

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

In the Matter of
Transition from TTY to Real-Time Text
Technology
Petition For Rulemaking To Update The
Commission's Rules For Access To Support The
Transition From TTY To Real-Time Text
Technology, And Petition For Waiver Of Rules
Requiring Support Of TTY Technology

NOTICE OF PROPOSED RULEMAKING

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I. INTRODUCTION AND EXECUTIVE SUMMARY

1. In this Notice of Proposed Rulemaking (*Notice*), we propose amendments to our rules to facilitate a transition from outdated text telephone (TTY) technology to a reliable and interoperable means of providing real-time text (RTT) communication for people who are deaf, hard of hearing, speech disabled, and deaf-blind over Internet Protocol (IP) enabled networks and services. Real-time text is a mode of communication that permits text to be sent immediately as it is being created. As a technology designed for today’s IP environment, and one that allows the use of off-the-shelf rather than specialized end user devices, RTT can, for the first time in our nation’s history, enable people with disabilities who rely on text to use text-based communications services that are fully integrated with mainstream communications services and devices used by the general public. In addition, RTT’s advanced features, including its speed, full character set, reliability, and ease of use, can significantly improve access to emergency services for people with disabilities and help reduce reliance on telecommunications relay services.

2. In order to facilitate an effective and seamless transition to RTT, we propose to amend the Commission’s rules as follows:

- We propose to replace our rules governing the obligations of wireless service providers and equipment manufacturers to support TTY technology with rules defining the obligations of these entities to support RTT over IP-based wireless voice services.
- We propose that, for wireless service providers’ and equipment manufacturers’ support of RTT to be deemed sufficient for compliance with our rules:
 - RTT communications must be interoperable across networks and devices, and this may be achieved through adherence to RFC 4103, as a “safe harbor” standard for RTT;

- RTT communications must be backward compatible with TTY technology, until the Commission determines that such compatibility is no longer necessary; and
 - Wireless services and equipment capable of sending, receiving and displaying text must support specific RTT functions, features, and capabilities necessary to ensure that people with disabilities have accessible and effective text-based communications service.
- We propose establishing timelines for implementation of RTT as follows:
 - For Tier I wireless service providers, and manufacturers that provide devices for such services, implementation of RTT would be required by December 31, 2017.
 - For non-Tier I wireless providers, and manufacturers of equipment used with such services, we seek comment on an appropriate timeline for implementation of RTT.
 - Finally, we seek comment on whether to amend the Commission’s rules to place comparable responsibilities to support RTT on providers and manufacturers of wireline IP services and equipment that enable consumers to initiate and receive communications by voice.

3. We believe that the above proposals for the migration from TTY to RTT technology will ensure that people with disabilities can fully utilize and benefit from twenty-first century communications technologies as our nation migrates from legacy analog systems to IP-based networks and services. We seek comment on the tentative conclusions, proposals, and analyses put forth in this *Notice*, as well as on any alternative approaches.

II. BACKGROUND

4. The Federal Communications Commission (FCC or Commission) has long sought to ensure that the communications needs of people with disabilities are addressed in our nation’s telecommunications policies. Over the past several decades, Congress has enacted, and the Commission has implemented, a string of federal laws designed to prevent people with disabilities from being left behind as communications technologies evolve and alter the way Americans communicate with one another, work, shop, learn, and access emergency services. For example, the Commission has established nationwide telecommunications relay services (TRS),¹ promulgated rules requiring access to telecommunications and advanced communications services (ACS),² and adopted requirements to ensure access by individuals with disabilities to 911 emergency services.³

¹ 47 U.S.C. § 225. TRS are “telephone transmission services that provide the ability for an individual who is deaf, hard of hearing, deaf-blind, or who has a speech disability to engage in communication by wire or radio with one or more individuals, in a manner that is functionally equivalent to the ability of a hearing individual who does not have a speech disability to communicate using voice communication services by wire or radio.” *Id.* § 225(a)(3).

² *Id.* §§ 255 (requiring telecommunications, voicemail, and interactive menu services, as well as the equipment used with these services to be accessible to and usable by people with disabilities if readily achievable), 617 (requiring ACS and equipment used with ACS to be accessible to and usable by individuals with disabilities, unless compliance is not achievable). ACS is defined as interconnected VoIP service, non-interconnected VoIP service, electronic messaging service, and interoperable video conferencing service. *Id.* § 153(1). “Readily achievable” is defined as “in general, easily accomplishable and able to be carried out without much difficulty or expense.” 47 CFR §§ 6.3(h), 7.3(h) (setting forth the criteria that go into a readily achievable determination). “Achievable” is defined as “with reasonable effort or expense, as determined by the Commission.” *Id.* § 14.10(b) setting forth the criteria that go into a readily achievable determination). 47 U.S.C. § 617(g) (defining “achievable”). Where accessibility and usability are not readily achievable (for telecommunications offerings) or achievable (for ACS offerings) in the service or equipment itself, the service or equipment must be compatible with peripheral devices and specialized customer premises equipment (SCPE) commonly used by individuals with disabilities to achieve accessibility to telecommunications services, if readily achievable under section 255 or achievable under section 716. 47 U.S.C. §§ 255, 617; 47 CFR §§ 6.5, 7.5(a)(2), (b)(2), 14.20(a)(3), 14.21(a). Such compatibility is defined

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5. Since the 1970s, TTY technology, which “employs graphic communication in the transmission of coded signals through a wire or radio communication system,”⁴ has provided the only means by which individuals who are deaf, hard of hearing, deaf-blind, and speech disabled can send and receive person-to-person text communications in real-time over the public switched telephone network (PSTN).⁵ In the United States, this technology uses Baudot tones to enable individuals to take turns typing back and forth to other TTY users.⁶ In order to ensure the same level of access to the telephone network through this technology as is available for users of voice telephone services, the Commission has adopted specific rules requiring support for TTY technology by providers and manufacturers of telecommunications and advanced communications services and devices. These include requirements for:

- Commercial Mobile Radio Services (CMRS) providers to be capable of transmitting 911 calls from individuals who are deaf, hard of hearing, or speech disabled, through means other than mobile radio handsets, such as TTY technology;⁷
- Common carriers and voice-over-IP (VoIP) service providers to provide, either on their own or through a state-supported TRS program, a form of TRS that can be accessed via TTYs;⁸
- Common carriers and interconnected VoIP service providers to offer their customers 711 abbreviated dialing access to PSTN-based TRS via a voice telephone or TTY;⁹
- Telecommunications service providers and equipment manufacturers to provide for TTY connectability and TTY signal compatibility with their telecommunications services and equipment;¹⁰ and
- ACS providers and equipment manufacturers to provide for TTY connectability and

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to include ensuring TTY connectability and TTY signal compatibility. *Id.* §§ 6.3(b)(3)-(4), 7.3(b)(3)-(4), 14.21(d)(3)-(4).

³ See 47 U.S.C. § 615c(g).

⁴ 47 CFR § 64.601(a)(33); see also Gallaudet University Technology Access Program (Gallaudet TAP), TTY Basics for Engineers/Product Designers, <https://tap.gallaudet.edu/Text/TTYBasics.asp> (last visited Apr. 28, 2016).

⁵ See generally Harry G. Lang, *A Phone of Our Own: The Deaf Insurrection against Ma Bell* 1-8, 116-29 (2000).

⁶ See 47 CFR § 64.601(7) (defining Baudot as “a seven bit code, only five of which are information bits”). The definition further notes that Baudot is used by TTYs to communicate with each other at a 45.5 baud rate.

⁷ *Id.* § 20.18(c).

⁸ *Id.* §§ 64.601(b) (providing that TRS regulations applicable to common carrier shall also be applicable to interconnected VoIP service providers), 64.603, 64.604(a)(3)(v) (listing the types of calls that TRS providers must provide, which include calls using TTYs), (c)(5)(iii) (requiring carriers and interconnected and non-interconnected VoIP service providers to contribute to the Interstate TRS Fund); see also 47 U.S.C. §§ 225(c) (requiring common carriers to provide TRS either directly or through a state program), 616 (requiring interconnected and non-interconnected VoIP service providers to participate in and contribute to the Interstate TRS Fund).

⁹ 47 CFR §§ 64.601(a)(1), 64.603; *Use of N11 Codes and Other Abbreviated Dialing Arrangements*, Second Report and Order, 15 FCC Rcd 15188 (2000). The Commission adopted 711 dialing access so that TRS users could initiate a relay call, anywhere in the United States, without having to remember and dial different 7- and 10-digit toll-free numbers when traveling from state to state. *Id.* at 15191, para. 3; *IP-Enabled Services et al.*, Report and Order, 22 FCC Rcd 11275, 11295-96, paras. 42-43 (2007) (*VoIP Accessibility and TRS Order*) (extending the obligation to offer 711 TRS abbreviated dialing access to interconnected VoIP providers); see also *Contributions to the Telecommunications Relay Services Fund*, Report and Order, 26 FCC Rcd 14532 (2011) (extending obligations to participate in and contribute to the Interstate TRS Fund to all interconnected and non-interconnected VoIP providers, pursuant to 47 U.S.C. § 616).

¹⁰ 47 U.S.C. § 255; 47 CFR §§ 6.5, 7.5; see also *supra* note 2, defining these obligations.

compatibility with their services and equipment.¹¹

6. *Related proceedings.* As our communications networks have evolved, the Commission has recognized a need to reevaluate these TTY support rules and how our communications policies should address the way that people with disabilities communicate by text. The limitations of TTYs have become more apparent,¹² and implementing more advanced accessibility technologies has become both feasible and necessary to continue ensuring effective communication for this population. The Commission's 2010 National Broadband Plan, for example, contained a recommendation to "open a proceeding to implement a standard for reliable and interoperable real-time text any time that Voice over Internet Protocol is available and supported."¹³ More recently, the Commission has emphasized the importance of ensuring continued access by people with disabilities to evolving technologies as part of its overall efforts to preserve core statutory values during the transition from time-division multiplexed (TDM) services running on copper networks to new all IP multimedia networks using copper, co-axial cable, wireless, and fiber as physical infrastructure.¹⁴ Particularly relevant is the Commission's acknowledgement that "as TDM networks are discontinued in favor of IP-based networks, there is an opportunity to implement IP-based real time text to replace TTY text services . . ."¹⁵

7. The Commission also has recognized the need for effective text communication access by people with disabilities to 911 emergency services.¹⁶ In its 2014 Report and Order directing CMRS and other providers of interconnected text messaging applications to be capable of supporting text-to-911 service, the Commission explained that as our nation continues its "evolution from a predominantly voice-driven medium of communication to one based more on text and data transmissions," the need to enable text-based communications to 911 has taken on greater significance – not only to enable enhanced access for people with disabilities, but also "because of the crucial role [text] can play in protecting life and property when making a voice call would be dangerous, impractical, or impossible due to transmission problems."¹⁷ While allowing compliance with the text-to-911 rules through short messaging

¹¹ 47 U.S.C. § 617; 47 CFR §§ 14.20, 14.21; *see also supra* note 2, defining these obligations.

¹² *See infra* Part III.A.

¹³ FCC, Connecting America: The National Broadband Plan at 182, Recommendation 9.10 (2010); *see also* Elizabeth Lyle, FCC Omnibus Broadband Initiative Working Paper Series No. 2, A Giant Leap & a Big Deal: Delivering on the Promise of Equal Access to Broadband for People with Disabilities at 31 (April 2010).

