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February 2, 2016

**VIA ELECTRONIC FILING**

Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12th Street, SW  
Washington, DC 20554

Re: ViaSat, Inc., WC Docket Nos. 10-90, 14-58, 07-135, 05-337, and 03-109; GN Docket No. 09-51; CC Docket Nos. 01-92 and 96-45; WT Docket No. 10-208

Dear Ms. Dortch:

As the Commission has recognized, the success of Phase II of the Connect America Fund (“CAF”) will depend in no small part on whether the Commission can effectively leverage the participation of a broad variety of service providers to stimulate competition for the limited funds available. The ability and willingness of providers to participate will depend, in turn, on how the Commission structures the contemplated reverse auctions—a fact brought into sharp relief by the considerable debate on the record over a proposal that would create three different participation tiers based on the capabilities of different service providers (and include a 100 milliseconds latency requirement and a 25/3 Mbps speed requirement for certain tiers), and establish a “waterfall” of funding that, as a practical matter, could leave little or no funding available for the “lower” tiers.

ViaSat submits this letter to propose an alternative approach to structuring the reverse auctions, which would facilitate broad participation and ensure that advanced broadband capabilities are made available efficiently and expeditiously to consumers in those areas otherwise left behind by incumbent local exchange carriers (“ILECs”). As detailed below, a qualified bid offering service at speeds of 50/5 Mbps that would satisfy a Mean Opinion Score (“MOS”) of four would be treated in the same manner as a qualified bid offering service at speeds of 25/3 Mbps that would satisfy a 100 milliseconds latency standard. The sole determining factor in selecting between two such bids in the auctions would be the bid amount—*i.e.*, the amount of support requested.

This alternative would increase the number of competitive offerings by minimizing the risk of certain providers deciding not to participate in the auctions because they would be unduly penalized on the basis of perceived technological limitations (as opposed to subscriber-

determined value) and left unable to acquire the critical mass of households necessary to take on the long-term commitments associated with the CAF.<sup>1</sup>

As an initial matter, ViaSat believes that the structure of the Phase II reverse auctions should reflect the primary objective of the CAF program, which is to make high-quality broadband service available in as many parts of the country deemed “unserved” by the Commission as possible, in a cost-effective and expeditious manner. ViaSat has explained that this objective can be achieved most effectively by utilizing a fully competitive process to identify service providers and technologies that offer the most “bang for the buck” in a given geographic area. To facilitate that end, ViaSat has urged the Commission to design its reverse auctions in a competitively and technologically neutral manner that allows participation by all types of service providers. ViaSat’s and other broadband providers’ mere presence in this proceeding has already spurred competition for Phase II funding, as reflected in the record. More specifically, ViaSat has urged the Commission to ensure that satellite providers are not excluded from participating and are not relegated to a limited role, given the significant contributions they can make to the overall success of the CAF (*e.g.*, offering speeds that meet and exceed the 25/3 Mbps standard adopted in the Section 706 context *today* and doing so sooner than providers using other technologies). Consistent with this view, ViaSat has supported a reverse auction structure that would allow all bidders meeting minimum service levels to compete against each other for support on an equal footing.

Recently, ViaSat has learned that a number of proposals have been made that would award bidding credits (or demerits) based on the characteristics of the services that would be offered by auction participants. In particular, some participants in this proceeding have proposed bidding demerits for services that would not be capable of providing less than 100 milliseconds of latency. As ViaSat has explained previously, and the Commission has acknowledged, services that do not satisfy the 100 milliseconds latency metric can still provide a high-quality experience to the end user (while satisfying that metric does not guarantee a high-quality experience).<sup>2</sup> To the extent, however, that the Commission views 100 milliseconds of latency as a proxy for such quality, ViaSat reiterates its prior recommendations that the Commission either: (i) employ an alternative quality metric, such as the MOS; or (ii) apply the latency requirement only with respect to the very limited amount of latency-sensitive traffic that may exist, thus enabling the use of hybrid networks to deliver the most cost-effective broadband solution to the consumer.<sup>3</sup>

If neither of those approaches is adopted, ViaSat recommends that the Commission allow bidders to offset any inability to offer latency of 100 milliseconds or less with a commitment to

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<sup>1</sup> See, *e.g.*, Comments of ViaSat, Inc., WC Docket No. 10-90, at 9 (Feb. 19, 2013); Reply Comments of the Satellite Broadband Providers, WC Docket No. 10-90, at 4-5 (Feb. 17, 2012).

