

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

Inquiry Concerning Deployment of Advanced
Telecommunications Capability to All
Americans in a Reasonable and Timely
Fashion

GN Docket No. 17-199

REPLY COMMENTS OF THE ENTERTAINMENT SOFTWARE ASSOCIATION

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Table of Contents

I.	INTRODUCTION AND SUMMARY	1
II.	BACKGROUND.....	2
III.	ESTABLISHING A LATENCY BENCHMARK FOR ATC	3
IV.	SPEED BENCHMARK FOR ATC	10
V.	ADDRESSING FIXED AND MOBILE ATC SERVICES	12

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I. INTRODUCTION AND SUMMARY

The future of the American video game industry increasingly depends upon high-bandwidth, low-latency connections, which are vital to many types of video game experiences. The Commission’s annual section 706 proceeding¹ plays an important role in helping to ensure that Americans continue to have a world class broadband experience. The Entertainment Software Association (ESA) is pleased to contribute these reply comments to this important inquiry.² With their widespread popularity and growing impact on many facets of American life, online video games are an important use case to consider in evaluating what constitutes an adequate broadband experience. ESA is therefore well positioned to offer its perspective on the

¹ See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans In a Reasonable and Timely Fashion*, Notice of Inquiry, FCC 17-109, GN Docket No. 17-199, 32 FCC Rcd. 7029 (2017) (“NOI”). Unless otherwise noted, all comments herein were filed in the NOI proceeding. See also 47 U.S.C. 1302(b).

² The ESA represents companies that publish computer and video games for video game consoles, personal computers, and the Internet. ESA’s thirty-four member companies include most of the world’s largest video game producers.

performance consumers need to access advanced telecommunications capability (ATC).³ Specifically, as discussed below, ESA believes (1) the Commission must incorporate non-speed network performance characteristics—especially latency—into its section 706 inquiry; (2) a fixed speed benchmark of *at least 25 Mbps/3Mbps* is required; and (3) that access to ATC requires access to both fixed and mobile broadband capability.

II. BACKGROUND

Video games are a vibrant part of everyday American life. As of 2017, more than 150 million Americans across the country play video games.⁴ Two thirds of American households are home to at least one person who plays video games at least three hours per week.⁵ An engine for economic growth, the U.S. video game industry generated more than \$30.4 billion in revenue in 2016,⁶ providing more than 220,000 jobs to Americans in all 50 states.⁷

In addition to cutting-edge entertainment, video games today provide broader societal benefits for education, the workforce, health care, and civic organizations. Educators use video games as next-generation learning tools in classrooms across the country.⁸ Companies use them to recruit and train employees and increase sales among their tech-savvy customers.⁹ Health

³ 47 U.S.C. 1302(d) (“The term ‘advanced telecommunications capability’ is defined, without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology”).

⁴ See *About: Industry Facts*, ESA, <http://www.theesa.com/about-esa/industry-facts/>.

⁵ See ESA, ESSENTIAL FACTS ABOUT THE COMPUTER AND VIDEO GAME INDUSTRY at 4 (2017), http://www.theesa.com/wp-content/uploads/2017/06/!EF2017_Design_FinalDigital.pdf.

⁶ See *About: Industry Facts*, ESA, <http://www.theesa.com/about-esa/industry-facts/>.

⁷ See Stephen E. Siwek, VIDEO GAMES IN THE 21ST CENTURY: THE 2017 REPORT, ESA at 2 (2017), http://www.theesa.com/wp-content/uploads/2017/02/ESA_EconomicImpactReport_Design_V3.pdf.

