apples-to-apples comparison. But just to understand the difference, what's your take on that?

MR. MOFFETT: Mine? Cable -- remember, cable is not -- is generally not doing green field builds at this point, other than line extensions to new developments. And suffice it to say, we haven't had a lot of new real estate developments in the last couple years.

But it is -- in all cases, it's cheaper to extend a network than it is to just build an

all new one because the cable operators are operating from existing head ends and that sort of thing. If you were going to start from scratch and say I'm going to start to build an entirely new plant, it's not clear it would be all that much cheaper. It might be a little cheaper because the labor costs are a little cheaper, but it's not clear it would be all that much cheaper.

I think the real issue is the overlay of an existing plant is now relatively cost-effective for a cable operator to extend the capacity of the existing plan or extend it marginally into new neighborhoods.

MR. CURTIS: So with that, Dallas, why don't you pick up on Steve's question now that we've kind of run around the horn a little bit?

MR. CLEMENT: Well, you know, in my opening comments I talked about spending $16 billion. And that $16 billion to offer digital video, digital voice, high-speed Internet would have been a much larger number if we were trying to get fiber to every home. So, I'm going to make

a plug for coax. It's pretty darn good technology, and it's really driven in the last mile the data business for the U.S. Cable industry.

We've all taken fiber closer to the home, so we actually did analysis in one market. And if you look at the percent of time a bit travels over our network, it's north of 80 percent is actually on fiber. It's just the last -- you know, the last little bit is over coax and we're taking fiber down, in some markets, as low as 150 homes passed per node. So, getting fiber down to that on average, we may be 3- to 500.

But so far, based on applications we see and we anticipate in the future, that hybrid fiber coax network satisfies the demand and satisfies the need. We're launching DOCSIS 3 and, as are our brethren in DOCSIS 3, is only limited in the number of qualms that you're aggregating. But we're out in the market today with a 50 meg service in a variety of our markets, and we'll be launching that more broadly.

To your question on sort of line extensions, and as I shared in my opening comments, in our franchises where we have rights of way access, et cetera, we've built out to 99.5 percent of homes. There are, historically, in markets like Phoenix and Las Vegas, there have been some line extensions. And, you know, in some cases we'll add franchises in the outskirts.

And to put some numbers on that, today our density is about 95 homes per mile, something like that. Today, it costs us about $50,000 a mile. And when you talked about sort of what's the limiter, you never put labor in, and, quite frankly, it's the cost to build networks is more labor, which doesn't scale. It's less technology, it's more labor.

Today in a line extension, a little bit to Craig's point, because it's not a green field, we're willing to build to less dense areas. So, we'll build to -- we think we can hit our cost to capital by building to densities of something like 40, maybe 50, you know, homes per mile. And

that's about where we are in our current franchise and that's how we've sort of hit the 99.5 percent of homes.

But a real issue to get a wired solution out to other areas where the density is just a lot less, it's a lot of labor to get it there, it's capital, not to mention the ongoing operating. If they have problems, you have to roll a truck, higher gas prices, et cetera.

MR. CURTIS: More wind chill time?

MR. CLEMENT: More wind chill time, that's exactly right.

Now, once we build it, to one of your other points, anyone who has the hybrid fiber coax network gets the full service. So, it's not limited in one neighborhood versus another. Everyone gets the full speed service that we're offering in the market.

But that's how we think about it.

MR. WELDON: (inaudible) comment on the -- one thing we've skipped over a little bit. We had FiOS, which is, of course, a fantastic

network. Thank you, Verizon.

MR. CURTIS: The check is in the mail.

MR. WELDON: And we have HFC, also a very good network. But we skipped over fiber to the node, right? Which is the kind of telco equivalent of HFC in some ways. Meaning it reuses existing copper plant and has, you know, slightly lower bandwidth offer as a result.

But fiber to the node is evolving, right? So, that is one of the ways we can answer the question of how to get more quickly, more economically to the underserved areas.

Is -- it's a version of the MDU strategy that was talked about. Is instead of putting that small DSLAM, which is really what an MDU unit is, in a building, which is what you do in an urban environment, you put it out on a pole and serve 8, 12, 24 customers on a pole with a fiber to the pole architecture.

And that's increasingly what we see as an equipment vendor is the request for these small modules that actually end up being sealed. We

have one that's called a sealed enclosure module and it's basically a line club put in a box, sealed up, and hung on a pole.

And then, you can get very close to the end subscriber reusing the copper that was already deployed. Yes, you had to take fiber out to that location and that's still a capital cost. But that capital cost typically is for that whole network built as about one-third of what a pure fiber build is because you save that labor in the last mile.

MR. CURTIS: In distribution, yes.

MR. WELDON: And just to give you numbers of what the technology can give you, if you take VDSL 2 up to its limit, it's either 50 or 100 megabits per second downstream, and then something less than that upstream, maybe 5, 10, 15 megabits per second upstream. So, that really is a legitimate way to evolve a network to reuse existing capital assets, like copper.

There is a point here that then it does affect regulation, in my view. Because to get the

most out of that, that last mile, you actually cannot unbundle it.

There are technologies related to how you vector those last mile connections, that if you really want to get the optimum performance out, you need to construct the whole binder into one box. And that box has to be owned by one operator, whoever it is.

And obviously, there's the issue of colocating on poles. I mean, it really doesn't work very well. So, there's a technological issue that if you want maximum performance, which you certainly want if you're going out to that location -- to have a network that's future-proof that can handle all the next gen services, all the high bandwidth upstream services like e-health, telemonitoring, remote monitoring -- you need to have that node controlled by one operator, whoever it is, whether it's a cable operator, telco, whatever.

MR. MOFFETT: And for financial reasons as well, obviously.

MR. WELDON: And for financial reasons.

MR. MOFFETT: You need to be able to have relatively high share.

The obvious push back to that, though, is when you get out all the way to the real edge of the network, and I mean the truly unserved parts of the country, the 8 or 9 percent. Getting 24 people within a sufficient loop length from a pole may not be an option in the very rural markets where the loop lengths are extremely long.

MR. WELDON: Yes.

MR. MOFFETT: And in those cases, although the telecom operator is usually already much closer and has copper facilities, the carrier over those very long distances may simply not be boostable and the HFC plant actually has the advantage, at least with amplifiers along the way you can sustain much, much greater distances.

But some of these distances are awfully long. And that's -- to the point that Hunter was making before about the difference between us and South Korea, they're just -- you're talking about

rural populations here that dwarf anything you find in Europe or most of Asia.

MR. NEWBY: I believe that the answer to Steve's question is that you need a plan. I look at Australia in current day, but really what I see is British Telecom and 21 CN.

If you're not familiar with 21st Century Network, and what British Telecom did, they basically announced -- I believe it was in '05 -- that they were going to shut off the PSTN in England in a matter of a few years. And a lot of folks laughed at them.

They did it before their deadline, and there were some hiccups because they were the first. But they established a real hierarchy, a real plan for England, the UK in general, and implemented it and it was phenomenal. Dense wave, you know, fiber-based dense wave, Ethernet, the whole thing.