¹⁴ *See Technology Transitions et al.*, GN Docket No. 13-5 et al., Order, Report and Order and Further Notice of Proposed Rulemaking, Report and Order, Order and Further Notice of Proposed Rulemaking, Proposal for Ongoing Data Initiative, 29 FCC Rcd 1433, 1435, 1443, paras. 1, 28 (2014) (*Technology Transitions Order*); *Technology Transitions et al.*, GN Docket No. 13-5 et al., Report and Order, Order on Reconsideration, and Further Notice of Proposed Rulemaking, 30 FCC Rcd 9372, 9373, 9486-87, paras. 1, 222 (2015) (*Emerging Wireline Order and Further Notice*). In order to ensure that applications for individuals with disabilities remain available and functional as part of any technology transition, the Commission's proposed section 214 discontinuance application review process includes an evaluation of the availability of services for individuals with disabilities as one of the criteria used to determine whether a service proposed as a replacement service for the legacy service is adequate. *Id.* at 9479, para. 205.

¹⁵ *Emerging Wireline Order and Further Notice*, 30 FCC Rcd at 9487, para. 223. The Commission sought comment on such implementation (*id.* at 9486-87, paras. 222-23), as well an appropriate transition period to complete a migration from TTY text services to real-time text. However, few comments were received in response.

¹⁶ *Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications; Framework for Next Generation 911 Deployment*, PS Docket Nos. 11-153 and 10-255, Second Report and Order and Third Further Notice of Proposed Rulemaking, 29 FCC Rcd 9846, 9848, para. 3 (2014) (*T911 Second Report and Order and Third Further Notice*).

¹⁷ *Id.* at 9847, para. 1; 47 CFR § 20.18(q). The Commission's decision to require text-to-911 support was in part a response to conclusions reached by the Commission's Emergency Access Advisory Committee (EAAC), that the vast majority of people who are deaf, hard of hearing, or speech disabled no longer have a direct means of accessing

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services (SMS) based text, the Commission sought comment on the need for other forms of text-to-911, including RTT.¹⁸

8. Finally, at least one other federal agency is exploring the effectiveness of RTT as a possible accessibility solution for advanced communications systems. In February 2015, the United States Access Board (Access Board), charged with establishing criteria and guidelines for ensuring disability access to information and communication technology (ICT) under section 255 of the Communications Act and section 508 of the Rehabilitation Act, proposed guidelines that would allow RTT to be accepted as an “equivalent alternative” to voice communications and TTY technology.¹⁹ In its proposals, the Access Board noted that “RTT is sufficiently mature as a technology (and has sufficiently proliferated in the current ICT marketplace) to warrant coverage in the proposed rule.”²⁰

9. *Petitions to the Commission.* On June 12, 2015, AT&T filed a petition requesting that the Commission initiate a rulemaking proceeding to authorize the substitution of RTT for TTY technology, as an accessibility solution for use with IP-based voice communications networks and services.²¹ AT&T contends that the communications sector is in the midst of a transformation to IP-based voice networks and services, and urges this regulatory change as a means of relieving equipment manufacturers and service providers from having to support legacy TTY technology as this transition takes place.²² Rather than retrofit TTY technology for next generation of IP-based services, AT&T requests that the Commission deem the provision of RTT an appropriate method of complying with the Commission’s rules requiring TTY support, provided that a network’s implementation of RTT is interoperable (1) with TTYs (*i.e.*, is backward compatible with TTYs) until TTYs sunset, and (2) with RTT as implemented in other VoIP networks.²³ AT&T simultaneously filed a petition requesting that the Commission

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911 from mobile devices because they have discarded their TTYs or have never acquired or used a “mobile” TTY. *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9853-54, para. 15 (*citing* EAAC Report and Recommendations at 29 (Dec. 6, 2011), http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-312161A1.doc (EAAC Report and Recommendations)). The EAAC was created under the Twenty-First Century Communications and Video Accessibility Act, Pub. L. No. 111-260, 124 Stat. 2751 (Oct. 8, 2010) (CVAA), to provide recommendations to the Commission on “the most effective and efficient technologies and methods by which to enable access to emergency services by individuals with disabilities . . . as part of the migration to a national Internet protocol-enabled network.” CVAA, § 106(c)-(c)(1) (codified at 47 U.S.C. § 615c(c)-(c)(1)).

¹⁸ *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9851, para. 10. The Commission noted the “limitations of SMS-based text-to-911,” namely the need for users to finish typing their messages before sending them (*id.* at 9902, para. 132), which “underscored the need for further development of platform architectures and standards” that could include RTT. *Id.* at 9897-98, paras. 123-24 (requesting comment on RTT communications, as well as 911 text messages delivered over Wi-Fi and non-CMRS networks, non-interconnected text applications, rich media services, and telematics).

¹⁹ See 47 U.S.C. § 255; 29 U.S.C. § 794d (requiring federal agencies to “develop, procure, maintain, or use” information and communication technology (ICT) in a manner that ensures federal employees with disabilities have comparable access to and use of such information and data relative to other federal employees, unless doing so would impose an undue burden); Access Board, Information and Communication Technology Standards and Guidelines, Notice of Proposed Rulemaking, 80 Fed. Reg. 10880, 10881 (Feb. 27, 2015) (*Access Board 2015 NPRM*). Pursuant to 47 U.S.C. § 255(e), in 1998, the Access Board developed guidelines for telecommunications equipment, which were then used by the Commission to develop its section 255 regulations. See *generally* 47 CFR Parts 6, 7.

²⁰ *Access Board 2015 NPRM*, 80 Fed. Reg. at 10888.

²¹ Petition of AT&T Services, Inc. for Rulemaking, PS Docket Nos. 10-255 and 11-153, WC Docket No. 04-36, CG Docket Nos. 03-123 and 10-213 (filed June 12, 2015) (AT&T Petition for Rulemaking).

²² *Id.* at 2.

²³ *Id.* at 6.

temporarily waive the Commission's requirements to support TTY technology for wireless devices and services on VoIP networks "during the pendency of the rulemaking and until RTT is fully deployed to allow [AT&T] to offer VoIP services that do not reliably support TTY."²⁴

10. On July 24, 2015, the Consumer and Governmental Affairs Bureau, together with three other bureaus within the Commission, released a Public Notice inviting comment on both of AT&T's petitions.²⁵ On October 6, 2015, the Bureaus granted AT&T a temporary waiver of the Commission's requirements to support TTY technology on IP-based wireless networks subject to certain conditions.²⁶ The waiver expires on December 31, 2017, or on the effective date of rules providing for alternative IP-based wireless accessibility solutions, whichever is earlier. Since issuance of the *AT&T TTY-RTT Transition Waiver Order*, other wireless carriers have requested and received comparable waivers to facilitate their rollout of IP-based wireless technologies.²⁷

²⁴ Petition of AT&T Services, Inc. for Waiver, PS Docket Nos. 10-255 and 11-153, WC Docket No. 04-36, CG Docket Nos. 03-123 and 10-213, at 2 (filed June 12, 2015) (AT&T Petition for Waiver).

²⁵ *Request for Comment on Petition for Rulemaking to Update the Commission's Rules for Access to Support the Transition from TTY to Real-Time Text Technology, and Petition for Waiver of Rules Requiring Support of TTY Technology*, Public Notice, 30 FCC Rcd 7438 (CGB PSHSB WTB WCB 2015) (*TTY-RTT Transition Public Notice*). The other three bureaus were the Wireline Competition Bureau (WCB), the Wireless Telecommunications Bureau (WTB), and the Public Safety and Homeland Security Bureau (PSHSB) (collectively, with CGB, "the Bureaus"). Unless otherwise indicated, all citations to comments and reply comments in this NPRM refer to comments and reply comments filed in GN Docket No. 15-178 in response to the *TTY-RTT Transition Public Notice*. See Appendix B (List of Commenting Parties).

²⁶ *In the Matter of Petition for Waiver of Rules Requiring Support of TTY Technology*, Order, 30 FCC Rcd 10855 (CGB PSHSB WTB WCB 2015) (*AT&T TTY-RTT Transition Waiver Order*). The Bureaus imposed conditions on the waiver because individuals with disabilities will be unable to access innovative IP-based wireless technologies during the waiver period. *Id.* at 10862-63, para. 17. The conditions require AT&T to provide notice to its customers about the lack of TTY support for calls to 911 services over IP-based wireless services, to alert customers about alternatives for calling 911 over these networks, and to file reports with the Commission and alert customers about AT&T's progress toward providing IP-based accessibility solutions, such as RTT. These conditions, as well as the reason for imposing them, are similar to those adopted by the Commission in earlier orders waiving TTY requirements for emergency calling with respect to digital wireless services. See, e.g., *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Memorandum Opinion and Order, 12 FCC Rcd 22665 (1997) (*E911 Order*); *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Order, 12 FCC Rcd 20224 (WTB 1997) (*1997 WTB E911 Order*); *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Order, 14 FCC Rcd 694 (WTB 1998) (*1998 WTB E911 Order*).

²⁷ See *In the Matter of Petition for Waiver of Rules Requiring Support of TTY Technology*, Order, 30 FCC Rcd 12755 (CGB PSHSB WTB WCB 2015) (*Verizon TTY-RTT Transition Waiver Order*) (granting waiver to Verizon); *In the Matter of Petition for Waiver of Rules Requiring Support of TTY Technology*, 30 FCC Rcd 14404 (CGB PSHSB WTB WCB 2015) (*Cellular South TTY-RTT Transition Waiver Order*) (granting waiver to Cellular South, Inc.), modified, Letter Order, DA 16-58 (CGB PSHSB WTB WCB Jan. 15, 2016). Each of these entities were subject to the same conditions that were imposed on AT&T. However, because the petitions filed by these entities generally had failed to provide evidence of their plans to develop and deploy an interoperable accessible text solution in the IP environment, the Bureaus added one more reporting obligation to submit plans for such deployment, to be filed within 90 days of the waiver grants. Subsequently, the Bureaus granted waivers to members of the Competitive Carriers Association based on the association's representation that they would meet substantially the same conditions applied to the other parties granted waivers. *In the Matter of Petition for Waiver of Rules Requiring Support of TTY Technology*, Order, DA 16-435 (CGB PSHSB WTB WCB Apr. 20, 2016) (*Competitive Carriers Association TTY-RTT Transition Waiver Order*).

III. THE LIMITATIONS OF TTY TECHNOLOGY AND THE NEED FOR A RULEMAKING

A. The Limitations and Declining Use of TTY Technology

11. TTY technology was developed more than fifty years ago as a means of enabling people who are deaf, hard of hearing, and speech disabled to use the legacy PSTN.²⁸ Describing this technology as “obsolete,”²⁹ “antiquated,”³⁰ and “anachronistic,”³¹ AT&T and others contend that it has no place in the deployment of IP-based next-generation communication networks. AT&T states that although TTYs served consumers in the past, this technology was “designed for a circuit-switched network environment[,] . . . was never intended to operate, and does not operate well” over IP networks now replacing the PSTN.³² Commenters on AT&T’s petition generally agree that the technical barriers associated with supporting TTY transmissions over IP networks will impede the ability of individuals with disabilities to communicate with others as VoIP service becomes the preferred technology for voice telephone communications.³³ These commenters document the significant challenges that TTY technology presents on IP-based communication networks and platforms,³⁴ including its susceptibility to packet loss,³⁵ compression techniques that distort TTY tones,³⁶ and echo or other noises that result from the transmission of the Baudot character string.³⁷ These deficiencies, commenters report, can degrade quality, augment error rates, and hurt the reliability of telephone communications.³⁸ AT&T’s Petition for Rulemaking explains that when these shortcomings occur, synchronization of the conversation also can be impeded, and the transmission can become garbled until it is restored.³⁹ For TTY users, Consumer Groups note, this not only is frustrating, but also can present a dangerous situation in an emergency, when

²⁸ *E911 Order*, 12 FCC Rcd at 22667, n.3.

²⁹ CTIA – the Wireless Association (CTIA) Comments at 1, 3 (the wireless TTY obligations are technologically obsolete and unnecessary to meet the needs of today’s consumers); AT&T Petition for Rulemaking at 3.

³⁰ CTIA Comments at 1 (asking the FCC not to apply antiquated wireless TTY requirements to new wireless networks and products).