<sup>2</sup> See Letter from ViaSat to FCC, WC Docket No. 10-90, at 7-8 (Aug. 21, 2015), *attached* as Exhibit A hereto (“ViaSat August Letter”).

<sup>3</sup> *Id.*

provide speeds of 50/5 Mbps. For the reasons detailed below, by providing download speeds (*i.e.*, bandwidth) that are twice the minimum otherwise required, and satisfying a MOS of four, a bidder would more than address any policy concerns that underlie a latency requirement, as well as ensure the quality of the end-user's broadband service.<sup>4</sup>

ViaSat's proposal assumes that any qualified bidder also would need to meet minimum requirements with respect to pricing and usage allowances based on the urban rate survey (which establishes ranges meant to ensure "reasonable comparability" between urban and rural areas, as required by Section 254 of the Act), as well as satisfy build-out schedules no more demanding than the schedule applicable to price cap carriers exercising rights-of-first-refusal. Similarly, this proposal assumes that compliance with relevant eligibility criteria and requirements (*i.e.*, actually meeting the required performance metrics) would be measured, validated, and enforced pursuant to mechanisms otherwise adopted under Phase II of the CAF.<sup>5</sup>

The reasonableness of this "speed-for-latency" tradeoff is supported by generally available market data. As ViaSat has previously explained, broadband service quality depends on a combination of service dimensions or characteristics that together determine the end-user experience.<sup>6</sup> Chief among these is speed. Even a cursory examination of the marketing materials of leading broadband providers reflects that speed is one of the two most critical elements used to market service to the consumer (along with price).<sup>7</sup> In fact, ViaSat has found that the speed of an offered service has a greater impact on consumer adoption than any other

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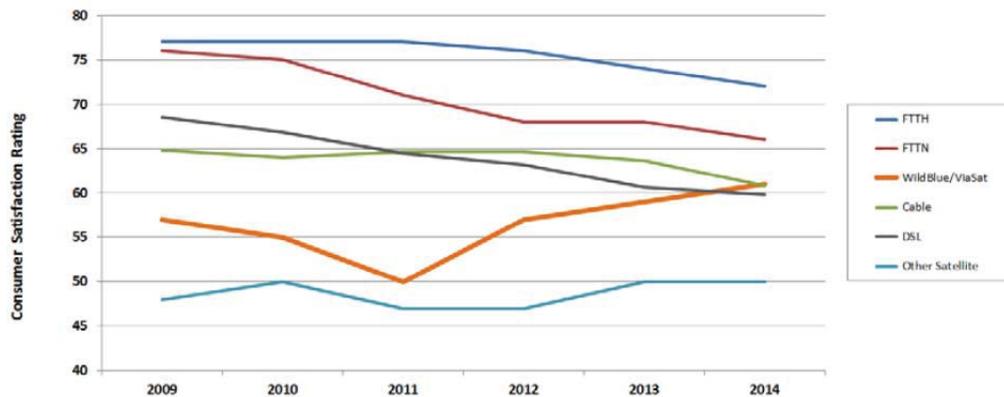
<sup>4</sup> A high-quality user experience can be ensured for voice traffic by requiring providers to offer service with a MOS of four—as the Commission previously has acknowledged. *See, e.g., Connect America Fund*, Report and Order and Further Notice of Proposed Rulemaking, 29 FCC Rcd 8769, at ¶ 29 (2014) (finding it would be appropriate to use "other metrics" in lieu of the 100 ms latency standard to assess service quality in certain areas, and that, "[s]pecifically, any winning satellite provider may satisfy our requirements for quality of voice service by demonstrating it can provide voice service that meets a Mean Opinion Score (MOS) of four or greater.").

<sup>5</sup> To the extent that concerns may exist about using recorded messages to establish compliance with a MOS metric, *see* Letter from ADTRAN, Inc. to FCC, WC Docket No. 10-90 (Dec. 30, 2015), ViaSat has no objection to the Commission's clarifying that MOS must be established based on "live" communications.

<sup>6</sup> *See generally* Mark D. Dankberg, Thomas E. Moore, and Girish Chandran, *Toward a National Broadband Plan: Ensuring a Meaningful Understanding of Broadband Capabilities and Facilitating Competitive Choices* (Aug. 31, 2009), attached to Letter from ViaSat to FCC, GN Docket No. 09-51 (Aug. 31, 2009) (discussing the multiple dimensions of "broadband" service and cautioning against the adoption of restrictive standards that could artificially constrain the evolution of broadband service).

