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FEDERAL COMMUNICATIONS COMMISSION

NATIONAL BROADBAND PLAN WORKSHOP

TECHNOLOGY/APPLICATIONS AND DEVICES

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2   Panel 1 - Current Experiences and Trends in
     Applications and Devices
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12   TIM NAPOLEON
     Chief Strategist, Digital Media, Akamai
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14   ROBB TOPOLSKI
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16   EVAN YOUNG
     Senior Director, Product Marketing, TiVo Inc.
17
     BILL GURLEY
18   General Partner, Benchmark Capital

19   Panel 2 - Emerging Applications and Devices and
     the Infrastructure to Support Them
20
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 1                P R O C E E D I N G S
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 2   MR. DAVID: Thank you all for coming.

 3   We have a panel that I've been excited about all

 4   month in having this group of people together,

 5   this one and the second one. I think some of the

 6   people on the second panel this afternoon are or

 7   will be in the audience. The only thing I will

 8   say to preface the set of workshops that we've put

 9   together for today is that we purely artificially

10   divided into current and future. As these people

11   begin to talk you'll realize that it's a futile

12   effort to divide current into future. So I am

13   giving everyone clearance to talk about the future

14   if you would like. If there is someone on the

15   second panel who wants to raise a question, funnel

16   it in. We can maybe create a cross-workshop

17   debate if that's useful.

18   Our goal for today in this Applications

19   and Devices Workshop is to get a view from

20   practitioners, people who are looking at the

21   network and the application stack and devices, get

22   a view from them about where we are today in terms

1   of utilization, the diversity of utilization, the

2   distribution of utilization across various user

3   communities, and a sense of where we're going.

4   Among other things as this feeds into the

5   Broadband Plan, we need to understand to the

6   degree we can, and we will be wrong, how to think

7   about networks being utilized in 3 years, in 5

8   years and in 20 years. We're not going to do a

9   lot of forecasting as part of this plan mainly

10   because I certainly don't want my name on

11   something that's going to be wrong and laughed at

12   like the famous McKenzie consultant who

13   recommended that AT&T not focus on mobile because

14   there would only a 100,000 users back in the day,

15   whatever it was. I don't want to be part of that.

16   But we do need to look into how utilization is

17   going to change and therefore how networks and

18   devices have to change.

19   With that I'm going to let my

20   co-questioners introduce themselves and then we're

21   just going to turn it over to the five of you to

22   spend your 5 minutes talking about whatever you'd

1   like to talk about, and then we'll throw it open

2   to questions from all venues.

3   MR. KNAPP: I'm Julian Knapp, Chief of

4   the Office of Engineering and Technology.

5   MR. NEWMAN: Stagg Newman, Chief

6   Technologist, Broadband Team.

7   MR. MILLER: James Miller, Office of

8   Engineering and Technology.

9   MR. DAVID: I'm not going to go into

10   detailed introductions. Anoop Gupta joins us from

11   Microsoft and I'll let him kick off because his

12   first name starts with an A and he's sitting right

13   next to me.

14   MR. GUPTA: Thank you. It's wonderful

15   to be here and it's a privilege to have this

16   opportunity to provide an input on an issue so

17   foundational to all of our futures, to the

18   competitiveness of the U.S. and opportunity for

19   all citizens. It's wonderful to have this

20   opportunity to have a dialogue with such a select

21   and influential audience.

22   I don't think there is any doubt for any

1   of us that the Internet will play a critical role

2   in our lives whether at work or at play, and also

3   how we think about our education systems, how we

4   advance the quality of health care and reduce

5   cost, how we deal with the energy and the climate

6   issues, all of the issues that are so foundational

7   and are of deep interest to this administration,

8   and how we enjoy entertainment and connect with

9   our family and friends.

10   I'm not going to use any slides, it's a

11   complex topic, so I found that the simplest way to

12   discuss this is to identify some high-level trends

13   and the policy implications that are going to be.

14   I'm watching the clock so I'm going to go pretty

15   quickly.

16   Trend one that I want to talk about is

17   that I believe the growth in storage and the

18   Moore's Law that drives storage capacity and the

19   emergence of cloud computing where we are taking

20   that storage and pictures and putting them up is

21   going to also drive proportional increases in the

22   bandwidth and the throughput requirements of the

1   network. I just returned from a vacation 10 days

2   covering the Grand Canyon and Bryce and Zion

3   Arches and I took in 10 days 38 gigabytes of

4   photographs and videos. It was a Cannon SLR,

5   nothing special about it that you're doing. It

6   takes HD video. I just got the load, and if I

7   take the average capacity of 1 megabit that we

8   have upstream, it's going to take 3 days to upload

9   it to share with the rest of the family that is

10   there. Microsoft has things like PhotoSend where

11   I took the Balance Rock and Arches, took lots of

12   photographs because we can start building 3D

13   models off of it and sharing with the rest. As

14   you go around and look and people are doing that

15   for all kinds of institutions. So even if you

16   consider me high end today, 3 to 5 years from now

17   I don't think this is going to be uncommon. The

18   number of pixels and the size of flash RAM is

19   going to drive it.

20   What does it means in terms of policy

21   implications? It means we need broadband

22   technology that scales the same way the rest of

1   the silicon does and is future proof, and fiber is

2   one of the technologies today and it's important

3   to get it as deep to the end user. We have talked

4   previously about the priority today should be to

5   anchor institutions, schools, libraries,

6   hospitals, and having open-ended connectivity

7   because then it allows connectivity to the

8   surrounding communities. Wireless is critical.

9   The second very mega trend I want to

10   talk about is that applications are like a gas in

11   the sense that they are limited only by human

12   imagination, and new ones will be invented that

13   expand usage to consume all length bandwidths. So

14   in any prediction we do there is only one

15   application, we will consume the bandwidth that is

16   available whether as we go from standard

17   definition to high definition to Quad HD to 3D

18   video, 3D video as part of Silverlight that

19   Microsoft is already doing. Cameras at $100 are

20   becoming available. MRIs are 3 gigabytes, remote

21   medicine and all these things.

22   What is the importance of this trend?

1   It is that basically will the U.S. be the

2   innovator of the applications because you need a

3   critical mass community who is going to innovate,

4   or is it going to happen in Korea, Japan or Sweden

5   where you have the applications and critical mass

6   innovation? So I think it is really important

7   that we make sure that the United States is the

8   country where the leading edge deployment of

9   broadband is available so that it is our companies

10   that are doing it.

11   Let me go to a device related trend.

12   The diversity and the number of devices connected

13   to the Internet will increase massively that we

14   see. PCs of course are there, but broadband

15   enables smart phones, they're going to double,

16   TVs, smart electric city meters, smart

17   thermostats, washing machines, rain scales that

18   are connected to the Internet. So we see a

19   massive increase in these devices and it's already

20   starting to happen in the notion of Internetted

21   things.

22   A couple of quick things that people may

1   not think about. One is we are running out of

2   IPv4 address space more rapidly than people might

3   be thinking, and the transition to IPv6 will not

4   be as easy as many people are imagining and I

5   think that a deep public/private partnership is

6   needed in making sure it's a smooth transition.

7   Just like we might have thought about digital TV

8   and Y2K, that is there. Also in terms of the

9   spectrum, both licensed and unlicensed spectrum.

10   As we've seen, all of the mobile people now

11   they're sort of warming up to the WiFi

12   availability and how we go and enable both more

13   spectrum, more efficient use of spectrum as in the

14   case of white spaces, using that spectrum, and

15   looking at the wire line and wireless as

16   complementary rather than competitive or silo

17   technologies, I think a policy framework like that

18   is really important.

19   Let me end there given that I'm done

20   with my 5 minutes. I have a bunch of other points

21   that we can discuss during questions. Thanks.

22   MR. NAPOLEON: I'm Tim Napoleon. I'm

1   the Chief Strategist for Akamai Technologies.

2   Akamai started out as an MIT start-up based out of

3   Boston, Massachusetts. We've since grown over the

4   last 10 years to power the online applications for

5   several sectors of business, everything from the

6   media and entertainment space, from people like

7   Xbox and iTunes, to the financial services space

8   with Websites like Fidelity, to government

9   agencies, and recently even things like the NASA

10   launch on the iPhone. So we have a very broad

11   spectrum of customers who are really leveraging

12   the Internet to both run their businesses and

13   reach consumers in new and engaging ways.

14   A couple of the trends I wanted to talk

15   about, we publish a quarterly report called "The

16   State of the Internet Report." How we get that

17   data for the report is the way Akamai likes to

18   solve the problem of Internet congestion and

19   Internet speed is by putting our services as close

20   to the edge as possible. So we're in nearly about

21   2,000 networks and we have about 45,000 servers.

22   The partnerships that we have with the ISPs is

1   that they take our servers and put them in their

2   last mile networks so that the things like videos,

3   popular software applications, popular webpages,

4   don't transverse the middle mile networks where

5   there is the most constrained capacity, and stay

6   resident at the edge of the network. So what we

7   saw in the last quarter was over 10,000 servers

8   were requested by ISPs and shipped. The primary

9   driver of that is from the ISPs dealing with the

10   explosion of video. The explosion of video is

11   happening for two reasons. Reason number one is

12   there is more video consumption on higher powered

13   computers, so the price point for the MIDs and

14   notebooks and things that can play back Hulu are

15   now under $500 and have made that a massive

16   adoption for consumers. The next big trend that's

17   driving that is the overall quality of the video.

18   We went from small 320 by 240 kind of grainy, rub

19   your eyes, probably can't watch it for more than a

20   couple minutes, to now we're delivering all the

21   way up to HD video for long format shows. So when

22   you hear the term over-the- top models are going

1   directly to consumers with broadband, that type of

2   model is actually going to be very much a reality.

3   So we're seeing things like rental models from

4   Netflix, sale models from iTunes becoming a larger

5   and larger percentage of media revenue.

6   The last piece I'll use to close out for

7   my time is to go through some data that we're

8   seeing that shows some of this growth. How we

9   collected this data was from end user requests to

10   the Akamai Network from these various ISPs around

11   the globe. On a daily average we're seeing about

12   a terabit per second of traffic through the

13   network and that's an average. We peak well over

14   2 terabits per second when popular things happen,

15   for instance, the inauguration or the upcoming

16   World Cup. They used to always use the analogy

17   for the government that at the Super Bowl when

18   everybody flushed their toilets, the water works

19   should slow down, so we want to make sure that

20   doesn't happen on the Internet.

21   The next piece is the number of people

22   we're seeing on the Internet. On a monthly basis

1   we're seeing about 425 million unique IPs access

2   content on the Akamai Network. Those are global

3   users. Then for domestic users, we're seeing

4   about 115 million unique IPs. Additionally, we're

5   seeing the average global broadband speed, so this

6   is the average connection speed to the network, is

7   about 1.5 megs per second, so that's the global

8   average. The best country for broadband speed

9   which is no surprise is Seoul, Korea, their

10   average connection speed is about 11 megs per

11   second, and that includes both mobile and

12   broadband. As for the U.S. in terms of overall

13   averages of the average broadband speed, we rank

14   about nineteenth in the world, so we have to step

15   that up to get up to number one, it's our American

16   duty, and 3.8 megabits per second is the average.

17   If you think about it though from a stat we track

18   at Akamai on our wall, is total minutes saved by

19   all these people accessing content? We accelerate

20   the delivery of webpages and media, so you'd have

21   to wait longer if you didn't get cached by Akamai,

22   and that has become into billions and billions of

1   hours of time we've saved the general population.

2   So if you can think about broadband speeds as just

3   a time saving function, I think there is a gross

4   domestic product/output productivity argument we

5   can make that by just accelerating the speed of

6   broadband access for these 114 million people who

7   are accessing the Web, we can drive additional

8   productivity out of our economy. So I think just

9   from a productivity standpoint, having fast

10   Internet access is a necessity.

11   MR. DAVID: Thanks, Tim. Robb?

12   MR. TOPOLSKI: My name is Robb Topolski.

13   I am Chief Technologist for the Open Technology

14   Initiative at the New America Foundation and also

15   work in the same role for the public interest

16   groups Public Knowledge and Free Press.

17   I'm a software developer. I worked for

18   the last years at Intel and Quarterdeck Office

19   Systems on networking products. I've been in

20   digital communications for 25 years. I hold an

21   advanced class amateur radio operator's license

22   and have made my focus digital modes. So I've

1   watched the evolution of this and seen the

2   technology applications leapfrog the platform and

3   network and then have seen the platform and

4   network respond to grow in order to handle that

5   increased demand only to see the demand again

6   leapfrog, and this game continues and is healthy.

7   Everybody probably remembers when America Online

8   decided to change their dialup model to an

9   unlimited dialup model and all of a sudden the

10   service that was able to handle the capacity

11   couldn't handle it anymore. In 1994- 1993ish I

12   remember when this rather disruptive technology

13   known as the World Wide Web came to take over the

14   Internet and kind of sucked up every available bit

15   of bandwidth because the World Wide Web came with

16   images and Gopher and such did not. I remember a

17   service called PointCast which doesn't exist

18   anymore because network operators thought that the

19   push technology tended to push too much traffic

20   through their pipes and they shut that down. And

21   I also remember the network responding each time

22   to the inevitable demand and there being times

1   where I would sit in strategic meetings at Intel

2   wondering how are we going to fill these pipes?

3   What new thing can we do to increase demand for

4   our networking products? And these were all

5   decisions that we were trying to make in order to

6   respond to the fact that we had excess capacity,

7   we have felt that breathing room from time to

8   time.

9   Something is different this time. The

10   country that founded the Internet is now number 19

11   and we are having discussions from our top

12   Internet service providers not on how we can

13   provide the next generation of speed, but how we

14   can manage the demand within the network that we

15   have, and I don't think that's healthy at all. We

16   need that leapfrog to continue.

17   As an innovator, one thing that I've

18   been able to count on is the thing that I create

19   here for the Internet works everywhere on the

20   Internet. The Internet has standards and that the

21   standard operating procedure for the Internet in

22   Washington, D.C. or the Internet in Hillsboro,

          1   Oregon or in Santa Monica, California, any place I

          2   might be developing this, will work every place

          3   else because the Internet protocols are the same.

          4   When we have ISPs that are managing the

          5   network to favor the products that they like and

          6   disfavor the products they don't, that breaks that

          7   predictability, that interoperability that I count

          8   on. Some examples, just this past week the Dutch

          9   ISP that goes by the name of UPC announced that

         10   they were cutting back on all traffic that's not

         11   http based traffic down to two-thirds for 12 hours

         12   during their working day. As a developer that

         13   tells me either if I'm in the Dutch market I want

         14   to make sure that my application is http based

         15   whether it's appropriate to be or not, or I don't

         16   want to work in that particular area, or I could

         17   expect high support costs in that area. But UPC

         18   isn't alone. There was an announce about a year

         19   ago that BT was doing the same thing. An outfit

         20   named Samno said that they detected this

         21   unannounced interference. Cox Communications here

         22   in the United States has said that they were

1   experimenting with a preferencing/dispreferencing

2   service. The Internet standards promote

3   interoperability, promote predictability, promote

4   low cost of support, and that generates

5   investment, that generates the dollars coming in

6   for those next generation products.

7   As for being number 19, all I have to

8   say is our network is our test bed. Most of the

9   best things on the Web were invented in somebody's

10   garage at home, and if we are operating on last

11   year's network, there is no way that we can be

12   expected to develop next year's killer

13   applications. We can only chase taillights when

14   we're in nineteenth position. Thank you.

15   MR. DAVID: Thanks, Robb. Evan?

16   MR. YOUNG: Good afternoon, and thank

17   you for inviting TiVo to participate.

18   I'd like to talk about three issues with

19   respect to broadband apps, network and policy

20   development. I'm going to use some TiVo specific

21   examples, but we think these apply generally to

22   ensuring free and open competition, innovation and

1   consumer choice when it comes to broadband

2   services.

3   The first issue is access to signal

4   particularly as it pertains to consumer choice

5   among broadband connected devices. You might

6   think that this is a solved problem because with a

7   PC I can access broadband by plugging in Ethernet

8   or just using the 802.11 network. But broadband

9   services can be delivered many ways, some more

10   open than others. You can get broadband via hard

11   line, ATSC encapsulation, satellite, cellular and

12   wireless networks. And while I can hook my PC or

13   other devices to my home Internet connection, this

14   is not generally true across most of the other

15   methods. Consumers are often restricted in the

16   types of equipment they can use on a particular

17   network, particularly cellular, cable or

18   satellite. Competing device makers often don't

19   have access to signal on these networks and that

20   results in restricted consumer choice. Given that

21   cellular and wireless networks are an increasingly

22   popular way to access broadband, consumers

1   shouldn't be restricted to the provider's

2   equipment, they should have choice in the devices

3   and the user interfaces and the default services

4   that are presented to them.

5   In addition, many devices are delivering

6   functionality and services across multiple

7   networks. The iPhone is an example of a device

8   that accesses the cellular network as well as an

9   open wireless network if it's available. TiVo is

10   another example where we access ATSC broadcast

11   cable networks and Internet broadband services in

12   an integrated fashion. You can see running across

13   the lower right hand track all of the different

14   ways this episode or medium can be gotten. I can

15   get it off of broadcast, I can get it off of cable

16   on demand, and via broadband I can get it via

17   Amazon on download or Netflix via streaming. So

18   we believe TiVo and others should be free to

19   innovate in the ways of presenting content and

20   services to consumers and integrating those

21   multiple sources, and for this, access to signal

22   is key. If there were restrictions on access,

1   TiVo wouldn't be able to present all of these

2   options to consumers. I should note that people

3   who use a traditional cable set top will see only

4   cable delivered options. They won't see ATSC

5   channels and they won't see Netflix or Amazon on

6   their cable set top. Consumers using a PC to

7   watch video may be able to access Netflix or

8   Amazon on their PC, but they can't watch linear or

9   VOD cable services there. TiVo is only able to do

10   this level of integration because of the cable

11   card standard. Tru2way is a new and sort of

12   troubling standard that restricts choice of

13   presentation to just what the MSO provides. I

14   won't talk about that here because this is on

15   broadband. But in any case, if the MSO or service

16   provider restricts access to specific services

17   coming over broadband in favor of their own

18   services, this is another restriction of consumer

19   choice.

