

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Inquiry Concerning the Deployment of Advanced	)	GN Docket No. 14-126
Telecommunications Capability to All Americans	)	
in a Reasonable and Timely Fashion, and Possible	)	
Steps to Accelerate Such Deployment Pursuant to	)	
Section 706 of the Telecommunications Act of	)	
1996, as Amended by the Broadband Data	)	
Improvement Act	)	

**REPLY COMMENTS OF THE OPEN TECHNOLOGY INSTITUTE AT NEW  
AMERICA**

September 19, 2014

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## **Executive Summary**

In light of recent market developments, novel consumer harms in the interconnection disputes between operators, widespread consumer complaints about Internet speeds and latency, and the evidence submitted by commenters, we conclude that the Commission should certainly take the steps suggested in the Notice of Inquiry to revise the thresholds for defining “advanced telecommunications capabilities.” In particular, we support an increase in the defined speed threshold from the current bar of 4 mbps/1 mbps upward to 50 Mbps/20 Mbps—a goal set for 2015 by the Commission in the 2010 National Broadband Plan. Further, we support the establishment of a latency metric as a part of the Section 706 review that takes into consideration both round trip times and packet loss. And finally, we recommend the Commission apply this latency metric as an important criteria in determining whether reasonable and timely deployment of those “advanced telecommunications capabilities” has occurred.

## **I. Introduction**

In light of recent events in the United States broadband market regarding interconnection disputes, evidence from consumer complaints about their home broadband service, and the comments submitted in this and other proceedings,<sup>1</sup> it is clear that the Commission should take steps to revise the threshold for what constitutes “advanced telecommunications services.” U.S. broadband subscribers are often hampered by high prices for relatively low speeds<sup>2</sup> and more and more consumers are using higher speed connections for communication, entertainment, and civic applications every day. We argue in these reply comments that in order to make certain that consumers are served appropriately for modern needs, the Commission should consider incorporating changes to the standard throughput benchmark for “advanced telecommunications capability.” We also argue that in addition to monitoring throughput when evaluating the “reasonable and timely” deployment of broadband, the Commission should incorporate a latency metric that includes round trip times and packet loss. Finally, we argue that the Commission should include a test of latency and quality of service that measures congestion in the review process. We believe including these metrics, tests, and improvements to the Commission’s evaluation of advanced telecommunications capability will significantly benefit consumers and ensure a robust, modern Internet.

## **II. The Commission should adjust the standard throughput benchmark for “advanced telecommunications capability” upward to the 2015 goals of the 2010 National Broadband Plan.**

The evidence in this docket clearly shows that demand for bandwidth is ever-increasing and household usage far exceeds the 4 Mbps/1 Mbps standard the Commission set in 2010. The

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<sup>1</sup> Reply Comments of The Open Technology Institute at New America, *Protecting and Promoting the Open Internet* GN Docket No. 14-28, (September 15, 2014) (“OTI Reply Comments”).

<sup>2</sup> Russo et al., *Reining in the Cost of Connectivity: Policies for Better Broadband in 2014*, New America, January 2014, available at [http://newamerica.net/publications/policy/reining\\_in\\_the\\_cost\\_of\\_connectivity](http://newamerica.net/publications/policy/reining_in_the_cost_of_connectivity).

Internet has evolved rapidly since then and many broadband households have embraced much higher speeds to serve the demands of multi-user households. Indeed, in areas where ISPs offer speeds in excess of 50 Mbps, consumers are rapidly subscribing to those services. Comcast noted in its second quarter earnings call that 47 percent of customers subscribe to speeds of 50 Mbps or higher.<sup>3</sup> Other cable operators reported similar developments<sup>4</sup> in addition to Verizon, which stated earlier this year that 46 percent of customers subscribe to tiers of 50 Mbps or higher.<sup>5</sup>

Like much of the technology press reporting on this issue, we find the sum of the arguments offered by commenters seeking to retain the 4/1 standard unpersuasive.<sup>6</sup> Given the pace of change in online markets, the expansion of multiple device households, the dramatic increase in higher-bandwidth applications, and the myriad broadband products available with 50+ Mbps offerings, it goes against common sense and the real-world experience of users to leave the standard at 4/1. This standard is not adequate for a typical broadband household today, much less can it be reasonably described as “advanced telecommunications.”