And, lo and behold, about a year after they were really up and done and ready, the BBC launched something called iPlayer. I don't know

if anybody picked up on this; was about a year and a half ago. And when iPlayer was launched, it's a video service. They call it "catch up TV."

And they limited it just to the folks that were in the UK. And it was basically anybody could go and watch any BBC program they wanted to through their computer on the local public Internet in the UK. And the video consumption that that created to the last mile brought any non-BT network to a halt, to their knees. Tiscali, Carphone Warehouse, BSkyB, they petitioned the BT. They said, you know, we -- they said to the BBC, please shut this off.

I mean, this was all public. Please shut off the iPlayer, you're killing the Internet. And BBC said, well, actually, no. That didn't exactly kill the Internet. It just killed the networks that are inferior. And there are networks that could support this. So if your networks are having a problem, we'll actually just tell our customers which network they should use to gain access to this video service. Which at

the time, the only network that was possible to do with was British Telecom's 21 CN.

And, as a matter of fact, Tiscali and the others got together and asked -- I believe it was the BBC -- for them to be compensated for the necessary network upgrades to the tune of 834 million pounds for the necessary network upgrades just to support one video service over the public Internet in the UK.

So, I look back to Western Union and the telegram. And I think about how that was rolled out and the technology was adopted by multiple mom-and-pop shops throughout the United States, and they all went bankrupt. And Western Union rolled them up.

Western Union's name actually comes from its intended purpose, to unionize all telegraph networks west of the Hudson river. And then they became a monopoly, essentially, in telegram. And Alexander Graham Bell had a different idea. He wanted to solve the problem of people having to go to the telegraph station, so he wanted to put a

phone in everyone's home. And in solving one problem he created another, which is called the last mile.

And what's interesting is the adoption rates of telephones in the early days probably weren't enough to cover the cost of capital. But if you look at it over the course of 100 years, it makes a lot of sense.

So, I think that $4,000 bringing fiber to the home today may seem very expensive. But if you take into consideration the fact that once FiOS is probably out to a certain number of penetration that they're comfortable with, we may see an iPlayer service from ABC or NBC or CBS. There may only be one network from the home that can support it. And then they could generate revenue based upon subscription rates of customers that want access to a service that they can't get from any other network.

MR. CURTIS: That's an interesting point. Interesting point.

MR. ARMENTROUT: Just a thought on a

previous conversation about the hybrid model, which is one of the points that I had mentioned earlier, is the need for access to the remote terminals. Because it would be great if we could get access to those remote terminals because, you know, in most places we have middle mile or we have network backbone fiber that is in proximity to RT, so we could support high bandwidth for MDUs or DSLAMs to reach these consumers that are at a distance.

And we have -- you know, the customers we serve today with ADSL 2-plus-type technology is primarily served from the central offices. We have about 70 central offices in the West Virginia footprint, but there are thousands of RTs in West Virginia. So, there's an enormous opportunity to deliver broadband to the unserved and underserved if we can get access to the RTs.

Now, we also have built -- we have over 2,200 customers that we have done fiber to the business. Now, we haven't done fiber to the home because we couldn't get an ROI to work. But we

could make one work for business. But in the process of that model, what we have done is we have laid a GPON infrastructure that's been basically paid for by the business sector. But now the infrastructure is there available for a residential deployment, where we'll be able to make an ROI work, but it's been in a -- it's a step process. Business has to make the model. Once it's completed, now we can look at a residential build out from the infrastructure.

MR. CURTIS: Got it. Rebekah, you want to jump in?

MS. GOODHEART: Just follow up with Dallas. You mentioned, you know, what you provide in your franchise areas. Have you considered, with sort of the state reg franchises in reform, expanding to adjacent areas? And if so, sort of what's your analysis when you consider expanding beyond your existing franchise area?

MR. CLEMENT: Sure. You know, in the '90s, what I like to say is the hardest thing we did was execute. We were trying to roll out

broadband and roll out these new services to as many homes as possible, and then signing up as many customers as possible and making it a good experience. And that was our focus.

Today, the hardest thing we do is prioritize and focus. And to a certain extent, it's capital resources. But to a large extent, it's throughput of the organization. So, when you think about a dollar a focus, would I take that dollar a focus and would I go to extend the network into rural, less-dense areas? I can't earn the return of capital on that, as we talked about. Would I take that focus and extend to new franchises that are, in all likelihood, covered by someone else? Then I'm building two networks, to Craig's earlier point, and competing for that same customer. That's tough also to make the return on capital.

Or would I take that dollar and extend to more businesses in my footprint? Or would I take that dollar and extend to cell sites within my footprint, where it's incremental dollars,

incremental focus, and I have people who already know the addresses and know how to do that?

So, for us, we've found that the better focus and the better deployment of capital is addressing the needs within the footprint that we've already built.

MR. CURTIS: Got it. Marcus, you want to jump in?

MR. MAHR: I mean, I guess maybe just sort of building on that a little bit.

I mean, I think sort of it would be useful to get sort of folks' perspective on -- I guess, again thinking sort of long-term, what's going to happen for the last 10 percent or whatever? Is it some point going to make business sense to sort of serve them rather than upgrading the existing customer base? Or do you sort of foresee that that trend is kind of going to be what's continuing?

And if, in theory, you could get some level of broadband service to a particular set of customers, then over time the company is just

going to have business incentives to upgrade that. Or is that sort of a separate -- are the unserved area's sort of a separate problem distinct from that?

MS. GOODHEART: And to add on what Marcus just said, is there something that the government or the Commission could do to sort of spur additional deployment where you're not considering it right now?

MR. CLEMENT: Yes. And so for us, like I said, it's -- there's two cost components. Three in the fullness of time, but the first is to actually build it. And like I said, it's the labor, it's the capital to do it. And right now, with the less dense homes, it's just -- we can't earn our cost of capital. So, if the government were to in some way subsidize or figure out a way to help defray some of that cost as part of the greater public good, then that's a possibility. And, you know, from Cox we'd be happy to participate in that process.

However, there's the additional costs,

and that's the operating, the wind chill time, the gas. Because, you know, if you're operating a network, you're a service provider and you're providing service. So, it's not the calls into the call center. It's not even the cost of sending the bill, perhaps. But you are going to periodically roll a truck and we roll a lot of trucks. And so there's an incremental operating cost to, you know, to meet that rural customer.

You know, you have the -- also, the opportunity. And what percent of those customers are going to subscribe for the full revenue sort of set of services? Or are those customers typically of a demographic where it's going to be a lower subscription? So that puts further pressure on the business model.

To your point on sort of upgrading, if we were able to get out there and we were able to make that first -- those first couple of parts work, you know, the upgrade, that's a little bit of an issue. You certainly need to have some ongoing maintenance, but the upgrade typically is

in the electronics, either in the home or back in the network, you know, once you've spent the labor to actually get to the home.

MR. CURTIS: How big a problem is the OPEX wind chill time as the linear density goes down? And you imagine, you know, you've got a garage someplace and you're trying to service, you know, even in the cell tower world, that can get to be a pretty big footprint for an orbit of 80 sites. But when you're out in a pretty rural area, linear density gets crazy, assuming the initial capital investment made since on a normal, urban OPEX level. Right? And then you layer in the rural OPEX layer. How big a problem is that?

