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Testimony of

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Chairman Blackburn, Ranking Member Doyle, and members of the Subcommittee, thank you for the opportunity to testify before you today and share the views of the Information Technology and Innovation Foundation (ITIF) on defining and mapping broadband in the United States. ITIF is a non-partisan think tank whose mission is to formulate and promote public policies to advance technological innovation and productivity internationally, in Washington, and in the states. Recognizing the vital role of technology in ensuring prosperity, ITIF focuses on innovation, productivity, and digital economy issues, with broadband policy a core concern.

DEFINING AND MAPPING BROADBAND IS IMPORTANT

Broadband access is necessary to participate in the 21st-century economy; it accelerates social opportunity and economic growth. Accelerated deployment of advanced broadband infrastructure understandably sees bipartisan appeal, and expanding the geographic footprint of the nation's digital infrastructure should be a significant part of any infrastructure plan.[1] Investment in broadband, as well as other smart infrastructures, will result in considerably greater economic returns to the national economy than simply throwing money at concrete.[2]

Thankfully, the existing private-investment framework for broadband has seen tremendous achievement, attracting capital expenditures that make U.S. broadband an international success story.[3] While users will probably always want more, faster, and cheaper access, the light-touch oversight of increasingly competitive broadband has worked incredibly well, overseeing dramatic increases in network coverage and capacity supporting a flourishing U.S. digital ecosystem.[4] The nation's networks and the services they enable are key tools in advancing U.S. competitiveness and productivity—getting these policies right matters.

Despite this success, more can and should be done to ensure that virtually all U.S. residents have access to robust broadband services. But providing the infrastructure to support universal broadband is expensive, and public dollars should be targeted where they will be most cost-effective in achieving our policy goals. Deciding where federal support is justified, and achieving the biggest return on necessarily limited investment requires a firm grasp on what those policy goals should be, as well as the geographic state of existing broadband offerings. While more information is generally better than less, if infrastructure funding is provided through a market-based approach, for example through procurement or reverse auctions, the need for highly detailed maps is greatly reduced.

Additional Efforts to Achieve Universal Broadband are Justified

One of the core questions regarding any infrastructure system or project is the appropriate mix of public and private involvement. Some projects are designed, built, owned, and managed by government, others by the private sector. Most involve a mix. While it is not possible to say a priori which is better—public or private ownership—all else being equal, private-sector ownership and operation brings several advantages, including a greater incentive for efficiency and innovation.[5]

Public ownership or operation of infrastructure makes the most sense for true public goods: resources that are both non-excludable (meaning it's difficult to prevent access to those who have not paid) and non-rivalrous (meaning consumption by one doesn't prevent simultaneous use by another). Broadband falls into neither of these categories.

However, if we continue under the high-level principle that innovation and investment are best supported when infrastructure deployment is led by the private sector where it is possible to earn an adequate return on investment, there are circumstances other than public goods where the government should intervene: put simply, where it is impossible to achieve an adequate return because costs are too high compared to revenues. This is extremely relevant in the broadband context, especially in high-cost (often rural) areas where the cost-per-home passed is significantly higher than in more-densely populated urban areas and where revenues from customers simply cannot recoup those costs.

Government support for more universal broadband service is further justified, because of the tremendous benefits that reverberate throughout the economy and society at large. These spillover network effects—what economists call positive externalities—allow for a more productive and flourishing nation, and are not fully captured by the prices providers can charge for the service. While no technology is an unequivocal good, broadband, and the enhanced productivity, education, communication, and entertainment it provides, deserves government support.