We recommend the Commission consider its own standard set as a goal for 2015 in the 2010 National Broadband Plan—a 50 Mbps/20 Mbps threshold. Further, we recommend setting in place a plan for regular review and upward revision of this threshold as markets develop and consumer bandwidth usage inevitably expands. We support strong consideration for evolving the

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<sup>3</sup> See Petition to Deny of Free Press, *Applications of Comcast Corp. and Time Warner Cable Inc.*, MB Docket No. 14-57 (August 25, 2014) at 36.

<sup>4</sup> *Id.*

<sup>5</sup> Karl Bode, “Verizon: 46% of Users Subscribe to 50 Mbps or Higher,” *DSLReports.com*, January 21, 2014, available at <http://www.dslreports.com/shownews/Verizon-46-of-Users-Subscribe-to-50-Mbps-or-Higher-127410>

<sup>6</sup> Mike Masnick, “Big Broadband Begg FCC Not To Expose Their Lies by Defining Broadband Accurately,” *TechDirt*, September 9, 2014, available at <https://www.techdirt.com/articles/20140908/16295828456/big-broadband-begs-fcc-not-to-expose-their-lies-defining-broadband-accurately.shtml>; Comments of AT&T, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 14-126 (September 4, 2014) at 7-9; Comments of Verizon, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 14-126 (September 4, 2014) at 30.

Section 706 standard as a symmetrical speed threshold—much as Verizon has done<sup>7</sup>—given the growing market importance of two-way services and the clear intent of the statute to support two-way communications capacity.

**III. A latency metric should be added to the benchmark for determining “advanced telecommunications capacity” in order to reflect the centrality of two-way real-time services in modern broadband usage.**

The Internet experience for consumers is not solely a factor of data throughput. For many real-time services, adequate throughput levels will not deliver a satisfactory consumer experience if latency (high round-trip times or “RTTs”) and packet loss are abnormally high. These are clearly relevant factors for the Commission to consider when evaluating and applying the definitional standard for “advanced telecommunications capabilities” outlined in the statute.

The recent disputes over interconnection agreements between ISPs, transport networks, and content providers like Netflix demonstrate this point very clearly. For a period of months, millions of subscribers to speed tiers between 10 Mbps and 100 Mbps were, regardless of having purchased services at those tiers, unable to fully use Internet applications (like Netflix) which require data throughput at rates lower than the speed tiers to which the consumers subscribed. In some cases the actual data throughput was simply far below the advertised rate, thus explaining the problem. In other cases, the disruption in the consumer experience was caused by latency and packet loss, or at the very least such loss was a strong contributing factor.<sup>8</sup> Therefore, we believe the Commission must recognize these aspects of Internet access services as necessary considerations in the definition and evaluation required by Section 706. In some cases, the latency and packet loss may appear as a result of traffic congestion in the local access network.

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<sup>7</sup> Jeff Baumgartner, “Verizon Applies ‘SpeedMatch’ Brand to FiOS Upgrades,” *Multichannel News*, August 25, 2014, available at <http://www.multichannel.com/news/technology/verizon-applies-speedmatch-label-fios-upgrades/383345>.

<sup>8</sup> See OTI Reply Comments.

In other cases, it is a function of congestion (sometimes the consequence of business disputes rather than technical capacity limits) that takes place at interconnection points or somewhere upstream on the Internet between the end-user and the server hosting the requested data. Quite presciently in its first Section 706 inquiry, the Commission noted that Internet peering arrangements “may have a significant impact on the deployment of broadband capability” and announced their intent to “monitor these issues closely.”<sup>9</sup>

The Commission has established elsewhere that even real-time applications that function with relatively low throughput requirements will not function effectively if RTTs are too high.

