

APPROVED AND ADOPTED BY THE
DISABILITY ADVISORY COMMITTEE
June 16, 2016

**Recommendation of the FCC Disability Advisory Committee
Technology Transitions Subcommittee
HD VOICE
June 16, 2016**

1. WHEREAS standard definition voice quality associated with the public switched telephone network (PSTN) is becoming competitively obsolete; and
2. WHEREAS traditional analog telephone systems, as well as digital and IP systems that use narrow-band encoding, do not transmit sounds that are higher than approximately 3,400 Hertz (Hz), which is problematic since some of the acoustic cues that are important for speech intelligibility will be at frequencies above that level; and
3. WHEREAS users who are deaf or hard of hearing generally have reduced access to or a reduced ability to extract the defining properties that distinguish speech sounds from each other; and
4. WHEREAS the addition of acoustic information above 3,400 Hz increases the amount of speech that may be available by approximately twenty percent;¹
5. WHEREAS the additional amount of available speech improves speech understanding, reduces expenditures of mental effort, and provides better overall speech quality for deaf and hard of hearing individuals²; and
6. WHEREAS users who have undiminished hearing, may not significantly benefit from additional bandwidth in terms of speech understanding, but they may benefit in terms of improved overall speech quality and reduced mental effort during the speech perception task³; and
7. WHEREAS Internet Protocol (IP) telecommunication systems are less constrained by the technical barriers that limit the acoustic performance of traditional telephone systems; and
8. WHEREAS all of the commonly used HD voice telecommunication methods remove some audio information in order to reduce the number of bits-per-second required for digital transmission with the objective of doing it in a manner that reduces the impact on speech intelligibility; this removal of information could impact the reliability of legacy systems⁴ that transmit data as audio tones; and

¹ Mead Killion and H. Gustav Mueller (2010). Twenty Years Later: A New Count-the-Dots-Method. The Hearing Journal 63:1, 10-17. Online: <http://www.etymotic.com/media/publications/erl-0113-2010.pdf> (Last accessed: 4/15/2016)

² Linda Kozma-Spytek, Paula Tucker, Mary Garvert, and Christian Vogler (2016). AT&T Final Report. Online: <http://tap.gallaudet.edu/IPTransition/Wideband%20Audio/> (Last accessed: 4/7/2016). Filed with the Federal Communications Commission in Docket 13-5, April 7, 2016,

³ *Id.*

⁴ Alarms, medical devices, TTYs and comparable systems encode their data as audio tones and transmit them over PSTN. Some HD Voice encoding techniques, due to being optimized for voice communications, are unable to transmit such data without introducing errors.

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9. WHEREAS support for wide-band audio (hereafter “High-Definition voice” or “HD voice”) in telecommunication equipment and services would benefit all users in that it would enhance the quality of voice communications for all consumers, particularly those who are deaf or hard of hearing; and

10. WHEREAS IP techniques that support HD voice already exist and have been implemented successfully for voice communication in a variety of telecommunication products, systems, and services; and

11. WHEREAS industry associations have begun to update their hearing aid compatibility (HAC) standards and testing procedures to accommodate HD Voice for deaf and hard of hearing people⁵; and

12. WHEREAS there are different commonly accepted digital encoding and transmission techniques to support HD voice in telecommunication equipment and services; and

13. WHEREAS IP techniques that can encode and transmit sounds up to approximately 7,000 Hz are available and have been implemented in a variety of applications; and

14. WHEREAS examples of such applications include, but are not limited to, the ITU-T G.722 standard, the ITU-T G.722.2 standard, the ITU-T G.711.1 standard, and the Opus technique; and

15. WHEREAS existing implementations use different HD Voice codecs because of differing needs and technical constraints; and

16. WHEREAS because a single HD Voice codec would be unable to meet these differing needs and constraints, a means for enabling a variety of different HD Voice codecs⁶ is needed to allow these implementations to work together for the widespread adoption of HD Voice; and

17. WHEREAS technical discussions and recommendations within appropriate stakeholder groups, such as standards bodies, are necessary to further evaluate the technical issues raised herein.