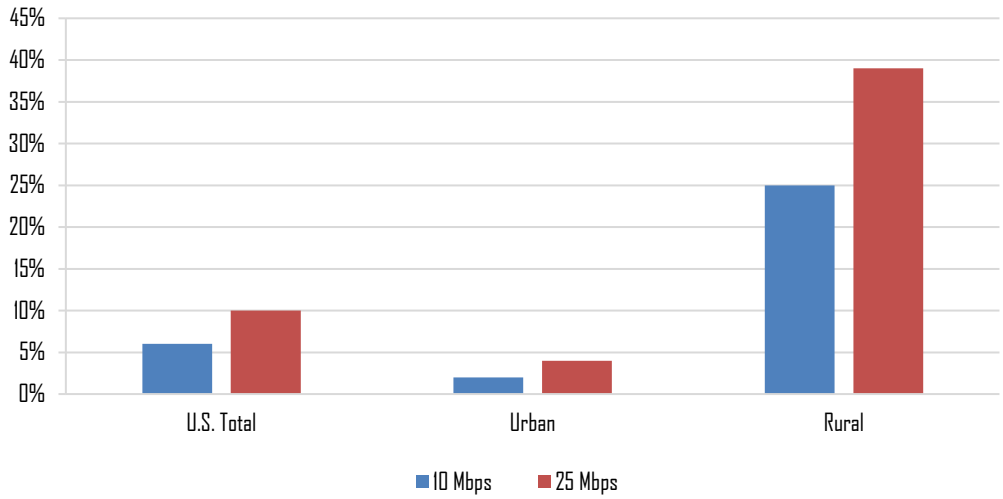
Policymakers would be wise to continue to rely on a light-touch approach to seeing Internet infrastructure continue to evolve to meet shifting consumer demands, but step in where private provision is uneconomical. In addition to existing support through the Universal Service Fund, a potential infrastructure package offers a unique opportunity to considerably accelerate the deployment of both fixed and mobile networks that should be seized.

Scarce Infrastructure Resources Should be Used Effectively

Policymakers should work toward achieving universal usage of broadband—note this is both a demand and supply issue, and digital literacy and broadband adoption deserve more focus than they currently receive. Truly universal usage will allow society to organize itself with the assumption that the entire population has access to digital services. There are numerous policy challenges still confronting this transition, but availability of infrastructure remains one, especially in rural, high-cost areas.

Only about 6 percent of Americans lack access to fixed terrestrial broadband at 10 Mbps, but when looking at higher speeds or only looking at rural areas, its apparent more can be done.

Figure 1: Americans Without Access to Fixed Terrestrial Broadband by Download Speed[6]



Support is justified for high-cost areas, and should be made for both fixed as well as mobile broadband. This supplemental public investment should be directed to where it will be most effective. When faced with the question of where to direct federal support dollars, policymakers have three high-level options:

1. Give access to those who have none—connect the truly unserved.
2. Increase speeds of existing networks.
3. Support an additional competitor, giving consumers more choice.

Priority should be given in that order, focusing first on the truly unserved, until the incremental cost of connecting each additional premise becomes untenable. Only after that task is completed should infrastructure support should aim to increase speeds of existing networks—aiming for cost effective upgrades, not necessarily "future-proofing."

The third option should generally be off the table. Government should not be in the business of actively funding additional competitors where the economics do not support further fragmentation of the market. This does not mean that governments should not enable new overbuilders to enter new markets; they should not, however, subsidize those competitors. Much work remains to be done to simply enable additional investment, by new entrants and incumbents alike, and the current FCC is examining some potential policy levers.

There is a misperception that the economic benefits of broadband require significantly higher speed networks. Contrary to those who insist that gigabit fiber networks are a national imperative, study after study repeatedly show that the economic benefits of broadband are greatest when adding additional users even if at lower speeds, not upgrading networks to supposedly "future-proofed" technologies.[7] There is a clear and extremely large diminishing marginal utility to additional network speed.[8]

If policymakers want to have the largest impact when subsidizing infrastructure investment, the research is clear: Focus first on those populations without any connection at all, rather than improving speeds. For example, a study in preparation for an infrastructure-subsidy program in the United Kingdom examined the relative effectiveness of each euro of subsidy. The study estimated a consumer surplus of €2.25 for each euro invested to achieve 100 percent coverage of 15 Mbps—a significant gain beyond what the market would otherwise bear for each subsidy dollar.[9] This €2.25 was compared with a €0.72 surplus per euro spent for 50 Mbps to 92 percent of the country, and a €0.34 surplus per euro spent for speeds over 50 Mbps for 64 percent coverage.[10]

These economic trade-offs are complicated, depending on variables such as the marginal externality to faster speeds, geographic cost structures, and existing infrastructure. But a focus on broadening coverage to truly unserved populations is clearly the most cost-effective improvement.