MR. CLEMENT: You know, I don't have the numbers to be able to tell you. It's 20 percent more than at 100 homes density. I wish I had the numbers, and maybe that's a follow-up.

So, I -- you know, qualitatively, I would say the bigger issue is the cost to build. That is clearly the biggest issue. And the OPEX is sort of a secondary issue.

MR. CURTIS: Secondary issue?

MR. CLEMENT: Yes.

MR. CURTIS: So, it's -- so, I guess where I'm heading, right, is if you found a way to make the initial build work, would you -- you know, you wouldn't want to get yourself into a position where it wasn't sustainable because the OPEX was just too crazy. Right? Two different problems, two different solutions. If you can convince yourself that on an OPEX level it's sustainable, maybe it makes more sense to drive towards a CAPEX solution.

MR. CLEMENT: You know, I actually go back to my earlier point. And in order of priority, I'd say it's the CAPEX to get there. Then it's what's the average revenue out of that home? And that's sort of the second issue. And then the third issue is the cost to support.

MR. CURTIS: This is on the (inaudible), low- speed, multiple services, triple -- yes.

MR. CLEMENT: Yes. I mean, exactly, because you need both of that in order to justify

the ongoing operations of folks out in -- outside of the core network.

MR. MOFFETT: Yes, Tony, you may actually have some of this data. But from -- this goes back many, many year ago. But, surprisingly, the OPEX of maintaining the more rural parts of the plant isn't really all that different because, like, the labor productivity rates tend to be much higher. The drive times tend to not be all that much longer, because even though the distances are much further --

MR. CURTIS: Don't have stoplights, right.

MR. MOFFETT: -- the traffic levels are lower. And so, it actually drives less cost difference than you think. It's really the CAPEX side.

MR. DiMASO: Yes. And I -- just to add to that. I think that, you know, part of the goal of FiOS, right, is to remove a lot of the manual intensive process that you get with a copper plant, right? Because you're setting up a passive

optical network to be something that you can diagnose and fix remotely as often as possible. And it's the name of the game, which need to tie in also to the back office systems, et cetera.

So, in theory if the economics of the capital build make sense, in theory you'd also have some positive impact on the ongoing operational maintenance.

I think, you know, really, Rob, the issue is -- you almost have to dissect these areas. Because even in rural areas, is it a rural cluster where, you know, you go out 50 miles, but then there's 1,000 homes right in a cluster that you can serve?

MR. CURTIS: Good linear density once you get (inaudible), yes.

MR. DiMASO: Right. Or is it 1 home every 35 miles, right? Different set of issues, right?

MR. CURTIS: Yep.

MR. DiMASO: So I think, you know, the issue with the last 10 percent, for lack of a

better term, or whatever that is, is really it becomes almost what is the granular view of these areas? What is really the demographic, what is really the geographic issue? What are the nuances of this? What are they being served with today in terms of voice services, wireless services, et cetera, satellite?

And is there some combination of those technologies that exist and the assets that exist geographically --

MR. CURTIS: What's the easiest alignment?

MR. DiMASO: Yes. So -- exactly. So, I think it's clearly not a one size fits all. And I think we've had lots of one size fits all build outs until you get to that 80, 85 percent. And then all of a sudden, you get different reasons where the economics change substantially, right?

MR. CURTIS: Yep.

MR. DiMASO: And the last thing you want to do is find a way to reach it and find out that the demand isn't there, you know?

MR. CURTIS: Right, yep.

MR. DiMASO: So you do want to have that component of it. So I think that, you know, our view as we look at these things is to really try to drive more granually into the issue and say, okay, so what would be the combination of things in this area?

Now, in lieu of that, I would opt that cable should really be the lead -- (Laughter) No, I'm only kidding. No. But I think the point is, there are maybe hybrid fiber coax solutions, there are -- may be a wireless solution. It may be a satellite-based solution. But there's enough things being -- you know, being done out there that if we really took a look at each of these areas, we probably could come up with a set of solutions that made sense.

MR. CURTIS: And, Tony, what I think I'm hearing Dallas say is there are really two drivers. One, it's the total cost of the build and the second is it's not just adoption of some service. It's adoption of enough services at the

right subscription level to make it work.

MR. DiMASO: Right.

MR. CURTIS: Is that your sense as well that in a lot of these areas you're going to have, you know -- maybe they take, you know, very slow data only --

MR. DiMASO: Right.

MR. CURTIS: -- no video, and that's a big driver? Or is it more the capital problem, from your point of view?

MR. DiMASO: It's -- for me, it's more the capital problem. I mean, I think -- you know, the fact of the matter is, you could argue that in remote locations, you have less demand for services. I would argue if I was out in the middle of nowhere, I would want as much access to as much capability as possible because that's what that is, basically the basis of my life, you know? My connection may be the basis of whatever I do, et cetera. It's all -- entertainment, et cetera, like that.

So, I think that our general instinct is

that barring something wrong with our assessment of what would be demand, in a lot of remote locations for services that are inherently remote access, that there should be enough demand.

But we'd want to -- because of the inherent risk of the build, you'd want to kind of do a double take and really analyze what's there.

And again, you'd probably be looking at working with municipalities locally in terms of what goes on there. So, it really lends itself to more of a public/private partnership effort than other areas might.

MR. NEWBY: I think the one size fits all comment that Tony made is excellent. In the Australia case, I think they determined -- and I might not be accurate on this, but 90 percent of the folks would get 100 meg, 10 percent would get 12. And that 12 is serviced by people, you know, who were living in the Outback by choice. And it will be satellite.

So, I think if we could help the FCC, it would be -- you know, with this particular point

it would be, what's the definition of broadband? And "broadband" is a very general term. It's like, in my world, colocation or fiber. Like, what is fiber? Is it dark fiber, is it lit? Is it available for lease? A lot of folks have fiber, but they have it themselves. A lot of other people don't. So, if you ask the people that have it if there's fiber, they say sure, there's plenty. We'll never need to build more. And then there's several hundred people that say there isn't any. So, the definition of broadband.

And then just beyond that is, well, what are the services? You know, Tony, you're right. You would want the most, you know, broadband that you could have because of your lifestyle and everything else, but that's why you live here.

That's why you live, you know, wherever, near a well- connected place.

I've also been out to South Dakota. Lovely place, went to Mount Rushmore. Had zero bars on my phone from Sioux Falls to Rapid City. Seven hours straight, zero bars. And I saw signs

that said town population two. I don't even know why they made the sign, just two people that live there and there was one house and I think they were related. You know, what are we talking about? You're going to build fiber all the way out to that town of two? There's no way that there's a business case for that.

And again, broadband, very broad term. What are we trying to accomplish with this national broadband plan, you know? And if we don't have a hierarchy and if it doesn't set aside certain areas that currently there isn't anything and differentiate between the two, there's no way that anybody could afford to do it unless we go back to there's one carrier for the whole nation and that's it and it's subsidized with taxes, which, obviously, we're not going to do. So, we have to deal with, you know, the realities of what population densities are and where we can actually get things done.