<sup>7</sup> *See, e.g.*, <http://www.verizon.com/home/fios-fastest-internet/#plans> (last visited Feb. 2, 2016) (listing Verizon FIOS plans and emphasizing, in bold type, speeds and prices associated with each offering).

factor. And as ViaSat has explained to the Commission, and as shown in the following chart, ViaSat’s satellite broadband service—which currently offers speeds as high as 25/3 Mbps<sup>8</sup>—now has an overall user satisfaction rating that is on par with that of leading cable-based broadband service providers, and exceeds that of leading DSL-based providers.<sup>9</sup>



FTTH: FiOS, FTTN: U-Verse, Cable: average score of CableOne, Charter, Comcast, Cox, MediaCom, Time Warner, DSL: average score of AT&T, Century Link, FairPoint, Frontier, Verizon, Windstream. ViaSat not ranked in 2013, data point is interpolated.<sup>10</sup>

Notably, consumer satisfaction with satellite broadband service has been rising, and is considerably higher, since ViaSat brought its current-generation broadband service into operation four years ago and began offering speeds that are leaps and bounds above those available previously by satellite. This increase in available speeds helps to explain why about one-third of ViaSat’s broadband customers have switched to satellite from terrestrial broadband alternatives.

The amount of speed (or bandwidth) actually provided to an end user has a significant and direct impact on the quality of the end-user experience for the vast majority of Internet traffic. Notably, Internet video streaming and downloads *alone* account for over 60 percent of Internet traffic today, and are expected to account for 80 percent of all Internet traffic by 2019.<sup>11</sup>

<sup>8</sup> See *ViaSat Unveils Fastest Home Satellite Internet Service in the U.S. with the New Exede WiFi Modem and a 25 Mbps Plan* (Nov. 18, 2015), available at <http://investors.viasat.com/releasedetail.cfm?ReleaseID=943346>.

<sup>9</sup> See ViaSat August Letter at 2-3.

<sup>10</sup> Source: *Consumer Reports* issues published February 2010, May 2011, June 2012, May 2013, May 2014, and May 2015, available at [www.consumerreports.org](http://www.consumerreports.org).

<sup>11</sup> See *2015 Measuring Broadband America Fixed Broadband Report* at 7 n.3 (citing *Cisco Visual Networking Index: Forecast and Methodology, 2014-2019 White Paper* (May 27, 2015), available at [http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white\\_paper\\_c11-481360.html](http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html) (“Cisco VNI Paper”)).

The quality of the end-user experience when using these applications is tied to the amount of speed (*i.e.*, bandwidth) available to that user. Significantly, neither this video traffic (nor, for that matter, most web traffic or file sharing traffic) is at all latency sensitive.<sup>12</sup>

At the same time, higher speeds allow multiple users in a given household to access these and other applications. Notably, the number of devices connected to IP networks is likely to be at least three times as high as the population in 2019, further driving the need for high levels of speed (*i.e.*, bandwidth).<sup>13</sup> It is no surprise that Cisco predicts that these demands will cause average broadband speeds to double to 43 Mbps by 2019<sup>14</sup> (although those speeds are unlikely to be available in areas of the country deemed “unserved” by the Commission absent Commission action to ensure that result).

Given these trends, ViaSat believes that sound policy warrants adopting a reverse auction structure that accommodates, and does not penalize, service providers that can provide robust broadband speeds to consumers, as well as offer very good levels of voice quality, even if the supported service would not provide less than 100 milliseconds of latency. Notably, under ViaSat’s proposal, the 50/5 Mbps speed (*i.e.*, bandwidth) threshold would be five times higher than the 10/1 speed required of price cap ILECs that exercised their rights-of-first-refusal, and also would be higher than the average speeds that Cisco expects will exist by the time auction winners likely would start to roll out service to the subject households.<sup>15</sup>

ViaSat continues to believe that a “unified” reverse auction structure would be most effective. But if the Commission chooses to impose “latency-based” requirements on bidders, ViaSat’s approach at least would provide a way for the hardest-to-serve consumers to have access to much higher speeds than they otherwise might be able to obtain while ensuring a high-quality end-user experience overall. This approach also would facilitate greater inclusiveness of service providers, promote competition among all eligible services (as already evidenced by some of the filings in this proceeding), lead to better auction results, and ensure greater consistency with the Commission’s principles of competitive and technological neutrality.

Please contact the undersigned should you have any questions.

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<sup>12</sup> See *2015 Measuring Broadband America Fixed Broadband Report*, at 7 (noting that “differences in average latencies across all technologies are unlikely to affect less interactive applications such as web browsing and video streaming”).