³¹ AT&T Petition for Rulemaking at 3 (noting that “regulatory obligations to support the technology on next generation IP platforms are anachronistic”).

³² *Id.* at 5.

³³ *See, e.g.*, Verizon Comments at 1; Telecommunications Industry Association (TIA) Comments at 3; AT&T Reply Comments at 2 (noting that commenters all generally agree that TTY “no longer meets the needs of persons who are hearing or speech impaired and that the Commission should begin a proceeding to allow for the provision of RTT in lieu of TTY for IP-based voice networks”).

³⁴ *See generally* Verizon Comments at 1.

³⁵ CTIA Comments at 8; AT&T Petition for Rulemaking at 7; AT&T Reply Comments at 8.

³⁶ American Association of People with Disabilities (AAPD) Comments at 1-2; TIA Comments at 3-4; Verizon Comments at 4; Omnitor AB (Omnitor) Comments at 5-6; Michigan Public Service Commission (Michigan PSC) Comments; Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI), American Association of the Deaf-Blind (AADB), California Coalition of Agencies Serving the Deaf and Hard of Hearing, Inc. (CCASDHH), Cerebral Palsy and Deaf Organization (CPDO), Deaf Seniors of America (DSA), Hearing Loss Association of America (HLAA), National Association of the Deaf (NAD), and Rehabilitation Engineering Research Center on Telecommunications Access (RERC-TA) (collectively, Consumer Groups) Comments at 6, 8; AT&T Reply Comments at 8.

³⁷ AT&T Petition for Rulemaking at 6-7 (explaining that the Baudot character string uses 1400 and 1800 Hz tones that can appear as an echo when transmitted over IP networks).

³⁸ Consumer Groups Comments at 6, 8; CTIA Comments at 8.

³⁹ AT&T Petition for Rulemaking at 7.

effective communication is critical.⁴⁰ TTYs are also criticized for their slow transmission speed,⁴¹ their dependency on turn-taking,⁴² their use of significant network bandwidth,⁴³ their lack of interoperability with dedicated text devices used in other countries,⁴⁴ and their limited character set, the latter of which can make communicating certain information, such as e-mail and web addresses, difficult or impossible.⁴⁵

12. The record shows that these technical and functional limitations of TTY technology have resulted in a steady decline in its use in favor of other forms of text communication that offer greater ease of use, improved features, and practicability.⁴⁶ Consumer Groups explain that “[a]s IP networks have proliferated, the limitations of TTY have become clear to users on IP networks.”⁴⁷ Decreasing use of TTYs in favor of new technologies is also revealed in a survey of the participants in field trials conducted to assess the user experience of the quality and interoperability of RTT and alternatives, from March to October 2015 in the United States and Sweden.⁴⁸ Reports by the Interstate TRS Fund Administrator, Rolka Loube, also confirm decreasing reliance on TTYs; over the past 7½ years, its monthly filings show a drop of nearly 80 percent in the number of minutes attributed to TTY-initiated relay calls.⁴⁹ Further, commenters report that TTYs are hardly ever used with wireless services.⁵⁰ CTIA explains that consumers have “opted for innovative wireless services, including SMS, instant messaging email, IP

⁴⁰ See Consumer Groups Comments at 7, 9.

⁴¹ AT&T Petition for Rulemaking at 6; Baudot tones generally transmit at only 60 words per minute, in contrast to the speed of speech, which can be three or four times faster; see generally EAAC Report on TTY Transition at 10, 15 (Mar. 11, 2013), http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-319386A1.doc (EAAC TTY Transition Report) (explaining that the maximum Baudot transmission rate is about six characters per second, which is slower than many people type).

⁴² TTYs use the “half-duplex” mode, which requires parties to a call to take turns communicating. AT&T likens this to communication over a walkie-talkie and asserts that this “prevents interactive, conversational communications; when one TTY user is transmitting, the other TTY user must wait.” AT&T Petition for Rulemaking at 6.

⁴³ CTIA Comments at 8.

⁴⁴ RERC-TA, Trace Research & Development Center at the University of Wisconsin-Madison (Trace Center), and Gallaudet TAP (collectively, Technology Research Centers), Proposal R1v3 for Implementation of Real-Time Text Across Platforms, GN Docket No. 15-178, at 14 (filed Nov. 17, 2015) (Proposal R1v3). Proposal R1v3 is a collaborative document on RTT developed by the Technology Research Centers.

⁴⁵ Proposal R1v3 at 13; Omnitor Comments at 6; see also EAAC TTY Transition Report at 14-15, 38 (listing limitations of TTY technology).

⁴⁶ See, e.g., Consumer Groups Comments at 5 (“While TTY was a widely-used accessibility technology for many years after it was first introduced in 1964, its users have largely migrated to newer technologies. . .”); Recommendation of the FCC Disability Advisory Committee at 1 (Oct. 8, 2015), <http://apps.fcc.gov/ecfs/comment/view?id=60001303572> (DAC Oct 2015 Recommendations) (TTY usage has been “in steady decline for some time and there is evidence to suggest that wireless TTY usage is extremely limited”); *AT&T TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 10859, para. 10 (reviewing the decline of TRS consumers utilizing TTY technology).

⁴⁷ Consumer Groups at 5; AT&T Reply Comments at 6.

⁴⁸ Trace Center, Omnitor, and Gallaudet TAP (Trace et al.), Real-time Text Interoperability: Status and Field Trial at 24 (filed Dec. 17, 2015) (RTT Field Trial Report). Of the 49 deaf and hard-of-hearing participants, only 9 (18 percent) reported regularly using a TTY to communicate, and most of those said they used it only for TRS or for communicating with friends or relatives who use a TTY. *Id.* at 24, 25.

⁴⁹ In June 2008, TRS providers handled 803,689 TTY-based interstate TRS minutes, as compared to 170,396 minutes in January 2016. Rolka Loube, TRS Fund Performance Status Report, <http://www.rolkaloube.com/#1formsreports/c1zvl> (last visited Apr. 28, 2016).

⁵⁰ EAAC, TTY Transition Report at 12 (finding that TTY usage was declining by approximately 10 percent each year and estimating that only 100,000 TTY users remained in the United States in 2013).

relay, and various social media applications, rather than wireless TTY.”⁵¹ Further evidencing this trend, CTIA says, is that state equipment distribution programs are expanding their equipment offerings beyond legacy TTY devices, to more modern and innovative devices.⁵² Likewise, in prior rulemakings the Commission has acknowledged this steady migration away from TTY technology.⁵³

B. Need for a More Advanced Text Communications Solution

13. Commenters responding to the *TTY-RTT Transition Public Notice* are unanimous in their support for a rulemaking proceeding to explore RTT or an alternative text technology as a replacement for TTY technology for newly deployed IP-based voice devices and services.⁵⁴ As noted by AT&T, this support comes from a wide variety of stakeholders, including consumer organizations, telecommunications providers and trade associations.⁵⁵ For example, CTIA notes that the Commission’s current rules “may not provide the flexibility necessary for CMRS providers and equipment manufacturers to offer innovative accessibility solutions as alternatives to wireless TTY, such as RTT.”⁵⁶ Verizon adds that the Commission’s rules “should encourage, not hinder, the development and deployment of successor technologies like RTT with superior reliability and other attributes that can serve as substitute, and eventual replacement, for TTY. . . . By updating the rules as AT&T suggests, the Commission can provide industry with a clearer path to move forward with this important effort.”⁵⁷ The Michigan PSC highlights the need to initiate a rulemaking proceeding “to obtain full details” about RTT as a replacement for TTY technology in “modernizing” the Commission’s rules.⁵⁸ The Consumer Groups request an expedited rulemaking, to ensure that consumers are not left without access to either TTY or

⁵¹ CTIA Comments at 4 (citing reports developed by the Wireless Rehabilitation Engineering Research Center that found that 95 percent of deaf individuals who owned or used a tablet or mobile phone used text messaging). CTIA maintains that there is minimal evidence to suggest that consumers have used TTYs with wireless services since the Commission imposed this mandate. *Id.*

⁵² *Id.* at 5 (listing, as examples of such devices, mobile phones and tablets with pre-installed accessibility apps). Approximately two-thirds of the states have programs that distribute SCPE to qualifying individuals with disabilities at low or no cost. *See generally* Telecommunications Equipment Distribution Program Association (TEDPA), <http://www.tedpa.org>.

⁵³ *See e.g., Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications*, Further Notice of Proposed Rulemaking, 27 FCC Rcd 15659, 15701, para. 110 (2012) (“new digital technologies, more mobile and less expensive, had caused most TTY users to migrate away from use of these devices as their primary communication mode”); *Implementation of Sections 716 and 717 of the Communications Act of 1934 as Enacted by the Twenty-First Century Communications and Video Accessibility Act of 2010*, Notice of Proposed Rulemaking, 26 FCC Rcd 3133, 3166, para. 88 (2011) (noting that “a sizeable majority of consumers who previously relied on TTYs for communication are transitioning to more mainstream forms of text and video communications” and seeking comment on whether the Commission should phase out the TTY compatibility components of its rules governing telecommunications and ACS access).

⁵⁴ *See, e.g.,* CTIA Comments at 1; Consumer Groups Comments at 3; RERC-TA Reply Comments at 2. Omnitor suggests that a declaratory ruling may be sufficient to clarify that the existing scope of the Commission’s rules requiring TTY support allows for the substitution of more appropriate accessibility solutions for TTY. Omnitor Comments at 3. AT&T cautions, however, that while a declaratory ruling may be able to resolve the “TTY-centric language” of sections 20.18(c) and 64.603 of the Commission’s rules, rule amendments are needed to address the TTY provisions and avoid confusion with respect to compliance with Parts 6, 7, and 14 of the Commission’s rules. AT&T Reply Comments at 13. We agree that a rulemaking is more appropriate to delineate the minimum functionalities and standards that define an appropriate text replacement for TTY technologies on IP networks.

⁵⁵ AT&T Reply Comments at 13.

⁵⁶ CTIA Comments at 7.

⁵⁷ Verizon Comments at 2; *see also* TIA Comments at 4; AAPD Comments at 1; Consumer Groups Comments at 3.

⁵⁸ Michigan PSC Comments at 2-3; *see also* DAC Oct 2015 Recommendations at 2.

RTT in the wireless IP environment during the waiver period and after it ends, on December 31, 2017.⁵⁹

14. Support for Commission action also comes from the Commission's federal advisory bodies that have addressed this matter over the past several years. Most recently, in October 2015 and February 2016, the Commission's Disability Advisory Committee (DAC) submitted two sets of recommendations that support the Commission's exploration into the use of RTT or other text-based solutions as a replacement for TTY technology and present RTT issues for the Commission's consideration.⁶⁰ Prior to this, in March 2013, the Commission's EAAC recommended replacing TTY support requirements with requirements for direct access to 911 services via IP-based text communications that include real-time text.⁶¹ Like others, the EAAC noted the declining use of TTYs,⁶² and it further explained that making calls through TRS, which requires going through a communications assistant, is regarded by most consumers as an ineffective means of accessing 911 assistance because it can result in delays and errors in communication.⁶³

IV. PROPOSALS FOR RTT IMPLEMENTATION

15. We propose to amend the Commission's rules to replace our rules governing the obligations of wireless providers and manufacturers to support TTY technology with rules defining the obligations of these entities to support RTT over IP-based wireless voice services.⁶⁴ Based on the record summarized above, we tentatively conclude that the technical and functional limitations of TTYs make this technology unsuitable as a long-term means to provide full and effective access to IP-based wireless telephone networks, and that there is a need to provide individuals who rely on text communication with a superior accessibility solution for the IP environment. We further tentatively conclude that RTT can best achieve this goal because it can be well supported in the wireless IP environment, will facilitate emergency communications to 911 services, allows for more natural and simultaneous interactions on telephone calls, will largely eliminate the need to purchase specialized or assistive devices that connect to mainstream technology, and may reduce reliance on telecommunications relay services.

⁵⁹ Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI), et al., *Ex Parte* Letter, GN Docket No. 15-178, at 2-3 (filed Oct. 19, 2015) (Consumer Groups *Ex Parte*). *See also* AAPD Comments at 2.

⁶⁰ DAC Oct 2015 Recommendations at 2 (asking the Commission to ensure a "smooth transition from TTY to RTT and other next-generation text-based communications solutions that simultaneously ensures the communications needs of consumers with disabilities are met and that CMRS providers and equipment manufacturers can feasibly meet those requirements"); Recommendation of the FCC Disability Advisory Committee (Feb. 23, 2016), <http://apps.fcc.gov/ecfs/comment/view?id=60001486890> (DAC Feb 2016 Recommendations).

⁶¹ EAAC TTY Transition Report at 4; *see also* Verizon Comments at 4 (mirroring this EAAC recommendation and noting that addressing AT&T's proposal would provide a "timely opportunity" to reconcile the Commission's outdated rules while encouraging the development of "newer technologies that will better serve consumers with disabilities").

⁶² *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9853-54, para. 15 (*citing* EAAC Report and Recommendations at 29).

⁶³ EAAC Report and Recommendations at 25; *see also T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9854-55, n.51. During a TRS 911 call, the communications assistant (CA) relays the conversation between the caller and the 911 call taker by voicing to the call taker all information that the caller generates by typing or signing, and then typing or signing back the call taker's responses to the caller. In response to these recommendations, as noted above (*see supra* para. 7), the Commission adopted rules requiring support for text-to-911 service.

⁶⁴ We propose to define "support" to mean "to enable users to initiate, send, transmit, receive, and display RTT communications in accordance with the applicable provisions of [the new rule part defining RTT and its minimum functionalities]." *See* Appendix A (Proposed Rules).

A. RTT Support by Wireless Providers and Manufacturers

1. Transmission of RTT over IP-based Wireless Services

16. To achieve an effective and timely transition to RTT, we propose to require RTT support at a specified time in the future, but, as discussed further below, also seek comment on the extent to which there should be an interim period preceding such deadline, during which covered entities would be allowed to provide either RTT or TTY support on IP-based wireless services. We believe that establishing an RTT requirement is necessary to ensure that people with disabilities continue to have effective access to wireless communications services as these services make the transition to an all-IP environment, and we seek comment on this approach. To this end, we propose the following revisions to the Commission's rules:

- Amend section 20.18(c) to require wireless IP-based voice service providers to be capable of transmitting 911 calls from individuals who are deaf, hard of hearing, deaf-blind, or speech disabled through RTT technology, in lieu of transmitting 911 calls from TTYs over IP networks;⁶⁵
- Amend Part 64 to require wireless interconnected VoIP service providers to support TRS access through RTT technology, including 711 abbreviated dialing access, in lieu of supporting TRS access via TTY technology;⁶⁶
- Amend Parts 6 and 7 to require providers of wireless interconnected VoIP services subject to these rules to provide and support RTT, if readily achievable, in lieu of providing connectability and compatibility with TTYs; and
- Amend Part 14 to require providers of wireless VoIP services subject to these rules to provide and support RTT, unless this requirement is not achievable, in lieu of providing connectability and compatibility with TTYs.

2. End User Device Support for RTT

17. We believe that the availability of RTT-capable end user devices for users is essential in order to facilitate the use of RTT for emergency purposes, fully integrate RTT capability into the IP environment, and ensure that RTT users have the same range of device choices offered to the general public for voice communications.⁶⁷ To this end, we further propose to amend the Commission's rules in the following manner to address the ability of wireless devices used by consumers to support RTT.

18. *Wireless service providers.* For providers of IP-based voice services, we propose to:

⁶⁵ Consistent with the recent amendment of section 20.19 to ensure that IP-based wireless services are covered by the hearing aid compatibility requirements of that rule, the proposed amendment of 20.18(c) would make this provision applicable to "providers of digital mobile service in the United States to the extent that they offer terrestrial mobile service that enables two-way real-time voice communications among members of the public or a substantial portion of the public." See 47 CFR § 20.19(a)(1)(i); *Improvements to Benchmarks and Related Requirements Governing Hearing Aid-Compatible Mobile Handsets, Amendment of the Commission's Rules Governing Hearing Aid-Compatible Mobile Handsets*, Fourth Report and Order and Notice of Proposed Rulemaking, 30 FCC Rcd 13845, 13847, para. 2 (2015) (*2015 HAC Order*); Appendix A (Proposed Rules).

⁶⁶ See *supra* para. 5 (noting that interconnected VoIP service providers are required to provide access to TRS).

⁶⁷ The DAC has asked whether there should be a requirement for all terminal equipment used on Session Initiation Protocol (SIP) or 3rd Generation Partnership Project (3GPP) IP Multimedia Subsystem (IMS) networks to support established RTT standards. DAC Oct 2015 Recommendations at 3. See also Consumer Groups Comments at 5 (explaining that the use of RTT technology does not require the user to buy and connect a separate device because RTT can be made available on smartphones, tablets, and similar devices); EAAC TTY Transition Report at 8 (explaining that an overwhelming majority prefers to use the same device and tool in the same way to call 911).

- Amend section 20.18(c), which requires the transmission of 911 calls from TTYs,⁶⁸ and Parts 6, 7, and 14 to require that, to the extent a wireless provider issues design specifications, purchases for resale to users, or otherwise authorizes new handsets or other text-capable end user devices for use with its IP-based voice services,⁶⁹ the provider shall ensure that such devices have the ability to send, receive and display RTT.⁷⁰
- If it is not readily achievable (under Parts 6 and 7) or achievable (under Part 14) to incorporate RTT capability within such wireless devices, the wireless provider shall ensure that such devices are compatible with RTT-equipped stand-alone devices or software applications, “if readily achievable” for equipment subject to Parts 6 and 7 of the rules, and “unless not achievable” for equipment subject to Part 14 of the rules.⁷¹

19. *Manufacturers.* For manufacturers of wireless handsets or other wireless text-capable end user devices used with IP-based voice services, we propose to amend Parts 6, 7, and 14 to require such manufacturers to:

- Ensure that their devices have the ability to send, receive, and display RTT, if readily achievable for equipment subject to Parts 6 and 7 of the rules, and unless not achievable for equipment subject to Part 14.
- If it is not readily achievable (under Parts 6 and 7) or achievable (under Part 14) to incorporate RTT capability within such devices, ensure that such devices are compatible with RTT-equipped stand-alone devices or software applications, if readily achievable for equipment subject to Parts 6 and 7 of the rules, and unless not achievable for equipment subject to Part 14 of the rules.

20. Our proposal to create an affirmative requirement for RTT support is consistent with past Commission actions and Congressional mandates to ensure that, as communications networks evolve to incorporate new technologies, accessibility safeguards be amended to ensure that people with disabilities continue to have effective access to communications. The purpose of section 716, added to the Act by the CVAA, is to ensure that “*advanced* communications services” that incorporate new technologies are

⁶⁸ 47 CFR § 20.18(c).

⁶⁹ In this *Notice*, the terms “capability to send, receive, and display text,” “text capabilities,” and “text-capable” mean that the device has a screen that can display text and the ability to receive and send text over IP networks. For example, “other text-capable end user devices” could include computers and tablets that have RTT programs (“soft phones”) and “total conversation” videophones that have programs allowing for video, audio, and text transmissions. *See generally* Proposal R1v3 at 10.

⁷⁰ Conversely, if the carrier’s specifications are for wireless phones that do not have the capability to send, receive, and display text, a carrier would not have an obligation to ensure that such phones have native RTT capabilities. *See* DAC Feb 2016 Recommendations at 2 (suggesting that requirements should not be imposed on equipment that “does not support any way to generate, present, receive or display text for other purposes”). We further note that, while under section 20.18 (authorized by Title III) the obligation to provide RTT capability in devices used to access 911 would be unqualified, under Parts 6 and 7 (authorized by section 255), the above obligation will apply to telecommunications equipment only if it is “readily achievable” to provide such capability and under Part 14 (authorized by section 716), to equipment used with ACS only to the extent it is “achievable.” *See* 47 U.S.C. §§ 255, 617.

⁷¹ Authority for this requirement and the end user device proposals in the next paragraph is again found in section 255, which requires equipment used with telecommunications services to be compatible with SCPE, if readily achievable, and section 716, which requires equipment used with ACS to be compatible unless not achievable. *See* 47 U.S.C. §§ 255, 617; 47 CFR §§ 6.5(a)(2), (b)(2); 7.5(a)(2), (b)(2).

accessible to individuals with disabilities.⁷² As explained by the Senate committee report on the CVAA, the CVAA's purpose is "to update the communications laws" to ensure accessibility, because, since the previous update in 1996 (when section 255 was added), "[i]nternet-based and digital technologies are now pervasive . . . [and] the extraordinary benefits of these technological advances are sometimes not accessible to individuals with disabilities."⁷³ Thus, for example, section 716(d) expressly prohibits ACS providers from "install[ing] network features, functions or capabilities that impede accessibility or usability."⁷⁴ By requiring wireless providers and manufacturers, as they deploy IP-based voice services, equipment, and networks, to implement RTT as a state-of-the-art accessibility technology, we will ensure not only that such networks do not impede accessibility, but that "the extraordinary benefits of technological advances" are accessible to individuals with disabilities as Congress intended.

21. Our proposals are also intended to avoid repetition of past failures to build in accessibility at the outset of technological changes, which led to long delays in providing access to new communications technologies for people with disabilities. For example, in the mid-1990s, despite the public safety dangers of leaving people with disabilities behind as the wireless industry made its transition from analog to digital technology, repeated delays resulted in the lack of access to digital wireless services by TTY users for over six years, well past the rise in popularity of digital technology with the general public.⁷⁵ Similarly, it was not until 2005 that digital handsets began integrating hearing aid compatibility, again despite the introduction of these handsets in the mid-1990s.⁷⁶ Each of these delays imposed considerable hardships on people with disabilities, who remained without digital wireless access – and without emergency access via wireless networks – for lengthy periods of time after these technologies became available to everyone else. Additionally, industry efforts that were needed to eventually achieve such access – which took place very late in the design and development process of building of such phones – proved more costly and burdensome than would likely have been the case had accessibility been incorporated from the outset.

22. The Commission has noted that "[c]ommunication networks are rapidly transitioning away from the historic provision of time-division multiplexed (TDM) services running on copper to new, all-Internet Protocol (IP) multimedia networks using copper, co-axial cable, wireless, and fiber as physical infrastructure."⁷⁷ As these changes take place, we seek to ensure that our accessibility rules for IP-based voice networks achieve the *early* integration of accessibility features, so that people with disabilities can enjoy communications services as they emerge, along with the general population. We believe that amending our rules to require support of RTT at this time is likely to create greater certainty for companies that have expressed an interest in deploying RTT, and provide a supportive regulatory landscape in which to do so.⁷⁸ More specifically, with the action taken today, we expect that covered

⁷² See, e.g., 47 U.S.C. § 617(a)(1) (emphasis added); see also *id.* § 225(d)(2) (directing the Commission to ensure that its TRS regulations "encourage . . . the use of existing technology and do not discourage or impair the development of improved technology."

⁷³ S. Rep. No. 111-386 at 1-2 (2010) (Senate Report).

⁷⁴ 47 U.S.C. § 617(d).

⁷⁵ See *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Fourth Report and Order, 15 FCC Rcd 25216 (1997) (approving final extension of the digital systems TTY compliance deadline to June 30, 2002).

⁷⁶ See *Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones*, Report and Order, 18 FCC Rcd 16753, *erratum*, 18 FCC Rcd 18047 (2003) (creating the wireless hearing aid compatibility obligations that are contained in 47 CFR § 20.19).

⁷⁷ *Emerging Wireline Order and Further Notice*, 30 FCC Rcd at 9373, para. 1.

