



May 5, 2015

Ex Parte Notice

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *Connect America Fund, WC Docket No. 10-90; Ex Parte of Hughes Network Systems, LLC; Rebuttal Ex parte of Vantage Point Solutions*

Dear Ms. Dortch:

On March 27, 2015, Hughes Network Systems, LLC (Hughes) filed the above-captioned Ex Parte proposing an alternative approach to considering latency for CAF Phase II funding eligibility. This letter responds to the Hughes filing and flags technical concerns about what the “alternative approach” floated by Hughes would mean for consumer experience on supported networks.

After considerable study, the Commission has already established that “ITU data for a VoIP call [ITU Standard G.114¹] are an appropriate basis for determining latency sufficient for this aspect of Phase II,” and that, “after consideration of the ITU conclusion that consumers are ‘very satisfied’ with the quality of VoIP calls up to an ear-to-mouth latency of approximately 200 ms and the record received in this proceeding, ... the 100 ms limit adopted herein is consistent with ITU data.”²

Hughes attempts to sidestep this determination by measuring delay for only two specific applications, to the exclusion of everything else that broadband-capable networks are supposed to enable. When considered from the consumer experience, however, such a view of latency is at once flawed and deficient. Many interactive broadband applications that consumers and businesses demand are adversely affected as latency increases. Besides voice, high latency can limit consumers’ ability to use many other “real-time” applications, such as video conferencing, Virtual Private Networking (VPN), remote learning, and telemedicine, to name only a few. With all interactive two-way applications, latency is important since delays in delivering data can substantially degrade the quality of the application or make it unusable. New broadband investments – especially those funded by CAF resources – must ensure sufficiently low latency to support *both* voice-grade service *and* all other real-time applications for the un/underserved, as it

¹ See *In the Matter of the Connect America Fund, Report and Order*, WC Docket No. 10-90, DA 13-2115, released October 31, 2013 (the “PC Carrier Standards Order”) at ¶ 20

² “PC Carrier Standards Order” at ¶ 28.

is supported for their urban counterparts, which is why the FCC resolved to require a roundtrip latency of 100 ms or less for recipients of CAF support.³

Hughes' Proposed Web Page Loading Time Methodology

Hughes' notion of using a "Web Page Loading Time Methodology" as one of only two applications worthy or metrics, attempts to mask the entire latency issue. While web page loading time may figure into customer experience satisfaction levels, it completely skirts the need – and reasonable expectation of the consuming public – for low-latency service for many other applications, besides just voice.

To best capture the impact on consumers by analogy, assume one had to wait 60 seconds before any water would come out of a kitchen faucet every time it was turned on. If one was filling a 55 gallon drum (analogous to web page loading), that 60-second delay in the water first coming out may not seem all that significant. However, if one had to wait 60 seconds *every time* there was a need to fill a glass just to get a drink of water or for other routine kitchen tasks – analogous to other more interactive applications such as video conferencing, VPN, remote learning or telemedicine, as well as voice – it would quickly become an annoyance and almost unusable.

The public is not served – and CAF resources are not efficiently used – by possibly focusing on one application while permitting the degraded or precluded use of many others.

Hughes' Proposed R-Factor Test Using the E-model for Voice

Hughes also proposes a separate metric for voice, specifically, "The R-Factor Test Using the E-model for Voice." However, with the proposed use of this metric, Hughes would only mask the debilitating effect that unavoidable satellite delay has on voice simply by changing the grading scale. The E-model was developed as a transmission *planning* tool, to computationally estimate likely equivalent MOS scores and associated User Opinions that would result from various network impairments; however, it alone can cure nothing. In practice, the R-Factor will still map to an equivalent and poor Mean Opinion Score (MOS) – or more importantly, to a poor User Opinion, for voice.

As Vantage Point Solutions stated in its paper entitled *Analysis of Satellite-Based Telecommunications and Broadband Services*⁴ ("Analysis"), submitted earlier into the record for this proceeding by NTCA–The Rural Broadband Association, PhonePower, a VoIP service provider, performed an analysis of the MOS and other parameters that affect voice quality over various networks.⁵ PhonePower's analysis shows satellite providers, such as Hughes Network

³ "PC Carrier Standards Order" at ¶ 22.

⁴ *Analysis of Satellite-Based Telecommunications and Broadband Services*, November 2013, available at <http://apps.fcc.gov/ecfs/document/view?id=7520956713>, companion to the NTCA Ex Parte Notice of November 7, 2013, available at <http://apps.fcc.gov/ecfs/document/view?id=7520956712>.

⁵ Available at <http://www.phonepower.com/blog/2011/11/01/the-internet-through-phone-power-colored-glasses/>.