However, when attempting to bring coverage to the unconnected, costs quickly spiral out of control when looking at the last few percent. Using the FCC's cost models, Paul de Sa, former chief of the FCC's Office of Strategic Planning and Policy Analysis, analyzed the cost of achieving coverage of 98 percent of locations with "future-proof" networks—which he defines as cable or fiber.[11] He says this goal, which would be an increase of four percentage points, can be achieved for about $40 billion.[12] Achieving the last two percent—going from 98 percent to 100 percent—would double the cost.[13]

While it's not clear de Sa's goal, especially in specifying particular technology, is the right approach, the cost analysis is relevant—the last few percent of highest cost regions and areas are unrealistic to serve with wired network technology, and should reasonably be expected to rely on satellite, fixed wireless, or other broadband systems.

Policymakers are essentially faced with a price and quantity problem—how much coverage can be achieved for what price. Here, defining the goals you hope to achieve, mapping existing deployments, and modelling projected costs are worthwhile endeavors—all of which the FCC has experience with.

A BROADBAND DEFINITION SHOULD BE PRAGMATIC, BUT REFLECT REALITY

As a technical matter, broadband refers to a communications network that uses wider channels of frequencies, as contrasted with narrowband communications. As a policy matter, it is a bit more complicated: What you consider to be broadband can have profound implications in the policy space. For the purposes of good policymaking, we do not need to agree on a universal definition of broadband, with all its characteristics enumerated. Instead, we should seek a holistic understanding of broadband performance, and recognize different elements shift in importance in different policy contexts and over time. Generally, the FCC does this well, with a few notable exceptions.

There are several different characteristics that shape a user's experience of broadband. The predominant measure of broadband offerings has been download speed, measured in megabits per second (Mbps), but other aspects of broadband can be important in the types of applications one can expect to support, or the policy objectives one hopes to achieve. For example, consider

the requirements for a broadband service to participate in the Connect America Fund. In addition to broadband speed (10 Mbps down and 1 up), the commission also considers the time delay for a response over the network, or "latency," the usage allowance policies of an offering, as well as the pricing. Most of these would not be considered in a dictionary definition of broadband, but can be of relevance to policy decisions. Other technical considerations affect the quality of a user's experience, or what sort of higher-order systems a network can reliably support.[14]

The focus on download speed historically made sense, as it was a significant limitation on the usability of the Internet, but this may not always be the case going forward. The growth in demand for broadband speeds has largely been tied to growing demand for video streaming services. We are reaching the point where mass-market consumer broadband offerings can support video resolution approaching the maximum perceptible by the human eye, and, as a general trend, device screens are getting smaller, not larger. While there are certainly technologies on the horizon that could use significant amounts of bandwidth, such as ultra-high definition 360 degree video, there is no reason to think that demand for download speed will continue upwards indefinitely.

Lawmakers should avoid locking in particular aspects of broadband, and instead allow definitions of broadband as well as networks themselves to evolve over time. As a general matter, the FCC tends to take a holistic, pragmatic approach to defining broadband. This flexible approach is generally the right track, even if at times the commission has strayed into unhelpful, untenable definitions.

The FCC Generally Takes the Right Approach in Defining Broadband, with Some Notable Exceptions

There are a few important areas where the FCC "defines" a broadband service for different purposes, most notably for its Broadband Progress Report, and for the purposes of distributing Connect America Fund subsidies.

What is considered to be broadband can have profound implications in the policy space. Definitions of broadband in law or regulation should be grounded in what is actually offered, not a prospective or aspirational goal, and should avoid getting too far ahead of trends, or risk unduly shaping the services offered.

Take for instance, the recent decision, as a component of the FCC's 2015 Broadband Progress Report, to adjust their definition of "advanced telecommunications capability" upwards from 4 to 25 Mbps download, causing headlines to declare "The FCC Has Changed the Definition of Broadband."[15] This decision was rightly controversial, as the 25 Mbps threshold seemed carefully chosen to paint a particular picture of industry, defining away competition and supporting a finding of slow progress to trigger the commission's authority to regulate broadband providers under its recently expanded section 706 jurisdiction.

It is important to have reasonably ambitious broadband goals as a country, and there is certainly progress still to be made, especially in rural areas. But bringing even 25 Mbps wired broadband connections, let alone those measured in gigabits, to every corner of rural America will be considerably more expensive than bringing 10 Mbps service. Assuming funding is limited, this

means that if policymakers choose 25 Mbps service they will inevitably connect fewer households. The goal should be to deploy appropriate technologies at a reasonable subsidy level. Other countries recognize this fact: A competitive telecom industry is not going to provide ultra-high-speed broadband to where it is wildly uneconomical to do so. But telecom regulators in other countries typically take an objective analysis of the economics and look to where targeted subsidies make sense. In the recent "Broadband Progress" reports under former Chairman Wheeler, the commission focused instead on the lack of overbuilders in what are largely uneconomic areas.