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

MR. ROSENBERG: Yes. Question that came

in from the audience here. Several of you have brought up adoption rates in a couple of different contexts, in the business context and build out, things like that.

Question is, as you think about the things that you as providers could do -- whether it's dealing with the up front requirements for service in terms of service contracts, up front payments, things like that -- when you think about what are some of the things that the government can do to help drive adoption, how do you see the balance? What do you think is effective? And what have you undertaken already?

Dallas, I'm going to start with you because you're close by in dealing with this, but I'll go around the panel.

MR. CLEMENT: Sure, sure. You know, I think, as I said in my comments, that the biggest driver of broadband adoption is having a PC in the home. So, you know, even in our comments we talked about sort of a multistage process where you find a technology partner who -- and

partnership with the government to put technology in the home.

And it may be that you start with schools and you start with the youth. And we've got a variety of partnerships, technology partnerships with schools. And it's not just to get them used to broadband, but get them to use it, you know, correctly. And, you know, there are some dangers to broadband.

So, work with schools, work with low income, work with subsidies. And I -- you know, then once the customer has the PC, then there are a variety of service levels available in covered areas from a variety of providers. Some that are lower speed that are lower priced, some that are higher speed, higher priced. And so for those folks that don't currently have PCs, they may well be satisfied with a lower speed at a lower price.

Now, whether that meets their individual economics is something that we'd have to further see and further decide whether subsidies are necessary. And that's part of the broader, you

know, public good. But, you know, I think -- I've got four kids and, you know, I think the schools are adopting broadband and using computers more and more. But I think that's a ripe area to really sort of focus national attention, to get adoption in schools and utilization of broadband in schools much higher than where it currently is.

MR. WELDON: I'd like to make a point I think pertains to that. Is -- I think one of the concepts for enhanced services offers has to be some concept of not just high-speed Internet access, but managed service that you can offer as a set of applications as a managed service offering from any provider over that network using quality of service or whatever attributes.

So that then the idea is you have an array of applications that the user can sign up for voluntarily that might have tremendous value for them. So they're not just buying a data service in the sense of an HSI service. Actually, the network can support managed service offerings, for example, for remote monitoring, e-health, or

secure applications, these sorts of things that really do matter. And the important part is the funding for those services can come from someone other than the operator or the end user. It could come from the health care system. It could come from the advertising industry if they were willing to subsidize a connection by the willingness of a user to watch a certain amount of advertising.

So, one needs to, I think, have mechanisms in the network that support enhanced services or managed services because funding can come from other sources to partially offset the build cost because you subscribe to those managed services as well as government subsidy where appropriate. I agree that it would be nice if you could push a PC into every home, make the home network easy to set up, and perhaps subsidize even management of that home network for the less sophisticated consumer.

But I do think that managed services play a role in offering a sophisticated service package that the user can select from and

application providers can also then choose to fund using those capabilities.

MR. MOFFETT: This does get to the issue of, again, U.S. standing relative to other countries. And we've looked at this both in the perspective of broadband and also wireless, and you know, there are very fundamental differences beyond just geography. We have a much wider income distribution in this country than in most places, and so the sheer issue of the percentage of homes living significantly below the poverty line is very different than it is in, say, Western Europe, with the exception of Spain.

The issue -- and one issue that is rarely mentioned, but is a very real issue, is you don't have to be able to read to turn on a television set and use electricity.

But illiteracy rates in the U.S. are much higher than they are in most of the rest of the OECD. And so, using broadband if you're illiterate has relatively limited value because most of the broadband experience is still the

written word.

As it becomes more entertainment-oriented and less written word-dependent, you may actually see that the utility for certain segments of the population rises. But there are very deep social impediments beyond just the lack of a PC that drive the 30 percent or 35 percent of households that could have broadband and don't.

MR. NEWBY: I think that's a fantastic point. If you don't have the ability for people to become educated, then they can't get to the point where they could actually use broadband. So, if we don't come up with a plan that can afford on its own, stand alone, to put infrastructure in the country on a very wide swath on that basis, and then make that infrastructure available as and when those pockets are ready to accept it, then those pockets will never have the infrastructure available to them or brought to them because there will always be that disparity.

Why should I build to bring it there if

the people aren't going to use it? For whatever reason. They don't have the money, the income levels are too low, or they're not educated enough to do it. So, there has to be a larger nationwide architecture that provides for intermediate access so that when an area can be developed on a case-by-case basis for income and for education. The fiber infrastructure is there. And then you could do wireless or whatever to bring it to the homes or the community centers or whatnot.

That's a holistic approach to solving the problem.

MR. ARMENTROUT: Yeah, and just to reference -- keep in mind, I represent the rural, very rural to remote markets in West Virginia. And in the 2,200 business where we deploy GPON technology, we even, without pricing to the consumer, let them know you are now capable of 100 megabit of bandwidth. And there response was, what for? I'm -- 512 works good for me. So, obviously there's a public awareness.

It's a business concept. Businesspeople

need to understand what big broadband can do for them, change the way that they forecast their business opportunities down the road, plan for bigger, better.

The other thing that I think would really be helpful for the FCC --

MR. CURTIS: Can I stop you there for a minute? So, what did you tell them when they said 512 is good for me?

What's the answer to that?

MR. ARMENTROUT: Well, we basically, you know, offered it to them and without even a pricing. But other than -- we actually went with -- we got some of the local delegates and some local political folks, we got them grouped together, went down, met with the mayors and the business leaders of the community, introduced them to the concept of how other communities have transformed, and tried to plant the seed. And for some --

MR. CURTIS: So what are those applications? What do you tell the business guy

who is quite content with 512? Now, you've got 100 megabits. What does he actually fill the pipe with? What does he do?

MR. ARMENTROUT: Yes. And I think that's an excellent question in the context of in a small community, you can't think but so big because if you're going to be realistic, you'll know you'll never be a big industry, you'll never be a big business. So, what we do is we share with them what -- how this can transform the community by bringing education to the home, call center type businesses. It can bring different types of businesses to communities which could generate jobs, and et cetera, et cetera.

MR. CURTIS: Got it.

MR. ARMENTROUT: So, we steered away from what can it do for your small business, because if you're mom and pop you'll probably always be mom and pop unless the community grows.

MR. CURTIS: Got it.

MR. ARMENTROUT: So, we point them more toward higher education and big business

opportunities and what that can do.

But I agree computers are a very important part, but I think that there needs to be a public awareness from a practical position. And what I mean by that is for the consumers who haven't had the Internet experience, grew up with it and haven't been around it, they don't really understand how it applies to them at the residential level.

What they don't realize is, if you're looking for a job you can go to Monster.com, you know. If you want to get the local news, you know, you can go on the -- it's the practical side. Because for the most part, in the rural remote areas the Internet technology is almost taboo. It's demonized because they haven't experienced it. All they've heard are the negative things that, you know, you read about in the papers.

So, I think there needs to be a practical application, an educational process to make the public aware these are some of the very

useful -- because it is a very good tool to have, particularly with job searching and education at home programs that you can, you know, work your way through for education purposes, training, information, education for research for the library -- replacement of libraries, et cetera, et cetera.