20   This brings me to the second issue which

21   is net neutrality. We strongly believe in net

22   neutrality. All broadband sites and services

1   should have open and equal access to the consumer.

2   Neither the last mile provider nor the backbone

3   provider should be able to favor or restrict

4   certain types of traffic based on either origin

5   source or on destination device. By that I mean

6   traffic based on origin shouldn't be restricted,

7   but similarly a cable provider's set top should

8   not receive traffic preference over TiVo in the

9   home, nor should a wireless provider's phone

10   receive network preference over an unlocked phone

11   that I use on that network.

12   As multiple services of networks are

13   integrated into single devices, it's important to

14   maintain parity of service across delivery

15   methods. If Amazon or Netflix were rate limited,

16   then a TiVo user might have no choice but to favor

17   the cable provider's services. As another

18   example, I can use Skype on my iPhone only when

19   connected to an 802.11 network. Skype is

20   disfavored on AT&T's 3G data network despite the

21   fact that bits are bits.

22   The final issue that I'd like to address

1   is consumer choice and user interface in accessing

2   these services. With respect to broadband

3   services and especially broadband video,

4   innovations in speed, picture quality and sound

5   quality go only so far. Consumers should have

6   choice in both the services they can access and

7   the way those services are presented to them. In

8   the same way I have a choice among the Internet

9   sites I like and the Internet browser and search

10   technologies I use to get to those sites on my PC,

11   I should have choices in the broadcast and

12   broadband video services I can use on my

13   television as well as the way those services are

14   presented to me. I should be able to choose

15   whatever device and user interface I want and that

16   accesses the services I want. That choice with

17   access to signal and net neutrality are the things

18   that we believe are necessary to guarantee

19   consumer choices and free and open competition,

20   innovation and the development of next generation

21   services.

22   MR. DAVID: Thanks, Evan. Bill Gurley?

1   MR. GURLEY: Thanks, Brian. My name is

2   Bill Gurley. I'm a venture capitalist with

3   Benchmark Capital in Menlo Park, California. Like

4   many people who come before you, I have a bias and

5   my biases are tied to being a venture capitalist

6   so I favor policy and regulation that allows for

7   the creation of new technologies, new markets and

8   new companies that generally threaten the status

9   quo, and I can only assume that the reason we're

10   here is dissatisfaction with the status quo, so

11   I'd make the argument that our interests are

12   aligned.

13   Let me move to the first point. I have

14   three points I want to try and get to quickly.

15   The first one is just more of an FYI. I don't

16   know that it demands policy attention, but I would

17   argue writ large the venture capital industry is

18   capitulating and throwing in the towel when it

19   comes to investing in telecom equipment either

20   wire line or wireless. The real problem is that

21   under the previous administration the kind of

22   stark oligopoly that's been recreated has created

1   a marketplace where even start-up winners don't

2   pay off for venture capitalists. They require

3   hundreds of millions of dollars and don't result

4   in positive ROI. I'm not looking for sympathy,

5   the sympathy line for venture capitalists is quite

6   short, but it's more to let you know that these

7   technologies aren't going to come from Silicon

8   Valley. They very well come from Asia where there

9   is a more competitive market.

10   The second point I'd like to make and it

11   relates to the first and some of the other

12   panelists have mentioned it, venture capitalists

13   very much favor open spectrum. It gives us a free

14   kind of unfettered blank canvas area where we can

15   innovate and invest where we don't have a fear of

16   the kind of control tactics that make it very

17   difficult for start-ups to compete in and around

18   the carrier network. So I would be a fan of any

19   policy, I'm not asking even for all open spectrum,

20   just some open spectrum, because I think if you

21   look at the innovation that's happened even around

22   802.11 from 200K up to 54 megs in a very short

1   timeframe and different applications and different

2   uses, you can see what Silicon Valley can do when

3   they're given room to run.

4   The carriers have two points they like

5   to make when you talk to them about metro scale

6   open spectrum wireless that I think are quite at

7   odds with one another. The first one is they'll

8   tell you that the technology sucks and it doesn't

9   work and you shouldn't rely on it. And the second

10   thing they'll tell you is that the networks are so

11   potently competitive that they'll hurt their

12   profits and therefore will need to be legislated

13   out of existence. You can't have both of those

14   things be true at the same time. It's not

15   logical.

16   We happen to be an investor in a company

17   that makes metro scale WiFi equipment called

18   Tropos Networks. These products have evolved

19   quite a bit since what you may have read about

20   EarthLink and maybe the Philadelphia Network. The

21   majority of Tropos' 750 customers, actually

22   municipalities here in the United States that are

1   using these networks currently to the theme of the

2   panel for a variety of applications including

3   video surveillance, mobile police forces, mobile

4   fire forces, ambulatory, traffic management, and

5   now smart grid.

6   I want to walk through real quickly four

7   examples of these although there are 750, and I

8   invite the FCC or anyone to visit any of these at

9   any given time. Oklahoma City has probably the

10   world's largest open spectrum network, 550 square

11   miles. Every single city employee has become a

12   mobile worker including the entire police force

13   and fire force. In St. Cloud, Florida, the city

14   council there decided for economic development

15   reasons they wanted to have a free WiFi network

16   over the entire city to attract business and for

17   consumers. There are 12,300 users of the network

18   today. For a third of those users, this is their

19   only broadband Internet access. This is a digital

20   divide story, Richgrove, California. This is a

21   very, very, very poor community of 2,300 people.

22   Only 20 percent of the population has a high

1   school education. The IT manager at the local

2   high school got a grant and was able to build a

3   network 1 square mile around the school which now

4   offers free access to that community and they want

5   to expand it. The challenge for a community like

6   this is we went to them and talked about the NTIA

7   grants and they said we've never filed a grant

8   before and we don't know how. In some of these

9   areas, it's a different type of problem that gets

10   in the way of them being successful.

11   Mountain View, California. You may have

12   heard about this. This is a network owned by

13   Google, and I think it's important to look at it

14   just from my understanding of what the technology

15   is capable of. This is a 12 square mile network.

16   It is free with 17,500 users a month and over 600

17   gigabytes a day. To put this in perspective,

18   that's about the same type of traffic you'd have

19   on a DSL network of this size, and I think

20   interestingly, more than the combined data traffic

21   of all the 3G networks in the area. So it's kind

22   of hard to talk about this not being a feasible

1   technology.

2   Lastly I'd mention Ponca City, Oklahoma,

3   which is a network that's only been alive a few

4   months. This is mixed city use, so all the

5   vertical applications I mentioned and public use

6   with 4,000 users a day. This is our latest and

7   greatest N technology. They're seeing 4 to 7

8   megabytes of average performance for each consumer

9   which is above the average Tim mentioned earlier

10   for all of the United States.

11   The last point I'd make before I close,

12   because I think this is important to regulation,

13   is city size matters. One of the things that

14   Tropos has found over the years is that the

15   smaller cities actually can implement these

16   networks much quicker, much more cost-effectively,

17   and the reasons I have on this list are smaller

18   cities lack bureaucracy, right-left issues, red

19   tape, mounting pole issue rights, and literally

20   the Philadelphia Network took 2 to 3 times per

21   square mile of some of these smaller cities and

22   easier 10 times for the time to implement. So I

1   would ask you to please consider the interests of

2   smaller communities, that if you can't help fund

3   them, please don't legislate them away or get in

4   the way of their own determinism.

5   MR. DAVID: Thanks, Bill. In various

6   ways you all touched on a triangle of issues,

7   applications, networks and devices. I have two

8   primary questions. One is other than video which

9   was talked about extensively, what are the other

10   applications that are driving bandwidth intensity?

11   Let's keep it short, the 3- to 5-year window. But

12   related to that is a point that Robb brought up

13   which is around leapfrogging. If you're right,

14   and I think you probably are that networks

15   leapfrog once they figure out that they have to

16   and the R&D and innovation that Bill was talking

17   about finally happens, the network leapfrogs where

18   devices are and then the devices catch up. My

19   question you is do we have examples where the

20   devices literally held back the network, not that

21   they took some time to fully utilize the network,

22   but where a network really wasn't useful for an

1   extended period of time at its inception because a

2   device didn't exist to use it? I don't have any

3   good examples. It's not a leading question. I'm

4   wondering if you think about 3G to 4G wireless or

5   2G to 3G or others. I'm interested in whether

6   devices ever lag the network in a significant way.

7   So maybe you can wrap those two questions

8   together. Robb, do you want to start?

9   MR. TOPOLSKI: I just came to

10   Washington, D.C., from Portland, Oregon, which was

11   one of the first networks for Clearwire.

12   Clearwire is a 4G WiMAX ISP with an aggressive

13   rollout schedule over the next several years.

14   When they came to Portland they did not have any

15   voice devices. They were strictly data devices,

16   either an in- home receiver/transceiver or an in

17   the mobile receiver/transceiver, but either one

18   was data. I think that really hurt Clearwire in

19   that that adoption was not what it would have been

20   if they also had a voice phone or device that

21   could make and receive calls.

22   MR. GUPTA: I wanted to talk about a

1   couple of things, one related to video and the

2   other not related to video. One is traditional

3   video is very latency tolerant and we should not

4   forget nonlatency or latency-sensitive

5   applications. Telepresence and telecommuting can

6   be a huge thing. Microsoft uses 220,000 hours of

7   conferencing per month. That saves us around 100

8   million miles a year of less air travel and around

9    $200 million in savings, and that requires low

10   latency. Project Natal which is a gaming

11   situation that we have where you don't need

12   controllers so we are really democratizing the

13   grandma going and interacting with the kids

14   requires very low latency where you're playing

15   ping-pong or soccer or lacrosse in the

16   communities, and those are different kinds of

17   applications that we'll need, and if you start

18   thinking of remote control surgery. So that is

19   one source of application that I don't want us to

20   forget about as we think about YouTube streaming

21   videos and things like that, that those are

22   critical.

1   The second area I want to talk about

2   that will be driving it is science and research.

3   There is a third branch of science emerging.

4   Traditional sciences were theoretical sciences and

5   experimental science, and the third science is

6   computational science which is driven by massive

7   amounts of computation and massive amounts of data

8   that are brought together. The Hadron Collider in

9   Switzerland produces around 10 to 15 petabytes a

10   year. There are some telescopes that will be

11   producing terabytes of data. The data goes into

12   these clouds and these massive data centers, but

13   the researchers are sitting across all of these

14   universities and accessing and driving how we

15   design the wind turbine blades or the next car or

16   something like that, and I think that will impose

17   a new requirement on network speeds both upload

18   and download as we look at visualizations, and

19   that's definitely another consideration people

20   should be thinking about and that's happening now.

21   MR. NAPOLEON: I think the key point of

22   the other killer application for the Internet

1   beyond video was collaboration. I'll use a

2   specific example, a start-up in Nashville called

3   StudioNow. If you've ever been in corporate

4   communications and you've had to produce a video,

5   especially if the video had a lot of regional use

6   where you had to go out and interview potentially

7   many different cities, you'd have to fly a video

8   production crew around to each city. You'd then

9   have to take that footage back and edit that.

10   You'd have a bunch of limiting factors, how many

11   editors you had at your studio and the time that

12   you took to travel. They built some software on

13   the Web that allowed people and all the

14   videographers around the country to certify

15   themselves. The marketing and communications can

16   put up their script. They can shoot in every

17   single region. Every person edits and they bring

18   everything back. So there was a recent project

19   that historically took 6 to 9 months to finish up

20   and they were able to finish it up in a few weeks.

21   The interesting thing about the Internet is the

22   collaborative effect of parallel process. You

1   have to almost have a new mindset in business that

2   you are no longer limited by your resources,

3   you're limited in your ability to collaborate and

4   coordinate resources. So the distributed aspects

5   of the Akamai Network also is starting to have

6   software applications that are coordinating

7   distributed resources, whether that's humans or

8   other devices and that distributed coordination is

9   a very, very powerful effect.

10   MR. GUPTA: On the science I was talking

11   about, distributed collaboration absolutely

12   resonates because the large files or whatever

13   you're sharing and driving across the network is

14   an element.

15   MR. KNAPP: Progressing along the same

16   line of thought that Brian had raised, when I

17   think back looking at the evolution of the PC and

18   the processing capability advancing and then the

19   software applications would catch up with that and

20   we had that kind of a leapfrog going on. I was

21   fascinated, Tim, by the figures that you had, here

22   are the average speeds and the capacities and so

1 forth. In thinking about applications, are there

2 any accepted norms for average speeds that weigh

3 in when you think about I'm going to develop this

4 application? Is there any accepted norm in the

5 industry or is it done by each company? I'm going

6 to stop there because I have a coupe of follow-up

7 questions.

8   MR. NAPOLEON: There are two answers to

9 your questions, yes, we found things from Jupiter

10 and others that we've done research that if a page

11 doesn't load in a certain amount of time, the end

12 users will abandon it. There's another problem

13 that makes it even more challenging for the

14 technologist, it's that people gravitate toward

15 the best experience they've ever had. So just

16 like when you first went over to your friend's

17 house and first saw a Redskin's game in HD, you

18 went home and said a new TV set is coming in this

19 weekend. The thing happened in that as soon as

20 you have a great broadband experience or you see

21 the speed of a very fast and good connection,

22 you're like I've got to have that now. So you've

1 had that experience probably when you got a new

2 laptop or a new PC. You didn't really realize how

3 slow your PC was before until you had the new

4 experience. I think it's not a fixed target that

5 we're aiming for. It's constantly evolving, and

6 so that's what the challenge it.

7   MR. KNAPP: Anybody else?

8   MR. TOPOLSKI: I'd just like to add to

9 that that as somebody who is developing products

10 for a particular network segment, we try to figure

11 out what's the worst-case scenario. What's the

12 slowest that they have access to? Because that's

13 what's going to drive our support costs. Those

14 people on that boundary are going to be the people

15 who are calling. So when we have a market where a

16 significant number of consumers are sub-1.5

17 megabit, we've got to write the application such

18 that it works for that and above and we're stuck

19 there. It might get better for somebody who's

20 faster, but at that point that's where we have to

21 cut it.

22   MR. GUPTA: One point on that. One is

1   certainly for companies like ours we want to

2   skilled audience so there's a business model that

3   works. That's important. One of the technology

4   approaches we are taking is making sure that we

5   have scalable codex and technology delivery

6   mechanisms. When you say you can watch the video

7   on the phone and you can watch it on the PC and

8   you can watch it in a single package in some

9   sense, you can scale across that thing and make

10   tools that do it. So that is one of the

11   technology ways you address a broad audience, that

12   you let the people have experiences based on the

13   capability.

14   MR. YOUNG: Just to echo that, if you

15   look at next generation over the top video

16   services, often these are competing against ATSC

17   and cable services. With ATSC I can get 19.2

18   megabits through the air, cable varies depending

19   on what the cable provider tries to do. If I'm

20   trying to do an HD stream to the home even using

21   very, very good compression, I often have to have

22   4 megabits to do that. So in the consumer's mind

1   they're going to go to whatever is the best

2   perceived service and if one of them is being rate

3   limited in a particular say, I think that's where

4   you get into some trouble.

5   MR. KNAPP: Is that real time or

6   buffered into the box?

7   MR. YOUNG: A few years ago when we

8   started developing some of these over-the-top

9   services with Amazon we did that on a download

10   basis because a lot of consumers if they had 1-1/2

11   megabit DSL, they couldn't get something in real

12   time so that a 2-hour movie would take you 4 or 5

13   hours to deliver. That's the way we were able to

14   achieve video quality, by just letting it take

15   longer. These days that isn't competitive in

16   terms of immediacy if you've got to wait for one

17   versus one that's coming over live. So these days

18   there are a lot of new and interesting steaming

19   technologies, a lot of them like Netflix, they

20   will change the video quality depending on what

21   kind of bandwidth you have. So that's good for

22   immediacy, but again these days a lot of consumers

1   don't want to watch something at VHS quality when

2   there's another alternative.

3   MR. DAVID: Stagg?

4   MR. NEWMAN: One of my roles is to give

5   homework assignments, so let me give the

6   assignment and then ask the question. It would be

7   great if each of you could give us your

8   definitions of broadband from two perspective.

9   First, the layperson's perspective, what does

10   Julius say to Senator Rockefeller when he goes up

11   to talk? Then the technical perspective, downlink

12   speed, uplink speed, and importantly, how do we

13   think about burstiness, volume, those types of

14   technical parameters when we define broadband.

15   What I'm really concerned about is how do we

16   develop a policy that with rational investment

17   keeps getting that broadband better and better.

18   I'll show my age, but since I've been connected to

19   the network, it wasn't even the Internet when I

20   started, it's gone up by a factor of 50,000. In

21   other words, it's doubled almost every year. I'm

22   going back to 110-bit-per-second modems, and they

1   did exist. My question now is what do you see is

2   the compounded annual growth rate going forward of

3   both the volume of users per month? Right now

4   it's somewhere between 2 and 10 gigabyte per

5   month. How do you see that growing? What will

6   cause discontinuous changes as opposed to

7   continued 40 or 50 percent keg or whatever the

8   number is? Similarly, what do you see as the need

9   for peak speed and how that should evolve?

10   MR. GURLEY: I'll start. I think to a

11   certain extent especially if you have unlimited

12   use priced networks, the innovators of the world

13   are going to develop applications just as they

14   have with processors that are going to use up as

15   much bandwidth as you make available to them, so

16   you're never going to reach any level of being

17   finished because there is always going to be

18   something that comes along and until we get to

19   two-way live real time video teleconferencing,

20   you're not going to have reached any kind of

21   assento (?) I feel your pain. I think it's a

22   really interesting problem especially for the

1   United States where the topology is so diverse and

2   it makes it very difficult. Therefore, an

3   acceptable level of broadband in one specific

4   location may be dramatically different from

5   another location.