<sup>13</sup> See Cisco VNI Paper.

<sup>14</sup> *Id.*

<sup>15</sup> *Id.*

Respectfully submitted,

/s/ John P. Janka  
John P. Janka  
Jarrett S. Taubman

*Counsel for ViaSat, Inc.*

cc: Stephanie Weiner  
Diane Cornell  
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**Exhibit A**

**ViaSat August *Ex Parte* Letter**

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August 21, 2015

## VIA ELECTRONIC SUBMISSION

Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12th Street, SW  
Washington, DC 20554

**Re: WC Docket Nos. 10-90, 14-58, 07-135, 05-337, and 03-109; GN Docket No. 09-51; CC Docket Nos. 01-92 and 96-45; WT Docket No. 10-208**

Dear Ms. Dortch:

As the Commission proceeds with its implementation of Phase II of the Connect America Fund (“CAF”), ViaSat takes this opportunity to comment on the recent exchange between ADTRAN, Inc. (“ADTRAN”) and Hughes Network Systems, Inc. (“HNS”) concerning potential alternatives to the 100 milliseconds latency requirement utilized for price cap carriers in Phase I.

Although ViaSat agrees that the Commission should eschew any “rigid requirement” that would preclude the use of any technology categorically—particularly where such requirement is “unnecessary to ensure that consumers can use real-time broadband applications such as VoIP,”<sup>1</sup> ViaSat also shares the concern that the particular, satellite-specific alternative standards suggested by HNS “could result in widespread subsidization of ‘second class’ broadband, contrary to the public interest.”<sup>2</sup> To address these concerns, ViaSat proposes a different set of alternative eligibility requirements intended to: (i) accommodate differences across technology platforms; (ii) minimize the contribution burden placed on end users; and (iii) ensure that consumers receive high-quality services capable of supporting important broadband

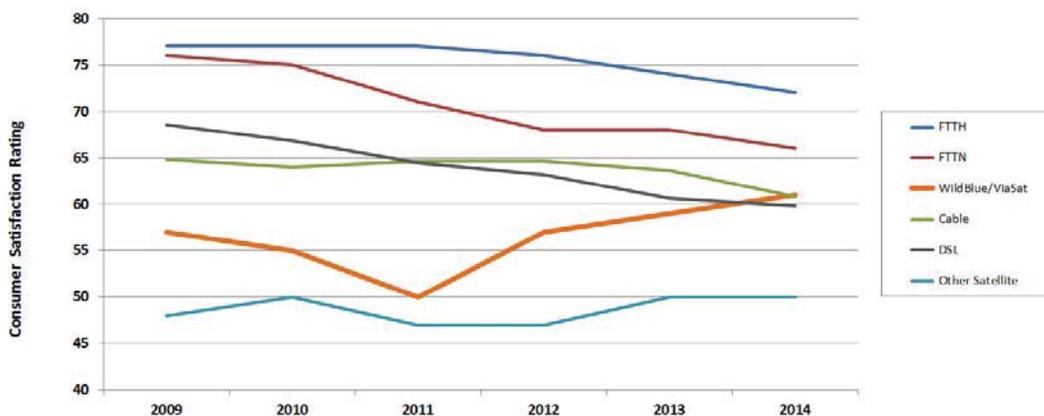
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<sup>1</sup> Letter from Jennifer A. Manner, VP, Regulatory Affairs, HNS to FCC, WC Docket No. 10-90, at 2 (March 27, 2015).

<sup>2</sup> Letter from Stephen L. Goodman, Counsel for ADTRAN, to FCC, WC Docket No. 10-90, at 1 (July 22, 2015).

applications—including the video streaming services that now account for more than 50 percent of peak downstream traffic.<sup>3</sup>

As an initial matter, ViaSat urges the Commission, in developing and implementing policies for Phase II of the CAF: (i) to consider how consumer perceptions of *today's* satellite broadband services favorably compare with those of other broadband technologies; and (ii) to recognize that the relative performance of satellite broadband services has improved significantly over time. As shown in the following graph, ViaSat's satellite broadband service now has an overall user satisfaction rating that is on par with that of leading cable and DSL-based broadband service providers. Notably, the reported level of satisfaction has been rising, and is considerably higher, since ViaSat brought its current-generation broadband service into operation four years ago, and in the very early stages of this proceeding. Moreover, as the Commission is well-aware, ViaSat's service is the highest-rated ISP, across all broadband technologies, in terms of delivering advertised speeds.<sup>4</sup> These reasons, and perhaps others, are why about one-third of ViaSat's broadband customers have switched to satellite from terrestrial broadband alternatives.