⁸ ESA, GAMES: IMPROVING EDUCATION at 1-2 (2014), http://www.theesa.com/wp-content/uploads/2014/11/Games_Improving_Education-11.4.pdf. See also Mark Griffiths, *The Educational Benefits of Videogames*, 20.3 EDUC. AND HEALTH 47 (2002), <http://sheu.org.uk/sites/sheu.org.uk/files/imagepicker/1/eh203mg.pdf>

⁹ ESA, GAMES: IMPROVING THE WORKPLACE at 1 (2014), <http://www.theesa.com/wp->

institutions and professionals use them to help with treatment and recovery and to train medical emergency responders.¹⁰ Nonprofit organizations use them to teach important values, engage a new generation of voters, and vividly expose audiences to problems facing people from different walks of life.¹¹

The defining feature of all such video games is interactivity—the ability to receive, incorporate, and respond to input from a player. Increasingly, video games feature real-time game play with other players in different physical locations and interacting over broadband networks. Cloud game play services (*i.e.*, where the game software is hosted on a remote server and played over the internet), a rapidly growing segment of the industry, require consumers’ access to broadband networks that can deliver split-second interactivity. In the terms of the Commission’s section 706 inquiry, access to today’s online video games requires access to ATC—a high-speed broadband connection that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications.

III. ESTABLISHING A LATENCY BENCHMARK FOR ATC

Historically, the Commission’s section 706 inquiry has focused on broadband speed. And, as discussed below, ESA agrees that “high-speed” broadband of *at least* 25Mbps download/3Mbps upload (“25/3 Mbps”) is an important definitional component of ATC. The NOI recognizes, however, that “there may be other characteristics of service in addition to speed relevant for evaluating deployment.”¹² It seeks comment on whether the Commission “should

[content/uploads/2014/11/Games_Improving_Workplace-11.4.pdf](http://www.theesa.com/wp-content/uploads/2014/11/Games_Improving_Workplace-11.4.pdf)

¹⁰ ESA, GAMES: IMPROVING HEALTH at 1 (2014), http://www.theesa.com/wp-content/uploads/2014/11/Games_Improving_Health-11.4.pdf

¹¹ ESA, GAMES: IMPROVING SOCIAL ISSUES at 1 (2014), http://www.theesa.com/wp-content/uploads/2014/11/Games_Improving_Social-Issues-11.4.pdf

¹² See NOI ¶ 15.

incorporate into [its] benchmarks any measures of latency or consistency of service” and whether it should “consider data allowances and other limitations on service.”¹³ Under the statutory definition, ATC must enable “users to *originate and receive high-quality*” voice, data, graphics, and video services. Today, such services—including high-quality online multiplayer and cloud-based video games—require that consumers have access to broadband connections that are not just fast, but also low-latency and reliable. ESA thus encourages the Commission to incorporate non-speed metrics into its annual inquiry and to set an ATC latency benchmark of less than 75 milliseconds (ms).

Latency. The Commission has previously “found that latency *plainly affects* whether consumers have access to [ATC].”¹⁴ ESA fully agrees. Low latency—typically measured by the number of milliseconds required for a packet to be sent and returned to the sender—is critical for interactive online services. Low latency is necessary for the immediate, responsive feedback that consumers have come to expect—and demand—from real-time interactive online applications and services. These interactive applications and services are precisely the kind of advanced services Congress directed the Commission to consider in this inquiry.

Video games are a prime example. For multi-player and cloud game play services, a consumer’s broadband connection must support low-latency connections with online game

¹³ NOI ¶¶ 15-16.

¹⁴ See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans In a Reasonable and Timely Fashion*, Twelfth Broadband Progress Notice of Inquiry, FCC 16-100, 31 FCC Rcd. 9140, 9149 ¶ 27 (2016) (internal quotation marks omitted and emphasis added). The Commission has also recognized the importance of latency in the universal service context, conditioning the receipt of universal service funds on the provision of broadband with latency at or below 100ms. See *Connect America Fund Phase II Service Obligations*, Report and Order, FCC 13-2115, 28 FCC Rcd. 15060, 15061, 15068-71 ¶¶ 2, 19-23 (WCB 2013) (price-cap carriers); *Connect America Fund*, Report and Order, FCC 16-33, 31 FCC Rcd. 3087, 3099 ¶¶ 27-28 (2016) (rate-of return carriers). Moreover, high-latency bids in the CAF II action will be discounted, in part, because consumers “clearly value . . . lower latency services.” *Connect America Fund*, Report and Order, FCC 17-12, 32 FCC Rcd. 1624, 1630-31 ¶¶ 23-24 (2017).