6   MR. GUPTA: I think one is we should

7   differentiate between what is baseline broadband

8   which we want every citizen to have, versus what

9   might be average or peak as a nation to

10   competitively develop applications. On a baseline

11   basis, the layperson definition I would use is so

12   that a citizen can participate meaningfully and

13   productively in the nation that is there, so the

14   common things so that they are not left behind,

15   they can be there whether it's education services

16   or whether it's health services, whether they have

17   to go to the Web to do their homework. All of

18   those capabilities, the citizen, every citizen,

19   it's a fundamental right and it's not a privilege

20   at that level. Technically I think these

21   definitions need to be updated over time. We've

22   talked about at least 4 megabit downlink and the

1   megabit per second uplink. It's 2 megabits right

2   now, but these need to be updated given the

3   quality of video that is there and what people

4   need to do. So that's the level I would talk

5   about.

6   In terms of compounded annual growth

7   rate, as I talked about, my own kind of gut and

8   this is not any law or something like that, is

9   that the same thing, Moore's Law, that is driving

10   storage capacity increases will also drive the

11   Internet consumption rate because today I'm

12   putting a 16 gig card in my camera and even if the

13   number of uploads and downloads is not changing,

14   I'm taking that and putting it up and it's super

15   easy and that is there. Or what we do with hard

16   drives when we download and fill those up. So

17   that is at least a fundamental right, and the

18   participation in the Internet itself is very high,

19   so I think the number of consumers is not going to

20   drive that massive growth rate. That part is

21   stabilizing. But the storage and the Moore's Law

22   capacity will drive the growth rate needs that we

1   need to support.

2   MR. TOPOLSKI: It's important that they

3   both grow. Comcast is arguably the largest

4   residential United States ISP, AT&T is probably

5   the largest overall ISP, but Comcast has

6   advertised a 250 gigabyte limit where they divide

7   between excessive use and not excessive use. That

8   limit has stayed the same now since it was

9   announced a year ago, yet the annual consumption

10   growth trend tends to be somewhere around 40

11   percent. Even during this time, that 250 gigabyte

12   limit which was applied to accounts that were 6

13   megabytes per second and 12 megabytes per second

14   and used to take several days if you were

15   downloading at full speed to hit that limit, now

16   they have 50 megabit connection services with the

17   same limit. So now you can hit your excessive use

18   limit, where it used to take days, now it take

19   hours. That's not really progress. We have

20   faster speeds, but no more capacity.

21   The question of growth rates also can't

22   take a back seat to the fact that we've heard that

1   we're number 19 now. Whatever we do, if we're

2   still going to be the innovation leader of the

3   Internet, we need to get back into first place

4   ranking somewhere and then raise the bar from

5   there rather than raising the bar from here.

6   MR. NEWMAN: I want to follow-up. I was

7   going to make the observation after Anoop's

8   comments that given the amount of pictures I'm

9   getting from my sister who is hopefully not

10   listening, I was going to suggest a much lower

11   limit on the Internet. Following-up on what

12   you've said, take the 250 gigabyte limit and let

13   me wear the hat of somebody who did worry about

14   CAPEX budgets at one time. The median according

15   to Cisco's data is somewhere between 1 and 2

16   gigabytes per month. If everybody started going

17   to 250 gigabytes every day or every month, we've

18   got a real CAPEX problem. What pricing policy do

19   you think would be acceptable that balances the

20   needs for the investors in the network to be able

21   to pay for the CAPEX investment because Bill from

22   the financial side is going to say they're not

1   doing it as a charity, versus users being able to

2   have a reasonable experience and you who are doing

3   great things at the edge of the network being able

4   to get to your users?

5   MR. TOPOLSKI: It's a fantastic problem,

6   but one of the things we started this meeting out

7   with was talking about the diversity of

8   applications that are going to start appearing on

9   the network. The thing that is going to report

10   several times a day how much power I'm utilizing

11   or what appliances are utilizing that power, those

12   things are going to use incredibly small amounts

13   of bandwidth and they're going to take that median

14   number and pull it way, way down because they use

15   incredible small amounts of bandwidth. Yet the

16   size of HD video screens seems to grow with a

17   Moore's Law like regularity, and those uses are

18   going to increase the number and pull that number

19   back up. So the industry has to think about

20   whether or not it makes sense to target part of

21   its marketplace with an unlimited service and

22   whether it might consider power users and strength

1   users and offer them, like you might buy extra

2   minutes on a cell phone or something like that,

3   additional ways to either purchase bandwidth or

4   offer them categories of bandwidth that have less

5   precedence during the peak hours, and these are

6   choices that they can offer. We haven't got there

7   yet. I think the ISPs are a little afraid of

8   pricing according to use, and they ought to be

9   afraid of that because most of their customers

10   would reject that. But on the other hand, they're

11   not thinking that some customers be the right

12   customers for creative products like that.

13   MR. DAVID: Just to put a final point on

14   that, are you saying philosophically, and I'm

15   interested in a diversity of opinions on this,

16   that you're okay with prioritizing based on

17   something else in the traffic, latency, jitter or

18   whatever, but you don't find caps in any way

19   acceptable. I'm wondering how that economically

20   ties together if you view it from --

21   MR. TOPOLSKI: I don't think the premise

22   is right. I don't think that caps are

1   unacceptable, but I don't think it makes sense to

2   have a service at a 250 gigabyte cap at 50

3   megabits per second and that cap not grow over

4   time. We are dumbing down the future of the

5   Internet by having a cap that doesn't grow. It

6   can only grow to this high and after that we're

7   going to stunt its growth. That's the part that I

8   object to.

9   MR. NAPOLEON: I think it's at least on

10   the entertainment and media side it's a function

11   of maximizing the RPO from the consumer. So if I

12   have $130 or $140 RPO on the video side for my

13   traditional cable thing and I've got $39 come in

14   on my broadband services side and I tie those two

15   businesses together, I'm going to optimize both of

16   those. If I split those two businesses apart and

17   think about the broadband services part of that

18   business, what I'm going to be focused on is what

19   killer apps can I put onto that broadband service

20   plan to get more subs to my broadband service

21   plan. So when you see areas where you have

22   companies that are true ISPs where they're

1   providing broadband access, they're very, very

2   willing to push broadband video and music and

3   other things because that's drives consumer

4   interest in the broadband service plan. So I

5   think the real thing that we need to think about

6   is allowing true ISPs that want to offer broadband

7   services to have that ability to do so, that when

8   you tie separate business models together they're

9   not going to think of those as separate joint

10 businesses, they're going to try to maximize RPO

11 and that's where we're at today.

12   MR. GURLEY: I'd reiterate Tim's point

13 which is I think the U.S. has a very specific

14 problem where the two companies that are pushing

15 broadband the furthest right now being Comcast and

16 Verizon both have business models that are

17 dependent on the video stack revenue, right now

18 for Comcast it's 75 percent of their revenue, for

19 Verizon, the amount of capital they're spending on

20 the FiOS network determines that that video

21 revenue be there. If you had a third competitor

22 provider that didn't have a video business, then

1   Tim's issue wouldn't exist and you could look at

2   that player as a kind of test point for these

3   different pricing schemes, but you don't and so

4   you're left I think looking maybe at a British

5   Telecom or some of the Korean ISPs and seeing what

6   are they offering and for how much, what kinds of

7   services, and using that as a checkpoint to watch

8   what's happening here.

9   I think tiered pricing as long as these

10   caps are really for the BitTorrent server guys are

11   perfectly fine. Where you really get into trouble

12   is if everyone has a cap and then you have these

13   per megabyte things above it that allow you to

14   differentiate your video service versus the other

15   one on a price basis, that's exactly what Tim was

16   talking about and that's where I think the U.S.

17   has got a big risk area as we think about policy.

18   MR. NAPOLEON: You by all means want to

19   avoid situations like in Australia where you have

20   Telstra who does metered bandwidth so that none of

21   the broadband services via ISPs can pencil out

22   because consumers have to pay a huge premium for

1   their bandwidth because it's metered bandwidth.

2   That really stifles innovation. When you have

3   models like in Japan where you have Yahoo! BB,

4   it's a very, very profitable business and it's

5   completely IP delivered video and broadband in one

6   package. So when you do allow ISPs to compete

7   directly, they are very successful globally.

8   MR. DAVID: James?

9   MR. MILLER: We were talking about

10   initially what kinds of applications are out

11   there, was there an age when applications weren't

12   filling the gap. We talked a little bit about

13   minimum bandwidth requirements perhaps and how

14   caps relate to that. The flip side to that might

15   be what kinds of applications are not being

16   delivered right now for lack of bandwidth or other

17   kinds of characteristics of networks. Just to go

18   to Anoop's example of pictures or Robb's beginning

19   discussions with BitTorrent discussions and

20   hosting barber shop quartet recordings for example

21   off of BitNet, is there a kind of step function

22   that users are going to use bandwidth differently

1   or the ways that they want to use it maybe are

2   being inhibited in some way from the network side?

3   Specifically, I think the kinds of things that

4   we're talking about would be user generated

5   content versus stuff that's prepared and delivered

6   video. Do you see that as a different model? I

7   wonder if we could get some of your thoughts on

8   that.

9   MR. YOUNG: I think to echo a little bit

10   of Bill's last point, because folks like Comcast

11   and Verizon are thinking about video services, my

12   upload speed on those is relatively modest, so

13   things like consumer telepresence is something

14   that you probably won't see developed. That's

15   something more in the realm right now of business

16   where a business can have a large line backed up

17   to them and they can afford the upstream bandwidth

18   quite easily. That's one example. Certainly if

19   I'm gaming with an Xbox or a 360 and I can chat at

20   50 kilobits per second, it's not video and it's

21   not that kind of presence.

22   MR. TOPOLSKI: In South Korea the kids

1   there love this face-to-face video conferencing

2   ability that they have and they game face to face.

3   When I visited a South Korean Website, and

4   unfortunately I don't read Korean, I tend to look

5   at what floats to the top of the popularity pile

6   just to see what the site is about. I hit some of

7   these South Korean sites and my computer just

8   drags because the amount of information, the

9   richness of this information, is so heavy and it

10   just didn't come through the pipes at any speed

11   that will make my computer display it in a

12   relatively reasonable amount of time. A minute or

13   2 minutes after I've started loading the page, I'm

14   still loading the page. The kids in South Korea

15   have video conferencing capabilities that our CEOs

16   that fly around in big jets don't have because the

17   bandwidth isn't here and it's there.

18   MR. NAPOLEON: I think one other

19   critical component that we're seeing is

20   traditional DVD and Blu-Ray revenue in the media

21   and entertainment industries in some Asian markets

22   is under a lot of attack from privacy, so one of

1   the ways that media companies are combating piracy

2   is going to more and more online subscription

3   based models. I'll use the example of World of

4   Warcraft which is a giant U.S. export to South

5   Korea and they actually have TV shows about the

6   game there. That model of having a connected data

7   center gaming experience that is subscription

8   based has gotten around the privacy concerns and

9   allows Blizzard to be a profitable U.S. based

10   media company. So I think that subscription model

11   of virtual worlds in gaming is really critical for

12   the future of U.S. media companies to provide new

13   streams of revenue that will replace some of their

14   physical based media that's susceptible to piracy.

15   MR. GURLEY: The only quick thing I

16   would mention is mirrored storage. I think the PC

17   vendors would probably if the bandwidth were

18   available provide mirrored storage of your local

19   drives which would be pretty intensive in addition

20   to the video upload.

21   MR. GUPTA: I totally agree with Bill

22   Gurley in terms of how these PCs are backed up as

1   you migrate from one to the other and in a

2   seamless way is important. The other thing is I

3   think we are focusing a lot and there were a lot

4   of good points made about PC connectivity and wire

5   line. One of the things that we see is how as the

6   PC, the mobile phone, the TV, and the experience

7   converge especially on the mobile bandwidth,

8   instead of 250 gigabyte caps, they are 5 gigabyte

9   caps. With the Zune HD that will come out, it

10   will allow 720P video viewing directly on the

11   device, and as I look at the convergence now I

12   want to be able to take my Zune next to the TV,

13   have it downloaded and it can play the 720P video

14   on the large screen or I can watch it on the small

15   screen. So as we start looking at these

16   convergence models, I think the demand for mobile

17   capacity will grow hugely and optimizing it will

18   mean a mixture of licensed and unlicensed spectrum

19   that is there that is used so that if you're

20   downloading at home, it's coming on fiber most of

21   the way and lost a bit, it goes over an unlicensed

22   spectrum, and so as from both a policy perspective

1   instituting it and from an application design

2   perspective, getting more efficient about the

3   combined use of the fiber and the wireless,

4   licensed and unlicensed, I think will become

5   pretty critical to delivering the experiences we

6   want to deliver.

7   MR. NEWMAN: I think you've made a great

8   point. We tend to want to think about what's the

9   standard for the broadband access pipe, but given

10   we've got multimedia, multiband devices, and as

11   you said your software is getting intelligent

12   enough to figure out the quality of the connection

13   of the end device and adjust to it, should we be

14   thinking much more about a world of many different

15   types of access? Might the extreme position be if

16   I have an LTE network out there, direct satellite

17   TV which is out there, and then ViaSat said they

18   were going to have 100 gigabit per second

19   satellite pipe, should we be thinking about what

20   my device figures out what to do rather than

21   thinking about a standard for the pipe from the

22   home?

1   MR. GUPTA: I think that is certainly a

2   feasible thing to do, in fact. Let me add another

3   twist to it. For energy we are thinking about

4   time-of-day pricing. So if you charge your new

5   electric car, and it comes in a few years, its

6   consumption is going to be around 20 kilowatt

7   hours, and in an average consumer's day, daily

8   consumption in households is around 20 kilowatts

9   an hour. You're doing a lot and you want to

10   charge it in the night and not during the day.

11   Similarly, caching can make a huge different in

12   consumption. So if I watch the news or other

13   feeds, they could have come at a different point

14   and devices will get smarter not only in terms of

15   the network they use but also the time when the

16   caching happens on the device itself when the

17   content is brought in so that we can optimize

18   network usage. We see a lot of smartness in the

19   software to enable these scenarios.

20   MR. YOUNG: I would say absolutely we

21   should be thinking about multiple networks and

22   similar services delivered across those networks.

1   For years there was very little competition in a

2   wire line phone. That's all there was. Now there

3   are lots of ways I can do phone services. I can

4   do it via Skype, I can use mobile phone and I can

5   use my old AT&T POTS line if I want to. Per your

6   earlier question about how should we think about

7   policy in this area, I think you want to think

8   about a way in which parallel services can develop

9   across these multiple networks whether it is

10   satellite, ATSC, wireless, Clearwire and some of

11   these other things. In many places I've got only

12   one choice of where I can go get video from, and

13   what if I could get it over something like

14   Clearwire? You take a look at the way that cable

15   and satellite have started to one-up each other in

16   terms of how they deliver video, but other kinds

17   of services, something like ATSC has been somewhat

18   left in the dust for various other structural

19   reasons, but I think you want to think of in terms

20   of the end user application, if there is only one

21   kind of network where that end user application

22   can work, that's going to limit choice. If there

1   is only one person or one entity that can really

2   deliver let's say IMAX quality video in the

3   future, you want to really make sure that there's

4   another network alternative for that.

5   MR. KNAPP: To build also upon Stagg's

6   question again, Bill, I was intrigued when you had

7   talked about the muni networks, and I'm assuming

8   you were talking about unlicensed, and Anoop

9   referred to it as well. Are any of the devices

10   used with those networks combined? I'm assuming

11   this is WiFi.

12   MR. GURLEY: Yes.

13   MR. KNAPP: Are they combined devices so

14   that when I'm in that area I can use the WiFi and

15   if I move out of the area I can use my --

16   MR. GURLEY: Some of the police forces

17   have a combination in the car that uses the

18   network if they're in the city. If they leave the

19   city premises it will fall back to a 3G or that

20   kind of network, so we're seeing those types of

21   things. I think the thing we're seeing that's

22   more endemic is iPhone usage on these networks

1   which I think is an interesting data point related

2   to the multiple networks and connectivity. If

3   Apple hadn't come along, it's not clear to me that

4   that innovation or that opportunity would have

5   been exposed. You had a powerful player come to

6   the market that was able to demand certain

7   features and functions that others didn't have and

8   now you're starting to see it organically pop up

9   and proven out. There wasn't any interest from

10   the provider's point in that happening prior to

11   that. But, yes, there is certainly mixed use

12   across these different networks at different

13   points in time.

14   MR. KNAPP: We had a couple questions

15   come in order the Net, so let me try one, "All of

16   the developments that are described by the panel

17   require large amounts of bandwidth. However, do

18   the problem of high charges for the middle mile,

19   also known as special access bandwidth in rural

20   areas, can cost from $100 to $400 per megabit per

21   second and providers are forced to ration

22   bandwidth in order to provide an affordable

1   product. How should this be addressed?" Does

2   anybody want to take a stab at that?

3   MR. GUPTA: In response to the NLI what

4   we have said is that some of the stimulus money or

5   the ongoing National Broadband Plan, getting fiber

6   to the anchor institutions would that gets fiber

7   to the communities because the schools are located

8   in the communities, with the requirement of open

9   interconnection so that this high- speed link that

10   is coming in then can be used to connect the rest

11   of the community. Leveraging WiFi, leveraging

12   white spaces, or leveraging wire line connectivity

13   is certainly important nationally just like we

14   built the national library systems and all the

15   rest of the things, is a step that would be very

16   beneficial to that cohort.

17   MR. KNAPP: Is there anybody else on

18   that question? Robb, you look like it's right on

19   the tip of your tongue.