WE SHOULD CONTINUE TO MAP BROADBAND ACCESS

The FCC collects broadband availability data, predominantly through its Form 477 information gathering process, to inform its policy analysis, create maps of coverage, and issue reports on the state of U.S. broadband. The FCC makes its data available, as well as various pre-made maps of coverage, availability, etc.[16] The FCC also summarizes this data in reports, most notably the Broadband Progress Report discussed above.

Some high-level data points are useful to get a sense of the remaining access challenge. According to the FCC's 2016 Broadband Progress Report, there are approximately 34 million U.S. citizens (10 percent) without home access to a fixed terrestrial service of at least 25 Mbps down and 3 Mbps up as of December 2014.[17] Note, this is down from approximately 55 million (17 percent of the population) just a year before that.[18] As then Chairman Wheeler put it, "That's a nearly 40 percent reduction in the number of unserved Americans in only one year."[19] What is more, only 6 percent of Americans lack access to fixed terrestrial service at 10 Mbps, and 5 percent lack access to such services at 4 Mbps.[20]

While high-level numbers indicate continued progress, pockets of America remain unserved. It is important we continue to understand where broadband is available. However, if policymaker's adopt a more market-based tool to allocate broadband infrastructure support, such as through procurement auctions, broadband availability maps need not be as detailed.

Detailed, Expensive Mapping is Unnecessary, Especially if Grants are Allocated by Auction

One of the more prominent attempts to map broadband access in the United States—the National Broadband Map—was led by the National Telecommunications and Information Administration and authorized by the American Recovery and Reinvestment Act.

The grants to various broadband grands made under the NTIA administered Broadband Technology Opportunities Program were subject to some criticism. Most notably, the grants were issued first, and then after the money was out the door, the NTIA followed up with an extensive broadband mapping initiative. It may have been better had these two projects been reversed. This criticism is partly justified, but it is important to remember these grants were made in effort to spur an economic recovery—time was of the essence, and the perfect the enemy of the good. Absolutely, it would be ideal to have up-to-date, highly granular maps when deciding where and how to support infrastructure projects. But these maps are expensive and difficult to produce (the National Broadband Map, which is now several years dated, was authorized to spend up to $350 million).

However, for the purposes of allocating grants for broadband infrastructure, the less technocratic, top-down the approach, the less detailed mapping you need. Here the competitive auction process within the Connect America Fund shows the way toward a better way to allocate broadband infrastructure subsidies. Again, policymakers are faced with an information challenge of discovering how much coverage can be achieved for what price. In allocating scarce subsidy dollars, pushing some of that discovery into an auction process could considerably reduce the need for highly-detailed, expensive broadband mapping.

Again, FCC Mapping is Generally on the Right Track

The FCC has taken up the task of mapping broadband availability, picking up where NTIA's National Broadband Map left off. The FCC has transitioned away from data gathered as a part of NTIA's State Broadband Initiative (SBI), and now relies on data gathered primarily through Form 477. Form 477, which was established in 2000, has been revised and modernized several times over the years, generally to improve granularity and expand the data points collected.[21]

There will always be flaws and challenges with mapping data. The appropriate level of granularity can be hard to achieve (a constant point of criticism), and relying on data collected twice a year means we will always be somewhat behind the curve. Mapping wireless coverage is especially challenging. The FCC now relies on "shapefiles" filed by providers—these are complicated geospatial models of provider's coverage that rely on a variety of inputs. While challenging, the FCC is generally on the right track with its data collection, and can continue to refine its practice over time.

Furthermore, measurements of actual broadband performance can also supplement FCC data. Numerous online "speedtests" of varying methodological soundness are available, although it can be especially challenging to measure super-high speed broadband.[22] Such tests, as well as drive tests in the mobile context, and other forms of private-sector data can supplement or double check FCC data.

CONCLUSION

Thank you again for this opportunity to appear before you today.

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most important changes that occurs when gigabit broadband services are adopted is that the wired access links from users' homes to their access provider is far less likely to be the performance bottleneck").