services and other players. The need for immediate and continuous interactivity means that, unlike other streamed services (e.g., music or video), buffering cannot compensate for lag in delivery. While different games can tolerate different latency levels, ESA believes latency below 75 ms is required for full enjoyment of today’s most popular multiplayer and cloud-based games. Electronic Arts, for example, targets under 75ms latency for its latest release of its popular online soccer game, *FIFA 18*. And Nvidia GeForce NOW, a cloud game play service, recommends latency of less than 60ms.¹⁵ Triseum, a maker of cutting-edge educational video games like *Variant: Limits*, which offers an immersive 3D world that allows players to manipulate objects by mastering calculus principles and theories,¹⁶ indicates that a low-latency definition of less than 100ms is acceptable. Importantly, cloud-based video games must account for latency not only between players in different locations but also the additional latency from the cloud server to the multiplayer server; essentially, the two layers of latency stack atop each other to affect performance. While many games are still playable if latencies hover above optimal levels, performance degrades as latency increases. Severe increases in latency ruin the game play experience.

The record here confirms that latency is a fundamental component of ATC for many advanced applications.¹⁷ Low latency is needed for all services for which consumers demand real-time communication without delays, including VoIP, videoconferencing, and Virtual Private

¹⁵ *Products: Systems Requirements*, NVIDIA, <https://shield.nvidia.com/support/geforce-now/system-requirements>

¹⁶ *Variant*, TRISEUM, <https://triseum.com/calculus/variant/>.

¹⁷ See, e.g., Comments of New America’s Open Technology Institute at 12-14, GN Docket No. 16-245 (filed Sept. 7, 2016) (refiled in Docket 17-199 on Sept. 21, 2017) (“OTI 2016 NOI Comments”); Comments of City of New York at 2 (filed Sept. 21, 2017) (finding latency, among other characteristics, “central to the user experience”) (“New York City Comments”); Comments of Communications Workers of America at 16 (filed Sept. 5, 2017) (“CWA Comments”).

Networks.¹⁸ It is also critical for emergency services, including high-quality 911 communications, and telemedicine, so as to allow doctors to participate in medical procedures remotely.¹⁹ Indeed, the Open Technology Institute, looking in part to the future of augmented and virtual reality interactive online applications, recommends a benchmark of less than 50ms.²⁰

ESA submits that, today, latency of at most 75ms is needed to access ATC. That benchmark reflects the dynamic innovation and advancement in interactive online applications and services, such as the high-quality online video games described above. Americans need access to such services, which provide not just entertainment but powerful interactive communications tools used for education, healthcare, and productivity. By setting a 75ms latency benchmark, the Commission could ensure that it is assessing ATC that can support the interactive high-quality voice, data, video, and graphics as contemplated by section 706.

Critics of adopting a latency benchmark argue that latency should not be singled out among other performance measurements.²¹ ViaSat, for example, asserts that latency is “not a significant factor” in consumers’ broadband experience, citing Sandvine statistics on Internet traffic and a recent academic study on willingness-to-pay for low latency service.²² But the inquiry here does not concern consumers’ relative use of *all* online services, the subject of the

¹⁸ Comments of the Wireless Internet Service Providers Association at 9 (filed Sept. 21, 2017) (“WISPA Comments”).