⁷⁸ See Omnitor Comments at 6 ("RTT has been discussed as a possible replacement for TTY for a long time, but uncertainty about its legality as a replacement has held back deployment. With the legality clarified, any hesitation

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entities will have the necessary incentives to invest and innovate to improve products employing RTT functionalities, promoting more effective access to 911 services and other communications for individuals with disabilities.⁷⁹

23. We seek comment on our tentative conclusions, proposals, and analysis, including the costs and technical feasibility of the proposed rule amendments, and on any proposed alternatives. We note that in its text-to-911 proceeding, the Commission determined that significant benefits could be attained by enabling people with disabilities to use text to access emergency services by phone.⁸⁰ In addition, the Commission previously has recognized that as our nation ages, the number of Americans who may need alternatives to voice telephone communications is likely to increase.⁸¹ We further believe that establishing a requirement to ensure that RTT is incorporated in wireless IP-based services and devices as these are designed and developed will reduce the overall costs of incorporating this access feature, while ensuring that people with disabilities are not left behind as we transition to this new technology. We seek comment on whether these assumptions are correct and generally on the benefits to be derived from incorporating RTT functionalities into wireless services and end user devices, including the benefits that may accrue for improving access to 911 services.

24. Technology Research Centers contend that the implementation of RTT would not add any hardware costs to support RTT, if limited to products used for receiving and displaying RTT that already have a display large enough to display multiple lines of text (or software designed to run on a multi-line display) and a mechanism for generating text for other purposes.⁸² They and others point out

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to deploy RTT in a good and interoperable way can be dropped.”); Consumer Groups Comments at 3, 7. Similarly, AT&T notes that allowing RTT support in lieu of TTY technology would incent providers to expand IP-based wireless services in unserved and underserved areas, including rural areas that have Internet but no cell coverage, the interior of buildings, and other areas where wireless or wireline services are limited or unavailable. AT&T Reply Comments at 2-4.

⁷⁹ Verizon Comments at 4-5; *see also* AT&T Reply Comments at 2; Omnitor Comments at 6-7. As in the *Emerging Wireline Order and Further Notice*, we seek to adopt requirements for text-based accessibility solutions that provide clear criteria, eliminate uncertainty for the industry, and encourage a prompt transition to new technologies widely adopted by the communications industry. *See generally Emerging Wireline Order and Further Notice*, 30 FCC Rcd at 9478, 9479, paras. 203, 205.

⁸⁰ *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9856-57, para. 20. The Commission considered in particular the annual economic benefits of reporting cardiac emergencies to 911 calls via text. The Commission employed this analysis while recognizing that public safety interests are not driven solely by economic considerations. *Id.* at 9857, para. 22.

⁸¹ The Commission found that approximately 48 million people in the United States are deaf or hard of hearing, a figure likely to grow, given that the incidence of hearing loss rises with age. *See id.* at 9852-53, para. 13. For 2013, the reported incidence of hearing trouble is 17 percent in American adults between the ages of 45 and 64, 30 percent in adults between 65 and 74, and 48 percent in adults 75 years or older. National Center for Health Statistics, Health, United States, 2014: With Special Feature on Adults Aged 55-64 at 176, Table 49 (2015); *see also* U.S. Bureau of the Census, Current Population Reports, Special Studies, P23-190, 65+ in the United States at 2-2 (1996), <http://www.census.gov/prod/1/pop/p23-190/p23-190.pdf> (noting that “[a]bout 1 in 8 Americans were elderly in 1994, but about 1 in 5 could be elderly by the year 2030”). Included in this grouping will also be approximately 7.5 million people with speech disabilities. *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9852-53, para. 13 (citations omitted).

⁸² Proposal R1v3 at 13, 18-19; *see also* Telecommunications and Electronic and Information Technology Advisory Committee, Report to the Access Board: Refreshed Accessibility Standards and Guidelines in Telecommunications and Electronic and Information Technology, Recommendation 6A (April 2008), <https://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-ict-refresh/background/teitac-report/6-the-recommendations> (TEITAC Report) (recommending that, under section 255 of the Communications Act and section 508 of the Rehabilitation Act, voice telecommunication endpoints that have a multi-line visual display be able to receive and display time-synchronized RTT transmissions).

that many Internet-enabled terminal devices, including smartphones, tablets, and VoIP desk phones, already have such text generation and display capabilities.⁸³ Additionally, the Technology Research Centers claim that “these costs will be kept down if real-time text design is incorporated in the beginning of the design process” when they “should be merely a small fraction of the overall design costs, which can be amortized across all the products sold – and carried forward to future designs.”⁸⁴ We seek comment on the merits of these assumptions, and on how they would be affected by the outcome of the issues raised for comment in this section regarding the scope of an equipment capabilities requirement.

B. Timelines

25. *Larger wireless carriers.* We next seek comment on when our rules requiring implementation of RTT should become effective. We propose that this be completed by Tier I wireless service providers, which offer nationwide service, no later than December 31, 2017.⁸⁵ AT&T and Verizon have indicated they will be capable of meeting this deadline,⁸⁶ and information provided by AT&T suggests that this will allow ample time for RTT deployment.

26. We believe that this implementation date will encourage expeditious deployment of RTT, yet allow a reasonable period for service providers to comply with rules adopted pursuant to this *Notice*. It will also respond to Consumer Groups’ concerns that a longer deadline would leave vulnerable populations without access to TTY or accessibility solutions during and beyond the waiver period.⁸⁷ We seek comment regarding this proposed implementation date for these carriers,⁸⁸ and specifically whether it will afford sufficient time for this category of providers to achieve compliance with the rules proposed in this *Notice*. Alternatively, we seek comment on whether it would be preferable to establish a specified interim period of time – prior to the deadline set for an RTT requirement – during which Tier I covered entities would be allowed to support RTT over their IP facilities if they are unable to support TTYs. We ask parties that believe such interim period is necessary to explain whether and how such period would be needed to afford additional flexibility during the transition to RTT technology. We further ask commenters who disagree with our proposed deadline of December 31, 2017 for Tier I carriers to explain why additional time would be needed to achieve deployment of RTT.⁸⁹

⁸³ Proposal R1v3 at 18-19; AARP, Comments, GN Docket No. 13-5 et al., at 17 (filed Oct. 26, 2015) (AARP Emerging Wireline Comments). Further the Technology Research Centers state that while initial software costs may be incurred to “develop, test, and connect a software text codec into their device software and to connect display and text generation software to the codec, both open source and commercial codecs and reference designs for implementation are available for this purpose.” Proposal R1v3 at 13.

⁸⁴ Proposal R1v3 at 18.

⁸⁵ 47 CFR § 20.19(a)(3)(v) (defining Tier I providers).

⁸⁶ See IP-Voice Accessibility Status Report of AT&T at 3 (filed Apr. 6, 2016) (AT&T Status Report); Verizon, Report at 2-4, 5 (filed Feb. 11, 2016) (Verizon Status Report) (reporting successful testing of interoperable RTT capabilities to date). In addition, Cellular South, Inc., has indicated that it is on target to meet this deadline. See Cellular South Report at 5 (March 17, 2016). AT&T notes that while implementation of any new network feature such as RTT is “complex and multi-faceted,” AT&T believes that “the end of 2017 is a realistic deployment date.” AT&T Reply Comments at 9, n.19.

⁸⁷ Consumer Groups Comments at 10 (asking for a “date-certain” by which RTT will be “widely available on IP networks”).

⁸⁸ See generally DAC Oct 2015 Recommendations at 3; see also *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9847-48, paras. 1-2 (requiring the implementation date of December 31, 2014, which was less than five months from the date of release of order, August 13, 2014, in order to take action “to ensure the potentially life-saving benefits of text-to-911 are available to all consumers as swiftly as possible”).

⁸⁹ We note that the deadline for an RTT requirement will eliminate the need for further waivers of the TTY obligations. However, it will not eliminate the obligation to make RTT backward compatible with TTY technology until such obligation is terminated by the Commission. See *infra* Part VI.B., seeking comment on when this should

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27. *Smaller wireless carriers.* We propose that smaller wireless carriers, to be defined as those that do not fall into Tier I, be given an additional period of time to achieve compliance with the proposed RTT support requirements beyond the deployment date proposed for the larger, Tier I carriers. We believe that allowing additional time for these carriers to achieve compliance would be appropriate, given that they generally serve smaller subscriber populations and may have fewer device options.⁹⁰ We seek comment on what would be an appropriate extension of time, as well as whether we should distinguish between Tier II and Tier III carriers in determining appropriate benchmarks for these providers.⁹¹ Alternatively, we seek comment on whether it would be more appropriate to tie the obligations of these carriers to the timing of their transition to IP-based wireless technologies, such as IMS/VoLTE or 4G services. Finally, to what extent would it be appropriate to establish an interim transitional period, akin to what is discussed above for Tier I carriers, during which such smaller carriers would be allowed, but not required, to support RTT in lieu of TTY technology?

28. *End user devices.* We propose that the timeline established for RTT support over IP-based wireless services apply as well to handsets and other text-capable end user devices for use with such services, and thus propose that any such handsets or devices sold after December 31, 2017, have RTT capability. We seek comment on this proposal. Making this requirement effective at the same time that wireless services are required to become RTT-capable would ensure that sufficient handsets are available for people with disabilities to have access to text communications in real time after the existing orders waiving service provider requirements for TTY support expire. Will the proposed December 2017 deadline for the Tier I service providers allow sufficient time incorporate RTT capability in end user devices? Is it more appropriate for the deadline established for end user devices to apply to the date on which new devices are manufactured, rather than first made available to the general public?

29. In addition to requiring the inclusion of RTT support on new terminal devices, consistent with section 255's requirements for telecommunications access and the CVAA's requirements for access to advanced communications services and equipment, should there be a requirement to add RTT capability to end user devices already in service at the compliance deadline, at "natural opportunities," previously defined by the Commission to occur upon "the redesign of a product model or service, new versions of software, upgrades to existing features or functionalities, significant rebundling or unbundling of product and service packages, or any other significant modification that may require redesign?"⁹² Further, to the extent that it is not achievable under section 716 or readily achievable under section 255 to

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occur. In other words, the timing for a phase-out of the TTY backward compatibility obligation may be different from the deployment dates for providing RTT capability on IP-based wireless services and devices.

⁹⁰ In the *2015 HAC Order*, the Commission afforded an additional three months for non-Tier I service providers to achieve compliance with new hearing aid compatibility obligations because the record showed that such providers often have difficulty obtaining the newest handset models. *2015 HAC Order*, 30 FCC Rcd at 13871, paras. 50-51.

⁹¹ See *id.* at 13856, para. 21 & n.62 (defining Tier II service providers as "non-nationwide mid-sized CMRS providers with greater than 500,000 subscribers as of the end of 2001" and Tier III service providers as "non-nationwide small CMRS providers with no more than 500,000 subscribers as of the end of 2001").

⁹² *Implementation of Sections 716 and 717 of the Communications Act of 1934, as Enacted by the Twenty-First Century Communications and Video Accessibility Act of 2010, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 14557, 14609, para. 124 (2011) (*ACS Report and Order*); *Implementation of Sections 255 and 251(a)(2) of the Communications Act of 1934, as enacted by the Telecommunications Act of 1996, Access to Telecommunications Service, Telecommunications Equipment and Customer Premises Equipment by Persons with Disabilities*, Report and Order and Further Notice of Inquiry, 16 FCC Rcd 6417, 6447, para. 71 (1999) (*Section 255 Report and Order*). Rules governing telecommunications and ACS accessibility do not require manufacturers of equipment to recall or retrofit equipment already in their inventories or in the field. In addition, cosmetic changes to a product or service do not trigger the need for a manufacturer or service provider to reassess their devices for accessibility under these sections. *Id.* at 6448, para. 73; *ACS Report and Order*, 26 FCC Rcd at 14609, para. 126.

make an end user device accessible through RTT, by what date should such device be made compatible with a stand-alone RTT device or app to the extent that these become available?