MR. DiMASO: Yes, I -- let me just add that what's interesting is, you know, we're getting to that point where maybe the deployment outstrips the application set that we can get on the platform, right? Which is maybe a better problem to have than not having it.

But clearly, you know, if you look at the capacity of some of these networks, you kind of say why are we not using them for virtually everything else? I mean, we do have issues in remote health. You know, a good portion of the health care equation is being able to rapidly diagnose remotely and monitor chronically ill patients, elderly people. So, why aren't we using it for that, right?

And so you get to a situation, again, where from a broad perspective you have some major application sets that deal with health care and deal with energy management and deal with security for elderly people at home, et cetera, that tie into bigger social issues that we're trying to solve fundamentally, that we haven't pushed institutionally, which is one area I think, you know, the FCC theoretically could speak to. You know, talking to, you know, a hospital consortia, talking to the insurance providers, plugging into why aren't you monitoring, you know, patients who have been out for 30 days since your return rate of patients from surgery in under 30 days is killing your cost structure in the hospital. What -- how are you using the technology to do that? You know, what is fundamentally there? So, I think that's broad.

In terms of some areas that are underserved, I think, again becomes a more granular issue. There's the cluster of folks who haven't adopted because they're older and they're

concerned about it, et cetera. There's the significant cluster that economically, even if they could afford the computer, cannot afford the monthly fee for Internet access. So, what's the answer to the total package of services?

There's others where you have the school situation. So, well, I can go into school and I can get the computer. I -- that's sufficient, I don't really want anything. But fundamentally, ultimately, we're going to have the entire society really plugged in because too much is going on. And too much can be developed in health care and energy, et cetera, to expect that somebody who's not aware or illiterate can be left out. And there is a social cost to that. And that social cost of the literacy translates to economic cost and then it translates into other issues.

So, I think the real issue is, you know, how do you get the group of companies and government entities that touch each of these clusters together? You know, if you get an Intel and you get some of the computing providers and

you get some of the cable companies and the carriers and we get together with the FCC and say, okay, we're going to look at this cluster in this particular area and here's the demographics of that, what combination of services do we think could address it, right?

And what do we do about the educational component? What do we do about the security component of that, et cetera? So, I think we've got to dive in more granularly at some of these issues rather than trying to look too broadly.

But in the broad sense, I think we really have to start driving some of the bigger institutions to how do we use this technology to reach into the community.

With all of the issues we've had, for example, with H1N1 flu scares, it still amazes me that there isn't a lot more planning going on in terms of, you know, utilizing remote access technology just in case you have a hit from a corporate environment of something else. Because if 20 percent of your people are out sick, 40

percent are not coming in because they think they're going to get sick. If you have a formal game plan to be remote accessed, you're in good shape.

We see some of that, but it's much more haphazard. And I think that's where, you know, government, particularly the FCC, can kind of step forward and say, you know, what is your game plan in the event of this? Not to completely, you know, have the entire country out of communication. What is your remote access game plan?

And so there's certain things I think we could poke --

(Interruption)

MR. WELDON: I agree with that very strongly, that the clustering and the one size fits all that doesn't exist.

But I think what would be good for the FCC to do is to look at -- well, I wouldn't call them cluster cases, canonical cases that represent significant fractions of the population and look

at the private/public investment model and for the set of services that apply in those canonical areas. And there's probably only 5 to 10 canonical types. They're probably based on size and density and economic bracket, right? And then also probably what existing technology is already connecting them.

And then instead of services overlaid in that, so having the FCC come up with -- cooperating with operators and communications providers and computing providers to decide what a canonical offer looks like in that region, I think would be a very valuable thing to do. And then we can decide how to address it best, right? There might be two or three alternatives that give different tiers of services for different funding models and perhaps some are subsidized, some have a PC that's subsidized, some just use government subsidies, perhaps in terms of encouraging users to use government services online, things like that.

So, the canonical cases, I think, we

would recommend.

MR. CURTIS: I think Steve's got a question from online that digs into adjacent areas on this exact issue.

MR. ROSENBERG: That's right. From Jeff online. We've talked a lot about residential broadband, obviously institutional broadband. So, the national purposes, verticals, the schools, hospitals, and then also businesses more broadly, how do they effect the cost structure of rolling out broadband and big broadband?

David, I think you've talked a little bit about that in your footprint. So, why don't we start with you, if that's okay?

MR. ARMENTROUT: If you could clarify the question, I want to make sure I answer it correctly.

MR. ROSENBERG: Okay. Well, we've talked a lot about the barriers and ability to roll out broadband residentially. Feels like there's an opportunity to use the scale that businesses, that schools and hospitals, for

example, can give you to change the entire equation of the equation, the equation of the finances and where you're able to roll out.

MR. ARMENTROUT: Yes, absolutely. Again, with our model what we have done is we have looked at reducing our operating costs by reducing the leased facility, by building out fiber to the business. So, from an OPEX cost, it's good for the company. It does reduce the amount of technical time that's required because we have less rollout when it rains or storms because, you know, fiber is less susceptible to the inclement weather problems than copper is. So, from an OPEX side, it works great.

To the business who now gets fiber, that infrastructure that has been laid to support the business. Now, when you go and want to look at a residential fiber to the home model, you don't have to look at middle mile build out. You don't have to look at backbone. The only thing you really have to look at is the blades that you're going to add to increase the bandwidth, and the

next thing is just your drop in your -- the consumer equipment.

So, the cost -- and I can tell you, our cost for fiber to the business is about $1,750 per business. And if you take out the splitter and the middle mile piece, the cost to add a residential consumer off of that same infrastructure is $720. So, it's significantly less.

MR. CURTIS: And what would it be without the business tenant?

MR. ARMENTROUT: You'd be back to the $1,750.

MR. CURTIS: Back to the $1,750, got it. That's -- get a lot of leverage that way.

MR. NEWBY: Dallas, it sounded like you were coming at it from the other perspective, have it -- started with a res build and moving towards businesses.

MR. CLEMENT: Yes, that's exactly right. In fact, the nice thing about broadband, and sort of starting back in the mid-'90s, is that it built

our credibility on operating two-way networks. And it raised the level of our game in terms of reliability, network outages, network management, et cetera, such that we built credibility in our markets and we could go sell to small, medium, and sometimes large businesses. And so we've built a very substantive business selling to hospitals, selling to military establishments, and some of our markets where that's schools, and all kinds of businesses. And those decision-makers oftentimes at the businesses are the same decision-makers at home. And so we're able to sort of leverage that.

In terms of the cost of build out, we have a metro core, fiber-based, and so building out to commercial establishments in terms of industrial areas is relatively inexpensive. It used to be that we would build out only when we had enough signed contracts and we could make -- we could justify the cost right then and there.

Today, we built enough confidence in ourselves and credibility in the market such that we're building out into those areas and then going

and trying to compete for the business. Clearly, in sort of strip malls and areas where the network was already going across, that's been prime for us.