The FCC’s original Broadband Measurement Report stated:

Latency is another key factor in broadband performance.... The impact of latency is felt in a number of ways. For example, high round-trip latencies may compromise the quality of voice services in ways that are perceptible to consumers. Even lower latencies, which may not be directly noticeable by human perception, can still degrade network performance. Computer networks and applications are more sensitive to latency than humans. Latency affects the rate of information transmission for TCP protocol, which is commonly used to support Internet applications, and can therefore limit the maximum speed achievable for a broadband service regardless of the actual service speed.... Thus, latency can have a significant effect on the performance of applications running across a computer network. As service speeds increase, the impact of network latency can become more noticeable, and have a more significant impact on overall performance.<sup>10</sup>

The Commission's questions in the NOI with respect to latency and packet loss are therefore highly relevant and timely. And we concur with other commenters that have raised this issue.<sup>11</sup>

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<sup>9</sup> *Inquiry Concerning the Deployment Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146, Report, FCC 99-5 (February 2, 1999) at ¶99.

<sup>10</sup> Federal Communications Commission, *2012 Measuring Broadband America*, July 2012, at 15, available at <https://www.fcc.gov/measuring-broadband-america/2012/july>.

<sup>11</sup> See e.g. Comments of Netflix, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 14-126 (September 4, 2014) at 12-13; Comments of the Entertainment Software Association, *Protecting and Promoting the Open Internet*, GN Docket No. 14-28 (July 15, 2014) at 6-7 (“ESA Comments”); Comments of Level 3 Communications, LLC, *Protecting and Promoting the Open Internet*, GN Docket No. 14-28, (July 15, 2014) at 9-10; Comments of Cogent Communications Group, *Protecting and Promoting the Open Internet*, GN Docket No. 14-28, (July 15, 2014) at 16.

It is quite clear that some kind of congestion metric should be a part of the Section 706 review and standard for advanced telecommunications capability. However, setting a standardized metric for latency that is a perfectly reliable proxy for “advanced telecommunications capabilities” is challenging. But the Commission can set benchmarks that flag thresholds of performance that typically correspond both to adequate and inadequate service provision. For example, the Connect America Fund requires recipients to provide <100 ms RTTs during peak periods of usage as a minimum standard for enabling real-time applications for price cap carriers.<sup>12</sup>

But this minimum standard clearly cannot be the benchmark for *advanced* telecommunications capability. This standard must be set higher. Indeed, the Commission noted in the CAF order “that we are adopting a more lenient approach than the 60 ms average latency standard the Bureau originally proposed in the Public Notice.”<sup>13</sup> Furthermore, the Commission has previously proposed that average round-trip delay of 100 ms or greater for more than 30 minutes necessitates reporting a service outage.<sup>14</sup>

The Commission has pointed to Cisco’s Cloud Readiness Tool as a resource stating “[a]dvanced cloud applications, such as group video calling, connected education/medicine, and HD video conferencing, require latency less than 100 ms.”<sup>15</sup> According to Cisco’s tool, the U.S. currently ranks 42nd out of 150 countries for fixed networks with an average latency of 60 ms.<sup>16</sup> We recommend an RTT standard with a maximum of 50 ms. The Commission has noted that

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<sup>12</sup> *Connect America Fund*, WC Docket No. 10-90, Report and Order, DA 13-2115 (October 31, 2013) at ¶¶22-23.

<sup>13</sup> *Id.* at ¶28.

<sup>14</sup> *The Proposed Extension of Part 4 of the Commission’s Rules Regarding Outage Reporting to Interconnected Voice Over Internet Protocol Service Providers and Broadband Internet Service Providers*, PS Docket No. 11-82, Notice of Proposed Rulemaking, FCC 11-74 (May 13, 2011) at ¶49.

<sup>15</sup> *Connect America Fund, Further Comment on Issues Regarding Service Obligations for Connect America Phase II*, WC Docket No. 10-90, Public Notice, DA 13-284 (February 26, 2013) at ¶26, note 42.

<sup>16</sup> See “Cisco Cloud Readiness Tool,” Cisco, available at: <http://www.cisco.com/c/en/us/solutions/service-provider/cloud-readiness-tool/index.html>.