FTTH: FiOS, FTTN: U-Verse, Cable: average score of CableOne, Charter, Comcast, Cox, MediaCom, Time Warner, DSL: average score of AT&T, Century Link, FairPoint, Frontier, Verizon, Windstream. ViaSat not ranked in 2013, data point is interpolated.

Source: *Consumer Reports* issues published February 2010, May 2011, June 2012, May 2013, May 2014, and May 2015, available at [www.consumerreports.org](http://www.consumerreports.org).

<sup>3</sup> See Sandvine, *Global Internet Phenomena Report: Latin America & North America*, at 4, Table 1 (May 2015) (showing Netflix with 36.48% share and YouTube with 15.56% share of peak downstream traffic over fixed facilities in North America).

<sup>4</sup> See *2014 Measuring Broadband America Fixed Broadband Report*, at 15 (2014) (noting that average peak download speeds per ISP varied from a high of 139 percent of advertised speed for ViaSat to a low of 83 percent of advertised speed for Verizon DSL); *2013 Measuring Broadband America February Report*, at 7 and 10 (2013) (noting that 90 percent of ViaSat consumers received 140 percent or better of advertised speed, and that average peak download speeds per ISP varied from a high of 137 percent of advertised speed for ViaSat to a low of 81 percent of advertised speed for Windstream).

Notably, as is the case with every other technology, the quality of satellite technology turns on precisely how the technology is deployed and how the provider manages the provision of service to customers. These perspectives should frame the development of truly technology-neutral CAF performance metrics.

**A. For CAF Phase II, the Commission Should Adopt Different Eligibility Criteria than the 100 Milliseconds Latency Requirement**

As depicted above, *today's* satellite broadband technologies provide high-quality service to end-user consumers that compares favorably to that which many terrestrial providers propose to provide *in the future* by deploying new or upgraded facilities with the benefit of CAF support. This development reflects the significant efforts that satellite broadband providers have made to improve their technologies and service offerings. Indeed, ViaSat alone has invested *billions* of dollars of private capital to develop a state-of-the-art broadband network designed to overcome the historical limitations of legacy satellite networks and provide a high-quality end-user experience.

ViaSat is eager to make its Exede<sup>®</sup> broadband services available to millions of additional consumers in CAF-eligible locations that currently do not receive true broadband service. ViaSat is well-positioned to quickly and efficiently serve those consumers through attractive service plans offering prices, speeds, usage allowances, and quality that would more than satisfy the “reasonable comparability” benchmarks being contemplated by the Commission. However, ViaSat may not be able to justify the deployment and dedication of capacity to serve those needs if it is not allowed to participate in CAF programs on the same terms as other providers. Simply stated, foregoing the use of capacity and capital for other business services, and bearing the costs involved in obtaining and maintaining eligible telecommunications carrier (“ETC”) status, may not make sense unless ViaSat can participate in the reverse auctions on the same terms as everyone else.

Consistent with the Commission’s longstanding commitment to competitive and technological neutrality,<sup>5</sup> ViaSat has advocated the adoption of CAF eligibility criteria that enable broad program participation by wireline, wireless, satellite, and other service providers on the same terms and conditions. As ViaSat has explained, this approach would facilitate the use of limited CAF support by the most efficient and effective service providers—regardless of the technologies they use. This approach therefore would minimize the CAF funding burden placed on the end-user consumers that effectively fund universal service programs.

In CAF Phase I, the Commission departed from its historical commitment to competitive and technological neutrality, which had allowed (and continues to allow) satellite-based services to participate in, and receive support through, other federal universal service

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<sup>5</sup> See *Federal-State Joint Board on Universal Service*, Report and Order, 12 FCC Rcd 8776, at ¶ 48 (1997) (concluding that rules that minimize competitive and technological bias would “facilitate a market-based process whereby each user comes to be served by the most efficient technology and carrier”).

programs.<sup>6</sup> Instead, policies were adopted that favored terrestrial incumbents and eligibility criteria were adopted that effectively “boxed out” entire classes of service providers. Particularly problematic was the 100 milliseconds latency requirement imposed on support recipients, which categorically excluded satellite broadband providers that use geostationary spacecraft.