Systems and WildBlue Communications, have VoIP service classified as “Very Annoying” using the MOS scale. As Hughes itself points out, the ITU specification correlates the E-Model R-Factor score to the MOS.⁶ Telchemy, which has authored extensions to the E-model, provides this correlation in its *Voice Quality Measurement* Application Note of November 2014.⁷

User Opinion	R Factor (Narrowband)	R Factor (Wideband)	MOS (ITU Scaled)	MOS (ACR Scaled)
Very Satisfied	90 - 100	115 - 129	4.3 - 5.0	4.1 - 5.0
Satisfied	80 - 90	100 - 115	4.0 - 4.3	3.7 - 4.1
Some Users Satisfied	70 - 80	90 - 100	3.6 - 4.0	3.4 - 3.7
Many Users Dissatisfied	60 - 70	80 - 90	3.1 - 3.6	2.9 - 3.4
Nearly All Users Dissatisfied	50 - 60	65 - 80	2.6 - 3.1	2.4 - 2.9
Not Recommended	0 - 50	0 - 65	1.0 - 2.6	1.0 - 2.4

From the above, the average MOS for satellite providers Hughes Network Systems and WildBlue Communications (ViaSat) in PhonePower’s study, (MOS < 1.5), would be the equivalent of *near zero* R-Factor scores in Telchemy’s correlation chart above, and completely “Not Recommended.”

Even if the E Model could mathematically show somewhat more favorable R Factors for the same actual user experience, it still will not characterize it at an acceptable level. Using the E Model, Vantage Point calculates that the *optimum* narrowband⁸ R Factor that a satellite provider could achieve would be 67, even assuming *perfect* operation of G.711 codecs, which use a substantial amount of bandwidth to avoid compression and to introduce the least delay, and accounting *only* for propagation delay for satellite transport (not even processing delay at the satellite), subtracting *nothing* else for echo or packet loss, assuming these are perfect, and assuming that all other impairments are ideal or no worse than ITU default values. In Telchemy’s correlation chart above, an R Factor of 67 is well within the “Many Users Dissatisfied” category, even for this unlikely optimum case. In practice, additional delay would be likely to occur with satellite and other terminal processing delays, along with other less-than-perfect impairments that would also subtract from the R Factor. Thus, the findings of PhonePower’s study are not surprising.

⁶ Hughes Ex parte at page 4.

⁷ Available at <http://www.telchemy.com/appnotes/TelchemyVoiceQualityMeasurement.pdf>. Absolute Category Rating (ACR) is the MOS of a large pool of listeners.

⁸ Wideband codecs, while they may improve fidelity (at the expense of significantly higher bandwidth), do not mitigate the effects of delay. It must be noted that wideband codecs map differently to User Opinion and MOS, as discussed in ITU-T Rec. G.107.1 (12/2011), a separate ITU Wideband E Model document, available at <http://www.itu.int/rec/T-REC-G.107.1-201112-I/en>, and as shown in this Telchemy correlation chart. Further, it should be noted, as pointed out by Telchemy in its Application Note at page 6, that, “User perception of call quality can also be affected by variable bitrate codecs that switch between narrowband and wideband sampling rates during a call. In particular, transitions from wideband to narrowband are associated with a drop in quality. Calls with frequent switching between narrowband and wideband may be perceived by users as more annoying than calls that start as narrowband and remain consistent throughout the call.”

It follows then, that while the E-model R-Factor methodology facilitates computationally-based transport network *planning*, simply changing the scale for measuring VoIP delay, *i.e.* from the MOS to the E-model R-Factor, both of which are correlated to each other and which refer to this same, unacceptable level of service, will have no bearing on making the service any more acceptable for CAF Phase II funding, and that the Commission's adopted 100 ms requirement for provider network latency⁹ – regardless of application – remains appropriate.

Conclusion

Hughes' proposals to measure latency would mask the debilitating effect of unavoidable delay imposed by geostationary satellites on the total consumer broadband experience. The FCC has made clear its expectation that, to the extent possible, network investments should "further the statutory goal in section 254 of ensuring that consumers in rural and high-cost areas of the country have access to advanced telecommunications and information services that are reasonably comparable to those services in urban areas ...".¹⁰ It follows that support should not flow to networks on which critical performance characteristics would result in "Many Dissatisfied Users" and which, due to immutable laws of physics, can never be improved. Nor should standards be reduced or relaxed just to fit a particular technology in defiance of consumer expectation and demand; there should be no "grading on the curve" when it comes to consumer experience. Contrary to the primary intent of the National Broadband Plan, such an approach would serve only to create and perpetuate a technical digital divide between rural and urban areas.

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Pursuant to Section 1.1206 of the Commission's rules, a copy of this letter is being filed via ECFS with your office. If you have any questions, please do not hesitate to contact me at (605) 995-1777 or Larry.Thompson@Vantagept.com.

Sincerely,



Larry D. Thompson
Chief Executive Officer
Vantage Point Solutions

cc: Rodger Woock (FCC), Cathy Zima (FCC), Suzanne Yellen (FCC), Alexander Minard (FCC)

⁹ *Id.* [2]

¹⁰ "CAF Phase II Order" at ¶ 15. 47 U.S.C § 254(b)(3) states that "Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas."