

THE BROOKINGS INSTITUTION

MAXIMIZING THE BENEFITS OF BROADBAND

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

MR. WEST: Good morning. If we could have everyone sit down, we will start our program. I am Darrell West, vice president of Governance Studies and director of the Center for Technology Innovation at the Brookings Institution. And along with Rob Puentes, I'd like to welcome you to this forum on the future of broadband.

Broadband is a major driver of economic growth and civic engagement. Through the connectivity that it provides, it makes it possible for consumers, businesses, and governments to communicate with one another and engage in a wide variety of activities. Every day we're seeing new applications in education, health care, energy, communications, and transportation, among other things.

The Internet of things is enabling the growth of sensors, remote devices, and machine-to-machine communications. In this situation, it is vital that we have a fast, universal, and open broadband. Last week, the Federal Communications Commission approved a plan to subsidize broadband Internet access for underserved Americans through the reform of the Lifeline program. There's hope that we can close the digital divide and bring the benefits of technology to all people.

Today we are very pleased to welcome Tom Wheeler to Brookings. Tom, as you know, is the chairman of the Federal Communications Commission. For over three decades, he's been involved with telecommunications and technology. As an entrepreneur he started a number of different companies offering innovative cable, wireless, and VITO communications services. Prior to joining the FCC, Chairman Wheeler was a managing director of Core Capital Partners, a venture capital firm investing in early-stage IP-based companies. He also is the author of a new book that we highly recommend on Abraham Lincoln and the telegraph, one of the original technologies that helped power a new era of communications and commerce.

So, Mr. Wheeler will deliver a keynote speech that will be followed by a discussion moderated by Blair Levin. Blair is a nonresident senior fellow in the Metropolitan Policy Program at Brookings. He currently serves as the executive director of Gig.U: The Next Generation Network Innovation Project. That's a consortium of leading universities connecting through Next Generation Network. So, Blair also serves as an advisor to a variety of nonprofit organizations. Many of you know he also was one of the major architects of the U.S. National Broadband Plan that has helped put America on the path to a digital economy.

We will be archiving this event, so anyone who wishes to view after today will have an opportunity to do so through the Brookings.edu website. We also have a Twitter feed setup at #FCCLive. That's #FCCLive, so any of you who wish to post comments during the forum are welcome to do so.

So, please join me in welcoming Tom Wheeler to the Brookings Institution. (Applause)

MR. WHEELER: Thank you very much, Darrell, and to you and Rob for hosting this. It's great to be here at Brookings. I was saying to Darrell and Rob one of the really significant functions that this institutions provides is to become a place where policymakers and the public can interact on important issues. So, I'm really grateful to you for hosting this today.

Maybe we ought to start out today with a little broadband scripture. In the beginning (laughter), there was Blair Levin and the National Broadband Plan. (Laughter) The excellent work of the National Broadband Plan called our attention to the opportunities and challenges of broadband. The kind of work that is presently being carried on by the President's Broadband Opportunity Council continues that kind of forward-looking effort. And as Blair told us in the first line of the National Broadband

Plan, broadband is the defining network of the 21<sup>st</sup> century. Broadband networks facilitate today's economy and today's social activity.

But even more important than what they're doing now -- what it is doing - - broadband is doing now-- is what it is igniting in terms of new possibilities for the future. Thanks to broadband, the often unimaginable of today becomes the reality of tomorrow. We only have to look at a couple of facts that we now accept as common to see that. The largest taxicab company has no cars. The largest overnight-stay company doesn't own any hotels. And the fastest-growing of the top 10 retailers in America has no showrooms. What they do have is easy access to broadband, which enables them to assemble resources in new ways, to present them to the public in new ways, and to define an economic future that is task-based as opposed to production-based, pre-broadband activity.

We should not overlook, as well, that broadband is also the igniter of more broadband. As the success of broadband services increases the demand for broadband, it also increases the incentive for competitive broadband. And it's because of this two-pronged impact that our policy is to expand broadband and to ensure that our broadband resources are fully utilized. That means that we want to expand broadband geographically into areas where it doesn't exist. It means that we want broadband to be affordable for and adopted by all of our citizens. And it means that we want broadband to be open and free of any artificial inhibitions on its use.

So, here's the punchline. It's pedal to the metal on broadband policy for both consumers and competitors. Expanding broadband requires better network technology. It requires more competition. It requires that companies continue to invest to satisfy consumer demands for bigger, better, and more broadband. It requires that broadband providers not be able to limit competition in broadband-dependent markets

like apps and online services by invoking their gatekeeper power. And it requires the limitations on consumer demand, whether on the basis of geography or economic circumstances or disability, be removed. Simply put, broadband should be available to everyone everywhere.