<50ms is necessary for health care remote monitoring technologies<sup>17</sup> and that “real-time video telemedicine consults in particular require low-latency, reliable connections (connections that do not cause video interruptions or degraded quality) in addition to relatively high bandwidth. Such high quality connections can be critical to the quality of medical care delivered.”<sup>18</sup> Just recently, Parks Associates predicted that “doctor-patient video consultations will nearly triple from 5.7 million in 2014 to over 16 million in 2015,” thus further necessitating attention from the Commission on this matter.<sup>19</sup>

There are many other examples of popular consumer applications that require low latency. With 59 percent of Americans playing video games, many of which online, gaming represents one of the most popular Internet activities.<sup>20</sup> One study entitled *On The Impact of Delay on Real-Time Multiplayer Games*, found that with a car racing game “below 50 ms, no significant alterations of the lap time are measurable. Hence, we believe that even for competitions, a presentation delay up to 50 ms is uncritical.”<sup>21</sup> The Entertainment Software Association also recently highlighted the importance of low latency services to the Commission:

Timely delivery of gaming data is often critical when gamers in far-flung locations play over the Internet. For example, delayed gaming data could result in a late swing of the bat in an online baseball game, the inability to repel a surprise attack from an arthropodal alien in an action game, forfeiting a turn in a strategy or card game, a missed instruction from an online teammate, or even being disconnected from a game server entirely. In other words, increases in latency could render the most important feature of a game—the interactivity—useless.<sup>22</sup>

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<sup>17</sup> Federal Communications Commission, “Health Care Broadband in America,” OBI Technical Paper No. 5, August 2010, at 7, available at <http://transition.fcc.gov/national-broadband-plan/health-care-broadband-in-america-paper.pdf>.

<sup>18</sup> *Rural Health Care Support Mechanism*, WC Docket No. 02-60, Report and Order, FCC 12-150 (December 21, 2012) at ¶14.

<sup>19</sup> “Parks Associates: Doctor-patient video consultations will nearly triple from 5.7 million in 2014 to over 16 million in 2015,” Parks Associates, August 25, 2014, available at <http://www.parksassociates.com/blog/article/chs-2014-pr10>.

<sup>20</sup> ESA Comments at 2.

<sup>21</sup> Lothar Pantel and Lars C. Wolf, *On the Impact of Delay on Real-Time Multiplayer Games*, Presented at Network and Operating System Support for Digital Audio and Video (NOSSDAV), May 12-14, 2002, available at <http://web.cs.wpi.edu/~claypool/courses/4513-B03/papers/games/wolf.pdf>.

<sup>22</sup> ESA Comments at 7.

The ESA went on to note “Latency is also critical in other contexts. Low-latency connections allow edge providers to provide the immediate, responsive feedback in web applications that consumers expect, allow doctors to participate in medical procedures remotely, and allow consumers to communicate without awkward lag, among other latency-sensitive Internet services.”<sup>23</sup> With a wide variety of latency-sensitive Internet uses, the Commission will not be able to adequately assess the deployment of “advanced telecommunications capability” without the inclusion of data related to the latency experienced by end users.