20   MR. TOPOLSKI: An acquaintance of mine

21   provides services to his neighborhood for a fee,

22   but they are Web only services. He has made the

1   decision that he is going to inspect the traffic

2   and disallow certain high-bandwidth services so

3   that he can do his business at all, and he suffers

4   actually from this backhaul problem, that the cost

5   of backhaul is extremely expensive. So in order

6   to hit these people and give them high-speed

7   email, high-speed Web surfing at a price that they

8   afford, he has had to make decisions such as no

9   peer-to-peer file sharing, and he has done that.

10   We have gone around and around about that, but

11   what I would hate to see happen is something that

12   the FCC does says that he can't be in business at

13   all. If he's made that decision and that works

14   for him and that works for his customers and

15   looking at those facts it's deemed to be rational

16   and reasonable, then I think that that ought to be

17   allowed.

18   MR. GURLEY: I would reiterate that

19   point. I'd say the first thing is let's not pass

20   legislation that prohibits experimentation or city

21   development or anything that might happen in these

22   areas. They're not scalable for large companies

1 to go after anyway. And a lot of what's being

2 served by people like your friend are hacked

3 together open spectrum networks that can work and

4 do people get service that way, and the cheaper

5 the technology is because there is more open

6 spectrum technology and more competitive, the

7 cheaper it's going to be for them to deliver.

8   The second thing I would know the FCC

9 has talked about, I'd just revisit the traditional

10 POTS program that you have with all the CVECs that

11 are used, it's cost-plus, it's being abused in a

12 lot of different ways and I think kind of

13 rejiggering that toward broadband instead of telco

14 lines would be very effective.

15   MR. KNAPP: I would also announce that

16 if there are questions from the audience, we've

17 got somebody with cards back here. They can come

18 around. Just flag them down and they'll come

19 around and you can write down your question and

20 they will bring them on up.

21   MR. DAVID: I wanted to follow-up on

22 something Anoop started to talk about and maybe

1   draw it out a little bit further. Stagg asked

2   about a definition of broadband. If anyone is

3   following or blog you saw last week we posted a

4   thought piece on that. We've gotten a lot of

5   interesting commentary on it. You raised an

6   interesting point which didn't come out cleanly in

7   any of that commentary which is maybe there should

8   be two definitions. Maybe there's a baseline

9   which I think you described in your words as a

10   right and not a privilege. You didn't say what

11   you thought that number might be today, and let's

12   assume that we can find a way to evolve that. But

13   then I'm interested in the premium target

14   broadband as well looks like to you today. Then

15   more interestingly perhaps if we're going to do

16   this right and really define this for a variety of

17   purposes, we're interested in your input on how to

18   define it in a way that it evolves naturally and

19   doesn't need to be revisited in a series of

20   workshops and panels on national broadband

21   strategy every 2 years, but that it evolves as

22   technology and utilization evolves.

1   MR. GUPTA: This is on the -- in some

2   sense. One is we should think about baseline and

3   we should think about it for households, and we

4   should think about it for anchor institutions, and

5   it will be different kinds of limits and

6   bandwidths that you want to provide.

7   MR. DAVID: That was an interesting

8   point. Should we think about it as a fixed line

9   and wireless independently or do you want to leave

10   that to --

11   MR. GUPTA: I want to leave that because

12   you people will start using combinations and

13   wireless becomes licensed wireless or cellular or

14   WiFi wireless, it starts getting --

15   MR. NEWMAN: How about fixed versus

16   mobility which is not a technology distinction?

17   MR. GUPTA: But even fixed versus

18   mobile, say if I have high fixed coming and then I

19   have WiFi at 54 megabits per second, it's not

20   fixed versus even mobile. By mobile you mean

21   cellular.

22   MR. NEWMAN: I'm talking about from the

1   user's standpoint, mobile meaning --

2   MR. GUPTA: Anywhere.

3   MR. NEWMAN: -- anywhere.

4   MR. GUPTA: Maybe it could be that. I'm

5   just thinking out loud. The second definition is

6   just about national competitiveness. All of us

7   are building on the same technology and we need to

8   be there as the number one nation. How do we get

9   there I think is important.

10   MR. DAVID: I want to get other views,

11   but before we leave you, how would you think about

12   that number? If you prefer to avoid actually

13   putting a number on the table, that's fine, but

14   maybe the thought process would make that an

15   acceptable number today that would allow us then

16   to evolve it.

17   MR. GUPTA: I will leave that, but we

18   know the countries who are ahead of us. We know

19   what they are using. Some of them have very

20   different geographic and cost constraints where it

21   might be very densely packed. So we need to be

22   pragmatic about it, but within that pragmatic

1   outlook we should look at the sufficient number of

2   our nation's people need to be the best and number

3   one in connectivity.

4   MR. NAPOLEON: I really like the time

5   saved. The benchmarking of what's it take for

6   these set of tasks and just benchmarking that

7   across a basket of goods, that just as you would

8   have an inflation index you would have a time to

9   download index across a basket of goods and then

10   you could get a relative sense of what our speeds

11   are versus other countries and it's something

12   that's very metric driven and you can watch it.

13   MR. GURLEY: I think there's an

14   interesting point that they're making where for

15   the first time I think maybe from a policy

16   standpoint, the U.S. is way behind and so we don't

17   need to ideate or pontificate about what might

18   happen or where. We can just simply go to one of

19   the other 18 nations that are ahead of us and

20   measure what they're doing, look at the

21   applications they're accomplishing, look at the

22   price points, look at everything that's being

1   charged and ask is that something that we want for

2   our citizenry or not and what does it take to get

3   there? But I don't think we have to make

4   something up. I think we can just go watch.

5   MR. NEWMAN: Let me ask for help on

6   that, a homework assignment again, because the

7   OECD measures are not good scientific measures.

8   One way you get way ahead in the OECD metrics is

9   to have very few people per household. I don't

10   think we want to mandate to kill the first born in

11   very household. Providing us accurate benchmark

12   information from the consumer standpoint would be

13   great for those of you who are in multinational

14   companies, to let us know what is really happening

15   out there.

16   MR. KNAPP: This is the third time I'm

17   doing this, coming right on top of Stagg's

18   question, I'm thinking the same way. We, at least

19   the engineers think in terms of megabits per

20   second, but what really matters here is the end

21   applications to users. If there were a way for us

22   to better understand if we got to this benchmark

1   however you quantify it, here are the kinds of

2   applications, I think this is along the lines of

3   what you were getting at, Tim, here are the

4   applications that would work well, if you really

5   want to get to the situation where the folks at

6   home can do video-to-video conferencing you got to

7   get here. The same homework question, just a

8   little different way. Is there some way that we

9   can quantify this so that you can understand that

10   you set your target here and here are the kinds of

11   applications that you might be able to run or if

12   you set it low you're not going to achieve that?

13   MR. GUPTA: With that approach I worry a

14   little. Certainly it's a valid one because

15   anything you do you want to intersect in multiple

16   ways to validate what you do. Because when you

17   say maybe you can do person-to-person video

18   conferencing, how many people are doing it. Is it

19   HD? One of the big things we see is actually

20   machine to machine using massive amounts of

21   bandwidth. So imagine that the security

22   monitoring thing for your house or your building

1   or small business is video that gets generated,

2   captured and analyzed by another machine to say

3   when you record, when to do something else. So

4   there is going to be actually a whole bunch of new

5   applications which are going to be

6   machine-to-machine usage of data and that's why if

7   we are not ahead then somebody else is going to be

8   generating those applications while we are saying

9   what is in our basket in some sense. So we just

10   need to be cautious in how we look at it, the way

11   that it's a valid approach.

12   MR. GURLEY: I would just say spend 3

13   weeks in Seoul.

14   MR. NAPOLEON: That's funny. I just

15   spent 3 weeks in Seoul.

16   MR. KNAPP: Is there anybody who hasn't

17   been to Seoul in the last week?

18   MR. NAPOLEON: You can see though that

19   there's a sense of pace there that is pretty

20   exciting. Our elevators take 7 seconds to close,

21   their elevators you kind of have to dive into

22   them, so there is definitely a quickness and a

1   pace that goes along with the speed of their

2   bandwidth.

3   MR. KNAPP: This is kind of along the

4   same lines. It asks, "Should the network be

5   designed to support any amount of information,

6   games, or should the software games be designed to

7   work across the network? Because no matter how

8   big the pipe is, games can be designed that will

9   fill up the pipe and more." So this question is

10   mostly focused on games, but I think the basic

11   question comes back to this question, the

12   interplay between the applications and the

13   capacity of the network. Is there some

14   responsibility on the part of the application's

15   designers to be efficient?

16   MR. NAPOLEON: The application designers

17   have every motivation to be efficient, to work

18   within the network that's available today. If

19   they don't then their product doesn't get adopted

20   or it costs too much to support or somebody else

21   beats them to a better whatever it is that they've

22   invented. So there is really no need to ask

1   application developers to do this. They do this

2   anyway. They're used to making it fit into

3   whatever the network is that we have today. But

4   there is a reality and the reality is that the

5   connection came first and then the traffic across

6   it. You get into a problem when you wait for

7   demand to accede to the network because that has a

8   tempering down or a tamping down effect. The more

9   healthy cycle is to have the network grow ahead of

10   the demand so that the first-run innovations work

11   and then improvements happen after that.

12   MR. DAVID: I think we've hit the end of

13   our time today for this panel of the workshop. I

14   really appreciate you coming, a couple of you from

15   the West Coast. We have some West Coast folks on

16   the second panel as well. I think it's important

17   to get a diversity of views and diversity of

18   places from which you come, and I think we had a

19   pretty fruitful conversation. I would leave with

20   the second panel one thing we didn't expressly

21   touch but might be interesting, beyond spectrum

22   and beyond universal service and beyond net

 1   neutrality, in the next 6 months what should be

 2   thinking about as for the government, not just the

 3   FCC, but the rest of the federal government should

 4   be doing. Bill raised the topic of innovation at

 5   the state and local level, really at the local

 6   level from a network deployment standpoint. I

 7   think that's a compelling topic that we're going

 8   to address next week in a workshop on the 1st with

 9   a series of state and local CIOs and others. But

10   we may want to come in the afternoon back to what

11   else does this community think the FCC and the

12   rest of government should be focusing on, not just

13   what we should not be doing, but we have this

14   6-month period to figure some things out, what

15   should we be doing that hasn't been done that way

16   today? Thank you very much. Stagg?

17   MR. NEWMAN: I just want to add to that

18   list because Blair just asked me, should we have a

19   long-term research program focused 10 years out?

20   MR. DAVID: Thank you very much.

21   (Recess)

22   MR. KNAPP: Good afternoon. Sorry to

1   break up all the terrific conversations that are

2   going on. But if I could ask the panelists to

3   come up front and for our audience to take their

4   seats so we can get started with our second panel.

5   So, good afternoon. And we're on to the

6   second part of this afternoon's session. This one

7   is focusing on emerging applications and devices

8   and the infrastructure to support them, and talk a

9   little more on the infrastructure side.

10   As Brian said earlier, it was kind of

11   difficult as we went through this in

12   distinguishing between current and emerging or

13   future. I think the lines blur. And we're --

14   feel free to talk about what's going on now as

15   well as the vision that you see in the future.

16   We've just had one change in the

17   panelists. Brian, unfortunately, wasn't able to

18   stay for the second part. He had a travel

19   commitment to make. And we've got Alison Neplokh,

20   who's joined us from the Media Bureau.

21   And with that, I think we'll just go

22   ahead and dive right in. We will have -- this

1   time I'll announce it at the start -- somebody

2   over here to take questions from the audience as

3   we go through, and from the web as well.

4   So, Sunil?

5   MR. DALUVOY: Great. My name is Sunil

6   Daluvoy. I'm with New Business Development at

7   Google. And first of all, I'd like to thank the

8   Broadband Task Force for inviting me back here at

9   the FCC. It's been about almost 10 years since I

10   left the Commission, and it's amazing how some

11   things have not changed. Some of the debates in

12   this town are still the same, but under a

13   different name.

14   But also, what I find quite amazing is

15   the things that have changed. In about just a

16   short two years since my company has advocated

17   openness and the Commission adopted it in the 700

18   megahertz, the amount of devices and applications

19   we're seeing is truly astounding. So, I'd like to

20   spend a little bit of time talking about that

21   today.

22   And from where I sit in New Business

1   Development, my job at the company -- to give you

2   a quick background -- is to do deals to help build

3   the company's new products. That involves

4   technology, licensing deals, content licensing

5   deals, and strategic partnerships. So, I come

6   with that background to give you a perspective

7   from the valley from where I sit, not to advocate

8   any particular regulatory model or view. I'll

9   leave that to the policy team to do that.

10   And from that vantage point, what I'm

11   seeing from the application side is quite

12   impressive. We have now such a tremendous amount

13   of data, where I think is incredible is you see a

14   set of applications help us manage and use all

15   this data. And I think that's important for us to

16   take into account, whether it be just information

17   as power concept, for instance, like flu trends,

18   understanding when outbreak of flus that are

19   occurring, applications that help us manage that;

20   power meters to help individuals and understand

21   how much their power consumption is and to change

22   it accordingly, too.

1   But it isn't just education. Some of

2   this information and applications that are taking

3   advantage of it are -- just help us deal with

4   everyday problems: A company like How Cast to

5   help us visually learn how to change a tire or,

6   you know, how to cook fish, for example; another

7   company like Bill Shrink, again, help us manage

8   how to pick the right cell phone carrier, device,

9   and cell phone plan. Now, all these applications

10   are incredibly useful, incredibly powerful. And

11   most of them are free. And what they've done is

12   take advantage of a tremendous amount of data

13   that's already out there and make it manageable,

14   make it useful for people to use.

15   But it isn't just about consumption,

16   too. I think what we'll see is a number of

17   applications that are just about also creation.

18   Now, with any phone you can take a picture and you

19   can upload it to your web album. And you can also

20   take a video at the same time and upload it to

21   your YouTube home page. The idea that we're not

22   just passive consumers, but active creators is

1   also very compelling trend that we're seeing in

2   where I sit at Google.

3   And the variety of this stuff is partly

4   due to the fact there's some common

5   standardizations in platforms that are occurring.

6   In the case of smart devices, whether it be the

7   iPhone App store, the Android, the BlackBerry, or

8   Palm, they're all providing developers a sense of

9   common platform to develop and lowers their costs

10   of development. And just in the last short period

11   of time -- last time I checked -- we have over 1.5

12   billion apps downloaded in the -- from the iPhone

13   App store, and 65,000 of them were third-party

14   apps.

15   And these -- so these applications allow

16   for -- another sense is augmented reality. What I

17   mean by that is you have eyes, which are on the

18   cameras. You have basically ears, which are

19   microphones, and skin, which is your touch

20   screens. And you also know your locations. With

21   all these different sensories combined, what these

22   devices can do is quite interesting. I mean, you

1   can basically, with an application like Open

2   Table, find out the restaurants that are nearby

3   you and book a reservation with three or four

4   clicks on your phone.

5   My favorite application is called Taxi

6   Magic. You can basically -- again, with a few

7   clicks on your phone -- have a taxi pick you up

8   where you are by dispatching a number of different

9   taxicabs that are available. And it just appears.

10   And really, it seems like magic to me.

11   Even Google is involved with this stuff

12   in building an application called Latitude, which

13   allows you to share your location with people that

14   you've already agreed to or your friends group,

15   your family, and you can see where they are, too.

16   We think that sharing of the information is

17   incredibly powerful and leads to further

18   applications that we can only imagine at this

19   point.

20   The next part I'd like to discuss is,

21   really quickly, devices. I see my time is running

22   faster than I thought. I think there's an

1   interesting paradox here. You know, on one hand,

2   you have, because of the cloud computing, a

3   convergence of devices, whether now the phone can

4   be the GPS or navigator, it can also be the music

5   player and the camera. On the other hand, because

6   of the cloud computing, you've a plethora of new

7   devices, whether they be the tablet or the

8   netbooks. So, I think that's an interesting thing

9   that it enables because of this connection to this

10   broadband pipe.

11   So, again, I'll leave the rest for the

12   question. But I wanted to commend the Commission

13   for the -- hosting this workshop and I wish we had

14   done more of this when I was here. And happy to

15   participate and Google -- as they can, in sharing

16   data and providing tools to inform the inquiry.

17   MR. KNAPP: Thank you, Sunil. Jeremy?

18   MR. LIEW: Hi. Thanks. My name is

19   Jeremy Liew, I'm a managing director at Lightspeed

20   Venture Partners. We're a venture capital firm

21   with about $2 billion under management. And I

22   lead our Internet and media consumer face -- and

1   gaming -- consumer facing investments. I

2   appreciate the opportunity to share some views

3   here today.

4   I think the discussion about what

5   broadband is is a good place to start with some

6   comments, you know, and I think there are three

7   separate elements of broadband that are, I think,

8   important to sort of tease out. Each of them have

9   different implications for usage.

10   And the first is simply the always

11   on-ness of broadband. And I think, regardless of

12   speed, when you find, you know, that your Internet

13   connection is always on, you see a meaningful

14   increase in the use of information look-up. And

15   so there's a whole bunch of use cases around that

16   I think are independent of, you know, megabits per

17   second or anything else.

18   We've seen that with PCs and we're

19   increasingly seeing it with mobile devices, and

20   with the iPhone in particular, where you're seeing

21   this instant on, constant connection leading to a

22   whole bunch of utility use cases -- information

1   look-up use cases, including a bunch of the ones

2   that Sunil mentioned that I think you just --

3   these are new behaviors that are important.

4   The second one is the one that I think

5   is the most time has been spent on and that is the

6   speeds for the downloads. And, you know, I think

7   they've been discussed at some length, so I won't

8   go into that in any more detail.

9   And then the third one is obviously the

10   speed of upload. That is an area that I think has

11   had less focus for immediate consumption and more

12   for, you know, this idea of content creation and

13   sharing. And, you know, I think that we're just

14   starting to see the beginning of those use cases

15   emerging over the last couple of years. Because,

16   as always, whenever you see new medium, the

17   behaviors that existed in an old medium translate

18   the quickest. And you need a little bit more

19   percolation time before you see some new behaviors

20   emerging.