My message today is simple. The job of the FCC is to exercise its authority with both determination and discretion so the technology, competition, investment, and consumer empowerment are able to work together to reach our nation's broadband goals.

As you probably know, I think history matters -- a lot. So, let's consider some history. Networks have been a defining economic force throughout history, and the victory laurels have gone to those who embraced the new networks.

The exciting part about our time is that while broadband and the Internet may be the most important networks in history, their effects have not yet been the most significant in history. The simultaneous emergence of the mid 19<sup>th</sup> century railroad and telegraph networks reshaped the economy and society of that time more than the internet, and all that it has produced has shaped ours thus far. And the key sentence -- the key phrase in that sentence of course is "thus far."

My conviction is that we are on the cusp when our broadband networks will prove even more transformative than the networks of the 19<sup>th</sup> century. And that belief is based on this new fact: Broadband networks are new in a new way. Broadband networks are new in a new way. And that new way is the evolution from hardware-based networks to ones that are software-based with a result that changes the nature of networks.

The effect of this is the virtuous circle where new applications are enabled by broadband, which drives the next generation of applications, which drives the

next generation of broadband in an ever-continuing cycle. There are multiple benefits of the network's evolution from hardware to software.

First, we're moving from networks with limited functions to a world in which software expands network capabilities and makes them available to a wide variety of nontraditional applications. As one person recently put it when describing this to me: Networks are moving from SIP -- from a SIP world to an API world. The result will unleash innovation in both networks and their applications.

Another impact of software replacing hardware is that the cost of expanding network capabilities decreases. In the old days it was necessary to add a physical circuit if you wanted to increase capacity. Today it's often just a matter of adding computing power.

Finally, the evolution to software-defined networks with virtualized components means that network operating expenses decrease. Verizon, for instance, reports that the replacement of central office physical switching systems with software reduces their real estate costs by up to 80 percent. What used to require floors and floors of switches can now be done with a few racks of computers for a fraction of the price -- of the space and price.

And the same holds true of energy costs. Powering a few computers can save up to 60 percent on energy costs as compared with powering endless switches. With all of these advantages of software-defined networks, the expansion of network capabilities, the economies available in expanding capacity, and the reduction in operating costs, it's no wonder that AT&T has said that by 2015 75 percent of their network will be controlled by software.

But this is not just about reducing costs and increasing functionality for incumbents. The effects of software-based networks are also good for consumers and

competitors, because they enable LECs -- the local exchange carriers -- to become more fulsome competitors to cable operators' dominant position in high-speed broadband.

So, thank you, Gordon Moore. Fifty years ago, Gordon Moore, the co-founder of Intel, posited what has become known as Moore's law, that the power of microchips would double and thus computing costs decline about every two years. The compound doubling every couple of years has meant that the 60 transistors that were on the microchip when Moore propounded that law are now over a billion, but the cost has remained relatively stable.

You know, we tend to think of Moore's Law in terms of how the smart phone in our pocket or purse now has as much computing power as a multi-million-dollar super computer of a few decades ago. But Moore's Law is also what is driving the revolution in network economics. Its ever less costly computing power magnifies the capacity of network connections.

For optical fibers, of course the result is optimal. But even for bandwidth-constrained copper networks, low-cost computing power allows transmissions to be broken into parts and sent over different strands to be reassembled at the other end, increasing throughput. And the same concept, called carrier aggregation, is increasing the throughput of wireless networks through increased processing power. That the nature of the network itself is changing right under our noses is a significant data point for those of us in the oversight business.

As the cost of delivering broadband goes down, the opportunity for broadband expansion including competitive broadband expansion and broadband innovations goes up. This means that we're not going to let imaginary concerns about investment incentives in the omnipresent bogeyman of so-called utility regulation cause us to let up on policies that encourage fast, fair, and open broadband.

Since we come together today on the heels of the DC circuit's decision rejecting requests to stay the Open Internet Order, let's begin by addressing the relationship between broadband network openness and investment. As you know, the big argument of the ISPs and their stay request was that somehow ensuring that networks would remain open would erode their incentive to invest. Fortunately, there is a disconnect between what is said in Washington advocacy and what happens in real life.

While a few big dogs are threatening to starve investment, others are stepping up. The CEOs of Sprint, T-Mobile, CableVision, Charter, and Frontier Communications have all publicly said that Title II regulation does not discourage investment. Recent transactions, both announced and rumored, point to the same conclusion. And of course the post-Open Internet announcements by AT&T, Bright House, CenturyLink, Cincinnati Bell, Comcast, Cox Cable, TDS Telecom, and Time Warner Cable about their plans to expand their broadband service certainly speak for themselves. Yet there are a group of broadband providers who feel that the movement from analog to digital transmission should be their ticket to escape what I've called the network compact, those responsibilities that have always governed the relationship between those who build and operate networks and those who use them: access, interconnection, consumer protection, public safety, national security.