¹⁹ Comments of NTCA—the Rural Broadband Association at 12-13 (filed Sept. 21, 2017) (“NTCA Comments”). *See id.* n. 26 (high latency “makes unusable many real-time applications, such as voice, emergency notifications, health services and virtual private networks.”) (quoting Vantage Point, *Satellite Broadband Remains Inferior to Wireline Broadband*, attachment to Letter from Great Plains Communications and Consolidated Companies, to Marlene H. Dortch, FCC WC Docket No. 10-90 (filed Sept. 5, 2017)).

²⁰ OTI 2016 NOI Comments at 13.

²¹ *See, e.g.*, Comments of ViaSat, Inc. at 7-9 (filed Sept. 22, 2017) (“ViaSat Comments”). Comments of Verizon at 14-15 (filed Sept. 21, 2017).

²² ViaSat Comments at 7-9.

Sandvine report; it concerns consumers' use of specific advanced services identified by the statute—those that enable users to “originate and receive high quality” applications and services. That’s why the Commission has already concluded that latency “plainly affects” ATC access. Furthermore, the recent academic study actually confirms that consumers—and gamers in particular—do value low-latency service.²³ More generally, the suggestion that consumers are willing to trade-off latency for other performance characteristics is simply incorrect when it comes to high-quality interactive applications like multi-player video games. Fast download speeds cannot make up for laggy connections that can ruin the game play experience.²⁴

ESA recognizes that the high-orbit satellite technologies used to provide broadband today inherently provide service with latency well above 75ms, because a data packet must travel tens of thousands of miles from the earth station to a high-orbit satellite and back. But satellite broadband is rapidly evolving. There are now a dozen or so applications for low earth orbit constellations pending before the Commission. Moreover, new business models, involving satellite and terrestrial provider partnerships, may be capable of providing broadband with latencies nearing this benchmark.²⁵ Regardless, as the Commission and others have stressed, high-latency satellite service is still—and should remain—broadband service (and eligible for universal service support where appropriate), even if does not constitute ATC.²⁶

²³ Yu-Hsin Liu, Jeffrey Prince, and Scott Wallsten, *Distinguishing Bandwidth and Latency in Households' Willingness-to-Pay for Broadband Internet Speed*, TECHNOLOGY POLICY INSTITUTE at 33, 38, (August 2017), <https://techpolicyinstitute.org/wp-content/uploads/2017/08/Distinguishing-Bandwidth-and-Latency-in-Households-Willingness-to-Pay-for.pdf> (estimating that households are willing to pay over \$8.00/month to reduce latency to below 60ms and that the 40% of households in the study that “use video, play games, transfer files, or stream music” have “a greater aversion to high latency”).

²⁴ Buffering is not a great option to smooth over the gaps because of the inherent interactive nature of games.

²⁵ See Comments of O3b Limited at 2, 4-5 (filed Sept. 21, 2017) (providing high-speed broadband with typical latencies of less than 150ms).

²⁶ See NOI ¶ 1, n.1 (explaining that ATC is a “statutory term with a definition that is more narrow than the term ‘broadband.’”). See also Comments of AT&T at 6-8 (filed Sept. 21, 2017) (explaining that the term ATC is not

Finally, the Commission asks whether there are “reliable and comprehensive data” sources it could use, should it adopt a latency benchmark.²⁷ ESA notes that, since 2011, the Commission has been collecting information on latency through the fixed Measuring Broadband America program, which involves rigorous broadband performance testing—including latency measurements—for 13 of the largest wireline broadband providers that serve well over 80 percent of the U.S. consumer market.²⁸ Data from the 2015 Measuring Broadband America Report, for example, shows that average latency results for *all* terrestrial technologies ranged from 14ms to 52ms, far below ESA’s recommended 75ms benchmark.²⁹ To the extent this data is insufficiently granular, the Commission could use it in conjunction with Form 477 deployment information to extrapolate latency statistics for broadband deployment. In addition, the Open Technology Institute identifies many external sources the FCC can consult for latency measurement.³⁰ Finally, under the Commission’s transparency requirement, all broadband providers are required to disclose “expected and actual . . . latency and the suitability of the service for real-time applications.”³¹

Other Non-Speed Characteristics. ESA also believes the Commission should broaden its inquiry beyond speed and latency. Whether broadband enables users to originate and receive high-quality services depends on multiple broadband characteristics, including service reliability

synonymous with the term “broadband”) (AT&T Comments).