21   And so, similarly, with the Internet,

22   you saw video consumption, news, sports, and so

1   forth, and commerce, which all had established

2   precedence from the offline world, migrate before

3   some of this more organic content creation that

4   really needed time to bake.

5   The second point that I'd like to

6   address is around the idea of devices. And I

7   think, you know, there's a discussion on the other

8   panel about what's the right way to measure

9   broadband. Is it megabits per second or is it

10   time?

11   I come out on the side of time. And I

12   think that's really important from a consumer

13   perspective because, you know, the difference

14   between 50 and 100 megabits per second might be

15   milliseconds or fractions of a second when it

16   comes to serving a web page. And so that's sort

17   of immaterial to a user.

18   One of the interesting things about the

19   proliferation of mobile devices is that render

20   speed, which is not a significant factor for PCs,

21   becomes quite a significant factor for the time

22   from when a user, say, makes a click and sees a

1   web page served or so forth. And, in fact, when

2   we were doing some diligence for one of our

3   investments in our mobile browsing company, we

4   learned that for iPhones the average time to

5   render a page is about 40 seconds, of which about

6   8 seconds -- this is an iPhone connected to WiFi.

7   It takes about 40 seconds, on average, between

8   when you click on a page and when that page

9   completes loading. Only 8 seconds of that is

10   composed of data coming in and roughly 32 seconds

11   is composed of that processor on that phone trying

12   to show the pictures and the web page that you've

13   looked at. And so even significant increases in

14   bandwidth speed may not, in fact, meaningfully

15   change the user's perception as to how long things

16   take. So, that's an interesting perspective as

17   well.

18   I think the last point that I'd like to

19   make is, as always -- and this point was made on

20   the last panel -- applications and usage follow

21   the presence of the infrastructure and network.

22   And oftentimes what you see is relatively

1   frivolous uses of increased bandwidth in the

2   beginning. And again, it takes time for these new

3   applications to percolate, often a gestation

4   period that's measured in years rather than months

5   or weeks. And so any work that we do to try to

6   improve the broadband infrastructure of this

7   country, I think we will have to be willing to

8   accept that there's going to be a period where the

9   use of that infrastructure may be frivolous, it

10   may not be -- it may be more entertainment focused

11   than utility focused. And we just need to be

12   prepared for that and prepared to defend against

13   that because it requires a little bit more time

14   before new applications emerge.

15   MR. KNAPP: Thank you. David?

16   MR. HSIEH: Great, thanks. Actually, I

17   have some slides. Are they available?

18   MR. KNAPP: Yeah, they're --

19   MR. HSIEH: Oh, perfect.

20   MR. KNAPP: They're loaded and all set.

21   MR. HSIEH: Thank you. So, my name is

22   David Hsieh. I run marketing for Cisco's Emerging

1   Technologies Division, which is sort of shorthand

2   for all of the cool new internally developed

3   technologies. So I have a lot of fun. And I'd

4   like to talk a little bit about, in particular,

5   one emerging technology that I think has some very

6   interesting implications for broadband deployment.

7   So, if you go to my next slide.

8   Cisco, as you can imagine, does a fair

9   bit to study broadband traffic patterns. And it

10   probably comes as no surprise to anybody that

11   we're seeing tremendous growth in broadband usage

12   globally across the Internet. But what's maybe

13   more interesting is if you sort of go down a level

14   from that, and if you could just click to my next

15   slide and look at what's causing the growth.

16   Obviously there's, you know, lots of

17   different applications emerging. But the one that

18   is the, you know, primary driver of broadband

19   growth is video. And it's, you know, started with

20   peer-to-peer video and, you know, probably people

21   bootlegging a few videos here and there. But more

22   and more, it's becoming mainstream video content,

1   so Video on Demand and downloads for entertainment

2   and things like YouTube, et cetera.

3   But we're seeing a very strong trend

4   towards the growth of video communication as a key

5   driver of bandwidth usage. And we think that that

6   will be a, you know, a very powerful future

7   enabler for a variety of different purposes.

8   And so, you know, that's a -- we think a

9   very important part as we look across the

10   broadband initiative to think about the future of

11   video deployment.

12   And if you'd go to my next slide. We

13   see this not only across the open Internet. We

14   also see this across businesses. We see

15   businesses adopting the use of video as a way of

16   essentially virtualizing their employees and using

17   it as a way to, you know, compensate for the

18   globalization of their businesses. And so, you

19   know, not only large businesses have made

20   significant investments in using video as a way to

21   drive, you know, communications and to foster, you

22   know, collaboration across their company, but, you

1   know, they do it across company boundaries, so

2   small companies doing it with their partners and

3   suppliers and customers and whatnot.

4   Cisco has an area that we've invested

5   very heavily in. Many of you have heard about

6   Cisco TelePresence, which essentially is a way to

7   initially virtualize a meeting. And so, you know,

8   if you imagine taking a conference table like the

9   one pictured here, cutting it in half and moving

10   one half of it 1,000 miles a way and connecting

11   the two halves by network -- and if you can click

12   through to the next slide -- then you get a sense

13   of what Cisco TelePresence is. And essentially if

14   you are in a TelePresence meeting, we've tried

15   very hard to create a virtual meeting environment

16   where you feel like you are sitting across the

17   table from somebody just as if they were, you

18   know, within an arm's reach although they may be

19   separated by hundreds or thousands of miles.

20   If you go to the next slide. So this

21   sort of gives you a sort of more life-like picture

22   of what TelePresence looks like. And we're seeing

1   -- if you can just sort of just -- I have a build,

2   if you can just click through. This is full

3   high-definition video. So, people show up in

4   life-size on these 65-inch plasma displays. And

5   we've created a sense of immersion by not only

6   combining multiple video channels, but also

7   special audio, certain lighting capabilities, et

8   cetera, and the inclusion of data services. So

9   you can share presentations and slides or

10   projected information and create, essentially, a

11   virtual meeting between any number of locations

12   anywhere around the globe.

13   If you go to my next slide. Sorry -- if

14   you could build that one more.

15   Now, you've seen sort of one that

16   comprises a virtual room, but there are a number

17   of other endpoints that are available. So, you

18   can have smaller systems, you can have bigger

19   rooms. And so, the bigger rooms would be useful

20   for things like remote education or, you know,

21   virtual classrooms. The smaller systems, which

22   could be in a, you know, small conference room and

1   a private office in a home office, are examples of

2   ways that you can have individuals participating

3   in meetings. And, of course, these systems can

4   interact with each other.

5   And Cisco's been very public about

6   bringing this all the way into the home with a

7   consumer TelePresence effort. So, you'll see, you

8   know, Cisco TelePresence and technologies like it

9   creating a breadth of video capabilities that

10   allow you to meet with anybody in the world as if

11   you were there, without having to travel.

12   Last slide -- sorry, one more. And so,

13   you know, if you sort of look at how TelePresence

14   might, you know, be deployed in a rural community,

15   certainly, you know, there's some easy

16   applications, right? So, telecommuting is one.

17   And we actually have a number of examples of that

18   inside of Cisco. It enables small businesses or

19   remote businesses to conduct business globally and

20   meet with customers, partners, suppliers, without

21   being handicapped by their location.

22   It gives businesses access to global

1 expertise, right? You can use TelePresence as a

2 way to consult with experts in a particular field.

3 You can imagine a, you know, a farmer who can use

4 TelePresence to actually talk to a farming expert

5 or a grain expert or whatnot.

6   There's an opportunity for businesses to

7 provide a whole range of consumer-to-business

8 services: Consulting services, you know, banking

9 services, planning services, and whatnot. A

10 phenomenal opportunity for remote education and

11 actually bringing, you know, the world's best

12 instructors to a virtual classroom and, again,

13 making distance and location not a handicap.

14   And then, you know, there's also

15 obviously a range of applications built around

16 social communication and enabling, you know,

17 people in outlying areas to be part of, you know,

18 global communities. Again, without regard to

19 their location.

20   So, we think that, you know, this

21 category of technologies is a great opportunity

22 to, you know, help, you know, rural communities

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1   feel closer, but without loosing their, you know,

2   unique location attributes. And as we look at how

3   broadband plays, this is the kind of application

4   we think should be considered.

5   MR. KNAPP: Thank you, David. Laureen?

6   MS. COOK: Hi, my name is Laureen Cook,

7   VP of LTE/4G Strategy at Alcatel-Lucent. Thank

8   you very much for including Alcatel-Lucent in

9   today's program.

10   One of the main topics we'd like to talk

11   about regarding applications in device trends is

12   the fact that there is no killer app. Killer app

13   is definitely a misnomer that we have been in

14   search of for years throughout various

15   reiterations of cellular service.

16   As we approach converging services, such

17   as LTE and fiber to the home, we see

18   user-generated content and technologies that

19   require mash-up components that will be the

20   driving force behind the future of application and

21   device trends in the future.

22   We're currently working and spending a

1   great deal of time is -- at Alcatel-Lucent on

2   emerging technologies. Looking at LTE, looking at

3   the -- looking at technology from the consumer's

4   perspective. As there is no one killer

5   application. You need to look at the various

6   segments of the market. And when we look at the

7   marketplace, we see that the consumer generation,

8   or the consumer customer, in particular, the

9   millennial generation is looking for

10   personalization and ubiquity of services.

11   Immediacy. From any access point, anywhere,

12   they're looking for a common portal to their data

13   when they want it, where they want it, and how

14   they want it.

15   When we look at the enterprise, we're

16   looking -- the enterprise is looking for increased

17   business productivity tools. And they're looking

18   for a reduced computing cost for their employees.

19   When we look at the operators, operators

20   are looking for new potential revenue streams from

21   non- traditional telco sources. As voice is

22   becoming more of a commodity over time, we're

1   seeing that various forms of data stream -- high

2   bandwidth, high definition data -- hogging revenue

3   stream's become more and more a key factor in the

4   proliferation of the operators and their

5   competitiveness going forward.

6   As a manufacturer of telecoms' equipment

7   -- as one of the largest manufacturers of

8   telecoms' equipment in the world in terms of

9   volume, we have a great deal of experience in

10   working within these three segments. In

11   particular, we're focusing on five major segments

12   that we think are of significant importance to

13   this panel, which is enterprise and e-Health care,

14   media and entertainment, automotive connectivity,

15   digital signage, and cloud computing. And what

16   we'd like to do is share some of our insights with

17   our customers and our experiences with the network

18   operators and the end users to help formulate the

19   -- and of all the industry, as it should going

20   forward.

21   Thank you.

22   MR. KNAPP: Thank you. Mathew?

1   MR. OOMMEN: Sure. First of all, thank

2   you very much for having me here. And at Sprint,

3   I'm responsible for the device development,

4   systems development, and technology development

5   for Sprint.

6   When I walked in today, I heard Julius

7   -- that was probably the comment that I heard when

8   Julius was talking about -- I don't want to

9   necessarily in the next panel talk more about

10   spectrum. And I think you mentioned net

11   neutrality. And --

12   MR. KNAPP: That was Brian.

13   MR. OOMMEN: Well, I appreciate that.

14   And sorry that Brian's going to miss. But we

15   appreciate you guys inviting us so that we can be

16   enabling how to empower consumers and make

17   broadband what we call as pervasive and

18   affordable. Next slide, please.

19   So, if you look at it, (inaudible) has

20   obviously been at his work and it's driven by

21   consumers demand for driving innovation. What do

22   we mean by innovation? Initially, the device was

1   And so how did the Boyles of the world

2   become successful? Because Sprint believes in

3   openness. Sprint believes in enabling openness

4   not just at the network level, not just at the

5   device level, not just at the systems level or the

6   platforms level, but a uniform way of enabling

7   open as a platform for third-party developers to

8   create new, unique applications and services.

9   Also, allowing the customer who has to be

10   empowered to create their own UI and experience.

11   To me, that is the differentiation.

12   I heard someone talk about broadband.

13   What is broadband? Broadband is defined by the

14   customer, be it an enterprise customer or a

15   typical consumer. Next slide, please.

16   So, if you look at -- if Susan Boyle was

17   on one edge of that balance -- actually, just

18   because of where we are in terms of as a broadband

19   revolution or revolution from the U.S. standpoint,

20   we asked -- the United States, in my opinion,

21   should be driving the broadband revolution.

22   Unfortunately, we've been outsmarted by the rest

1   of the world.

2   I had the privilege and the opportunity

3   before I came into Sprint the last six years to

4   drive the broadband of a country called India,

5   where broadband was not pervasive, but it's

6   getting to be pervasive because there's over 300

7   million users, where in 2003, it was 16 million

8   users. Just to give you a comparison.

9   Now, use -- number of users is obviously

10   not what I'm talking about. It is that consistent

11   experience that needs to be given so that the

12   Boyles of the world -- you know, I describe Boyle

13   as an individual who is what I would say is simply

14   ordinary, but amazingly extraordinary. And that

15   amazing extraordinary was happened because it was

16   the world of the Internet.

17   The Internet is as quick as, today, our

18   speed of thought and the ability for someone to

19   type it in and it is available to the rest of the

20   world. But it -- to be really pervasive, in the

21   definition of broadband, every single component of

22   that network connectivity have to be successful.

1   Whether you call it first mile, whether

2   you call it middle mile, whether you call it end

3   mile, or whether you call it the mile that is

4   associated with your device, it has to work in

5   synchronization.

6   So it is very important for us as a

7   nation to offer this country and as a leader to

8   the rest of the world that we have applications

9   and services that can change the world, not just

10   when you have sitting under the tower or not just

11   when you are sitting in particular carriers' data

12   centers. Irrespective of where they are, we want

13   to empower them and make sure that they can use

14   this to enhance their value and productivity.

15   MR. KNAPP: Thank you. How do you see

16   -- on the one hand, clearly it's desirable that

17   people have the freedom to use whatever

18   applications that they want to, for innovators to

19   develop them and for users to have a good

20   experience.

21   How do you see that affecting -- first

22   I'll talk about the business models that exist

 1   today. Do you see those as changing with an

 2   application's environment that we're -- maybe the

 3   systems designer can't be sure of what the

 4   traffic's going to look like. If you could maybe

 5   just go down the line and comment on that.

 6   Sunil?

 7   MR. DALUVOY: Yeah, I think that's a

 8   great point, Julius. I mean, the idea that voice

 9   is commoditized, I guess, the way you're defining

10   voice in pricing voice today, I guess, is going

11   towards is diminishing in value per minute.

12   But you can have other ways of

13   generating that revenue. Just my own personal

14   use, my -- I think I pay to my cell minutes of

15   12,000 minutes back 4 years ago. I use about 500

16   minutes now. But my data is through the roof.

17   Now, the pricing plans for these -- at

18   least, I'm talking mobile world -- they don't

19   change as quickly as our usage changes, so there

20   is a little bit of a lag and gap that occurs

21   there. So I think they will have to, you know,

22   change their pricing model to reflect the usage.

 1   But there's plenty of -- the value and utility of

 2   that service or that network in that device is

 3   increased over the past five years. So just

 4   looking at it from a per-minute pricing, and that

 5   going to zero, does not reflect any type of dire

 6   straits these carriers are in. It does require

 7   them to be more creative in their marketing and

 8   figuring out how to price these plans

 9   appropriately.

10   There was a point that was made in the

11   earlier panel -- I think I went with the pricing

12   caps or just bandwidth caps. Again, this is a

13   matter of pricing. Why shouldn't the user just

14   use more, than be priced accordingly so they know

15   what they're getting into? So, if they're

16   extracting a lot of cost onto the network, they

17   should be paying the same amount or reflected,

18   relatively speaking.

19   MR. LIEW: Was your question focused on

20   the business model for the people who are

21   providing broadband? Or for the people who are

22   providing the apps that sit on top of that

1   broadband?

2   MR. KNAPP: It was -- it's actually for

3   the providers. But if you have any insights on

4   the app side that -- we're glad to hear that, too.

5   MR. LIEW: I'm not going to have a lot

6   of insight on the provider side.

7   MR. KNAPP: Right.

8   MR. LIEW: But I think, you know, for

9   the folks -- for the app providers who are

10 building this functionality that will sit on top

11 of the broadband that ultimately consumers are

12 finding the value in, you know, ultimately there's

13 only two business models for those folks: You're

14 either going to get the user to pay you or you're

15 going to give it away for free and support it with

16 advertising.

17   On the, you know, getting people to pay

18 you side, you know, there's a variety of, you

19 know, of people who are having some success with

20 that. But I think on the advertising side, you

21 know, one of the earlier questions on the panel

22 was, what else in government could affect, you

1   know, this landscape, this universe? And the FTC

2   has been talking a little bit about some privacy

3   work to do with behavioral targeting.

4   Behavioral targeting probably represents

5   30 to 40 percent of the revenue for advertising

6   supported business models today, probably more for

7   startups, perhaps a little bit less for bigger

8   companies and established media brands. And

9   depending on where some of the proposed policy

10   comes out on, you know, opt in for -- opt in

11   third-party cookies for behavioral targeting -- I

12   don't want to get too down in the weeds on it.

13   But there's implications for the ability for

14   start-up companies to actually be able to have

15   sufficient revenue from advertising models to be

16   able to provide the sort of services that

17   consumers are looking for.

18   MR. KNAPP: David? Do you ever worry

19   about the traffic getting so heavy that the

20   highway won't carry it?