Here's a simple statement of fact: Broadband is the most powerful and pervasive network on the planet. And giving credit where credit's due, that's a line I first heard from Blair Levin. Broadband is the most powerful and pervasive platform on the planet. Suggestions that that kind of platform, that kind of pervasiveness, that kind of network can exist without oversight are unthinkable. But the kinds of oversight, designed by the Open Internet Order, are a new regulatory model designed for these new network times.

I keep describing this oversight as a referee on the field who can throw the flag. In our implementation, I plan to adhere to the wisdom that the best referees do not make themselves part of the game unnecessarily. As a proud disciple of Woody Hayes and Urban Meyer, I believe the players should be allowed to play. Referees make sure the game is played fairly. They don't call the plays. It will be up to the competitors, for instance, to advocate for themselves in negotiations with other competitors. Our job isn't to substitute the FCC for what should be hard-fought negotiation and tough competition. It's up to the players to compete hard against their opponents. But make no mistake about it. If they violate the rules, we'll blow the whistle. We're arbiters of the last resort, not the first resort. We will not micromanage networks as was done in the pre-broadband days. This means no retail rate regulation, no network unbundling, and no tariffs. In short, none of this bogeyman-of-utility regulation.

In that environment, at a time when consumers are demanding better broadband, why would a rational broadband provider not make the investment to give it to them? The answer, of course, is only if competition is lacking, only if consumer demand is artificially limited. Companies invest to win the race of competition if there is a race. As we push onward into the broadband future, our challenge continues to be ensuring that the preconditions for broadband ignition are as widespread as possible, and the best tools for accomplishing that are competition and consumer demand.

So, let's be clear. We're not going to let up on protecting and promoting broadband competition. As I've made plain on innumerable occasions, competition is paramount. It is the best assurance of industry dynamism, that opportunities for improvements in quality and reductions in cost will be pursued assiduously, and that the benefits will be shared with consumers. Suffice it to say that continuing to protect and encourage a competitive marketplace is a foundational requirement of our responsibilities

at the FCC.

Our skepticism about the competitive impact of the proposed Sprint/T-Mobile merger a year ago and the recently abandoned Comcast/Time Warner cable merger are evidence that we take seriously our responsibility to protect competition. But protecting competition is only half of the equation. Our job is to promote competition as well. We know broadband competition works. Just look at cities like Kansas City and Austin and Lafayette and Atlanta and Chattanooga. The arrival of even one well-equipped broadband competitor causes significant competitive response from incumbent operators with qualitative improvements benefitting consumers of incumbent and insurgent companies alike.

The Commission will continue to look for ways to promote broadband competition. One way is to lower some of the cost of the extending broadband facilities. We dealt with the inability of competitors to get access to poles and conduits in the Open Internet Order. And building on that, we're now undertaking an effort to better align the costs of using poles and conduits.

Perhaps the FCC's most tangible role in growing broadband is to allocate and make available both licensed and unlicensed spectrum necessary for competitive wireless broadband. Our use of auctions, a competitive device in their own right, for assigning licensed spectrum is well known and, in most quarters, well celebrated. Making available spectrum for unlicensed use draws less public attention, but as the remarkable success of Wi-Fi demonstrates, it is literally an indispensable element in the provision of broadband today. And if "more indispensable" is a permissible concept, it will be more indispensable to the broadband of tomorrow.

I've recently spoken to Chairman Walden under whose leadership the Incentive Auction Law was created. We are of one mind. There will be an incentive

auction in the first quarter of 2016.

When I came on board at the agency, the question of whether the broadcasters would show up for the incentive auction was a matter of debate. Well, of course this is a voluntary decision by each broadcaster, governed by the ultimate free market, an auction. I'm quite encouraged by what we've been hearing from broadcasters.

While we're talking about spectrum, we should not overlook the role it will play in determining who the international leader in 5G broadband networks is. This nation is the international leader in 4G LTE as a result of the availability of spectrum to become a home for LTE. We do not intend for the United States to lose the pole position in the international wireless broadband race. We will maintain that leadership in the same way we obtained the leadership in 4G -- first, through being out front in allocating the appropriate spectrum and, second, by allowing carriers to deploy 5G service in any frequency band they find suitable, including the 600 megahertz in the upcoming auction.

Another way to stimulate broadband is to increase opportunities for additional competition in upstream markets. That's why we proposed a rule to give over-the-top video providers the ability to choose the same business model as cable and satellite providers with the same program access rights. We expect to move that to a Report and Order this fall.