To your point on hospitals and schools and to the point that Marcus is making a little bit, and Tony also, you know, where I think we all struggle in this ecosystem and the FCC can help is, so, today broadband to businesses is about connectivity, and it can do lots more than connectivity. But in the case of schools, whether it's a client server and there are special apps available for the school, is there a way to leverage what the school's trying to do in education back into the home or back to -- or between businesses?

Someone's got to take the leadership. It's not really sort of in our wheelhouse as a service provider. The schools typically, in any given school, don't have the expertise. They need broader leadership. And so you sort of are left wondering who's got the ball?

And I think it's the same thing in health care, same thing in energy demand management. And that's where I think there's a real opportunity to sort of drive consensus and really understand, you know, the business model and the benefit, and drive those applications and utilization of that connectivity.

MR. CURTIS: Got an online question which I'll tinker with just a little bit.

Fundamentally, the question is I subscribe to a service that promises -- their words, not mine -- let's make up a number so we don't give anything away, 10 megabits down.

And when I download a DVD, it keeps telling me I only get 1.3.

Two questions. What is the choke point in the network from your point of view that causes the spread between advertised and delivered? And then second, you know, given some cost structure for the best efforts network, what's your point of view on the incremental costs to make it an SLA-driven network on the -- you know, put

guarantees around the advertised rate?

MR. DiMASO: Well, I've heard AT&T's having a lot of problems with it. (Laughter) Don't get it, but you know, it's -- no, sorry, no disrespect.

You know, one of the issues -- and it's interesting, because, you know, we've always basically came out with advertising as up-to, right? But you don't want to -- you can't have it that far off, right?

The issues -- and this gets back to the whole issue of service-level quality guarantees is that if it's within an ecosystem. If it's within the Verizon network or it's within the Cox network or whatever, you, in theory, have no excuse if you can't control all the variables on that to deliver it. And one of the challenges in the open Internet environment, of course, is that your choke points could be remote servers. They could be the site that's delivering the capability. So, that's one of the issues that we're challenged with.

We don't -- we get, on occasion, issues of degradation. And none has come to my -- I periodically get, you know, customer calls and different things, but certainly I don't see all the service calls. So I couldn't quote on all that.

But clearly you usually don't see that level of degradation unless there's something fundamentally wrong on the routing system. And so, if we do get that, we take it as a service call. We'll check, you know, through the routing to the end of our network and take a look at where that's coming in. But from that point, it's awfully hard to diagnose what the issue is.

If the same customer is having a problem from multiple different sites, then somewhere along the line we're missing something and we've got to go back and recheck our network. If it's multiple customers from the same, you know, download of a video type, then you can safely go to, you know, with a remote server or whoever owns the remote servers. If it's a normal, like, say a

Disney video, you can go to Disney and trace back and can work with them on it.

MR. CURTIS: What's your sense of that, you know, if you drew the histogram of the troubles that came in over, you know, root cause? Is it mostly slow applications over performance, do you think?

MR. DiMASO: You know, I don't want to be -- I don't have the data for that, Rob, so I hate to comment on it. I think there's certainly, from what we've seen, elements of both. There's elements of issues in our network.

There's elements of issues at the user location. There's elements of issues at the server. We've seen all of that. I certainly couldn't comment on the breakdown of that because I haven't seen any data.

MR. CURTIS: That's fine.

MR. DiMASO: So, I don't want to be unfair about it. But suffice it to say, that's one of the issues in guaranteeing a service level is how do you do that? And so a lot of the

discussion, for example, we have with video providers or others with content is do you want to host it on our servers? And then we can guarantee a service level because we control all the components.

So, there's always a lot of that discussion about what comes in over the Internet versus what you can host in your own cloud.

MR. CLEMENT: And I'll just comment on that a little bit. You know, in the early days with broadband, it was speed and price. And it wasn't even speed because someone had this application that needed a particular speed.

It was speed because speed was the indicator, from a consumer's perspective on, well, they must have a better network, they're offering a faster speed. And so in the early days, there was lots of marketing on speed and price. And it was -- and up to a best efforts and people were sort of qualified that, and people rarely got to those advertised, you know, speeds.

But the Internet is sort of an

interesting thing. And it's viral and there's all -- you know, there's broadband reports. And so, today, I think service providers are actually much better at getting to advertised speeds because there are the vocal minority who are keeping you honest. And they're saying, hey, Cox, you're not getting to that speed whereas Verizon is getting to that speed. So, you know, they're sending folks to, you know, Verizon.

So I think the service providers are doing a much better job of getting to those advertised speeds than perhaps we have in the past. I agree with Tony that oftentimes today, if you're not getting the advertised speed, it's typically not within the Cox network. It's typically outside of the network.

You know, real concerns on whether or not it makes sense to offer guaranteed service on the residential side, we certainly do that on the business side, but it's a premium service. And for those customers in the home who want guaranteed throughput, we sell them a

business-level service rather than a residential service.

Craig talked about a little bit, you know, before in terms of, you know, how on the residential side you over provision the network. And that's taken into account in terms of how we build the network, how we operate the network, and take into account in terms of making our costs to capital. And so, you know, looking to guaranteed bandwidth when the applications aren't requiring that just adds another cost layer that, at least today, customers aren't asking for.

MR. NEWBY: This will really all just take time, I think, to manifest. If you look back to when Vanderbilt built the Grand Central Parkway, there was only one car on it. And today, in about a couple hours, you won't be able to move. And, you know, you sell a guy a Ferrari who lives on Long Island, what's his SLA, he can do a buck-10 into the city. Not that good.

You think about take rates and subscription and overbilled, and it's contrarian

to the concept of the public Internet, which no one owns and really no one can regulate because it's a public infrastructure. Couldn't it be on the local side, the access side, the server side, the other side of the planet? And you don't really know -- and I've always been an advocate for private Internets. You know, IP is not the Internet. IP is Internet Protocol. And you have a couple representatives of very large private Internets, essentially.

The issue with that, though, is that not all content can be hosted locally in your world. So if you're going to offer an SLA to a customer and say for anything that's on our network, that's like, well, okay, great. Well, what's on your network? You going to put up a web page that says how many, you know, providers are hosted locally on your servers? And what if it is, in fact, something that isn't? You know, and then what's the SLA?

It's not like the old days with point-to-point frame and ATM where you could have,

you know, CIR on a PVC. And so this is going to be this speed and it works. We moved away from the frame cloud and then the Internet cloud sort of took the name, but it was all public infrastructure.

The way to solve for it -- and there's no silver bullet because tomorrow, an app could come out, you know, the new YouTube that nobody has hosted on their stuff. But the way to solve for it is building out more core infrastructure of your own to expand your own network. Just ask anybody who's built their transport network on their own fiber and think if they could give up that fiber how would they survive in the public Internet cloud? They couldn't.

So, getting deeper and deeper and denser and denser in your own physical infrastructure footprint with your own equipment and then in the established peering points, which are essentially IP interconnection points, throughout the world -- we have several of them in the U.S. -- the major last mile networks can directly connect to the

content in order to get from the last mile to that point, though you need what is referred to as middle mile or back haul or long haul or whatnot.

Those neural points become more dense. This is a living, growing organism essentially that we're creating. And it will continue to morph over time.