21   MR. HSIEH: No.

22   MR. KNAPP: You can always build more.

```
 1              MR. HSIEH:  Yeah, exactly.  You know, I

 2     think -- you know, one perspective, particularly

 3     as we look at, you know, video as a driver of, you

 4     know, usage, video is an experiential technology.

 5     So, you know, when there are glitches in your

 6     video, you see them, right?  You know, and if

 7     anybody's ever tried to watch a ball game, you

 8     know, over the Internet, right?  And had a, you

 9     know, bad connection or a congested connection or

10     whatnot, and, you know, you sort of see the play

11     stop and then maybe you get a little jitter and

12     all of a sudden you've missed a key shot or, you

13     know, everybody's running down the field the other

14     way, you have no idea what happened.

15              You know, understands how the experience

16     relates to the quality of service you get.  And,

17     you know, we think that in general it's good to

18     have different levels of service, right?  That,

19     you know, carriers and providers can charge for

20     to, you know, allow different levels of

21     capability, you know, at different price points.

22     And when we look at things like Cisco
```

1   TelePresence, we make, you know, heavy use of, you

2   know, capabilities in carrier networks that offer,

3   you know, quality of experience guarantees. You

4   know, they can get packets from one end to the

5   other end, you know, in a reasonably guaranteed

6   way and within certain types of conditions, which

7   allow you to have the kind of robust, interactive

8   communication that people want.

9   Now, you know, you could opt not to pay

10   for that level of service and you might have a,

11   you know, quality of communication that's not as

12   good. And I think, you know, that's where you can

13   let market forces come to play. But, you know,

14   certainly, you know, making sure that there are

15   differing, you know, levels of quality that

16   carriers can offer and not homogenizing everything

17   we think is an important capability.

18   MR. KNAPP: Laureen?

19   MS. COOK: Okay. Well, as we approach

20   the rollout of LTE, the business models are

21   definitely changing. Voice has become more of a

22   commodity. We have on a global basis learned from

 1   the mistakes of the past with the rollout of 3G,

 2   where there were no devices or applications to

 3   fill the pipe.

 4   The value here of the ecosystem becomes

 5   extremely important in the rollout of high

 6   bandwidth products and services going forward.

 7   The business models are changing in that there

 8   will not be one particular operator or one

 9   particular content provider or one particular

10   applications developer who can do it all. We see

11   the value of the ecosystem and the leveraging of

12   various components of the ecosystem as becoming

13   more important in the development of mash-up

14   technologies and mash-up applications that are

15   required by our consumers.

16   We're already beginning to see

17   collaborative business tools that are utilizing

18   both social networking sites and are utilizing

19   both business applications at the same time.

20   We're seeing machine-to-machine applications with

21   cloud computing. I mean, we'll be seeing a lot

22   more of that going forward.

1   So, therefore, the value of the

2   ecosystem and understanding that companies need to

3   come together both on the service provider,

4   infrastructure, applications development, and

5   content development side, and come together to

6   form an ecosystem that will produce these new

7   devices and applications as we're ready to rollout

8   these networks, will make the rollout of these

9   networks far more beneficial and robust to the

10   population at large.

11   MR. KNAPP: Okay. Mathew.

12   MR. OOMMEN: Yeah, I mean, just to tag

13   from where Laureen left off. Because I believe

14   when we talk about mash- up, the real mash-up can

15   only be done when the network provider or the

16   service provider is open to allow third-party

17   developers to very easily have access to his

18   assets.

19   So, if you look at Sprint. I know a lot

20   of entities have been talking about open quite

21   recently, and cloud computing. And we always get

22   lost, what exactly is open and what exactly is

1   cloud computing? And what happens is I think it's

2   very important to work with the third-party

3   developers.

4   What I mean by that is, there's been

5   about 335 open devices on Sprint's network that

6   has got nothing to do with Sprint. And obviously

7   for us to having certified those 335 devices in a

8   very timely manner, there was a cost and effort

9   associated with it. But we made it easy for them

10   to come in and access our infrastructure.

11   What we see is the open network becoming

12   more like transaction-based services, if you will.

13   So we expose certain network components, whether

14   you use location-based services, whether you use

15   call control, whether you use messaging, or

16   whether I use the power of the pre as an example,

17   right. How do you expose certain components of

18   the devices, the network, the systems? And all of

19   that collectively forms your open ecosystem from

20   that carrier.

21   And I think it's very important for the

22   carrier to be adaptable to a changing business

1   model and enable new business models. However,

2   for the investments of the carrier, it's important

3   that the application ecosystem is willing to pay

4   that return on investment that is required by the

5   service provider, which I think ultimately is

6   required for any successful business.

7   MR. KNAPP: Stagg.

8   MR. NEWMAN: Yeah, I'd like to follow up

9   on that, but first a brief digression.

10   At this point, I hear there's no killer

11   app. But it occurred to me if we combine Cisco's

12   TelePresence with Sprint's mobility and offer

13   video TelePresence to the driver of cars, we might

14   have our true killer app.

15   But the real follow-up is, you know, a

16   lot of talk about the ecosystem and end-to-end

17   service development. As a policymaker, help me

18   think about that. Because when I first started

19   working for Bell Labs -- I will show my age, 1976

20   -- first thing is, I was asked -- and probably

21   Walter and Rashmi or some of the others in Bell

22   Systems were -- showed that if we allow the -- if

1   the FCC is making us let other people hook things

2   to the network. And the network's going to crash

3   and burn, and we were all charged to show why the

4   network would crash and burn if we allowed other

5   things hooked up to the Bell System network, i.e.,

6   phones.

7   We all failed. Somebody told me 10

8   years later they found one incident. But now

9   we're in a network and networks with very complex

10   devices -- you told us how important end-to-end

11   performance is, but what does a policymaker think

12   about -- what is the performance that we worry

13   about? Because we're not going to specify

14   end-to-end performance, and I don't think you want

15   us to. And we aren't going to specify

16   architectures, and I don't think you want us to.

17   So, how do we think about the performance and

18   policy in this world of end-to-end experience and

19   networks and networks, et cetera?

20   MR. OOMMEN: Since I generated most of

21   the points from Stagg, I think I will win a

22   response to it.

1   And because the definition, in my

2   opinion -- from Sprint's standpoint, Sprint has to

3   offer its customers the best experience at the

4   lowest cost structure. Because the customer is

5   looking for respective of the customer be doing

6   business applications or be in the mobile device.

7   When I -- to me, the biggest mobile

8   device is your car. So, your vehicle -- when

9   you're in your vehicle or whether you're at home,

10   at your office, the ability for Sprint should be

11   to give the most affordable service. How -- or

12   what's happening is, we've got more than 90

13   percent of the access, whether you call it special

14   access, whether you call it middle mile, et

15   cetera, being controlled by very few carriers.

16   That inhibits us in terms of having a level

17   playing field. That inhibits us in enabling the

18   Susan Boyles of the world to be successful in

19   terms of being pervasive, if you will, at the

20   right price point.

21   So, where we see help in working with

22   FCC would be how do we ensure that when we talk

 1   about broadband, that the broadband based on each

 2   customer's experience or each consumer's

 3   experience of Stagg's killer app that he talked

 4   about. If you really have to make video pervasive

 5   without the blurry images that David was referring

 6   to, you really need to have that connectivity that

 7   runs across from an end- to-end perspective.

 8   Because, you know, what do they say? Your network

 9   is only good as the weakest link.

10   So, we can continue to put more

11   bandwidth, but at what cost? Because, you know,

12   ultimately it is our competitors and our peers who

13   have that access and we will have to figure out a

14   mechanism that enables the consumers in the United

15   States to have the right experience.

16   MR. LIEW: I might just add to that. I

17   agree. I don't think you want to be specifying

18   architecture and I don't think you want to be

19   specifying end-to-end performance, but that

20   doesn't mean you shouldn't measure it. Because

21   that is ultimately going to be the predictor of

22   what sort of apps and what sort of user

1   experiences you're getting at the end of the day.

2   MR. DALUVOY: Stagg, to your point. The

3   end-to- end development you talk about, I think,

4   is -- you don't have to reiterate to the rest of

5   the panel here, set any standards or set any kind

6   of minimum thresholds, but it is tied to

7   competition policy, too. So, to the extent that

8   the OEM and device manufacturing sector is

9   competitive, to the extent that the carrier sector

10   is competitive, they will set what the consumers

11   ultimately want and desire, and that will drive

12   the innovation there.

13   MS. COOK: At the end of the day, the

14   customer just wants ubiquitous service, be it from

15   fiber to the home or via LTE. They don't care.

16   All they know is, at their touch point, at that

17   point in time, they want to be able to be offered

18   a consistent user experience. End of story.

19   MR. LIEW: I think they'd even trade off

20   consistency just for the user experience.

21   MR. OOMMEN: No, I concur with that.

22   Again, just as a short extension to what Laureen's

1   saying, whether we call LTE, ultimately that LTE

2   has to have a backhaul, that LTE need to have some

3   wired connectivity.

4   Because the content necessarily is not

5   sitting in a data center that has got all these

6   LTE backhauls. It is connected on very high,

7   whether you call it DWDM or not, to get into the

8   technology, but big, fat pipes. So, if we have to

9   be successful, whether it is LTE, whether it is

10   WiMAX, respective of technology from a 4G

11   standpoint and make broadband pervasive, we have

12   to break the connectivity bottleneck.

13   MR. NEWMAN: Let me try to get you all

14   to be more specific because we're still at the

15   platitude level, folks. What is the one thing you

16   would recommend policymakers do given the problems

17   you see out there?

18   MR. DALUVOY: I'll take a stab at that,

19   Stagg. One thing I mentioned before is, to be

20   very specific -- maybe too specific -- is, perhaps

21   look at spectrum from within the Commission and

22   look at ways you could open up existing spectrum

1   for the backhaul problem.

2   One example is CARS band frequency.

3   Look at ways you can open up the eligibility and

4   restriction usage to allow CARS band providers to

5   use it as backhaul in rural areas and high cost

6   areas.

7   These technologies already exist, the

8   cable guys have been using this for many years.

9   They've been using it less because they've been

10   moving it to terrestrial fiber networks. And so

11   you have a plethora of, you know, of spectrum

12   available out there. A pretty good chunk. And my

13   last recall is, the only application interference

14   tests, the people need to file to get it.

15   That's one example of dealing with the

16   backhaul issue.

17   MR. NEWMAN: Good, thank you.

18   MR. KNAPP: Don. Don't forget to file

19   on proceeding that just started today.

20   MR. LIEW: You know, another comment I

21   would make is, I think we're sort of getting hung

22   up on this idea that it needs to be a certain, you

1   know, speed, a certain megabits per second. And

2   that requires policy or technical solutions to

3   that.

4   As I said before, I think just the

5   always on-ness is actually more important than any

6   particular level of speed. And, you know, there

7   are still parts of America where it's actually

8   hard to get any broadband connection. And I would

9   go after that problem before, you know, before

10   trying to set some sort of minimum standard for

11   speed that has to be nationwide.

12   MR. OOMMEN: Again. Not to harp on the

13   point -- and I will come down to the ground

14   reality is, I think, we need some sort of

15   regulatory framework that gives us a level playing

16   field. And I've -- in the special access,

17   specifically.

18   And with respect to -- I've heard about

19   the spectrum story. And I agree, Sunil, we need

20   spectrum, as much spectrum as we can get.

21   However, I don't want any one of us to take the

22   notion that spectrum is going to fix backhaul

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1   because they are two separate issues.

2   Remember, RAM capacity is the capacity

3   between your mobile device and your mobile

4   station, whether you call it a BTS, a BSC, MSC,

5   whatever it is. Now, there is a backhaul capacity

6   which is much bigger than your multiple carrier

7   spectrum/RAM that is required, which is a separate

8   problem.

9   So, I would like to separate the two

10   issues as two distinct issues that need to be

11   addressed. Because addressing one does not solve

12   the pervasiveness of broadband at affordable cost

13   so that we are not laggers, but leaders in the

14   broadband space as we look at our emerging

15   broadband business.

16   MR. HSIEH: Just to add to your point.

17   I would love to see us view broadband connectivity

18   as a fundamental element of our country's

19   competitiveness on a global basis. And, you know,

20   if you look at where we stack up in broadband

21   deployment versus other countries, it's shockingly

22   low. I mean, considering what an, you know,

1   economic and political, et cetera, power we are

2   for us to be such laggers in broadband deployment.

3   And I think, you know, we should be looking at it

4   as fundamental to our competitiveness globally.

5   And we should seek to lead in

6   connectivity. And, you know, treat it as a way

7   that will help power the innovation of our

8   economy. And anything short of that, I think, is

9   --

10   MR. NEWMAN: Let me follow up on that.

11   Because I hear you --

12   MR. HSIEH: Sure.

13   MR. NEWMAN: -- and Jeremy saying two

14   different things. Right.

15   Currently, somewhere around 7 percent of

16   the country does not have broadband access other

17   than via satellite. That's not a big swing in the

18   addressable market in the U.S. So, are you saying

19   the real problem is the broadband we have is not

20   good enough? Or is it an adoption problem, that

21   it's those 40 percent who aren't taking broadband

22   we've got to convince them to take it? Or so --

1   are you saying we need to improve --

2   MR. HSIEH: Sure.

3   MR. NEWMAN: -- the broadband that's out

4   there, we need to get more people adopted, or we

5   need to get the unserved served?

6   MR. HSIEH: I would say, yes.

7   MR. NEWMAN: But prioritize.

8   MR. HSIEH: I think, you know, having a

9   better broadband infrastructure that enables, you

10   know, higher speeds at lower costs for, you know,

11   as much of the population as we can manage would

12   be our number one priority.

13   And, you know, if I look at, you know,

14   like my home use. I think I have 20 megabits per

15   second download speed and 3 megabits per second

16   up, which is pretty good --

17   MR. NEWMAN: Where do you live?

18   MR. HSIEH: I live in Walnut Creek,

19   California. And I am the envy of most of the

20   people I meet, who can't get anything even close.

21   But, you know, if you look at me compared to

22   somebody who lives in -- and I know there's a

1   discussion around South Korea earlier. But if,

2   you know, I lived in South Korea, I'd be able to

3   get a whole lot more for a whole lot less, right?

4   And so, you know, what would I do with that

5   bandwidth? To be honest, I'm not completely sure.

6   But --

7   MR. LIEW: I think that's the point,

8   though, right?

9   MR. HSIEH: No, no. But my point,

10   though, is that if you have it, right? And it is

11   available at some price that, you know, that helps

12   spark innovation, right? Because, you know,

13   you've got startups out there who say, boy, what a

14   great idea except, you know, our addressable

15   market's like, you know, a half of 1 percent of

16   the U.S. Based on the bandwidth or the quality of

17   service that this -- you know, that this

18   application needs.

19   MR. LIEW: But they actually aren't

20   saying that. They're not saying, you know, if

21   only there were more high speed connections we

22   could build a business. Because they're -- I

1   mean, startups -- well, startups that think like

2   that don't stay in business for very long. They

3   say what's the biggest market I can address today

4   and what service can I provide to them?

5   And I think, you know, to answer the

6   question that Stagg posed, I would take a

7   different perspective, which is, I think there's

8   an equity argument that says that, you know, the 7

9   percent of people who don't have access to any

10   sort of broadband at all need to get that. At any

11   speed. Not -- we shouldn't wait for some, you

12   know, 20 megabit, you know, standard before we

13   roll something out. We should get something to

14   them right away, because just having that always

15   on access changes their usage.

16   And then secondly, there are an awful

17   lot of people who have access to broadband that

18   don't take advantage of that access. And in large

19   part it's because, like video, it's experiential.

20   Until you try it, you don't know what you're

21   missing. It's really hard for someone who hasn't

22   experienced broadband access to imagine what

1   they're going to use it for. And that's where

2   this idea of kind of frivolous and trivial uses

3   are always the first use of any new technology,

4   broadband included. And we just need to get

5   comfortable with that.

6   So, you know, a good parallel is one

7   laptop per child, which was roundly criticized at

8   one stage because, you know, people were saying,

9   look, we're giving all these laptops to all these,

10   you know, underprivileged kids and they're just

11   using them to play games. Is that actually what

12   we wanted to achieve?

13   And obviously that's not the end game.

14   But once you start them using a computer, even if

15   it's to play games, that sets a baseline from

16   which they can start learning and discovering a

17   whole bunch of applications in addition to that.

18   And I think broadband is -- has a lot of parallels

19   to that.

20   So you have to accept that there will be

21   frivolous usage, and you have to even be prepared

22   to encourage it for people who have the ability to

1   access it, but have chosen not to yet.

2   Ms. COOK: But to Jeremy's point, I

3   mean, it may be perceived as frivolous usage in

4   the beginning, but that does change over time.

5   And we've already begun to see that.

6   We take a look at gaming, we take a look

7   at social networking and logistic-based services.

8   There are whole economies that are being born from

9   the Internet that were never possible before

10   because of these "frivolous services" that people

11   were playing with.

12   E-commerce is now being generated over

13   social network sites such as Facebook. So, by

14   expanding the Internet and by expanding broadband

15   access to all people, it gives them the

16   opportunity to build and develop. And, again, to

17   Jeremy's point, it may be a bit frivolous in the

18   beginning, but that does spawn on further

19   technological development and applications and

20   devices in the future.

21   MR. DALUVOY: Stagg --

22   MR. OOMMEN: No -- sorry.

1   MR. DALUVOY: Stagg, I guess in terms of

2   how you prioritize your policy issues really

3   depends on how much you believe it is a supply

4   issue, or is it a demand issue. And Jeremy made

5   this point earlier about the demand part. You may

6   have all this broadband out there and everyone has

7   3G or even 4G, but there are other factors that

8   affect people's usage of things.

9   For example, Jeremy pointed out the

10   processing power on the device. You know,

11   sometimes a bigger cause in the delay. And just

12   because you have the bigger pipes out there,

13   bigger spectrum out there does not necessarily

14   result in a commensurate increase in demand. And

15   one example I can share with you from Google is

16   that the bigger driver for our usage on mobile

17   devices was flat rate data pricing, not the

18   bandwidth. The (inaudible) PCIS introduced flat

19   rate data pricing, $5 a month. They -- five times

20   more Google searches than some of their

21   competitors. They're much larger -- and they were

22   also under 2.5 GCDMA network.