²⁷ NOI ¶ 15.

²⁸ See *Measuring Broadband America*, FCC, <https://www.fcc.gov/general/measuring-broadband-america>.

²⁹ See 2015 MEASURING BROADBAND AMERICA FIXED BROADBAND REPORT at 18, available at <https://data.fcc.gov/download/measuring-broadband-america/2015/2015-Fixed-Measuring-Broadband-America-Report.pdf>. See also 2016 MEASURING BROADBAND AMERICA REPORT at 20-21 (Table 7(a) & (b)). See also Communications Workers of America Comments (urging the Commission to look at actual statistics regarding latency (among other characteristics)).

³⁰ See OTI 2016 Comments at 14.

³¹ 47 C.F.R. § 8.3; See *Preserving the Open Internet; Broadband Industry Practices*, Report and Order, FCC 10-201, 25 FCC Rcd. 17905, 17938-17939 ¶ 56 (2010).

and data allowance limitations. Access to ATC requires access to broadband service that consistently meets the Commission's benchmarks and enables users consistently to access high-quality online services. For video games, significant variability in these performance metrics can ruin the consumer's game play experience. Given the measurement and data challenges, ESA understands that the Commission may not now be in a position to adopt a consistency metric. But the Commission should, at a minimum, continue to acknowledge the reality—that consistency of service matters when assessing ATC deployment.

Data allowances also matter, particularly where caps are set at levels that effectively prevent users from accessing today's high-quality voice, data, graphic, and video services. Such services often require large file downloads (some in excess of 100 GB) or involve data streaming services—either of which can quickly consume high percentages of a monthly data cap. Data allowances could become even more problematic—impairing both innovative services and competitive choices—as the video game industry moves to subscription service business models for cloud game play services. ESA has no objection to tiered pricing plans, which allow consumers to select the network performance and data levels they need to fully enjoy their choice of online applications and services. But where data caps are set too low they may become a disincentive to consumers experimenting with bandwidth-intensive applications. Consumers seeking to cut their cable cord, for example, can only choose an over-the-top alternative like Sony's PlayStation Vue if their data usage is not curtailed by an austere data allowance imposed by the cable company's broadband provider affiliate. The Commission should at least be mindful of such limitations in assessing the extent to which ATC is available.

IV. SPEED BENCHMARK FOR ATC

By statute, ATC must also provide “high-speed” broadband capability.³² The Commission seeks comment on “maintain[ing] the 25 Mbps download, 3 Mbps upload speed benchmark [for] all forms of fixed broadband.” ESA supports the use of the current benchmark *as a minimum* for this year’s inquiry. Access to today’s high-quality voice, data, video, and graphic services—including online video games—requires access to high-speed broadband of at least 25/3 Mbps. And that requirement is highly likely to increase in the near future given the rapid evolution and development of advanced online services.

The video game industry today—and consumers’ enjoyment of the game play experience—depends upon fast broadband connections. With the growing shift to digital game distribution, to get the benefit of buying and updating games online players need a broadband connection with adequate bandwidth to support large file downloads in a timely manner. In addition, cloud game play services require broadband connections with sustained speed requirements that range, depending on the game and the service, from 5 to 50 Mbps. The cloud game play service GameFly Streaming, for example, recommends a minimum stable bandwidth of 5Mbps but suggests 10Mbps for an optimal experience.³³ NVidia GeForce NOW, another cloud game play service, recommends 20Mbps for 720p streaming and 50Mbps for 1080p streaming.³⁴ Software publisher Electronic Arts targets download speeds of 15Mbps for high definition (1080p) cloud game play services. As noted above, consistency of service is critical to game play and these recommendations are minimum sustained speeds, not average speeds.