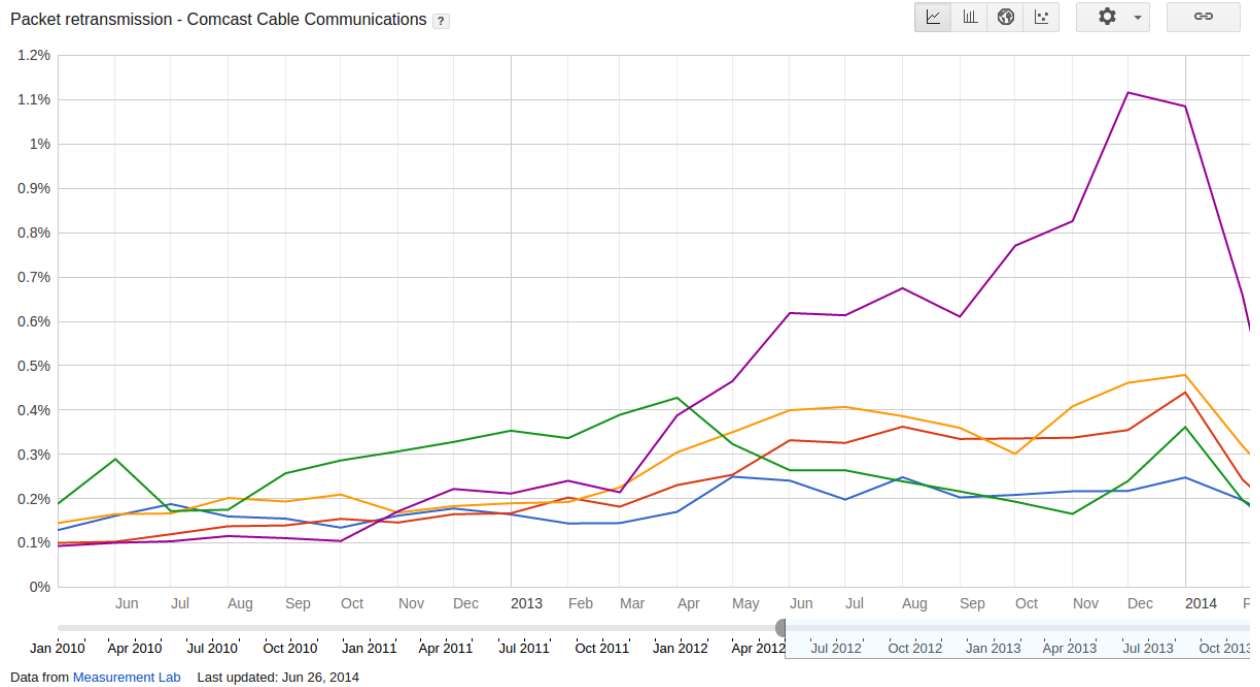
However, the Commission should consider a latency metric that uses more than just RTTs as the threshold. In some cases, a higher RTT may not be a reflection of congestion and degrading packet loss, but rather a reflection of the choice of a longer route that increases the RTT but reduces packet loss. And of course, this raises the larger point of whether a RTT standard can be uniformly applied for an ISP because the distance between the consumer and the server hosting requested files or services will have a large impact on the total RTT across the Internet. The ISP can only control the latency in the hops of the route that flow over its own network. Indeed, it is packet loss that may be the more fundamental evidence of a degraded Internet service that would not qualify as an “advanced telecommunications capability.” The two metrics—RTTs and packet loss—are related measurements and should be considered together. The Commission should therefore set a <50 ms standard as the recommended minimum RTT for advanced telecommunications services. But this standard should be a threshold that triggers inquiry into packet loss and a broader evaluation of the quality of the service.

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<sup>23</sup> *Id.*

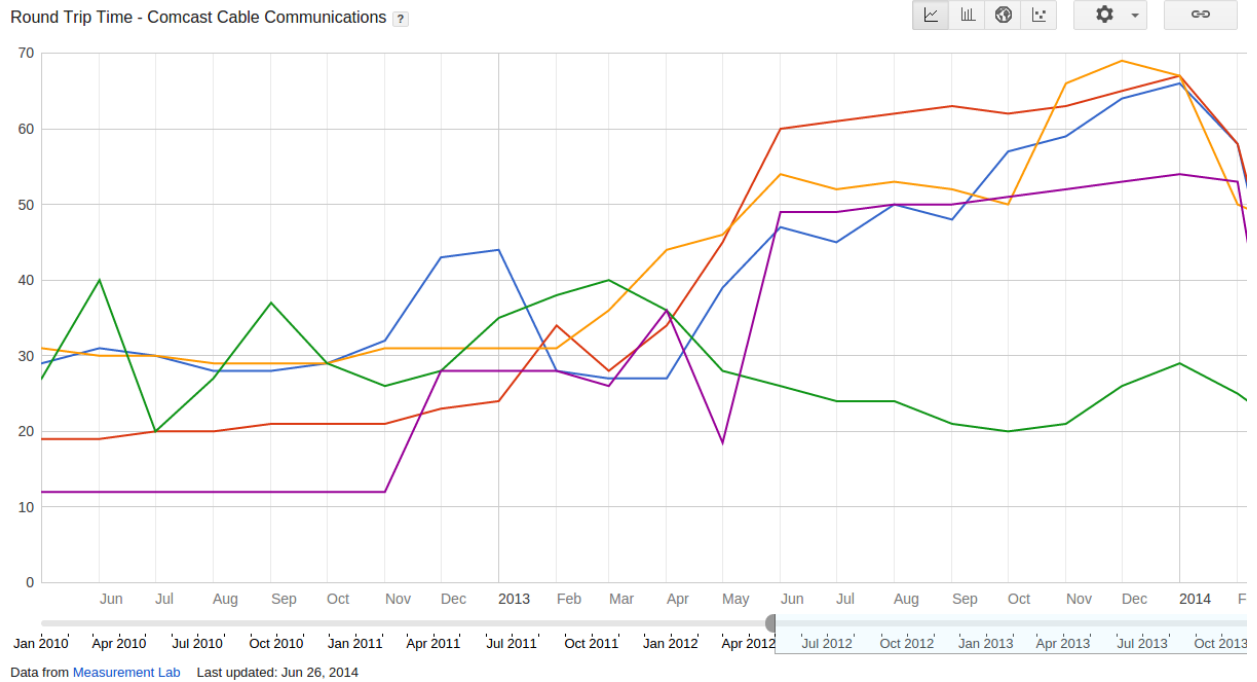
To get further clarity about an appropriate latency metric, we encourage the Commission to consult external data sources, including M-Lab and CAIDA. For example, the graph in Figure 1 below shows a measurement of packet loss using M-Lab data for Comcast customers in a handful of different United States markets over a period of months in which the company was engaged in interconnection disputes with peering partners resulting in significant declines in quality of service for real-time applications. The graph in Figure 2 shows the same time period with an RTT metric applied. This quantitative view into network performance should become a tool for the Commission in the context of the Section 706 assessment.