There is a new line of OTT providers queuing up to expand video choice and increase consumer demand for broadband. Demand for broadband is also affected by consumers' perceptions about the potential nonmonetary costs of using it. We committed in the Open Internet Order to address issues of privacy implicated by consumers' use of the Internet. We will begin that process with a Notice of Proposed Rulemaking in the Order.

And, finally, let me be clear. We should not and will not let up on our policies to make broadband more available. Converting universal service programs from their narrowband origins to broadband is among our most important initiatives. Chairman Genachowski began the reorientation from support of narrowband service to a focus on broadband. We have built on that by deploying \$10 billion over 6 years to 10 rural price cap carriers to provide broadband service to their customers. We have also begun a program to test nontraditional means of delivering broadband in rural areas. I have told Senator Thune that is my goal to similarly reform the broadband support program for small rate-of-return carriers. Commissioner O'Riley has played a significant role in this effort, including putting forth a set of principles. We're working with the affected carriers to explore the best approach.

We had been in search of a consensus proposal from the rate-of-return carriers that would help us meet the policy objectives that the Commission unanimously adopted in April 2014. Unfortunately, while I appreciate the carriers' willingness to engage, if we are to keep on schedule, time is not our friend. Absent a consensus from the parties involved, we will put forth our own proposal.

Just as we need to make sure that all parts of our country have broadband, we need to make sure that all our citizens are able to use it. Last year we modernized and expanded our efforts to address the broadband needs of schools and libraries. Our modernization of the E-rate program will produce an extraordinary return on investment and will do it very quickly.

But learning isn't confined to the classroom. As Commissioner Rosenworcel has pointed out, even though students can now connect at school, too many still experience a homework gap when they cannot get online at home. A recent Pew research study found that 5 million students -- that's nearly 20 percent of all students

between 6 and 17 -- do not have high-speed Internet service at home. It is simply unacceptable in an era when learning opportunities have never been richer or more available, but these students have to go to McDonald's or some other Wi-Fi-equipped location to do their assignments.

Our obligations and opportunities to extract more value from broadband do not end with our children. Another Pew study found that half of Americans who rely on smart phones for broadband access have had to cancel their mobile subscriptions because of financial hardship. Commissioner Clyburn has been championing the need to overhaul the Lifeline program to make it relevant in the 21<sup>st</sup> century. I support her efforts not only to rid the program of components that invite waste, fraud, and abuse but also to refocus Lifeline from voice services to broadband. We have recently adopted an NPRM to overhaul Lifeline. We will learn from that notice and then move on to reform and revitalize Lifeline.

Broadband access is also very important to another group of Americans, those who live with physical and intellectual challenges. Although our efforts do not receive headlines as much as some of our other activities, the application of information technology to attack the needs of Americans with disabilities will be a priority as long as I am chairman. We are, for instance, the first federal agency to harness broadband to allow those who use American Sign Language to communicate directly with the FCC using online video, a broadband effect. Several months ago we began urging all federal agencies to have an online video ASL capability.

To aid in this, the FCC is building a Web-based API platform that will allow any company or agency to plug in and utilize the power of broadband to do a simple thing: Help hearing-impaired Americans communicate.

The 25<sup>th</sup> anniversary of the Americans with Disabilities Act is coming up

next month. This is a great opportunity for all federal agencies to take the simple but significant step of harnessing online video for those who speak with their hands and hear with their eyes.

As I noted at the beginning of this presentation, we're closer to the beginning of the broadband network's promise than the end. The broadband-related agenda that I've described is key to ensuring that the technology's remarkable promise will be realized. If we succeed in accomplishing this agenda -- and I am determined that we will -- new generations of American innovators will be able to combine their technical abilities and entrepreneurial instincts with broadband's capabilities to produce great things, things that today we can't even begin to imagine.

Thank you very much. (Applause)

MR. LEVIN: I'll speak loudly while we're getting mic'd up, and just thank you for the kind words about the Broadband Plan and reference to the opening line of Genesis, but I have to say I always of thought of Reed as writing Genesis. The Broadband Plan was Leviticus and you're writing Deuteronomy, but (laughter) that story would have killed in North Carolina.

MR. REED: You tell them that's probably the Biblical sense then.

MR. WHEELER: That's so the first half of the story.

MR. LEVIN: Well, you know, there are judges, there are other things. But -- and I want to talk about your speech, but before I do that I want to talk about your book.

MR. WHEELER: But hold it higher, will you. Please, that's --

MR. LEVIN: Available on Amazon, and a cue for lawyers and lobbyists out there, you can never go back, according to Tom's book to himself.

But I do want to point out that you have been an opponent of

prioritization.

MR. WHEELER: Right.

MR. LEVIN: But in this book in which you say Lincoln was our most technologically sophisticated President, the only one to get a patent.

MR. WHEELER: Mm-hmm.