30. We also seek comment on the period of time, if any, that over-the-top applications or plug-ins for RTT should be permitted as an interim measure to achieve RTT on end user devices, and if permitted as over-the-top applications, whether manufacturers and service providers should be required to pre-install such applications on devices before they are sold to the public. The DAC recommends exploring under what circumstances requiring telecommunications and ACS support for RTT as an embedded or “native” function would be appropriate, as well as an appropriate transition period for manufacturers and providers of telecommunications and ACS to achieve this capability.⁹³ The DAC further recommends that “downloadable applications that provide the RTT functionality should be permitted until the eventual phasing in of native RTT functionality.”⁹⁴ We note that AT&T has reported that it expects to launch an OTT application to provide RTT by December 2017, and hopes to offer mobile devices with an embedded RTT solution by 2018.⁹⁵ TIA, however, states that an approach allowing RTT to either be built-in or “added later” would afford manufacturers the flexibility they need and offer “the most practical approach to enable consumers to have access to an effective solution.”⁹⁶

31. We propose that use of an over-the-top application as an interim solution, such as that which AT&T is achieving, will be sufficient to constitute compliance with the RTT requirement by December 31, 2017, and seek comment on this tentative conclusion. At the same time, we ask to what extent the Commission should be concerned that the advantages of RTT as a universal text solution will not be achieved until RTT is incorporated as a native function in end user devices, or at a minimum, pre-installed by the manufacturer or service provider as a “default” application.⁹⁷ We seek comment on whether this concern should guide our final rules, and further seek comment on what functionalities of RTT, and what associated benefits of RTT, if any, would be unavailable if it is initially implemented as an over-the-top application rather than as native functionality. With this in mind, we ask commenters to provide specific parameters for and factual showings justifying any timelines they propose for transitioning to native RTT functionality in covered devices.

V. ADVANTAGES OF RTT

32. *IP-Based Technology.* There is general agreement among AT&T and those commenting on its petition that RTT is an effective alternative to TTY technology for the IP environment. Commenters concur that RTT “is a native IP technology designed for today’s packet-switched network environment,”⁹⁸ which “offers an expanded array of features to enable more robust user conversations, including real-time editing of text and full-duplex functionality (i.e., both parties can communicate simultaneously).”⁹⁹ Consumer Groups support RTT because it transmits text instantaneously during a call for real-time interaction, and allows for “the intermixing of speech with text,” so that people can supplement speech for difficult-to-hear words.¹⁰⁰ The Technology Research Centers add that RTT also can be used to supplement voice communications by individuals who do not typically use RTT, but who may be in a situation where text is beneficial, such as a noisy environment.¹⁰¹ CTIA claims that RTT is

⁹³ DAC Feb 2016 Recommendations at 3 (Recommendation #1).

⁹⁴ *Id.* at 3 (Recommendation #3).

⁹⁵ AT&T Status Report at 3.

⁹⁶ TIA Comments at 6.

⁹⁷ *See infra* Part VI.D.

⁹⁸ CTIA Comments at 8 (*citing* AT&T Petition for Rulemaking at 5).

⁹⁹ CTIA Comments at 8 (*citing* AT&T Petition for Rulemaking at 9).

¹⁰⁰ Consumer Groups Comments at 6.

¹⁰¹ Proposal R1v3 at 16.

more spectrally efficient than TTY, as it uses fewer network resources.¹⁰²

33. AT&T, Verizon, and other carriers have made a commitment to deploy RTT as a successor technology to TTY.¹⁰³ AT&T states that RTT “is designed to operate on IP-based networks, [and] will be superior to TTY in every way – transmission speed, latency, reliability, features, privacy, conversation form, and ease of use.”¹⁰⁴ In this regard, AT&T notes that RTT conversations permit the seamless integration of voice and text, allowing parties to communicate simultaneously using a full set of characters, including characters used in languages other than English.¹⁰⁵ Verizon adds that parties generally agree that “RTT will ultimately promote a higher degree of accessibility, functionality, and reliability than cumbersome legacy TTY devices currently provide, facilitate the transition to end-to-end Next Generation 911 (NG911), and meet the needs of legacy TTY users during the transition.”¹⁰⁶ For all of these reasons, we tentatively conclude that deployment of RTT on IP networks will offer functionality greatly superior to that of TTY technology, and we seek comment on this tentative conclusion.

34. *Off-the-Shelf Devices.* Commenters also state that RTT will allow consumers with disabilities to make calls using the built-in functionality of a wide selection of off-the-shelf devices, including smartphones, tablets, computers and other Internet-enabled devices that have the ability to send, receive, and display text.¹⁰⁷ These parties point out that this can eliminate the high costs and other challenges involved in finding, purchasing, and making effective use of assistive devices such as TTYs.¹⁰⁸ In addition, the Technology Research Centers explain that in an emergency, individuals in distress would be able to use RTT on any text-capable phone available to them, and similarly would be able to communicate with anyone else without being concerned about whether the person they are calling has a specialized phone that can receive text.¹⁰⁹ Enabling people with disabilities to use off-the-shelf devices, they add, also will eliminate difficulties associated with having to achieve compatibility between mainstream devices or networks and assistive devices that use non-mainstream text formats,¹¹⁰ allow consumers with disabilities to take advantage of device and service discounts, bundles and other

¹⁰² CTIA Comments at 8, *citing* AT&T Petition for Rulemaking at 9.

¹⁰³ AT&T Petition for Rulemaking at 5-6; Verizon Petition for Waiver at 1.

¹⁰⁴ AT&T Petition for Waiver at 3.

¹⁰⁵ AT&T Petition for Rulemaking at 9.

¹⁰⁶ Verizon Comments at 1-2; *see also* Consumer Groups at 6 (agreeing that “because RTT was designed to be operated on IP networks, it does not experience the same reliability and transmission issues that impact TTYs when operating on an IP network”).

¹⁰⁷ *See generally* AT&T Petition for Rulemaking at 4, 9; CTIA Comments at 8; Proposal R1v3 at 23, 36; Consumer Groups Comments at 5; TDI, AADB, CCASDHH, CPDO, Deaf and Hard of Hearing Consumer Advocacy Network, DSA, HLAA, NAD, and RERC-TA Reply Comments (Consumer Groups Reply Comments) at 3.

¹⁰⁸ *See also* Consumer Groups Comments at 5 (noting that being able to access RTT through such mainstream devices would provide “a highly mobile accessibility solution”); AAPD Comments at 1; AT&T Petition for Rulemaking at 4, 9; CTIA Comments at 8; Proposal R1v3 at 16. However, as noted by the Technology Research Centers, specialized phones may still be necessary to meet the needs of people with more severe disabilities. Proposal R1v3 at 19. For example, people who are deaf-blind may still need devices that have refreshable Braille output or text enlarging capabilities and people who use sign language may still need videophones for either direct video communications or video relay services (VRS), the latter to communicate with individuals who do not know how to sign. VRS allows people to communicate in sign language with voice telephone users over a broadband Internet connection using video equipment. The video link allows the CA to view the party’s signed conversation and to relay the conversation back and forth by signing what the voice telephone user says to the signer and responding in voice to the voice telephone user.

¹⁰⁹ Proposal R1v3 at 35-36.

¹¹⁰ *Id.* at 6.

arrangements available to the general public,¹¹¹ and eliminate the need for friends, relatives, and colleagues of people who rely on text to communicate to purchase assistive devices or SCPE.¹¹² For all of these reasons, we tentatively conclude that the ability to acquire off-the-shelf RTT-capable devices will be beneficial for text communication users, and we seek comment on this tentative conclusion.

35. *Substitution for Telecommunications Relay Services.* Section 225 directs the Commission to ensure that TRS is available “in the most efficient manner.”¹¹³ The record suggests that, because RTT will provide greater opportunities for direct, point-to-point text communication and can enable text to be intermixed with voice, it can reduce reliance on relay services and thereby provide consumers with greater privacy and independence,¹¹⁴ while reducing overall costs for telecommunications users.¹¹⁵ For example, one form of TRS, captioned telephone relay services (CTS), currently uses CAs to enable people who are hard of hearing to receive captions of conversation spoken by other parties to a telephone call.¹¹⁶ We expect that RTT users might not need these services if they were able to receive RTT over VoIP phones to supplement incoming voice conversations for difficult-to-understand words.¹¹⁷ Similarly, we predict that people with speech disabilities who can type will be able to use standard phones capable of generating RTT to communicate with other persons who also have VoIP phones with displays.¹¹⁸ However, we note that these results are likely to be achieved only to the extent that RTT capabilities in end user devices truly become ubiquitous – *i.e.*, are enabled by default in all or most wireless (and eventually wireline) terminal equipment. To the extent that RTT is “supported” but not fully incorporated as a native or default function of devices – and is merely available for users to download or install – commenters suggest that the universal reach of text as a substitute for relay services will be less likely to be achieved, because many individuals who do not rely on text may not install this extra functionality.¹¹⁹ We seek comment on whether these assumptions are correct.

36. *Improvement of Telecommunications Relay Services.* In addition to substituting for TRS in some circumstances, we believe that RTT can be used to enhance the ability of TRS to provide functionally equivalent telephone service. For example, it would appear that for text-based forms of TRS, RTT can improve the speed and reliability of communications in an IP environment. The Technology Research Centers further note that individuals may be able to use RTT to supplement communications in sign language with text during VRS calls, reducing the time needed for CAs to convey detailed information, such as addresses and URLs.¹²⁰ We seek comment on these assertions and whether there are other ways that RTT can improve the provision of TRS for its users.

37. *Advantages Over Messaging-Type Services.* Text-based accessibility solutions include RTT, SMS, instant messaging and similar chat-type functions, and e-mail.¹²¹ With the exception of RTT,

¹¹¹ *Id.* at 16 (noting as well that people with disabilities would also be able to use “hand-me-down” devices).

¹¹² *Id.* at 14, 16.

¹¹³ 47 U.S.C. § 225(b)(1).

¹¹⁴ *See, e.g.*, AAPD Comments at 1; AT&T Petition for Rulemaking at 4; Proposal R1v3 at 6.

¹¹⁵ *See* Proposal R1v3 at 6, 37.

¹¹⁶ In a CTS call, the party to the call who is hard of hearing uses his or her own voice to speak directly to the other party, and supplements what he or she can hear in response with the captions generated by the CA. The CA produces these captions using speech-to-text or transcription technologies. There is also an IP form of CTS that allows the TRS user to receive captioned text via a computer or other similar device over a broadband connection.

¹¹⁷ *See generally* Consumer Groups Comments at 6; Proposal R1v3 at 4.

¹¹⁸ *See* Proposal R1v3 at 15.

¹¹⁹ *See, e.g., id.* at 6-7.

¹²⁰ *Id.* at 9.

¹²¹ *See, e.g., id.* at 8-9.

each of these technologies requires parties to complete their messages and to press “send,” “enter,” or a similar key to transmit the message to its recipient.¹²² By contrast, when a message is sent in real time, it is immediately conveyed to and received by the call recipient as it is being composed.¹²³ For this reason, several commenters maintain that RTT is the only type of text communication that allows a natural flow of conversation akin to voice telephone calls,¹²⁴ and therefore the only form that meets the criterion of functional equivalency.¹²⁵ Without the turn-taking and delays characteristic of messaging-type communications, these parties state, RTT gives call recipients “an opportunity to follow the thoughts of the sender as they are formed into words.”¹²⁶

38. In addition to the inability of messaging-type technologies to transmit communications instantly as they are created, the Technology Research Centers note what they consider additional drawbacks of these alternatives: the delivery of messages over SMS is not guaranteed;¹²⁷ instant messaging is not interoperable;¹²⁸ and certain features, such as conference calling, are not available via instant messaging across multiple providers.¹²⁹ Consumer preference for RTT over messaging-type services in conversational situations is also evidenced in field trials conducted by the Trace Center, Omnitor, and Gallaudet TAP.¹³⁰ Those expressing a preference for RTT in many of these studies reported this mode to be “more efficient because they could see what the other person was typing in real time” and to be more interactive, in that it provided “a better indication of the other person’s feelings and presence.” In contrast, messaging-type text methods were described as “slow and inefficient,” causing conversations to be “less natural and fluid.”¹³¹

¹²² *Id.*

¹²³ *See id.* at 8; Consumer Groups Comments at 6.