**Figure 1**



(The above graph displays a measurement of packet loss for Comcast customers in a number of markets for the time period of May 2012 to February 2014.)

**Figure 2**



(The above graph displays a measurement of round-trip times for Comcast customers in a number of markets for the time period of May 2012 to February 2014.)

**IV. A latency and quality of service test that measures congestion (whether actual or artificial) should be a clear factor in the Commission’s assessment of whether or not deployment is occurring in a “reasonable and timely” fashion.**

We contend that the latency and throughput degradation witnessed in the recent conflicts between network operators resulted in such a severe consumer harm for such a long period of time that from here forward, these metrics should be a significant factor in determining whether or not deployment is occurring in a reasonable and timely manner in the Section 706 test. We support the conclusions of Microsoft (filed GN Docket No. 14-28) that transparency and reporting on interconnection practices should be included in the Section 706 process.<sup>24</sup>

The review of these practices should focus on whether or not discrimination in the interconnection markets results in packet loss, latency, or declines in data rates such that popular

<sup>24</sup> Comments of Microsoft Corporation, *Protecting and Promoting the Open Internet*, GN Docket No. 14-28 (July 18, 2014) at 32-33.

applications and services are no longer functional. A significant degradation of functionality would demonstrate a lack of reasonable and timely deployment. Consumers buy connectivity from ISPs in order to get access to the content and applications they use for work, pleasure, and social and civic engagement. If these applications and sources of content are unavailable or unreliable, that lack of availability will correspondingly reduce demand for broadband. The importance of service quality as a consideration in broadband deployment and resulting adoption is apparent in the promotional materials of ISPs. Internet providers frequently point to the reliability of their connections. For instance Comcast encourages potential customers to “Get the reliably fast speeds you can't get with AT&T,” and goes on to state that Comcast “Delivers reliably fast speeds even during peak hours.”<sup>25</sup> Verizon states “FiOS brings the power, reliability and speed you crave.”<sup>26</sup>

And yet, online consumer complaint forums are replete with users frustrated with performance issues related to the degradation between last-mile ISPs and interconnection providers. Users found everyday Internet capabilities such as streaming video, VoIP, gaming and connecting a VPN to be unusable, most frequently during peak hours. These activities continued in some cases for months and affected users across the country. Here are a few examples that are representative:

Verizon in New York City:

I live and work in NYC. My house is approximately 0.8 miles from my office. During the day, I get about 4-6ms response times to my office and I can completely saturate both the upload and donwload [sic] on my 75/35 connection. I am a nework [sic] architect and we have about 25 users who live and work in NYC on FiOS and have the same issues as I do. The latency and throughput are completely UNUSABLE between about 4pm and 3am. We have an enterprise monitoring system that shows daily increases in latency for

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<sup>25</sup> See “With Comcast get the reliably fast speeds you can’t get with AT&T,” Comcast, *available at* <https://www.comcast.com/reliablyfast> (“Reliably fast claim based on February 2013 FCC Measuring Broadband America report.”).