1   Again, the pricing plan and the

2   economics around that affect the demand much

3   greater than necessarily throughput. Of course,

4   maybe if we get into what this Commission's

5   jurisdiction and where the coverage is, and this

6   is, of course, a broadband task force. Maybe you

7   focus on the supply part, but I think you should

8   also take into account the demand piece here, that

9   there's a number of applications that are very

10   compelling, that are very useful, that have

11   nothing to do -- there's enough throughput out

12   there today.

13   That's not to diminish the fact that we

14   shouldn't -- that we should be proud of where we

15   are in the rakings in the world. I'm not

16   suggesting that at all. I'm just suggesting the

17   demand piece is much more nuanced and it has much

18   more to do with economics and pricing than

19   throughput.

20   MR. OOMMEN: So, just to add to Sunil.

21   I think pricing is very important. But for one to

22   provide the right price structure, you need to

      1   have the right cost structure. Because when

      2   you're just the application creator, you don't

      3   necessarily always understand the cost of

      4   infrastructure that the infrastructure players

      5   have to go through to create that infrastructure.

      6   So, it is critical to understand the cost

      7   structure in providing that infrastructure.

      8   But I also -- Jeremy, to your point. I

      9   think we as a nation owe it to that 7 percent of

     10   the people, which is why those spectrums out there

     11   is very important in meeting certain segments of

     12   the society, from a pervasiveness. But, also, we

     13   want to make sure that broadband is enhanced at an

     14   affordable price because we are in a digital

     15   economy, not a U.S.-centric economy, but the

     16   digital global-centric economy.

     17   We've been talking about health care

     18   reforms here, I mean, pretty extensively the last

     19   few weeks, with all these town hall meetings.

     20   Could we disrupt the way -- you know, he talked

     21   about TelePresence. Could we disrupt the way

     22   health care is done in this country? And I think

1   we have opportunities to do that as well, and

2   broadband could be that big catalyst.

3   MR. NEWMAN: One more question and then

4   I'll shut up for a while.

5   Building on what you just said and what

6   Jeremy said about the unserved, if we follow the

7   normal rollout path for 4G, you know, we'll get 4G

8   to rural areas about 2020. Suppose we could

9   magically do something and get 4G out there

10   starting from the rural areas inwards in the next

11   2 to 3 years. Would that meet the need for

12   broadband connectivity to homes and businesses?

13   You know, would that really move the needle on

14   things?

15   MS. COOK: You would try to -- you would

16   have to find a way to make that cost-effective for

17   the operators to roll that out. And that's where

18   the challenge comes in.

19   MR. NEWMAN: What do we need to do to do

20   that?

21   MR. OOMMEN: I think I've said it once.

22   I'll say it again. But I think that's a critical

1   component.

2   I think -- Stagg, I'm glad you brought

3   that up because we have to not do the ordinary.

4   We have to do the extraordinary. Because if we

5   continue to follow incremental steps of saying I

6   would get 4G there in 2020, I think we have missed

7   the whole journey.

8   We have to do 4G in 2015 or 2012 or 2013

9   should be our strategy. And to do that, we have

10   to bring in certain regulations in certain areas.

11   And not to say that we want a fully regulated

12   service in every area. We just need to make sure

13   that there is fair and competitiveness, so that it

14   goes back to Laureen's point about affordability

15   is very key to that as well.

16   So that there is a business model and

17   not what we saw in 2000 and 2001, where we created

18   a bubble and realized that there was no business

19   model to justify that. And I'm sure the policies

20   that you want to make, you know, enhances the

21   possibility of a sound business model, if you

22   will.

```
 1              MR. LIEW:  Stagg, I think it would be

 2       terrific to have, you know, 4G starting in the

 3       rural areas.  But I'm not sure that it's

 4       necessary.  And, you know, I mean, David says he

 5       has 20 megabit download -- downstream speeds.  And

 6       I would say, David, why do you pay for 20 megabit

 7       downstream speeds?

 8              And he will probably say because I had 3

 9       before and it wasn't enough.  And why'd you get 3?

10       Because I had 1 and it wasn't enough.  And why'd

11       you get 1?  Because it was 500K and it wasn't

12       enough.  You've got to start with some level of

13       access to stimulate the demand for more.  If --

14       you know, I mean, otherwise, you have this problem

15       of it being uneconomic for folks to roll out at

16       the, you know, latest.

17              MR. NEWMAN:  Well, I was really trying

18       to -- is it, some think that's the question.

19       Would it be sufficient in rural areas to quickly

20       deploy -- call it 3.5G.

21              MR. LIEW:  Three, 2, EDGE, fine,

22       whatever.  Just give people instant on access and
```

       1   they'll start using the Internet for things they

       2   didn't use before. They'll start looking up phone

       3   numbers instead of pulling out the Yellow Pages.

       4   They'll start checking the menu before they get in

       5   the car. They'll check the movie times, and

       6   they'll say, gee, it'd be great to be able to see

       7   that trailer before I get in the car, although I

       8   know what time it is. And I need a faster

       9   connection. And they'll call their operator, and

      10   they'll be willing to pay for it.

      11   And then they'll say, jeez, if I didn't

      12   have to get in the car at all, I could just watch

      13   it on -- you know, sitting at home. I need a

      14   faster connection than that. And that's how it

      15   goes.