¹²⁴ *See, e.g.*, RTT Field Trial Report at 7; Proposal R1v3 at 4, 8-9; Consumer Groups Comments at 6.

¹²⁵ RERC-TA Reply Comments at 3. The RERC-TA states that voice telephony lets “both parties [to a call] take stock of each other’s thoughts the moment they are expressed in words, and enable[s] immediate interruption and interaction in a rapid conversational way.” *Id.* According to the RERC-TA, SMS cannot achieve functionally equivalent telephone service, and therefore is an insufficient text replacement for people who must communicate by reading and writing instead of using their voices. *Id.* A 2007 paper appears to support this position. *See* Xiaoqiao Meng et al., *Analysis of the Reliability of a Nationwide Short Message Service*, Proc. IEEE INFOCOM 1811-1819 (2007),

http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=4215793&refinements%3D4226149093%26filter%3DAND%28p_IS_Number%3A4215582%29. More recent data can be found in Richard H. Epstein, M.D., et al., *Communication Latencies of Wireless Devices Suitable for Time-Critical Messaging to Anesthesia Providers*, 116 *Anesthesia & Analgesia* 911-18 (2013), <http://journals.lww.com/anesthesia-analgesia/pages/articleviewer.aspx?year=2013&issue=04000&article=00024&type=fulltext>.

¹²⁶ RTT Field Trial Report at 7.

¹²⁷ According to the Technology Research Centers, delayed or missing messages can result because “messages are dumped in overload or long delay situations.” Proposal R1v3 at 8.

¹²⁸ The Technology Research Centers explain that software can enable an individual to log into multiple IM systems at the same time, but it will not allow conferencing and other features on each of the individual IM systems. *Id.*

¹²⁹ *Id.*

¹³⁰ *See* RTT Field Trial Report. Consistently, the researchers found that the majority of respondents preferred RTT over “turn-by-turn” messages, and that the real-time flow of text was “especially appreciated by the receiving party.” *Id.* at 39. For example, in one study, two-thirds (65.3 percent) of the participants preferred RTT for receiving text, and slightly less than two-thirds (61.2%) preferred this method to send text. *Id.* at 15; *see also id.* at 4, 29-30, 48.

¹³¹ *Id.* at 40; *see also id.* at 30 (for example, participants of one study found RTT to be “faster, as one is able to interrupt with corrections and comments without waiting for a complete sentence,” and they liked seeing “what is

(continued....)

39. *Access to 911 Emergency Services.* Perhaps the most compelling case to be made in favor of RTT over messaging-type services is in the context of emergency calls to 911. Recent studies reveal a preference for RTT in simulated emergency situations by 100 percent of participants.¹³² According to the Technology Research Centers, a principal reason for preferring RTT over SMS is that the latter can result in “[c]rossed messages [that] can lead to misunderstanding and loss of time. . . . In an emergency situation, a panicked caller may ask a second or third question if there is no immediate visible response from the 9-1-1 call-taker. This can lead to confusion, crossed answers, and error.”¹³³ In contrast, these groups explain, RTT enables “emergency call-takers [to] view the message as it is being typed and respond, refer, interrupt, or guide the information being sent to speed up communication and make it more helpful to emergency responders.”¹³⁴ In this manner, they say, RTT “allows for the efficient exchange of information and a continued sense of contact,” as well as the delivery of even incomplete messages, which can result in potentially saving lives in an emergency.¹³⁵

40. Verizon notes that “existing LTE standards already contemplate the transmission of RTT 911 with location and roaming capabilities”¹³⁶ and asks the Commission “to focus its efforts on developing RTT as a solution for end-to-end next generation 911.”¹³⁷ Taking such action, it says, would be consistent with Congress’s objective, as expressed in the CVAA, to replace legacy TTY technology “with more effective and efficient technologies and methods” that “ensure access by individuals with disabilities to an Internet protocol enabled emergency network, where achievable and technically feasible.”¹³⁸ The National Emergency Numbering Association (NENA) concurs that RTT “will further enhance the conversational nature of calls, allowing for faster, more accurate communication between telecommunicators and callers, and will better emulate the flow of TTY conversations to which many

(Continued from previous page) _____
typed right away”); RERC-TA Reply Comments at 12 (reporting similar results from a study conducted at Linköping University).

¹³² RTT Field Trial Report at 39; RERC-TA Reply Comments at 2, 11 (citing a study conducted at the University of Michigan). Similarly, the RERC-TA reports that consumers in experimental trials showed a considerable preference for RTT in communications involving “intensive” situations, causing it to conclude that RTT is necessary to achieve “efficient text dialogues with 9-1-1.” *Id.* at 2, 3.

¹³³ Proposal R1v3 at 8. The Technology Research Centers define crossed messages as those that occur when a person sends a second message before the recipient has finished answering earlier messages. *Id.* They go on to explain that “IM causes one user to wait with a blank screen, wondering what the other person is typing and when it will come. When the message is long or the typist slow this can lead to frustration or sending of another message.” *Id.*

¹³⁴ *Id.* at 9. By way of example, the Technology Research Centers explain that a messaging service might impede the ability of the following messages to reach a Public Safety Answering Point (PSAP) successfully because they might be cut off before the caller presses the send key: “I think I’m having a heart att__”; “Help. My ex is breaking into my hous__”. By contrast, they explain, RTT would allow the 911 call taker to see these messages as they were typed. The Technology Research Centers explain that “[t]he real-time nature . . . ensures partial messages are received when they are interrupted midsentence for any reason (caller passes out, caller is prevented from completing sentence by another person, etc), allow[ing] the 911 operator to optimize the information being sent . . .” *Id.* at 5; see also *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9902, n.363.

¹³⁵ Proposal R1v3 at 9.

¹³⁶ Verizon Comments at 5 (noting that LTE networks are widely deployed in the U.S. with substantial consumer adoption). Verizon reports that in the second quarter of 2015, 4G devices constituted approximately 73 percent of its retail postpaid connections base, and that its LTE network covers 98% of the U.S. population. *Id.*, n.15 (citations omitted).

¹³⁷ *Id.* at 5.

¹³⁸ *Id.* at 5-6 (quoting 47 U.S.C. § 615c(g)).

deaf or hard of hearing users are accustomed.”¹³⁹ Omnitor adds that the move to RTT will create “an enormous improvement in usability of the emergency service dialogue resulting in good lifesaving opportunities” especially when Next Generation 911 (NG911) deployment occurs, “because the NG9-1-1 plans contain the same standards for RTT as AT&T describes support for in the rulemaking petition.”¹⁴⁰

41. We recognize that, two years ago, the Commission adopted rules that could be met through the provision of SMS-based text-to-911 service. The Commission’s goal in doing so was to ensure that, in the near term, individuals have a direct and familiar means of contacting 911 via text through mass market communication devices that are already available to people with disabilities and other members of the general public.¹⁴¹ The Commission noted that some commenters were less supportive of SMS-to-911 because it does not support the ability to “send and receive text simultaneously with the time that it is typed without having to press a ‘send’ key.”¹⁴² At the same time, the Commission recognized that many stakeholders would choose to text to 911 through an interim SMS-based solution because of its ease of use for people with disabilities and ubiquity in mainstream society.¹⁴³ It went on to note that RTT “provides an instantaneous exchange, character by character or word by word,”¹⁴⁴ a feature that commenters to this proceeding say is critical in an emergency.¹⁴⁵ As this discussion makes clear, the record in the instant proceeding continues to reflect major concerns by several commenters about using SMS as a long term 911 accessibility solution. While we do not propose to make any changes to our existing text-to-911 rules in this proceeding, we believe that our proposals to facilitate the wider availability of RTT for people with disabilities could have a beneficial impact on the future evolution of text-to-911.

42. Based on the comments summarized above, we propose that RTT will be more effective than messaging-type services in meeting the communication needs of consumers with disabilities, including their emergency communication needs. We seek comment on this proposal. Are there other text-based communication solutions that can meet the general communication needs of this population as effectively as RTT, and if so, how?¹⁴⁶ How would the deployment of RTT or other text-based solutions impact the transition to NG911?¹⁴⁷ In response to the Commission’s *T911 Second Report and Order and*

¹³⁹ NENA Comments, PS Docket Nos. 10-255 and 11-153, at 14 (filed Dec. 12, 2011); AT&T Petition for Rulemaking at 11, n.19.

¹⁴⁰ Omnitor Comments at 6 (also noting that the long delays needed to compose whole sentences make SMS too “cumbersome to use . . . for emergency service conversations”).

¹⁴¹ *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9847, 9852, paras. 1, 12; *see also* EAAC Report and Recommendations at 29 (noting that many individuals who no longer had TTYs nevertheless had mobile service plans that included SMS). For purposes of the text-to-911 requirements, the Commission defined a 911 text message as one that “consists of text characters, sent to the short code ‘911’ and is intended to be delivered to a PSAP by a covered text provider, regardless of the text messaging platform used.”

¹⁴² *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9855, para. 17 (citing comments submitted by the Wireless Rehabilitation Engineering Research Center and NENA); *see also* EAAC TTY Transition Report at 4 (recognizing that RTT provides characteristics that are required by some users in emergency communications, for example, sending text continuously as it is typed and supporting captioned telephony).

¹⁴³ *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9855, para. 17.

¹⁴⁴ *Id.* at 9902, para. 132.

¹⁴⁵ *See* RERC-TA Reply Comments at 2-3; Proposal R1v3 at 9.

¹⁴⁶ *See, e.g.*, DAC Oct 2015 Recommendations at 2-3 (recommending that the Commission explore whether other next-generation text-based communication solutions, in addition to RTT, can meet or exceed the objectives of the Commission’s existing wireless TTY rules and in particular the communication needs of today’s consumers, including individuals who are deaf, hard of hearing, deaf-blind, or speech disabled, now or in the future).

¹⁴⁷ *See id.*

Third Further Notice, some commenters raised concerns about the feasibility and costs associated with accepting 911 calls delivered over RTT.¹⁴⁸ However, in its Petition for Rulemaking, AT&T states that the RTT-TTY interworking gateway that it is building into its network will enable individuals using RTT to communicate with all PSAPs without any added costs to the user or the PSAP.¹⁴⁹ We ask commenters to address concerns about the costs, benefits and feasibility of using RTT for accessing 911 services. Similarly, we seek comment on the technical and operational impact on PSAPs receiving RTT-based 911 calls.

VI. MINIMUM FUNCTIONALITIES OF RTT

43. The DAC recommends that the Commission “consider how telecommunication and advanced communications services and equipment that support RTT [can] provide the users of RTT (either in isolation or in conjunction with other media) with access to the same telecommunication and advanced communications functions and features that are provided to voice-based users of the services and equipment.”¹⁵⁰ We believe that this formulation captures the objectives of sections 225, 255, and 716 of the Act, which are to provide functionally equivalent communications and to ensure that telecommunications and ACS are fully accessible to and usable by people with disabilities. Accordingly, we propose that, in amending our rules to recognize IP-based text alternatives and facilitate the transition away from TTY technology, we should consider the extent to which RTT’s features, functions, and capabilities can provide people with disabilities with telephone service that is as accessible, usable, and otherwise as effective as voice-based services over IP networks.¹⁵¹ We seek comment on this proposed approach.