³² 47 U.S.C. 1302(d).

³³ *See Streaming: How it Works*, GAMEFLY, <https://www.gamefly.com/#!/streaming/how-it-works>.

³⁴ *See Products: System Requirements*, NVIDIA SHIELD, <https://shield.nvidia.com/support/geforce-now/system-requirements>.

These speed requirements, moreover, are for an individual consumer and/or device. As the Commission has explained previously, for access to ATC today, households need access to broadband connections that can support multiple family members simultaneously accessing applications and services over multiple devices.³⁵ Thus, while ESA believes that the current benchmark remains adequate today, it will need to be raised again—and likely soon—given the dynamic innovation in online services and the corresponding need for increasing bandwidth. Otherwise, the ATC definition and the Commission’s inquiry risk quickly becoming irrelevant in the rapidly changing broadband ecosystem.

The vast majority of commenters responding to the NOI support the Commission maintaining or raising the current 25/3Mbps benchmark.³⁶ Several argue that 25/3 Mbps should be considered the *minimum* bandwidth necessary to support advanced online services today, and that the Commission should upgrade the benchmark in the future as technology advances.³⁷ Others believe the current benchmark is not sufficiently “advanced” and advocate for higher fixed speed benchmarks of 50/20 Mbps,³⁸ 100/50Mbps,³⁹ or even 1Gbps⁴⁰—to promote competitive deployment, to align with goals set out in the FCC’s National Broadband Plan, and

³⁵ *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, 2015 Broadband Progress Report and Notice of Inquiry, FCC 15-10, 30 FCC Rcd. 1375, 1377 ¶ 3 (2015).

³⁶ NTCA Comments at 12; WISPA Comments at 7-8; Comments of ITTA—The Voice of America’s Broadband Providers at 3 (filed Sept. 21, 2017) (“ITTA Comments”); CWA Comments at 13-14; Comments of ADTRAN, Inc. at 5-7 (filed Sept. 21, 2017); Comments of NetMoby, Inc. at 10 (filed Sept. 21, 2017) (speeds should be at least 25/3Mbps); Comments of State of Colorado Broadband Office at 3 (filed Sept. 7, 2017) (“Colorado Broadband Office Comments”); New York City Comments 2; Comments of Free State Foundation at 9 (filed Sept. 21, 2017). *C.f.* Comments of USTelecom Association at 9-10 (filed Sept. 21, 2017) (finding that reducing the benchmark would be “unduly disruptive”).

³⁷ CWA Comments at 13-14; Colorado Broadband Office Comments at 3.

³⁸ *See* OTI 2016 NOI Comments at 2.

³⁹ *See* Comments of National Electrical Manufacturers Association (NEMA) at 3 (filed Sept. 6, 2017).

⁴⁰ Comments of INCOMPAS at 19-20 (filed Sept. 21, 2017).

to improve the United States’ global competitiveness in high-speed broadband deployment. Of those commenters who do not support the current benchmark, some urge the Commission to track multiple speed levels.⁴¹ ESA does not oppose tracking and reporting multiple speed levels and appreciates the value of additional information. But ESA believes that to make sense of the Commission’s determination of whether ATC is being deployed in a reasonable and timely fashion, the Commission should maintain a clear and consistent definition of ATC itself, including what constitutes a “high-speed” broadband service under the statute.⁴²