      16   MR. OOMMEN: And Jeremy, I mean, I agree

      17   with you. But I do have a slightly different view

      18   as well, because --

      19   Stagg, I think I am -- I, you know,

      20   having had the privilege, like I said, of being in

      21   a different place at a different period of time to

      22   see where they missed on the 2G. Certain

```
1     countries missed the entire 2G.  If they tried to

2     offer the same 2G, I would have been very

3     disappointed.  But they did 3G and beyond.

4            So I think we as a nation should not be

5     disappointed in offering -- not that we shouldn't

6     offer it and the trickles of the speed or

7     connectivity.  Please don't get me wrong.  I think

8     we really need to take care of our 7 percent,

9     which is critical.  But at the same time, if there

10    is an opportunity for us to give them the big

11    bandwidth, because health care in itself could be

12    a great application that rural community can have

13    without driving 100 miles to find the nearest

14    doctor.  Which is even common within the United

15    States, whether we accept it or not.

16            So.

17            MR. LIEW:  Yeah, I'm not saying not to

18    give it to them, I'm just saying --

19            MR. OOMMEN:  No, no, I hear you.

20            MR. LIEW:  -- that, like, you know, I

21    would not wait until 4G --

22            MR. OOMMEN:  Absolutely.  Totally agree.
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1   MR. LIEW: -- is the only option. I

2   would say, what's the fastest and cheapest way?

3   And if it's, you know, even a relatively, you

4   know, small pipe, better than nothing and better

5   than waiting.

6   MR. OOMMEN: Sure.

7   MS. COOK: But 4G. LTE is being

8   deployed as we speak right now. So, one could

9   argue that that probably is the fastest time to

10   market with the biggest pipe that they could get

11   in the most economic format.

12   And applications like e-Health care and

13   like e-Learning, which are huge initiatives here

14   in the United States, they're very viable right

15   now over the LTE, 4G networks as we speak. We're

16   running applications that are, again, mash-up

17   applications with leveraging the partners in our

18   ecosystem right now around e-Health, around

19   Telemedicine, around e-Surgical suites as well.

20   So, that will help fill that gap as well.

21   So, you might as well if you're going to

22   roll out broadband to that 7 percent, you might as

1   well give them the biggest pipe possible.

2   MR. LIEW: I don't have a dog in the

3   technology choice right here.

4   All I'm saying is, we shouldn't say

5   we're going to provide something that provides

6   TelePresence, health care, or it's not worth

7   doing. Right? There's plenty that's worth doing

8   before that point.

9   MR. DALUVOY: Well, you know, this is a

10   great opportunity with the examples that are

11   raised. I think one of the questions you asked,

12   Stagg, what should we do? Well, you as the FCC

13   perhaps should coordinate activity with Department

14   of Health, Department of Energy, Department of

15   Transportation because all these different

16   agencies are going through massive upgrades,

17   whether it be the smart grids or construction

18   programs and new roads and health care reform,

19   they all have a broadband nexus to it.

20   So, if one specific activity could be

21   how to coordinate better with these agencies to --

22   instead of viewing broadband as a sole individual

         1   industry, it's a compliment to enable or empower

         2   those other efforts.

         3   MR. KNAPP: Let me give a chance to

         4   Alison and James. Either one.

         5   MS. NEPLOKH: I'll go first, I guess.

         6   When you were talking about a lot of mobile

         7   applications, you tend to talk about very low

         8   bandwidth things. The augment your reality, or

         9   calling a taxicab, getting a menu, getting show

        10   times. When you talk about wired-type access, you

        11   talk about TelePresence and a lot of

        12   machine-to-machine communications that uses a lot

        13   more bandwidth.

        14   Is this merely a side effect of these

        15   bandwidths that are available today? Or is that

        16   actually something that even going into the

        17   future, the mobile applications tend to be the

        18   lower bandwidth type of applications.

        19   MR. DALUVOY: I mean, the biggest thing

        20   is openness principles, right. That enabled -- if

        21   you look at what the iPhone did, it's like -- it

        22   wasn't just the bandwidth. There's also the

         1   brilliant design and the UI and everything that

         2   combined together. And the openness idea that

         3   your third party -- the 65,000 apps are by

         4   third-party developers on the iPhone.

         5   So, again, it goes -- it was mentioned

         6   earlier: No matter how smart any one agency or

         7   company think they are, it's incredible what

         8   people come up with. So, there's no killer app

         9   per se that one's going to be the silver bullet,

        10   to Laureen's point. But there are so many out

        11   there that are very interesting that no one could

        12   have imagined.

        13   Have you guys seen the USAA automatic

        14   check depositing app? You take a picture of your

        15   check with your iPhone and you deposit it

        16   automatically in your checking account. I mean,

        17   that's just amazing, you know. This wasn't a mom

        18   and pop, this was a bank that came up with it.

        19   But, you know, this is just -- it reduces a

        20   tremendous amount of friction, and it's incredibly

        21   efficient. It's just -- I mean, those are the

        22   kinds of things you see done.

1   That may require some kind of bandwidth,

2   some kind of optical recognition, some technology

3   in there. But I'm just saying, just focusing on

4   the bandwidth piece of it is not providing the

5   complete picture.

6   MR. OOMMEN: Yeah. Just to, again, to

7   add. This is very interesting, again, because we

8   know of so many different carriers that have

9   restricted applications and services running.

10   These are the nation's largest carriers. Why have

11   they restricted if bandwidth is not an issue?

12   That's a question that I would pose.

13   If bandwidth is not an issue and

14   bandwidth is affordable, I cannot fathom why it is

15   an issue. Also, everyone talks about iPhone and

16   the 65,000 applications and the 1.5 billion

17   downloads very liberally. How many times have we

18   seen the pain the customers are going through of

19   not able to have the right experience on those

20   applications and those carriers? Are we reading

21   only one side of the picture?

22   Should we not read the other side as

1   well?

2   MS. COOK: Well, as we approach LTE and

3   it's deployment, that sort of goes away because we

4   do have the bandwidth and we do have the low

5   latency. So, those issues that were roadblocks

6   before for high definition, video hogging,

7   applications, and devices now become irrelevant.

8   There's more of a blurring as we see between fixed

9   and wireless. And as I have said earlier, the

10   user experience must be close to ubiquitous

11   regardless what the touch point is.

12   In the LTE environment media becomes a

13   huge -- video becomes a huge component that --

14   which will touch all the different verticals

15   within LTE. Video for video gaming, downloading

16   high definition music, high definition video

17   streams. But also as it relates to things such as

18   new avenues and new revenue streams such as

19   digital signage.

20   Digital signage opens up a whole new

21   medium which was never, ever possible before in a

22   3G environment. Now that you'll be able to deploy

1   and differentiate content at the drop of a hat

2   over the network, we'll be able to get even public

3   service announcements out to rural places before

4   that never could have access to some very critical

5   pieces of content either for the -- either from an

6   advertising perspective or from a public service

7   perspective.

8   Digital signage is a great example

9   because it also leads to the prospective sales and

10   e-commerce. And access to the Internet -- it

11   utilizes new applications and new devices that

12   we've never looked at before.

13   We talk about the connected car. The

14   car becomes your real mobile device. And in that

15   device, all kinds of applications can be layered

16   into there. Devices -- all kinds of services can

17   be layered into there to help stimulate e-commerce

18   -- again, public service, gaming, entertainment,

19   e-Health, home monitoring, smart grid technology,

20   smart home technology applications. All are

21   possible as we go into the LTE environment with

22   the low bandwidth -- a high bandwidth and low

     1   latency issues.

     2   MR. LIEW: To specifically answer your

     3   question, the reason that there aren't a lot of

     4   high bandwidth applications for mobile is because

     5   there isn't high bandwidth. So, companies that

     6   are relying on it go away.

     7   So, that will come. It will come as --

     8   MS. COOK: It will come. Open the pipes

     9   and they will come.

    10   SPEAKER: Good point.

    11   MR. KNAPP: So, do you think there are

    12   things sitting there that would be killer apps --

    13   great apps that people decide, well, I can't do

    14   this now because this speed isn't there.

    15   MR. OOMMEN: Yes.

    16   MS. COOK: Digital signage, classic

    17   example.

    18   MR. OOMMEN: I would say, more than

    19   that, anything that you do in your home on your

    20   desktop. My kids play Xbox left and right.

    21   MR. KNAPP: Mine, too.

    22   MR. OOMMEN: Could you actually do that

1   on your mobile device effectively and efficiently

2   and affordably? I think, no.

3   So, I think there are numerous

4   applications that one can think of and the

5   experience, irrespective of the screen. Would you

6   not want to have the same experience?

7   I know we keep saying bandwidth is maybe

8   not necessarily a bottleneck. I think it's a huge

9   bottleneck in terms of -- again, don't get me

10   wrong. It's not just bandwidth. It is the

11   processing associated with it, the memory

12   associated with it, the call functions and how

13   that is utilized at different levels. Whether

14   it's device, network, system. So, there's a

15   various components on it, but it is a critical

16   component in that process.

17   MR. KNAPP: I take your points. And let

18   me have James -- he had a question, too.

19   MR. MILLER: Just --

20   MR. KNAPP: And then I'm going to -- I

21   had questions coming in and they're great

22   questions, so I want to try to get to these, too.

1   MR. MILLER: Well, we've talked a lot

2   about the openness and, you know, kind of vehicles

3   to get where we're headed. We talked about the

4   benefits of having, you know, the access to

5   multiple networks on a device. You know, a lot of

6   the benefits of a flexible platform -- of a

7   flexible, you know, device, in effect.

8   And what kind of -- you know, we've

9   talked a little bit about some of the business or

10   development kind of considerations that go into

11   enabling that. But if we drill down a little bit

12   more into that, there's a lot of intellectual

13   property considerations that maybe people have to

14   deal with. Talking a little bit more about -- you

15   know, we've talked a little bit about the pricing

16   side. On the development side are the tools

17   available today, or is it everyone's expectation

18   that they'll just naturally evolve in the current

19   context to provide for these features?

20   You know, for example, cyber security

21   aspects. Is it sufficient for all e-commerce

22   applications and Telehealth, they're going to have

     1   different considerations, maybe, than social

     2   networking, which also have privacy issues. But

     3   might maybe have a different kind of take on that.

     4   So, maybe if we could drill down a

     5   little bit either on the development or the

     6   business side of, you know, how that openness

     7   actually comes into play. And, Jeremy, you talked

     8   a little bit about that as well as Sunil.

     9   MR. LIEW: Yeah, on the development side

    10   I have no doubt that if there are opportunities to

    11   make money, that companies will start to address

    12   those opportunities and I'll fund them. I don't

    13   think that that's something that you need to worry

    14   about too much.

    15   You know, on the sort of -- on the

    16   privacy/security stuff, I think, you know, those

    17   are areas that, you know, if the industry isn't

    18   self-regulating, then I think there's absolutely a

    19   role for government to, you know, to put some sort

    20   of set of guidelines or minimum levels and, you

    21   know, I think that's something that is

    22   appropriate.

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 1            MR. HSIEH:  I concur with Jeremy.  I

 2     think market forces will take care of itself.

 3     And, you know, when you provide the, you know,

 4     kind of right infrastructure you'll enable a range

 5     of innovation.  And, you know, the nature of that

 6     innovation will solve the critical problems,

 7     whether it be security or privacy, et cetera, as a

 8     part of that innovation process.

 9            MS. COOK:  Now, security is an issue.

10     However, market forces will definitely prevail.

11     When we take a look at social networking

12     applications, which are probably those that are

13     the most vulnerable right now, most of them going

14     forward are all opt in.  So, if you choose to opt

15     in, it's a risk and a reward, right?  That's

16     something that the consumer decides himself.

17            So, I think what we need to do as an

18     industry is take a look at where we are, and

19     define what is really important along security

20     lines.  However, opt in -- which is the case with

21     most of the applications going forward -- pretty

22     much is self-regulating.
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1   MR. KNAPP: Yes, Sunil.

2   MR. DALUVOY: I think security and

3   privacy has always been an issue. It's been an

4   issue even from the Carter phone decision. So,

5   but the same risks that bring along with new

6   technologies, they are -- there's plenty of

7   rewards and in the industry, and the government

8   could careful watch. They'll solve those issues,

9   I think.

10   MR. KNAPP: Okay. Let me get to some of

11   these questions that have been coming in. Some of

12   them we've touched on indirectly, but I think

13   there's a little different slant to this.

14   First one. Should ISPs be allowed to

15   prioritize traffic to ensure that advanced

16   applications work? Should application providers

17   and or advertisers be allowed to pay the ISP for

18   higher quality of service so as to enable

19   consumers to enjoy their content?

20   Jeremy, you want to take a stab at that?

21   MR. LIEW: Absolutely.

22   MR. KNAPP: Yeah, good.

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1              MR. LIEW:  Yeah, I mean, it's how

2     markets work, right?  It's -- yeah, absolutely

3     they should.

4              MR. KNAPP:  So, you'd support that.

5     Sunil?

6              MR. DALUVOY:  I would just add that, you

7     know, our belief is the non-discriminatory

8     treatment of traffic.  So, you know, if you're

9     going to -- like, if a subscriber pays for a

10    platinum package in cable, anyone can also pay for

11    that and get those same channels.

12             Same way, I think, that a main point

13    that we'd want to add to that or wrinkle -- a very

14    important one -- is that the non-discriminatory

15    aspect to it.

16             MR. KNAPP:  So, you would disagree.  In

17    other words, the application provider or the

18    advertiser could not pay the service provider to

19    make sure theirs went through faster or with a

20    better quality.

21             MR. DALUVOY:  Shouldn't discriminate

22    among the traffic from the origination or if it's
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1   a peer-to-peer or video traffic versus, you know,

2   a peer-to-peer music traffic.

3   I think that's going down a wrong path.

4   Definitely, it goes against the principles of

5   openness.

6   But if you were to tier based on the

7   service of your consumption of bandwidth, I think

8   that's appropriate. Just because as your costs

9   are directly related to revenue. And I think that

10   operators should be allowed to recover the cost

11   related to revenue, revenue related to cost, that

12   is.

13   But discriminating based on packets? I

14   think that just leads to a number of abuses that

15   could only curb innovation. Part of the benefits

16   that we're seeing on the iPhone is exactly -- or

17   even just the mobile web right now, or BlackBerry

18   app or Android -- is the fact that it has been

19   robust and open. And once you start discriminate

20   based on that, then the application developers who

21   can pay the most can then only get access to the

22   users.

1   This is going down a path where the

2   development cost becomes so high, then it becomes

3   who has the best interest. And at the end of the

4   day, the big companies will figure that out. But

5   I mentioned so many applications today that have

6   nothing to do with Google. These are just small

7   apps, three- or four-person shops that come up

8   with these crazy interesting ideas. That I think

9   everyone benefits from.

10   MR. OOMMEN: Okay, just --

11   MR. KNAPP: Okay, Laureen and Mathew --

12   MR. OOMMEN: I think I agree with Sunil

13   that we shouldn't be differentiating traffic.

14   However, I think it's also -- I think,

15   one point that he alluded to is very important for

16   us to understand this. There has to be a plan

17   that allows the user to consume, whether it's

18   X-amount of traffic, and once he is in that plan,

19   whether it's for the consumer's choice to see what

20   he wants to do, and it does not necessarily in the

21   best interest to have that traffic being tinkered

22   anywhere along the path.

1   But I would again highlight it is also

2   important that that application does not hamper

3   the network. Because we -- you know, everyone

4   keeps talking about security. I know we talked

5   about a one-instance case. It's kind of like an

6   insurance policy. Right?

7   Today at Sprint, whether you call it

8   Google Voice, whether you call it Skype, you call

9   it whatever you want, we at Sprint don't mess with

10 anybody's traffic. We allow all kinds of traffic.

11 However, we have certain terms and conditions,

12 just like we drive on the highway. You know, you

13 can do whatever you want, but there are within

14 certain rules.

15   So, we don't tinker with it. But we

16 still believe that there has to be a business

17 model and the customer has to adhere to the

18 business model, not managing the profile of the

19 traffic.

20   MR. KNAPP: Laureen?

21   MS. COOK: Actually, I would definitely

22 agree with what Mathew and Sunil on that.

     1   Non-discrimination unless the customer opts for

     2   it.

     3   We take a look at a 3G service provider

     4   right now in the UK, Blyk. Their whole business

     5   model is built around advertising. However, when

     6   the customer subscribes to their service, they

     7   know that that's part of the deal because they're

     8   getting next to free airtime. So, as long as the

     9   customer is aware and he opts in and agrees to the

    10   service terms and conditions, that's fine.

    11   MR. LIEW: That was the question, right?

    12   MR. KNAPP: Right.

    13   MR. LIEW: Is that, should you be able

    14   to discriminate based on the price that a customer

    15   pays?

    16   MR. KNAPP: Yeah. I feel like -- I

    17   think it was also, though, from the sending end,

    18   too. But I don't think we have to dwell on it

    19   anymore.

    20   MR. HSIEH: I would hate to see anything

    21   -- I mean, there are going to be applications

    22   where the quality of the experience will be

1   determined by the network. And so, I'd hate to

2   see anything that prohibited the ability to use

3   the network in a particular way to provide a

4   higher quality of experience.

5   MR. KNAPP: Okay. Another question. Do

6   the panelists agree or disagree with the premise

7   that the nation's network backbone must be fiber?

8   If so, how far out must the fiber reach? To the

9   home or to intermediate points?

10   Anybody want to take a try at that?

11   MR. DALUVOY: I think from a policy goal

12   we should try to get it to the home, as far as we

13   can.

14   MR. HSIEH: More is better.

15   MR. DALUVOY: Yeah.

16   MR. KNAPP: More is better.

17   MR. OOMMEN: I think I'm of the same

18   opinion. More is absolutely better. But we need

19   to make sure that the affordability factor is also

20   taken into account in that context. Because

21   without affordability -- you know, you want

22   someone to be willing to pay for. And there has

1   to be a business model around anything that we're

2   trying to do.

3   MS. COOK: Absolutely. More is better.

4   But at what price?

5   MR. NEWMAN: (inaudible) fiber.

6   MR. OOMMEN: Yes. I think more is

7   better. So that means if you can get the fiber

8   inside the home as well for the right cost

9   structure? Yes. I mean, that was, I think, the

10   general consensus of the panel.

11   MR. NEWMAN: But earlier panel, though,

12   talked about fiber fed wireless. And maybe

13   wireless is good enough if the fiber's close

14   enough.

15   MR. OOMMEN: It's -- again, so that's

16   another can of worms.

17   MR. DALUVOY: It's different policy --

18   sorry --

19   MR. OOMMEN: Sorry, go ahead.

20   MR. DALUVOY: From a policy objective, I

21   think is the goal. You may not get there --

22   you're not going to get there right away. But

1   just in terms of encouraging deployment of fiber

2   as far down into the network as possible should be

3   objective. I think that you'll never, you know --

4   not never, but it'll take several years in which

5   complimentary technologies will close that

6   endpoint.

7   MR. OOMMEN: So, in fact, that's exactly

8   what I was trying to just add to what Sunil's

9   saying is, you know, at the end it's spectral

10   efficiency. How many bits can you pump in within

11   a certain amount of spectrum? I don't know that

12   -- or rather, I don't believe that right now, we

13   have the luxury of having too much spectrum as

14   well. So I think in the near term, based on

15   technology and science for the near term as well

16   as the available spectrum, we will have to have

17   wireline technology embedded with wireless

18   technology.

19   It's not necessarily one versus the

20   other, which is why it is paramount that we need

21   to have this end-to-end relationship up and

22   working. It's not just one piece or the other.

1   MR. NEWMAN: I would observe, we have a

2   750 gigahertz -- I'm sorry, 750 megahertz pipe.

3   MR. KNAPP: I was wondering what you

4   were getting at --

5   MR. NEWMAN: I said is this a

6   millimeter?

7   MR. KNAPP: What's the factor of 10 to

8   the 3 among engineering friends or what -- we do

9   have a 750 megahertz clean pipe passing 90 percent

10   of the homes in the country called coax. Is that

11   enough?

12   MR. OOMMEN: It's definitely a start,

13   which is why doxys 3.0 and beyond has happened. I

14   mean, we have seen anywhere from 150 megabits to

15   250 megabits, you know, happening on a 6 megahertz

16   off that channel within doxys' of cable. Have --

17   you know, as part of a digital cable from a last

18   mile standpoint.

19   However, I don't think that is enough.

20   And I haven't seen it to be economical enough, so

21   let me just add that as well. It's not just a

22   question of speed at that point. It's a question

1   of cost and viability as well.

2   MS. COOK: We keep going back to

3   wireline and wireless are complimentary services

4   and cost effectiveness, and they're the two issues

5   that need to be looked at.

6   MR. KNAPP: Does the expanded deployment

7   of fiber help wireless deployment for backhaul? I

8   mean, how critical is it for that in this issue we

9   were talking about before, for rural coverage?

10   I mean, if you got the fiber out to the

11   small town and then -- so, how important is that?

12   How much of a help is this?

13   MR. OOMMEN: I think it's a huge help.

14   MS. COOK: Huge.

15   MR. OOMMEN: I think it's a huge help.

16   We just need to make sure it is given to the right

17   guys so that we can -- the rest of the general

18   public have access to it at the right price.

19   MS. COOK: You've got to look at the

20   global picture --

21   MR. OOMMEN: I think it's a huge one --

22   MS. COOK: Yeah.

         1   MR. KNAPP: David, this is more directed

         2   -- I've had the opportunity to come over to

         3   Cisco's facility in Washington and participate in

         4   a video conference worldwide, and it's terrific.

         5   I'm -- can you say a little bit more

         6   about what the company's experience has been and

         7   how extensively this is being deployed and what

         8   you think of the realistic visions for how it

         9   might change back business practices?

        10   MR. HSIEH: Sure. So, some -- you know,

        11   relatively interesting statistics.

        12   I mean, first of all, you know, one

        13   thing we've learned is that there's a sort of a

        14   tipping point in usage of video, when you get sort

        15   of the right formula. So if you look at, for

        16   example, the typical deployment of video

        17   conferencing. So, traditional video conferencing

        18   -- even high-def video conferencing, by the way.

        19   In most organizations, their utilization is

        20   usually less than -- for 90 percent, it's less

        21   than an hour per day per system. And in fact, in

        22   many organizations -- and you can all check inside

1   your own organizations -- it's less than 20

2   minutes per day per end point, which is not a

3   whole lot.

4   Across people who use TelePresence --

5   and it's not just Cisco TelePresence systems. Our

6   competitors have the same data. Most TelePresence

7   endpoints get, you know, four, five, six-plus

8   hours of usage per day per endpoint across their

9   entire system of endpoints.

10   So, you know, you're seeing a sort of a

11   several order of magnitude increase in usage. And

12   it's because, I think, the -- you know, we created

13   it -- you know, we've reached a tipping point in

14   the quality of experience where the immersive

15   qualities of the interaction make it useful for a

16   much broader set of applications than you would

17   with, you know, other types of video technologies.

18   You know, today there are, you know,

19   roughly about 1,000 around the planet that have,

20   you know, reasonable deployments of TelePresence.

21   But even in a, you know, global economic downturn,

22   you know, the TelePresence market is growing at

1   well over 100 percent year over year. So we're

2   seeing a, you know, tremendous growth as companies

3   look at this as a way of, you know, reducing air

4   travel and improving internal efficiency. And,

5   you know, globalizing their operations in a

6   productive way.

7   And I was actually thinking as I was

8   coming up here that the next time I come, I would

9   like to visit via TelePresence.

10   MR. KNAPP: Yeah, we could have you --

11   MR. HSIEH: And you could just put a

12   monitor right here, you can beam me in via

13   TelePresence, I'll do this from my office.

14   And you wouldn't lose anything. Because

15   me being here in person didn't, you know --

16   wouldn't add anything versus me being here via

17   TelePresence.

18   And I would invite all of my fellow

19   panelists to attend via TelePresence as well.

20   SPEAKER: You know, that's --

21   MR. MILLER: Nevertheless, we

22   appreciated you coming.

1   MR. HSIEH: Yeah, right.

2   MR. OOMMEN: To make that pervasive from

3   a form standpoint or from a connected car, I think

4   that is an outstanding application to have

5   TelePresence across the screens and across various

6   domains of your blended lifestyle.

7   MR. HSIEH: And, you know, just as a

8   side to this, you know, TelePresence has

9   applications beyond meetings or beyond, you know,

10   social purposes. Cisco, for example, have done a

11   number of trials of something we call

12   HealthPresence, which is actually a

13   TelePresence-enabled, you know, video medical

14   kiosk which is designed for rural communities.

15   And we did a very successful pilot with the

16   National Health Service of Scotland where they did

17   exactly that. And, you know, we showed some

18   phenomenal results in the improvement of quality

19   of care, accessibility of care in rural

20   communities that had, you know, no doctor service

21   whatsoever and were able to, you know, go to their

22   neighbor, you know, their, you know, local

1   HealthPresence system and, you know, meet with

2   the, you know, type of doctor, whether it's a GP

3   or specialist that, you know, could help treat

4   their conditions.

5   And it was incredibly effective.

6   MR. KNAPP: As we come to the close, I

7   mean, one of the takeaways, at least for me -- and

8   tell me if I'm -- if I have it right or off base,

9   you seem to be supporting, first of all, that

10   everybody should have some level of access,

11   however it's defined.

12   Jeremy, I didn't hear you say a

13   baseline. Your assertion is we'll just get them

14   connected and they'll want more and more and

15   that'll drive the market.

16   And also suggesting that there might be

17   tiered levels of service. So, not everybody

18   necessarily is going to need the robustness for

19   TelePresence, but they would pay for different

20   levels of service in tiers. Is that what I've

21   been hearing?

22   MS. COOK: Yeah.

1   MR. KNAPP: And keep it open. Is that

2   kind of the --

3   MR. LIEW: And accept some level of

4   frivolity in the uses.

5   MR. KNAPP: Accept frivolity.

6   MR. LIEW: And that's the -- you know,

7   that's -- I mean, I think that's sort of one of

8   the things you need to sort of be prepared for

9   from a public relations perspective as well

10   because you're going to get a lot of, you know,

11   frivolous use.

12   MR. HSIEH: Actually, I thought Sunil

13   had an interesting point about, you know, whether

14   we can tie together, you know, other initiatives

15   to sort of help on the demand side for broadband.

16   Right? Because, you know, we can make the

17   business model more effective for the service

18   providers, you know, if this attached not just to

19   a broadband deployment initiative. But it's tied

20   to a smart grid or energy initiative, and a health

21   initiative, et cetera. And to the extent that,

22   you know, you can coordinate policy on that and

1   help, you know, create incremental demand? I

2   think that would actually be a phenomenal

3   achievement.

4   MR. LIEW: I think this is exactly the

5   tension --

6   MS. COOK: That would help stimulate.

7   MR. LIEW: I think this is exactly the

8   tension because these are such noble enterprises.

9   And you can talk about TeleHealth and, you know,

10   you can talk about smart grid, and these are

11   things that everyone can believe in and get

12   behind. And you switch it on, and people are

13   going to start playing games. And you'll be like,

14   whoa.

15   MR. KNAPP: No, they'll do both.

16   MR. LIEW: Where's my TelePresence?

17   MS. COOK: They'll multitask.

18   MR. LIEW: They will eventually get to

19   these things, but they won't happen right away.

20   And you've got to be prepared for that lag.

21   MS. COOK: Right.

22   MR. OOMMEN: See, when Jeremy talked

1   about the $100 laptops, right? I mean, for kids

2   to play with, that is a starting point. But we

3   ask the policymakers from an FCC standpoint,

4   stimulating the economy from a health care,

5   energy, and education as core fundamental building

6   blocks for making, and where broadband is an

7   enabler layer, I think it's phenomenal. And for

8   us to be the leader in that space, I think there

9   is a great opportunity in front of us today with

10   the 4G entry path, just again making sure that the

11   wireless and the wireline component -- and I will

12   reiterate that -- are complimentary. One cannot

13   necessarily replace that in the near term.

14   So, we need to make sure that the

15   wireline processes and the policies are

16   complementing the wireless policies and processes.

17   MR. NEWMAN: Can I give a homework

18   assignment to this group, then?

19   SPEAKER: Do we get graded?

20   MR. NEWMAN: Yeah.

21   MR. KNAPP: They probably want me to cut

22   it off right now, Stagg.

1   Go ahead.

2   MR. NEWMAN: Jeremy, you've got the

3   bankroll. Google, you've got the information.

4   Cisco, you make pretty cool devices nowadays, you

5   got into the consumer market. Alcatel-Lucent,

6   you're in the network market and you've got the

7   network. Design an emergency pendant that we can

8   all wear that when we're in trouble, it's going to

9   either call the police, the fireman, or the

10   doctor.

11   MS. COOK: In reality, it already

12   exists.

13   SPEAKER: Sounds like my homework's

14   done. All right.

15   MR. NEWMAN: So, how does -- what does

16   the government have to do so that everybody has

17   one of these, we're wearing it, and it's

18   cost-effective?

19   MS. COOK: It's part of the ecosystem of

20   LTE.

21   MR. DALUVOY: A tax credit?

22   MR. NEWMAN: Okay. Those are the type

1   of ideas. This is a homework. Come back and say,

2   okay, we can have it -- you know, how do we --

3   you're saying the piece parts are there.

4   SPEAKER: Yeah.

5   MR. NEWMAN: How do we get it out there

6   so that we're all benefiting from that?

7   MR. OOMMEN: Yeah. From an end-to-end

8   standpoint.

9   MS. COOK: We're working very closely as

10   Alcatel- Lucent in that ecosystem to help bring

11   these new services and devices to the forefront of

12   launch of LTE as we speak, so issues around smart

13   metering, e-learning, e-Health care, it's all

14   there. It's just a matter of having economies of

15   scale, rolling out the networks, and getting it

16   out there.

17   MR. HSIEH: You know, I was thinking

18   that, you know, we've had Cash for Clunkers, and I

19   was reading this morning that there'll be Cash for

20   Appliances. And so, maybe the FCC could help lead

21   Cash for Communications as sort of the next

22   initiative.

1   MR. KNAPP: I can't close on a better

2   note than that, so.

3   MR. HSIEH: Trading your dial-up modem

4   for broadband. How about that?

5   MR. KNAPP: I want to thank all of our

6   panelists. And it's been terrific.

7   (Whereupon, the PROCEEDINGS were

8   adjourned.)

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