MR. WELDON: I'm going to relate to a thing we see. We're increasingly looking to build content management networks or content distribution networks to parallel the large global content distribution networks. So you do move more of the applications and you can do this dynamically. Meaning, you can discover a new application and move that content into your domain and serve the content that way. And that really is to improve the availability of the service because they're not making any money from that service. It really is to allow the broadband experience to be the advertised rate and not be constrained by server rate.

Now, other applications could be hosted

there, of course. But that is one of the ways in which it's being increasingly addressed by operators building CDNs within their infrastructure.

MS. GOODHEART: Everyone sort of mentioned the cost to build. And just to follow up in terms of, like, the Commission's role, two parts.

First, do you have a preference? In the record, people have proposed, like, direct funding like from a U.S. EPTEP-type pot fund and also tax subsidies -- I mean, tax credits. Is there a preference? Is there a benefit to one or the other?

And secondly, aside from pole attachments, which David mentioned, is there any regulatory issue that substantially delays deployment and increases cost substantially that we should be aware of?

MR. ARMENTROUT: I do have one comment that just comes to mind. In the early days of, you know, 1997, '98, and '99 timeframe, when there

were many newly-forming companies filing for CLEC status, all of the ILECs fairly pretty much had certificated various other companies who were certified to do work within a central office. So what that meant was, as a new start up company, you had your choice of construction contract workers that were certified to do the colocation work, which allowed you to get the best price and it allowed you to pick the vendor that could get the work done in a timeframe in which you needed it.

What is missing on the pole application make ready process is if there were -- what the make ready piece is the piece that's really broke. Because you can get the application processed in 45 days, which that really doesn't happen, ever. It's more like 90. But that you can work with some.

But the challenge comes, once you get the application back and it says X-amount of work has to be done in order to get these poles in a condition for you to attach your fiber. The --

what I think the FCC could do is, you know, put some ruling where the ILECs or the pole owners, whether it's some utility or whomever, have to provide a list of approved contractors that the CLEC could chose whom he could negotiate his best deal with. Then, I believe you could change the speed to market and you could also reduce the cost because now you'll have contractors competing against each other for pricing.

So, I think that worked very well in the early start-up days for the colocation process. And I think that could be very helpful out in the field.

MR. CURTIS: Question about the nature of traffic that you all expect, you know, going forward. Traffic's pretty much evolved in a very asymmetric fashion. It's largely been, you know, pushed downstream, you know, pull down a picture or receive an e-mail. We've not had a significant demand for, you know, symmetry, you know, uplink.

A, do you see that mix changing significantly, you know, over the next, you know,

let's call it three to five years? And if you do, what implications does that have for, you know, the way you need to think about, you know, building out, modifying infrastructure, you know, things along those lines?

MR. CLEMENT: Rebekah, your question first.

MR. CURTIS: Oh, yes.

MR. CLEMENT: Because I don't think we answered her question relative to tax credits or relative to the USF.

And then, Rob, I'll hit yours.

MR. CURTIS: That's great.

MR. CLEMENT: But for Rebekah, you know, I think we talked about the difficulty in having multiple carriers build out to remote locations. And to me, tax credits sound like, you know, you put some definition around it and you get it if you go build it. Is that the most efficient way or is it a more managed process for those one-offs? Is it a pocket out there somewhere or is it low density? And it may be conducive to

requiring a more managed process versus tax credits. But not my area of expertise, but wanted to offer that as a differentiator.

Relative to traffic, you know, interestingly enough, two years ago, I think we all thought that traffic was going to be more symmetrical because there was a lot of peer-to-peer out there. Now, the majority of peer-to-peer was illegal content, and we haven't talked about the legality of the content that is out there. But what we found today is that with iTunes and other applications offering legal content, they found that with content delivery networks the more efficient way is more asymmetrical. And it's more sort of downward pushing.

You know, if you look at the history -- I mean, if you look at what's happened in America for years and years and years, most all of it's down. It's call watching television seven hours a day, and that's all down. And I think at least our estimation is that that will continue to be

the majority. There will certainly be user-generated content that's uploaded and there will continue to be sort of upticks. But, you know, I think people will continue to consume, you know, more, and professionally generated content is still the majority of content that is viewed and utilized on the Internet versus the user-generated content.

MR. DiMASO: Yes, let me add, Rebekah, to your point. I think I would say the same thing, you know, to create an artificial incentive, to do the wrong thing probably wouldn't be helpful, right? I think, again, it comes down to what's the granular look at where we want to improve the situation? And let's kind of take what we have available today and figure it out rather than -- and if there was some economic incentive after that point in time for a specific component, great, but as a blanket policy, I suspect we wouldn't get the bang for the buck that you'd hoped you would.

In terms of the traffic, I would agree

with Dallas. I think that, you know, clearly our, you know, fire service has been designed for significantly more upload capability. And we're seeing a good portion of that, but primarily with business-related applications, you know, home-based businesses, small businesses, things of that nature.

And I think, you know, over time do I see an explosion of it? You know, unless there's a pandemic where everybody's working from home, okay, and trading huge files.

And I hate to think of that as an incentive to move forward, okay? Not exactly what we had in mind, you know?

But I think at the end of the day, that's something that will evolve over time as the other aspects of what we could utilize these platforms for evolves. So, I don't think it's something that we've got to have crash courses in upload capability.

But we aren't seeing enough of it with enough applications and with user-generated

content, but primarily on the business side with huge files for certain professionals at home, et cetera. That there -- we feel pretty good about it. But still primarily today, it's mostly the download speeds.

But, you know, again, we've designed the network not to have to continually upgrade the capability once the fiber's there and the electronics are on it. Now, it's layering as many applications as we can on it that make some sense for the different purposes of users in the home or in the small business, et cetera.

MR. CURTIS: I guess the reason I asked is, you think about a lot of the applications you all have talked about: Telemedicine, telehealth, remote monitoring, you know, videoconferencing, high-def videoconferencing. You know, a lot of that is clearly in the business end now, but you can imagine a world in which, you know, perhaps a lot of that stuff starts to push downstream into the home and the use starts to change. Just wondering -- Craig, it looks like you've got

something on the tip of your tongue on this.

MR. MOFFETT: Well, no, I just think you have to be aware. There is naturally a path-dependency issue here. And if you were an application designer today, FiOS now is getting close to a couple of million customers on the network, but that's still less than 2 percent of the U.S. Population with that level of upload capacity, right?

If you were an application designer, you would say the available market probably isn't sufficient that I'm going to design my application that way. So I'm going to design my application in a way that is less bandwidth-intensive upstream, does more processing in the client. And if you think about the way online gaming evolved, it evolved the way it evolved largely because of the upload constraints, and so games were designed the way they were designed.

And I think realistically that's going to remain a constraint for a long time. And as long as people design applications in order to be

cognizant of the constraints on the network, you'll probably be able to live within those constraints on upstream capacity, at least for a while. I mean, there clearly is a growing demand for uploading large files and that sort of thing. But the true synchronicity and the symmetrical large streaming traffic, I think, is more a question of the way you design applications today than it is of constraints on the network.