MR. LEVIN: You reveal that Lincoln supported prioritization, in fact gave AP -- the Associated Press -- priority in getting to the telegraph in order to get their stories out because they were generally favorable to Lincoln. So, my question to you, sir, is: If prioritization was good enough for President Lincoln, why isn't it good enough for Chairman Wheeler?

MR. WHEELER: Well, there you go again, Blair (imitating Ronald Reagan) (laughter).

MR. LEVIN: So true. I should note I discovered that reading as I do every month.

MR. WHEELER: Let me -- I'm glad you're -- are you only this far through?

MR. LEVIN: No, that's actually the reference to the point.

MR. WHEELER: I mean, it's a really good point. Here's what you've missed however. (Laughter)

MR. LEVIN: Uh-huh.

MR. WHEELER: Okay? The telegraph was the original open network. There was no prioritization in it. And a telegram was handled in the order in which it was received, okay? What your referencing is what really amounted to a form of new censorship that the Lincoln administration engaged in during the course of the war, and I would say that the realities of a wartime experience versus the kind of situation that exists

today is a little different, number one. But number two, remember -- always remember -- the telegraph, the first electronic network, was an open network.

MR. LEVIN: So, to be clear, you're opposed to prioritization but you're in favor of censorship -- your words not mine. (Laughter)

MR. WHEELER: It's always so much fun to sit down with you, Blair.

And we could talk more about his use of the A.P. but we won't.

MR. LEVIN: We won't. We'll move on it.

Yeah, you have to put a smiley face. If you quote me on that you have to put a smiley face.

So, now I'm going to go from, you know, snarky friend to actually kind of Brookings scholar and try to deal in some more serious --

MR. WHEELER: Serious snark.

MR. LEVIN: -- probably some more serious snark, yeah.

So, I want to tie together the speech you gave in September 1776 on broadband. In this speech, it becomes clear that one of themes of your chairmanship is how our country needs a lot more bandwidth and whether we get it -- and how we get it is, of course, interesting but we need a lot more bandwidth. And one of the things that we were trying to address in the Broadband Plan was how do we move from having ISP business models that are fundamentally based on the allocation of scarce bandwidth to empowering business models that are based on the deployment of abundant bandwidth? And interestingly, by the way, paid prioritization actually only works as a business model if you have scarce bandwidth. Once you get the gigabit connectivity, there's just no business model for it. You talked about this a bit, but when I hear you say "competition," what I actually hear is "deployment," that we need -- without some new deployment of abundant networks there won't be competition. Am I understanding that right?

MR. WHEELER: Yes. Yeah.

MR. LEVIN: And I think you actually said this, too, that government has an obligation to lower the cost of the inputs. I want to talk about both wireless and wired. Obviously, on the wireless side, spectrum is the key. And I would say that this administration and you have done a great job. You know, when we arrived with a broadband plan, there was no spectrum to cover. You ran the most successful at least in terms of money but I would say, actually, in deploying spectrum that wasn't there before the AWS3 spectrum. You've also done things -- and the administration, Larry Strickland, others played a role in that -- you've moved spectrum to higher-value uses. Also in terms of sharing, you talk about the incentive auction, and that's obviously very important, but are there other things that you can do in your time to create new spectrum? And I might just note CTIA just released this week a study that pointed out we got our demand side estimates right, which astonishes me actually -- I thought we were just making them up -- but it turns out that the guys who actually did the study were quite good. But we still are -- even with all that you've done, we're still running behind. Are there other things you can do to get more new spectrum for higher uses?

MR. WHEELER: Yes. I mean, first of all, it's an activity that is always underway to say "where can you find new spectrum?" But the reality is, as Mark Twain said about real estate, they aren't making it anymore. And so there's a new paradigm that has to develop both in the marketplace and the regulatory environment about spectrum that I think is based on two realities.

First is that everything in the world is economic, okay?, and that people who say, "I'll never part with my spectrum" -- if you can help them see the economic value in parting with that work, having a different approach to their use of the spectrum, it often can let the scales fall from their eyes. And that's what auctions do. And that's what

the incentive auction is doing.

The second paradigm shift is the concept of sharing, that spectrum used to be allocated on the basis of, well, this is the size of the analog waveform, and so we've got to have a block of spectrum that will allow that to operate and we've got to have guard bands on the side that will make sure that no other waveform interferes with that. And in a digital world, that all goes by the wayside and sharing becomes much more possible. And one of the things that I believe is going to come out of the spectrum auction is increased channel sharing where broadcasters will say, I'm going to take this 6 megahertz block, which is the size that was historically there for analog purposes but which can have five or six different digital channels in it and we'll share those. So, I think that we're moving from a concept of "it's mine" to "I've got to share it." That's going to require some transformation in thinking. And also we're moving to an environment where the economic issues can be -- where economic forces can help decide these kinds of issues.