As an initial matter, and as ViaSat has explained, no single performance criterion adequately measures service quality or predicts consumer satisfaction with respect to broadband performance.<sup>7</sup> That is particularly true where, as here, the performance criterion in question (*i.e.*, the 100 milliseconds latency requirement) does not serve as an effective proxy for broadband service quality. Notably, the vast majority of broadband traffic is *not* latency-sensitive, and a high-quality user experience can be ensured for both latency- and non-latency-sensitive traffic through alternative eligibility criteria—as the Commission has acknowledged.<sup>8</sup>

ViaSat believes that, in implementing CAF Phase II, the Commission should course-correct by developing and implementing alternatives to the 100 milliseconds latency requirement that are technology-inclusive while also being sufficient to ensure a high-quality user experience. To be clear, ViaSat does not support eligibility criteria that would compel some consumers to accept inferior services from certain types of supported providers.<sup>9</sup> Rather, ViaSat supports eligibility criteria that can accommodate differences across technology platforms and facilitate service to geographic areas supported through the CAF at the lowest cost to

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<sup>6</sup> See, e.g., *Federal-State Joint Board on Universal Service*, Fourth Order on Reconsideration, 13 FCC Rcd 5318, at ¶ 10 (1997) (concluding that “the principles of competitive and technological neutrality” demand that “non-landline telecommunications providers should be eligible to receive universal service support even though their local calls are completed via satellite”).

<sup>7</sup> See generally Mark D. Dankberg, Thomas E. Moore, and Girish Chandran, *Toward a National Broadband Plan: Ensuring a Meaningful Understanding of Broadband Capabilities and Facilitating Competitive Choices* (Aug. 31, 2009), attached to Letter from John P. Janka, Counsel to ViaSat to FCC, GN Docket No. 09-51 (Aug. 31, 2009) (discussing the multiple dimensions of “broadband” service and cautioning against the adoption of overly restrictive performance standards that could artificially constrain the evolution of broadband service).

<sup>8</sup> See, e.g., *Connect America Fund*, Report and Order and Further Notice of Proposed Rulemaking, 29 FCC Rcd 8769, at ¶ 29 (2014) (finding that satellite providers “may not be able to satisfy the 100 ms latency standard,” that it instead would be appropriate to use “other metrics” to assess service quality in certain areas, and that, “[s]pecifically, any winning satellite provider may satisfy our requirements for quality of voice service by demonstrating it can provide voice service that meets a Mean Opinion Score (MOS) of four or greater.”).

<sup>9</sup> ViaSat shares ADTRAN’s concern that simply watering down requirements in an effort to accommodate HNS “could result in widespread subsidization of ‘second class’ broadband, contrary to the public interest.” See Letter from Stephen L. Goodman, Counsel for ADTRAN to FCC, WC Docket No. 10-90, at 1 (July 22, 2015).

contributing end users, while still ensuring that consumers receive high-quality services capable of supporting important broadband applications.

Toward that end, ViaSat proposes the following specific criteria for CAF Phase II eligibility:

- ***Speeds of 25 Mbps downstream and 3 Mbps upstream.*** Speed is the most crucial element of high-quality broadband service. The proposed 25/3 Mbps standard would ensure that consumers receive service satisfying the definition of “advanced telecommunications capability” adopted in the Section 706 context.<sup>10</sup> There is no basis for supporting services with lower speeds when the 25/3 Mbps standard can be met by any number of service providers (including satellite broadband providers) in a given geographic area supported through the CAF within any reasonable build-out period that the Commission may adopt.

Notably, the amount of speed (or bandwidth) actually provided to an end user is by far the most important factor in ensuring a quality experience with video streaming applications, which now account for more than 50 percent of peak downstream traffic over fixed broadband facilities in North America.<sup>11</sup> In contrast, other network performance characteristics—like latency and jitter—are far less significant due to the use of caching and buffering in connection with such applications.<sup>12</sup>

- ***Service plans with usage allowances tied to urban rate survey results.*** In order to ensure that supported offerings are “reasonably comparable” to those available in urban areas, required usage allowances should be tied to the results of the Commission’s urban rate surveys.<sup>13</sup> ViaSat is confident that it would be able to provide service plans consistent with those results if it is allowed to participate fully in Phase II of the CAF, and urges the Commission to reject proposals for

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<sup>10</sup> See *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*, 30 FCC Rcd 1375 (2015).

<sup>11</sup> See n.3, *supra*.

<sup>12</sup> See, e.g., Tim Szigeti and Christina Hattingh, Cisco Systems, *Quality of Service Design Overview* (Dec. 17, 2004) (noting that streaming video applications have no significant jitter requirements and can tolerate up to 4 or 5 *seconds* of latency depending on buffering capabilities).