MR. WELDON: I would say in terms of the FCC's role, one of the services cases that needs to be seriously looked at is these canonical cases, the services cases that have continuous upstream streaming for remote monitoring, e-health, videoconferencing. At least one or two concurrent video streams need to be part of the service model you analyze to say is that an affordable model? Because a lot of the new revenue-generating services are there.

So, just because they may not consume anywhere near as much bandwidth on average as the downstream services, the revenue might be in the

upstream services. So -- and the economic and social benefit is in the upstream services, probably as much as the downstream. So, we need to have that as part of the equation. And then the application providers -- or the application writers will actually modify their application, hopefully, to take advantage of the network that gets built in the appropriate way.

But if the network doesn't get built correctly, we're always in this constrained environment. The social benefit doesn't appear and the economic benefit doesn't appear either. So, there needs to be a bar set that says this must be a design criteria to support one or two upstream communication sessions with video content. Otherwise, I think we will under-build the network.

MR. NEWBY: I'd like to answer both questions, but in reverse. Yours first and then Rebekah's. Because it came to mind as what a driver for the infrastructure build would be.

I believe that the change has already

taken place. It's all point and time and location based. Again, I go back to Korea. They have full duplex video mobile. We don't. If the network is there, the applications are developed and it comes down to a design spec. You need a plan or to be fortunate enough to live on a peninsula that's not very large.

Going back to that, though, we focus a lot on consumer with this discussion as it relates to infrastructure development for the country. Telepresence already exits; it has for some time. I'm a big fan of telepresence. I've been tracking it for years. And I happen to know a couple of people that are in that space who have really pioneered it.

And if you look at what telepresence is on the business side -- getting away from, you know, the Dick Tracy watch or the full duplex video mobile for consumers -- it's business-level, conference room-type, full duplex, everybody's in the same room, but they're all around the world. And it uses IP, but it does not use the public

Internet because the public Internet can't support it.

So there's a clear differentiation between applications, the public Internet, and that whole concept, and then a business-level application of full duplex video HD. You know, HD doesn't use a public Internet either, largely for origination for sure, and 720i on YouTube only for download and that's still sketchy.

So, there are the applications and they exist and you have to look at how you're going to design your networks in order to support them. It doesn't really make a whole lot of sense to have a private, dedicated telepresence network on a regional basis that can't connect to another one, which is why when HP built, you know, Heaven and Halo, they did it on their own dedicated DS3s to the endpoints, and then the core they had their own fiber and their own 10 gig waves. They don't use the public Internet, they don't use ISPs. ISPS don't exist in that equation. So, there's an app and it'll certainly drive it as and when the

business stakes make sense.

If we go back to your question, what could some of the incentives be? And I'll turn this whole back to the rural areas, specifically. If you're familiar with the Intercarrier Compensation Forum and the concept of the edge network built sort of within that, and the debate and battle that went on between those carriers that were living off of reciprocal compensation -- strictly a voice conversation, by the way, voice revenue.

Recip Comp and then the incumbents that want to drive that down to so far in the decimal point that you can't see a number anymore, Recip Comp and the fees that they were and still are generating in certain areas are, in a sense, a subsidy that has been keeping a lot of these companies alive for a long time without having the capital or any, you know, new infrastructure build out for new applications because they've been so remote. And a lot of that has to do with the lack of middle mile infrastructure facilities that

could get them high speed to the Internet that the rest of the world has.

But again, the disparity between voice and the PSTN and the IP world. And what I had said a long time ago, is that a big motivation is just to get away from Recip Comp on your own as a group and not let it just be squeezed out of existence to you and then you try to figure out how you're going to replace that revenue.

The incentive is to move to IP. And on the voice side, move to SIP. And do exactly what the ICF said and the edge network, but do it for yourselves. And as rural networks, create an IP network of your own that is yours.

So if you connected all the rural telcos in the country, they would have as many Annies and as many endpoints as an RBOC. They're disparate, but they could access one. And they could do that by creating their own Layer 2 network and establishing what's called a VLAN, virtual local area network connection, and use SIP trucking and set up their own gateways to be one

whole, homogenous network that just happens to represent a lot of different parts of the country. Then they could sit at the table with the big boys and negotiate a real peering and settlement agreement for all of their endpoints, which would probably total in the millions, a lot more than they are as standalone, independent entities that can be essentially, you know, cornered and killed off slowly on the voice side.

No disrespect to the big guys. So, if they did that, they would be able to peer their own internal traffic, which would allow them to call each other if they chose to do multilateral, which is obviously up to everybody on their own. Multilateral being free cost to originate, terminate, which is the way e-mail works. If anybody remembers e-mail used to cost a quarter or whatever it was? With, you know, IBM it's free. Zero mile, flat rate, global. Doesn't matter if you're in Singapore or wherever you are.

Voice is, in a lot of places right now, multilateral. It's free. There's something

called the voice peering fabric that existed since 2003. It has over 500 members, it carries over 2-1/2 billion minutes of totally multilateral traffic today, right now, between cable companies and CLECs and enterprises and VOBB providers and everything else.

That could go out to the rural areas and that could basically become a driver for them to connect to it. The voice peering fabric I'm referring to is a distributed, globally layered to Ethernet switch fabric for voice specifically. But there's no voice switch in it. It's just a big Ethernet provisioning mechanism. And if the rural networks were to connect to it and use it as their backbone, they could peer with each other.

That -- let's call it an application of the transition from PSTN voice to IP voice is what would be the motivation for them to get access to broadband. And if they, the rural telco level, start there, that gets you closer to them that they could then turn around and drive it further down to their end customers because they would

have -- obviously at that point it would be beneficial. They don't have to, but they could IP-enable their own endpoints. And that's the starting point. It's just the beginning.

And again, it'll take time and it'll migrate. But how else are they going to be motivated, incentivized, you know, as a group to do it? I agree, don't give incentives to create a problem. I think, though, that they see the writing on the wall. They need to make that transition to the IP world independently, and that would be good.

MR. CURTIS: I think, sadly, we're coming to the end of our time. But in the interest of parity, does one of the big guys want to say anything before we close this off?

MR. CLEMENT: I'll just make one point, one quick comment. And that is, you know, Craig talked about the fact that we're offering services that are dynamic and some services are under pressure. And the way we justify the cost for this network is a combination of private point-

to-point IP network or other technology network services that have some revenue associated with it and broadband, open sort of services. And if the FCC defines the open sort of set of services to include all the higher value stuff, then it's going to be a higher cost for the open Internet.

So, it's a delicate balance in terms of what's the business model for the higher value applications for the carriers? Because it's one network for us. And we have to look at all the revenue streams and all the cost components to be able to build, support, upgrade that one network.

MR. CURTIS: Guys, thank you very much. This has been a great discussion, from my point of view. Hope for everyone else as well.

You know, would like to continue, in all likelihood, the dialogue with everyone. There were a lot of issues raised that don't have data on yet that we'd love to get into deeper with all of you and hope you're amenable to that.

And let's just say thank you very much for taking the time to come here, participate on

the panel, and share your thoughts. It's extremely productive. Thanks a lot.

(Whereupon, the PROCEEDINGS were adjourned.)

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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