MR. LEVIN: Yeah, and with the multi-pronged approach -- some sharing, some licensed, some unlicensed, all of those things -- one of the things that I often find in policy debates in Washington is people see things in black and white instead of kind of the multi-pronged approach. I assume that one of the things you're saying is we need a lot more for licensed, we need a lot more for sharing, we need a lot more for unlicensed.

MR. WHEELER: And the fact of the matter is that you're going to have to be sharing inside licensed, and you're going to have to be sharing inside unlicensed as well. The procedure's PN that we put out on the auction yesterday, day before, laid out how in some instances it is ridiculous to say that in this big licensed area, because we've got some interference over in this corner, that everything else should not be available.

That's a geographic sharing concept. Then we've got sharing, as I said, inside the same band. So, I mean, I think sharing is both a licensed and an unlicensed kind of activity and opens up opportunities in both.

MR. LEVIN: Yeah. So let's move to talking about the wide world. You talked about it a bit and, indeed, in the last 12 months there's been a number of really promising announcements. One of the things we talked about on the Broadband Plan was the need to remove -- to lower both the cost of inputs, key inputs -- like you were talking about with poles -- and remove barriers at the federal and the state and local levels. A lot of cities have been changing the way they do business.

The Commission has taken away one of the key state barriers, which is loss preempting municipalities -- obviously, that's in court -- but I want to talk about at the federal level, both other things the FCC might be doing and also -- and you mentioned it -- the Broadband Opportunities Council, that the Department of Agriculture, Department of Commerce are co-chairing. I might know something that we called for in the Plan -- Recommendation 17.2 for kind of an ongoing multiagency task force to make sure there aren't barriers. How do you look at the process? What are your hopes for that? And also what do you plan on doing in your time to help wire deployment?

MR. WHEELER: Well, I think the Broadband Opportunity Council is a terrific structure that only can be done at the highest levels of government where everybody has to look at "what are the things in my policies that have an impact on broadband?" You know, I mean, there are obvious things, so can we have a dig-once policy with highways? Can we lay fiber when roads are opened up for EPA sewer grants? And multiple other kinds of things. And so the fact that the President has convened this kind of a group to say, okay, we're going to get introspective in our agencies and say, what is it that--not because of malice of forethought-- but we just never

thought about they head of broadband impact is really important.

Insofar as what we're doing, I mean, I kind of went through the list. I mean there are -- you know, we're dealing with poles; we're expanding Lifeline. The privacy issue, which I think probably we just had a sentence or two in there about, I mean, it's integral to the growth of broadband. If consumers worry that they don't have sufficient privacy online, why are they going to use online? And so we need to deal with that.

There's a generic issue, Blair, which is this whole transition from an analog TM-based environment to an IP environment. And we want that to happen. And so one of the things that we're going to be dealing with is how do you encourage that transition? At the same point in time, how do you make sure that you don't decouple it with the societal protections that have always existed in terms of our relationship with networks? And so that becomes a huge component of where we're going.

MR. LEVIN: Yeah. I want to switch topics from the networks to the adoption side and start by just noting an interesting announcement by the Markel Foundation about a way of both upgrading the skills of American workers as well as helping them find jobs by using LinkedIn and EDEX. It's actually -- we talked about this a bit in Chapter 13 of the Plan but, really, using that platform -- and it ties right to what you said about education, it doesn't just remain in the classroom -- part of it is to make sure we get broadband, that everybody has access to broadband where they live. And this, of course, brings up the Lifeline proceeding, which you're now looking at.

One of the things that was curious to me was the press focused on the political disagreements. But, as I kind of read beneath them, there did seem to me to be three core principles that I think there was actually consensus about. Number one, the broadband is the core communications service, and when Congress talks about universal

service, whether it be to rural areas or to schools or to individuals, it's going to be broadband.

Secondly, the problems of waste, fraud, and abuse really come from the fact that we have carriers do the certification. I'm not blaming the carries; I'm just saying that process leads to that, and there are many ways that we -- we need to take that certification responsibility away from the carriers.

And the third is we need to use market forces much more effectively to increase the value that the participants get. Am I seeing that wrong? Because there was a lot of focus on the partisan disagreement, but on those three principles I thought there was actually kind of agreement?

MR. WHEELER: You know, I think that's correct. It's a matter of degree, but I think that you've outlined the three corners, if you will, the three legs of the stool.

MR. LEVIN: Mm-hmm. Well, great, and I might note Ron Klain, who I know you know who just has many important jobs in government, did a really excellent piece on Democracy --

MR. WHEELER: Democracy -- I read it. Yeah, it's an excellent piece.

MR. LEVIN: -- on inequality and the importance of doing these kinds of things.