<sup>13</sup> See, e.g., *Wireline Competition Bureau Announces Posting of Broadband Data from Urban Rate Survey and Seeks Comment on Calculations of Reasonable Comparability Benchmark for Broadband Services*, Public Notice, 29 FCC Rcd 7992 (2014) (noting that 87 percent of responses relating to 25 Mbps speeds offer a usage allowance of 250 GB per month).

usage allowances that would severely restrict consumers' ability to use their service effectively and perpetuate the misperception that satellite broadband technologies are inferior to terrestrial alternatives.<sup>14</sup>

- ***Access to voice service with a Mean Opinion Score (MOS) of four.***<sup>15</sup> ViaSat recognizes the Commission's desire to ensure the quality of voice services that can be provided over CAF-funded broadband networks. Requiring that broadband providers provide access to a voice service that meets a MOS of four would ensure that end users can receive a voice service that consumers perceive as being of high quality. Notably, the Commission already has found that requiring support recipients to meet a MOS of four serves the same purpose as the 100 milliseconds latency requirement while avoiding the categorical exclusion of satellite providers.<sup>16</sup> A MOS of four indicates "High" speech transmission quality that the vast majority of users (approximately 90 percent) classify as "Good or Better." And, importantly, the MOS metric is a more reliable measure of perceived quality than latency alone. Among other things, the MOS metric accounts for latency, as well as coding, jitter, packet loss, and any of a variety of other technical factors that can impact the end-user experience with a voice call.
- ***Packet loss of no more than 0.01 percent.*** Although some degree of packet loss is to be expected in any network, low rates of packet loss are essential to ensure the integrity of data that is sent and received over a broadband service. For two-way, real-time applications other than VoIP, ViaSat recommends that the Commission adopt a packet loss requirement of no more than 0.01; for other

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<sup>14</sup> HNS instead proposes what it views as a "more achievable minimum requirement of 50 GB." See Letter from Jennifer A. Manner, VP, Regulatory Affairs, HNS to FCC, WC Docket No. 10-90, at 1 (July 20, 2015). But the fact that *HNS* may choose not to provide higher usage allowances to consumers through the CAF does not justify denying consumers high-quality broadband services—particularly as nothing inherent in the nature of today's satellite broadband services dictates that result.

<sup>15</sup> ViaSat previously had advocated the use of an R-score metric. However, the recent exchange between ADTRAN and HNS suggests that the R-score may amount to a "composite" measure that gives significant weight to low latency, and thus reintroduces the 100 milliseconds latency issue. See Letter from Stephen L. Goodman, Counsel for ADTRAN to FCC, WC Docket No. 10-90, at 2 (May 26, 2015). The use of the R-score thus risks the artificial and unnecessary exclusion of satellite providers notwithstanding their provision of high-quality service to consumers. Moreover, the Commission has indicated that the R-score is more of a network planning tool than a measure of customer satisfaction. See *Technology Transitions Policies*, WC Docket No. 05-25, FCC 15-97, at ¶ 218 (Aug 7, 2015). The proposed MOS metric avoids those issues by more directly measuring consumer satisfaction, and is consistent with ADTRAN's endorsement of a requirement of a MOS of 4.

<sup>16</sup> See n.8, *supra*.

applications (such as video streaming, and downloading or uploading files), a more lenient packet loss requirement, such as less than 1 percent, would be more than adequate. As noted above, the impact of packet loss on VoIP service is already included in the proposed MOS score and need not be separately specified for VoIP.

- **Average one-way jitter of no more than 30 milliseconds for interactive, real-time applications.**<sup>17</sup> Low jitter helps to compensate for packet delay and facilitates high-quality including interactive, real-time applications, such as video conferencing. For interactive, real-time applications other than VoIP, ViaSat proposes an average one-way jitter specification of no more than 30 milliseconds.<sup>18</sup> As noted above, the impact of jitter on VoIP service is already included in the proposed MOS score and need not be separately specified for VoIP; for applications like video streaming, the quality of service of which is managed by tools like buffering and caching, there is no significant correlation between low jitter and a high-quality end-user experience.<sup>19</sup>

In short, ViaSat believes that these eligibility criteria would advance the objectives of the CAF program far more effectively than a 100 milliseconds latency requirement because they would ensure that consumers receive high-quality broadband and voice services while facilitating competition between a wide variety of service providers and technologies—with resulting gains in program efficiency and effectiveness.