<sup>26</sup> See “Verizon FiOS,” Verizon, *available at* [https://www.verizon.com/home/MLP/college.html?x1=DP\\_INT\\_TV](https://www.verizon.com/home/MLP/college.html?x1=DP_INT_TV)

all of our users' home VPNs who use FiOS.... Our office has 3 ISPs and all of them experience the same latency issues around the same time, so I know that the issue isn't with any of our 4 ISPs.... I got Verizon so I can avoid TimeWarner-like speeds and reliability. This is unacceptable.<sup>27</sup>

#### Comcast in Albuquerque:

Ok, I'm in Albuquerque NM, and have been trying to figure out where the poor netflix resolution problem is. Until today I've had the 50Mbps plan. I've been using the Ookla Speedtest, the Speakeasy speed test, and the Netflix "Example Short 23.976" to monitor download speeds and streaming speeds. The first two testing programs confirmed better than 30Mbps for the last month which was the limit of my modem. The netflix program was always erratic with anywhere from 235kbps to 3000kbps download...but never higher. We decided to get DSL to compare. Today, I finally got my CenturyLink ADSL 1.5Mbps (just 1.5Mbps!) fully up and confirmed at 1.56Mbps download. Then my wife and I watched "Law and Order" as usual and were shocked. We saw better resolution than we've had in 3 months with the 50MbpsComcast service!<sup>28</sup>

#### Time Warner Cable in Southern California:

I've actually been dealing with this for a while. Only with TWC. They're going to fully rewire my entire apartment complex to see if it fixes my packet loss issues. If that doesn't work, I'm switching to uverse ATT. I've probably spent at least 20+ hours on the phone with their T3 support and had people come out to check the outside lines. In addition they credited me 150.00 to my account. So I'll update after they rewire this weekend.... The rewiring is nice, they ran new cable everywhere in my house for me hoping it would fix the problem (lol its hundreds of miles away from me!) Like i said, I'm hitting 16.25 1.09 all day everyday. except ffxiv [Final Fantasy XIV] which is a hot mess.<sup>29</sup>

In the face of significant and widespread service disruptions and general customer dissatisfaction, the Commission should review, measure, and standardize the application of a performance metric in evaluating whether or not reasonable and timely deployment of “advanced telecommunications capability” has occurred. Latency is a critical component to this assessment. As AT&T has noted to the Commission, “a network’s or service’s capabilities will not be ‘usable if they do not satisfy the particular performance criteria of their prospective customers, such as

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<sup>27</sup> “Unusable Speeds and excessive latency starting around 4PM – Verizon Forums,” Verizon, February 25, 2014, available at <https://forums.verizon.com/t5/FiOS-Internet/Unusable-Speeds-and-excessive-latency-starting-around-4PM/td-p/685671>.

<sup>28</sup> “Is comcast working on the Netflix issue? – Comcast Help and Support Forums,” Comcast, January 18, 2014, available at <http://forums.comcast.com/t5/Basic-Internet-Connectivity-And/Is-comcast-working-on-the-Netflix-issue/td-p/1999891>

<sup>29</sup> “Time Warner SoCal Users / Any user with lag,” Square Enix, December 3, 2013, available at <http://forum.square-enix.com/ffxiv/threads/124130-Time-Warner-SoCal-Users-Any-user-with-lag>.

high security for a bank or other financial institution, or low latency and packet loss for a VoIP service or telemedicine application.”<sup>30</sup> We agree. A service that only sometimes delivers the advertised quality (in terms of data rates, latency and packet loss) cannot be considered “reasonable.”

## **V. Conclusion**

The United States needs a strong, robust, and modern Internet, and in order to achieve those results, the Commission should heed the recommendations herein. The Commission should consider incorporating changes the standard throughput benchmark for “advanced telecommunications capability,” incorporate a latency metric that includes round trip times and packet loss, and should include a test of latency and quality of service that measures congestion in the Section 706 review process.

Respectfully Submitted,

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/s/

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<sup>30</sup> Comments of AT&T, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (June 8, 2009) at 32.