I'm going to ask one more question, and then we're going to open it up for questions from audience, and we're going to run about five minutes late -- or over our original time.

So, I want to start by saying you're the first non-lawyer chairman in quite a while at the FCC, and so in particular I want to congratulate you on two very major victories in the courts the other day on both the Title II --

MR. WHEELER: Well, you know, I wrote them all personally.

MR. LEVIN: Yeah, I know, and I was very impressed. And you were ready to argue the case that that called for -- and also on the auctions. But I want you to -- I always tell you while you're on the job you can't play historian. You've got to be decision-maker, and it's a different thing.

But I want you to play historian for a second. When I think back on my first stint at the FCC, one of the things that's interesting about what Reed did was there were a couple of decisions that got no controversy. They were really largely ignored. But I think, in the fullness of time, we saw them as being far more important. One was speeding up the digital television transition, which you and I worked on together in transition. By virtue of getting that spectrums out in 12 years rather than 30 years, which was the original plan, that created the foundation for 4G, as you said similarly we need to create a foundation for 5G.

The other was basically the elimination of terminating access for data and wireless and a longer story. But those things turned out to be incredibly important. In some ways I actually think you've done an interesting job of creating -- eliminating, terminating barriers for over-the-top video that I think is now fully appreciated. But I'm wondering as a historian, if you go forward 10 years and then look back at your time, what do you think will be the most underappreciated decisions today or ones that we're not looking at, that 10 years from now, again in the fullness of time, we'll say, really were important?

MR. WHEELER: Well, let me -- I don't know if most under-appreciated, but of the ones that are, attention isn't being paid to right now. As I indicated in my remarks, I feel, we feel, very strongly about the incredible opportunity that technology offers to help Americans with disabilities solve the challenges that they have. And we have -- the first meeting I had at the Commission with any outside group, I asked all the

disabled groups to come in and sit down and say let's talk about how we apply technology to solve the challenges of Americans with disabilities. And we will keep doing that, and the idea -- I mean, we've been through closed captioning; we've been through text to 911; we've been through a program that puts equipment out for people who cannot hear or see but can still use broadband. I talked about this open platform that we're going to have so that people can communicate. And we will keep pressing that agenda, because I think it basically comes down to this. If we are fortunate enough to exist in a time when technology can be applied to historical barriers that people have never been able to overcome before and we don't seize that and chase that as hard as possible, then shame on us. So, I think that's the thing -- I hope that that's the thing that we're doing that nobody's really paying attention to but will have a lasting impact.

MR. LEVIN: Well, thank you, certainly, for that.

And with that let me open it up to questions from the audience.

Cecile.

MS. KOHRS: This is Cecile Kohrs from TIG Advisors. Thanks for taking the call and the question.

MR. WHEELER: Hi, Cecile.

MS. KOORS: I wanted to ask, how do you envision the overbuilding of playing out and how do you envision -- how do you see promoting that, given the fact that it's not really cost effective at this point?

MR. WHEELER: Well, I think what I was saying is that the economics are changing, which I think is encouraging for those who believe in multifacility-based competitors. I also think that there is intermodal competition that is going to increase. That's one of the reasons why spectrum and 5G in everything is so important. And I think we just cannot accept the reality that, well, there's only going to be one provider and

we've got to do everything possible to make sure that we're creating an environment for multiple providers.

MR. LEVIN: Woman in the back. Yeah. That was you, yeah. Not that far back, sorry.

MR. WHEELER: Not that far back.

SHARON: Thank you. Sharon Dugat, *Voice of the Moderate*. I've been trying to understand this issue for average people. I'm -- you know, because there's been such lobbying about the censorship issue and all these different issues that have been -- I guess it's propaganda by certain lobbyists. But if you were to have to explain it in one paragraph or a quick sentence to, maybe, your mother or maybe an eight-year-old grandchild who actually probably know more about tech than I do -- but if you could please just explain it quickly to the average people what we're fighting for with the broadband issue. Thank you.

MR. WHEELER: I think it's a simple question, that because broadband is the definitive network of the 21<sup>st</sup> century, we want to make sure that it is fairly available, that it is fast and growing in terms of its continual increase in throughput and that is open. And "open" means not only open to those who want to pass through it but open to those who want to get access to it so that they can have the benefit of what passes through it.

MR. LEVIN: Yeah, right there.

SPEAKER: Thank you. Very quick question.

MR. LEVIN: Could you speak into the mic so people can hear you?

SPEAKER: You talked about how licensed and unlicensed spectrum are peanut butter and jelly and not oil and vinegar and that --

MR. WHEELER: I should have followed that line. Peanut butter and jelly are not oil and vinegar.

SPEAKER: I believe that is your line.

MR. LEVIN: Take credit for it.