**B. If the Commission Instead Retains the 100 Milliseconds Latency Requirement, the Commission Should Clarify that the Requirement Applies Only with Respect to Latency-Sensitive Traffic**

If the Commission decides to forego the use of the technology-neutral eligibility criteria described above and instead imposes a 100 milliseconds latency requirement for Phase II of the CAF, the Commission at least should clarify that such a requirement would apply only with respect to latency-sensitive traffic.<sup>20</sup> The CAF Phase I latency requirement extends from

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<sup>17</sup> Jitter frequently is defined as the variation in latency over times. Real-time, interactive applications can be sensitive to jitter. That jitter is derivative of latency undercuts HNS's claim that the Commission has not provided sufficient notice of the potential adoption of a jitter metric. *See, e.g.,* Letter from Jennifer A. Manner, VP, Regulatory Affairs, HNS to FCC, WC Docket No. 10-90, at 1 (July 20, 2015). Moreover, the Commission specifically has invited parties to propose alternatives to the 100 milliseconds latency standard. *See Connect America Fund*, 29 FCC Rcd 7051, at ¶ 150 (2014).

<sup>18</sup> *See* Tim Szigeti and Christina Hattingh, Cisco Systems, *Quality of Service Design Overview* (Dec. 17, 2004).

<sup>19</sup> *See id.*

<sup>20</sup> This approach is preferable to defining a more relaxed satellite-specific latency standard. *Cf.* Letter from Jennifer A. Manner, VP, Regulatory Affairs, HNS to FCC, WC Docket

the Commission's desire to ensure that supported services “enable use of real-time applications.”<sup>21</sup> In other words, the latency requirement reflects the Commission’s view that low latency could be a way to ensure a quality user experience with respect to a relatively narrow class of “latency-sensitive” applications.

But the Commission has never even *suggested* that low latency is necessary or desirable as a means of ensuring quality of service across *all* applications. In fact, low latency is *not* necessary to ensure a high-quality user experience with respect to the vast majority of broadband Internet access traffic. For example, low latency has little bearing on the end-user experience with respect to video streaming, which now accounts for most peak downstream traffic.<sup>22</sup>

Moreover, in designing and implementing their networks, operators make trade-offs between different performance characteristics. Different network technologies and architectures offer comparative advantages in some areas but not others. For example, terrestrial technologies may offer low latency service but at relatively low speeds. In contrast, geostationary satellite technologies tend to provide relatively high speeds but with moderate levels of latency. Assuming *arguendo* a direct relationship between latency and user experience that cannot be overcome easily through network design and management, it could make sense for a network operator to rely on one type of technology to transmit latency-sensitive traffic and another type of technology to transmit non-latency-sensitive traffic. But compelling network operators to design and implement networks using “low-latency” technologies for *non-latency-sensitive* traffic would force them to forgo the advantages of higher speeds offered by geostationary satellite technologies with no offsetting benefits in terms of user experience—a result that would undermine the integrity of the CAF and the interests of consumers.

Among other things, the requested clarification would allow support recipients to utilize “hybrid” network solutions, and thereby route latency-sensitive traffic using technologies optimized for low latency while routing other, non-latency-sensitive, traffic using technologies optimized for speed, throughput, cost, or other advantages provided by that other technology.

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For the reasons set forth above, ViaSat urges the Commission to adopt eligibility requirements that accommodate differences across technology platforms while ensuring that consumers receive high-quality services capable of supporting important broadband applications. Specifically, support recipients should be required to provide: (i) speeds of 25/3 Mbps; (ii) usage allowances tied to the results of the urban rate survey; (iii) access to a VoIP service with a Mean Opinion Score (MOS) of four; (iv) packet loss of no more than 0.01 percent for two-way, real-

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No. 10-90, at 1 (July 20, 2015) (proposing a “latency threshold for satellite broadband providers of 750 ms.”).

<sup>21</sup> See *Connect America Fund*, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663, at ¶ 96 (2011) (“*USF/ICC Transformation Order*”).

<sup>22</sup> See n.3, *supra*.

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time applications other than VoIP; and (v) average one-way jitter of no more than 30 milliseconds for interactive, real-time applications other than VoIP. If the Commission instead chooses to impose a 100 milliseconds latency requirement for Phase II of the CAF— notwithstanding the public interest harms that would flow from that decision—it at least should clarify that the requirement applies only with respect to “latency-sensitive” traffic. That clarification would limit somewhat the harms that otherwise would flow from the use of a numeric latency metric.

Please contact the undersigned should you have any questions.

Respectfully submitted,

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