1. RECOMMENDED that the Federal Communications Commission (the “Commission”) consider the benefits and opportunities that HD Voice technologies can provide deaf and hard of hearing users as compared to standard definition voice services, and that the Commission undertake this consideration as consumers come to adopt new technologies; and

2. RECOMMENDED further, that the Commission seek the consensus of service providers, equipment manufacturers, and consumer representatives on whether any further actions are necessary to achieve HD

⁵ See, e.g., the most recent revisions to TIA-1083 for including magnetic testing for HD Voice.

⁶ G.722 is used most commonly within enterprise telephony systems (see Note 1 at <https://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-ict-refresh/background/teitac-report/6-the-recommendations>), G.722.2 is used most commonly in cellular systems (see <http://www.gsma.com/newsroom/wp-content/uploads/IR.92-v9.0.pdf>), and Opus is used most commonly in browser-based telecommunications applications (see <https://tools.ietf.org/html/draft-ietf-rtcweb-audio-11#section-3>). Each of these have trade-offs – for example, G.722 is computationally simple and therefore economically feasible in typical low-cost wireline IP telephones, but does not have the ability of the other techniques to adjust the data transmission rates, while G.722.2 has been standardized for mobile networks because of its resource efficiency; Opus is able to scale up frequency ranges and bit rates for a wide range of different applications with different requirements.

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Voice interoperability between platforms, such as recommended encoding techniques, timelines or benchmarks; and

3. RECOMMENDED further, that if the FCC seeks to adopt new rules or requirements related to HD Voice interoperability, the Commission investigate whether potential HD voice encoding techniques for implementing interoperability between platforms are subject to patent or other intellectual property encumbrances and if so, whether those encumbrances are based on invalid patents and/or are subject to fair, reasonable, and non-discriminatory (FRAND) licensing commitments; and
4. RECOMMENDED further, that the Commission should consider exploring the impact of HD voice encoding techniques or standards for interoperability between platforms on the possible effect on functions such as home alarm systems, medical equipment, analog captioned telephones and TTYs⁷, and how this impact can be mitigated; and
5. RECOMMENDED further, that the Commission initiate steps to ensure that IP-based relay service providers are able to interwork with any communication service provider that supports interoperable HD voice, and that HD Voice is made available to relay service users for every call where it is offered by the communication service provider on the other side of the call; and
6. RECOMMENDED further, in order to achieve interoperability of HD Voice with both NG9-1-1 and relay services, the Commission should seek feedback from stakeholders on the steps necessary to ensure that interoperable HD Voice encoding techniques are harmonized with the NENA i3 solution⁸, and the Commission's relay service interoperability activities under the SIP Forum⁹; and
7. RECOMMENDED further, that the Commission seek feedback from consumers, researchers and industry representatives to determine if technical characteristics¹⁰ should be addressed for the accessibility benefits of HD Voice to be realized by deaf and hard of hearing people.

⁷ See *In the Matter of Transition from TTY to Real-Time Text Technology*, Docket Nos. 16-145 and 15-178, Notice of Proposed Rulemaking, adopted April 28, 2016.

⁸ NENA 08-003 v1. Online: https://www.nena.org/?page=i3_Stage3 (Last accessed on 4/6/2016)

⁹ SIP Forum Video Relay Service (VRS) Task Group. Online: <http://www.sipforum.org/content/view/404/291/> (Last accessed on 4/6/2016)

¹⁰ See Linda Kozma-Spytek. Voice Telecommunications Accessibility for Individuals with Hearing Loss. Presented to ETSI STQ#47, 6-10 October 2014, Prague, Czech Republic.

Online: <http://tap.gallaudet.edu/IPTransition/Wideband%20Audio/> (Last accessed: May 23, 2016.) For example, too-low bit rates in narrowband audio (using the AMR-NB codec) have been shown to hurt speech understanding among people with hearing loss. It is an open question as to whether a similar effect exists for the encoding techniques for HD Voice on mobile networks. Error correction strategies also could potentially have an impact on speech understanding. These two examples do not constitute an exhaustive list, and there may be other technical factors.