MR. WHEELER: I'll take it. (Laughter)

SPEAKER: And that --

MR. WHEELER: I thought it was chocolate and peanut butter. Anyway, go ahead, yes.

SPEAKER: Licensed spectrum holders need to understand that they have to accept more tolerance on interference. Can -- you've been chairman now for about 20 months. You've mentioned the oil and vinegar, I think, and the tolerance when you were chairman of the TAC. Can you outline some or mention some of the success stories that you've had on this one convincing licensed users that they're going to be having to share that spectrum? And do you have current or future initiatives on the existing spectrum that's out there now?

MR. WHEELER: So --

MR. LEVIN: Thank you. Good question.

MR. WHEELER: It goes back in part to the question that Blair asked a moment ago. There is a process of how you think about spectrum that is necessarily evolving. And it used to always be it's mine, you can't touch it. But because of the increase in demand for spectrum, that has to change and sharing has to be an important part of it.

I saw a presentation a couple of days ago that said that something like 60 percent of licensed mobile traffic is now carried on unlicensed Wi-Fi, and so at one point in time these two were just bitter enemies. I remember when AT&T wireless was the first to have interoperability with unlicensed and everybody said, oh, my goodness, you're giving away the store. I think we are going through a process -- an evolutionary

process in which the outcome has to be the recognition that spectrum is something that has to be shared, that there are definitely rights to make sure that it's not -- that people don't get walked all over and their capabilities destroyed. But the technology is helping us work our way through. So, I'm a big believer in the future of sharing a limited resource.

SPEAKER: (off mic)

MR. WHEELER: What? Yes, so we got -- I mean, all the things we're doing, you know, in 3.5 and new rulemakings we've had that we put out in the PM for the spectrum auction. I mean, the thought of how do you share spectrum is in damn near every spectrum discussion we have.

MR. LEVIN: Final question will come from the person in the corner there, if we can get the mic over to him.

Let me just say that when Chairman Wheeler is done, everyone stay in their seats. He needs to leave. He's running, actually, a little bit late so we need to let him get through. And, again, let me just say; available at Amazon, never hurts to quota; final question. (Laughter)

MR. WATNEY: Thank you. My name is Caleb Watney with the *American Action Forum*. My question is, obviously trying to expand access to broadband is extremely important, and I'm glad it's your goal. But using the right metrics is key to seeing how we're doing on that metric and, you know, trying to measure it. So, doesn't reclassifying broadband as 25 megabytes per second, as you did in January, conceal the true progress that's been made on this front, especially when your own Website lists 15 megabytes per second as advanced for consumers? Thank you.

MR. WHEELER: I understand what you read. I'm not sure what the question is. You're saying, is 25 meg a bad decision? Do you not like -- I mean, the

reality is that something like 82 percent of Americans now have access to 25 meg. That sure sounds like a standard to me.

MR. WATNEY: I mean, I guess the key metric I was looking at was specifically between rural and urban. If you look at 10 megabytes per second, which was, you know, the previous standard or around there, you know, it's something like 98 percent, 97 percent between rural and urban.

MR. WHEELER: Right.

MR. WATNEY: And then if you go up to 25 megabytes per second, it goes up to, like, 97 and 50.

MR. WHEELER: Right.

MR. WATNEY: So, I think it can be kind of confusing to see how much progress we've actually made on this front in terms of getting access. And so that's why I'm concerned that the 25 megabytes is too high.

MR. WHEELER: So -- well, like, I think I answered the question about, you know, if it's 82 percent or 86 percent, whatever that number is. That's a per se standard, I believe. The point that you raised about rural -- and what we've done in the Universal Service Fund is to set 10 megs. We're not going to give you money unless it is at least 10 megs, because we're living through an evolutionary process there. I think we want to be in a situation where we are saying this is what we should be pointing to. I would like to be pointing to, at some point in time, something beyond 25 megs, because the reality is as users increase, as contention increases -- you know, that the average home now has something like seven connected devices, and if they're all going, they going to choke even 25 megs. And the increase in applications, the increase in usage, the increase in the constancy of that usage happening all the time I think is going to be pushing us to ever higher needs, and I want to make sure we don't fall behind on that.

MR. LEVIN: Well, let me just close by saying that every chairman faces the dilemma of trying to focus attention on where we are and where we should be going. And I think -- and Reed Hundt who I'm very glad is here today -- it is one of the things he taught me when he was chair about how we really have to focus on how do we get better to where we are going. You have been doing an enormous amount in your time, but I know, as you said, the key point takeaway is pedal to the metal and you'll keep going. Thank you very much for your service to the country. (Applause)

MR. WHEELER: Thank you, Blair.

MR. LEVIN: Everybody stay seated.

MR. WHEELER: I appreciate it.

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