V. ADDRESSING FIXED AND MOBILE ATC SERVICES

Recognizing the growing use and capabilities of mobile broadband, the Commission proposes to incorporate both fixed and mobile services into the section 706 inquiry.⁴³ The NOI points to the fact that the statute defines ATC “without regard to any transmission or media” and as being provided “using any technology.”⁴⁴ Suggesting that mobile and fixed broadband services are substitutes for one another, the Commission seeks comment on whether it should focus on American’s access to *ether* fixed or *mobile* ATC in making the section 706 determination.⁴⁵ The Commission then goes on to stress the differences in mobile broadband capabilities, suggesting that any speed benchmark “would be lower than the 25 Mbps/3Mbps benchmark”⁴⁶ for fixed services, and asking how to account for “the important issues of

⁴¹ See, e.g., Comments of NCTA—The Internet and Television Association at 5-6 (filed Sept. 21, 2017) (finding the current threshold “somewhat arbitrary” and urging the Commission to report on the deployment of multiple speed thresholds); AT&T Comments at 7 (calling the current benchmark “aggressive” and calling on the Commission to recognize that “different standards may be appropriate in other contexts”).

⁴² 47 U.S.C. § 1302(d).

⁴³ NOI ¶ 5.

⁴⁴ *Id.* (quoting 47 U.S.C. § 1302(d)).

⁴⁵ *Id.* ¶ 9.

⁴⁶ *Id.* ¶ 18.

reliability/consistency of service and latency in the mobile broadband environment.”⁴⁷

ESA disagrees that fixed and mobile broadband services today are sufficiently substitutable such that access to ATC can be met by access to one or the other. ESA respectfully suggests that the Commission cannot have it both ways. If, guided by the statutory definition, the Commission adopts a technologically-neutral approach to determining access to ATC, there is no basis to adopt technologically-specific definitions of what constitutes ATC in the first place. Even setting this statutory inconsistency aside, the practical effect of the *ether/or* approach is to downgrade the definition of ATC by effectively lowering the speed benchmark and accounting for the higher latency and lower consistency of mobile networks. While mobile broadband is evolving rapidly and can provide a good experience for some online services—such as email, news updates, and navigation—it simply does not provide the fast, reliable, and low-latency connections that are required to support other applications, such as multiplayer games and cloud game play services, that have lower tolerances for latency.

Many commenters in the record share ESA’s view of the issue and describe in more detail the different capabilities of fixed and mobile broadband and the relative limitations of mobile service with respect to speed, reliability, data allowances and affordability.⁴⁸ As NTCA explains, “[m]obile wireless broadband service, while clearly valuable to consumers of all kinds, is simply not a substitute for a robust, high-quality, fixed wireline connection . . . and in rural areas in particular, meaningful access to mobile broadband will increasingly depend upon robust

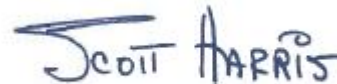
⁴⁷ *Id.* ¶ 19.

⁴⁸ *See, e.g.*, Comments of Microsoft at 7-10 (filed Sept. 21, 2017) (“Microsoft Comments”); NTCA Comments at 3-12; WISPA Comments at 4-6; ITTA Comments at 7-8; CWA Comments at 4-13, Colorado Broadband Office Comments at 1-3; 2017 Comments of Open Technology Institute at New America at 14-15 (filed Sept. 21, 2017); Comments of Public Knowledge at 3, 8-11 (filed Sept. 21, 2017).

fixed networks.⁴⁹ These commenters confirm that mobile broadband lacks the capability to support high-bandwidth, low-latency applications like videoconferencing and online video game services.⁵⁰

Simply put, mobile broadband today does not provide an adequate broadband solution for access to the advanced services, like the high-quality interactive video games on the market today. For the Commission to conclude otherwise and find that access to *either* fixed *or* mobile services is sufficient risks discouraging the deployment of those fixed networks that are currently capable of providing ATC—the exact opposite of the Congressional and Commission goals embodied in section 706.

Respectfully submitted,



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⁴⁹ NTCA Comments at 3.

⁵⁰ *See, e.g.*, Comments of Mimosa Networks, Inc. at 1-8 (filed Sept. 21, 2017); Microsoft Comments at 8-9.