¹⁴⁸ See Media Friends (d/b/a Heywire) Comments, PS Docket Nos. 10-255 and 11-153, at 13 (filed Oct. 15, 2014) (noting that RTT is technologically feasible but raising financial concerns); L.R. Kimball Comments, PS Docket Nos. 10-255 and 11-153, at 5 (filed Oct. 16, 2014) (asking the Commission to consider the ability of PSAPs to receive RTT given the lack of Internet access (due to security concerns) at PSAPs).

¹⁴⁹ AT&T Petition for Rulemaking at 9-10.

¹⁵⁰ DAC Feb 2016 Recommendations at 3; see also EAAC TTY Transition Report at 22-23 (recommending that RTT features include the ability to transfer a call, establish multi-point conference calls, record and retrieve messages from voicemail systems, and access and operate menu-based automated attendant and interactive voice response (IVR) systems); Proposal R1v3 at 17 (listing various telecommunications features that the Technology Research Centers contend should be made available to RTT users); 36 CFR § 1194.23 (describing the electronic and information technology accessibility standards for telecommunication products to comply with section 508 accessibility requirements).

¹⁵¹ We note that in the *Emerging Wireline Order and Further Notice*, the Commission tentatively concluded that a criterion for evaluating the adequacy of replacements for legacy services is the extent to which the replacement service or the alternative services available from other providers allow at least the same accessibility, usability, and compatibility with assistive technologies as the service being discontinued. *Emerging Wireline Order and Further Notice*, 30 FCC Rcd at 9480, paras. 207-08; see also *id.* at 9487, para. 222. Consistent with our statutory obligation under section 214(a) to ensure that “neither the present nor future public convenience and necessity will be adversely affected” by a discontinuance (47 U.S.C. § 214(a)), our longstanding section 214 discontinuance criteria call for a comparison between the service potentially subject to discontinuance and the proffered replacement service. While that comparison-based approach guides our evaluation of specific proposed discontinuances, here in the rulemaking context and in the specific context of this proceeding, given the age and limitations of TTY technology, including its slow transmission speed, limited characters, and lack of synchronicity, we do not believe the capabilities of TTYs should serve as a performance benchmark for current, IP-based text technologies. As noted above, a significant benefit of the migration to RTT is that it will enable people with communication disabilities to access telephone services in a manner that is far more integrated and less burdensome than was possible with TTYs. Thus, we believe it is preferable for our rules to promote or require implementation of the improved accessibility features made possible by these technologies where there is a factual record justifying this approach. We believe this will enable us to most effectively carry out our statutory mandates to ensure accessibility, usability and functional equivalence in emerging IP-based networks.

44. In this section, we tentatively conclude, propose, or seek comment on basic functionalities that we believe are necessary for a wireless provider's implementation of RTT to be considered compliant with the rules adopted by the Commission in this proceeding. Specifically, we seek comment on the extent to which each is necessary to achieve effective telephone access for individuals with disabilities, as well as its costs, other benefits, and any technical or other challenges that may be associated with its provision. Finally, we seek comment on the extent to which each of these features will be enabled or facilitated through the use of RFC 4103.¹⁵²

A. Interoperability

1. Need for Interoperability

45. We tentatively conclude that people who rely on text to communicate can only achieve effective RTT communications across multiple platforms and networks if the communication transmissions carried across, and the terminal equipment used with, those platforms and networks are interoperable with one another. We seek comment on this tentative conclusion. We note that there is consensus among commenters on AT&T's petition for rulemaking with respect to the need for seamless interconnection of RTT services across networks, service providers, and devices. Virtually all commenters agree with AT&T on the importance of not locking users into a single network, service provider, or device, as well as the value of "ensur[ing] that people with disabilities have the same kinds of choices in a competitive market as the population in general."¹⁵³ Trace et al. note that "[t]he benefits of a communications system increase greatly as more users and services can be reached by it."¹⁵⁴ They report "overwhelming agreement" among the participants in their field trials on the importance of RTT interoperability across different devices and technologies, including legacy TTYs, so that RTT users can make calls regardless of telephone system or carrier, can reach every telephone number, and can enjoy the same flexibility and choices as everyone else.¹⁵⁵

46. Consumer Groups note that if service providers were to adopt proprietary standards that do not interoperate, RTT users might not be able to communicate with other users in emergency situations.¹⁵⁶ Similarly, TIA states that "for RTT technology to successfully support the emergency communications needs of consumers with disabilities, interworking functionality must be developed"; accordingly, TIA urges the Commission to adopt rules that "focus on ensuring *interoperability* among all parts of the RTT system."¹⁵⁷ Likewise, Verizon states it will develop and deploy RTT technology that will be "accessible, interoperable with other RTT services and applications, and compatible with other providers' networks. . . ."¹⁵⁸ Making the same commitment, AT&T asks the Commission to deem RTT functionality in compliance with the Commission's TTY support requirements only if its implementation

¹⁵² RFC 4103 is defined as the standard Internet Engineering Task Force (IETF) Request for Comments (RFC) 4103, Real-time Transport Protocol Payload for Text Conversation (2005) and its successor protocol as determined by a telecommunications industry setting body, such as IETF or the Alliance for Telecommunications Industry Solutions. RFC 4103 is available at: <http://www.ietf.org/rfc/rfc4103.txt> (June 2005, last visited Apr. 28, 2016).

¹⁵³ RTT Field Trial Report at 42; *see also* RERC-TA Reply Comments at 8; Consumer Groups *Ex Parte* at 6 (noting that without interoperability, RTT users might have to acquire a new device each time they decide to change service providers, which would create barriers to competition and consumer choice); TIA comments at 5-6; Verizon Petition for Waiver at 3; AT&T Petition for Rulemaking at 5-6.

¹⁵⁴ RTT Field Trial Report at 42; RERC-TA Reply Comments at 7.

¹⁵⁵ RTT Field Trial Report at 7, 18, 38.

¹⁵⁶ Consumer Groups *Ex Parte* at 6. Trace et al. emphasize the importance of interconnecting with 911 emergency services and TRS, "so that users of RTT can reach all important society functions in real-time text and voice." RTT Field Trial Report at 42.

¹⁵⁷ TIA Comments at 5-6 (emphasis in original).

¹⁵⁸ Verizon Petition for Waiver at 3.

is interoperable with other VoIP networks.¹⁵⁹

47. Commission rules reflect a longstanding commitment to policies favoring the openness of telecommunications services across providers and devices, so that anyone can make a voice call to anyone else, regardless of the provider or device they are using.¹⁶⁰ For example, the Commission has promulgated a series of rules to ensure the interconnection of terminal equipment to the telephone network.¹⁶¹ Our rules also prohibit telecommunications carriers and ACS providers from installing “network features, functions, or capabilities” that impede the accessibility or usability of telecommunications and ACS services.¹⁶² Further, in the *Emerging Wireline Order and Further Notice*, the Commission tentatively concluded that a carrier seeking to discontinue an existing retail communications service in order to transition to a newer technology must demonstrate that the replacement service offered by that carrier, or alternative services available from other providers in the affected service area, provides voice and non-voice device and service interoperability – including interoperability with third party services – as much as or more than the interoperability provided by the service to be retired.¹⁶³ We believe that preserving interoperability is equally important in the transition from TTY to RTT technology. We further believe that, in the absence of interoperability, multiple versions of RTT may need to be supported, not only by user devices, but also by TRS call centers and 911 PSAPs – a burden that could entail a prohibitive expense for many such entities. We seek comment on this analysis.

2. RFC 4103 as a Safe Harbor RTT Standard

a. Merits of a Common Standard

48. We next consider how best to achieve RTT interoperability across communication platforms, networks, and devices. Consumer Groups maintain that having a single standard will “ensure that, from day one, RTT is a valuable and universally usable communications medium.”¹⁶⁴ They suggest that it will be less expensive for carriers to develop and deploy a single, interoperable RTT system now, than to each develop their own versions of RTT service and later try to reconfigure these to be

¹⁵⁹ AT&T Petition for Rulemaking at 5-6.

¹⁶⁰ See 47 U.S.C. § 151 (supporting universal connectivity by requiring the Commission to make wire and radio communications “available, so far as possible, to all people of the United States”); *Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities*, Declaratory Ruling and Further Notice of Proposed Rulemaking, 21 FCC Rcd 5442, 5459, n.136 (2006) (*VRS Interoperability Declaratory Ruling*) (banning provider practices that had been preventing VRS users from communicating with the VRS users of competing providers as inconsistent with the statutory requirement of functional equivalency and with the public interest).

¹⁶¹ See 47 CFR § 68.1 *et seq.*; see also Consumer Groups *Ex Parte* at 6 (citing *Promoting Interoperability in the 700 MHz Commercial Spectrum et al.*, Report and Order and Order of Proposed Modification, 28 FCC Rcd 15122, 15122-23, para. 1 (2013) (*700 MHz Interoperability Order*) (adopting interoperability measures that the Commission said would “serve the public interest by enabling consumers . . . to enjoy the benefits of greater competition and choices, and by encouraging . . . investment, [and] job creation” as well as the development of “innovative” services and equipment”). In the *700 MHz Interoperability Order*, the Commission explained that the lack of interoperability in the 700 MHz band had impeded consumers’ ability to switch between providers without purchasing new devices. *700 MHz Interoperability Order*, 28 FCC Rcd at 15126-27, para. 10.

¹⁶² 47 U.S.C. § 251(a)(1)-(2) (referencing the telecommunications accessibility provisions of section 255); 47 U.S.C. § 617(d) (referencing the ACS accessibility provisions of section 716 of the Act).

¹⁶³ See, e.g., *Emerging Wireline Order and Further Notice*, 30 FCC Rcd at 9485, para. 219 (asking commenters who disagree with the Commission’s tentative conclusion to explain how the Commission could nevertheless ensure that consumers are not harmed by the proposed discontinuance of service).

¹⁶⁴ Consumer Groups *Ex Parte* at 4.

interoperable.¹⁶⁵ The Technology Research Centers add that because “the IP voice communication infrastructure is rapidly being deployed,” early adoption of a common standard is necessary to facilitate support throughout the system and avoid having to later retrofit an installed base of equipment.¹⁶⁶

49. Industry associations, on the other hand, argue that it is premature to adopt a mandatory common standard for RTT at this time. CTIA contends that additional standards development and implementation are necessary before a single standard can be selected, given that “there are a number of possible implementation solutions” and “several technical standards” that could be used to implement an RTT solution.¹⁶⁷ Instead, CTIA recommends that the Commission adopt performance objectives, akin to those established to implement the Act’s mandates for telecommunications and ACS accessibility.¹⁶⁸ TIA similarly encourages the Commission to allow flexibility in the implementation of RTT and, while acknowledging the need for interoperability, urges the Commission not to mandate specific technological solutions to achieve this.¹⁶⁹

50. Consumer Groups respond that the adoption of a standard would set “a floor, not a ceiling,” and that doing so would not prevent companies “from innovating and providing greater functionalities” than are specified by the standard.¹⁷⁰ They also point out that the lack of a common standard sometimes has impeded the interoperability of communications technologies needed by people with disabilities. For decades, they report, the lack of an international standard for TTY technology has prevented TTY users from communicating by text in real-time with people living or visiting countries abroad.¹⁷¹ Similarly, according to Consumer Groups, the lack of a common standard for instant messaging sometimes prevents instant messaging (IM) users from being able to contact each other across IM platforms.¹⁷² Likewise, the Technology Research Centers explain, the lack of a common VRS standard has impeded full interconnection for users of this service since the early 2000s.¹⁷³

51. We agree with consumers and researchers that standards can be especially important to ensuring interoperability of technologies needed by people with disabilities and that common technical specifications will allow connectivity to occur seamlessly from one end of the call to the other without incurring obstacles along the way.¹⁷⁴ At the same time, we acknowledge the need for the Commission’s

¹⁶⁵ *Id.* (further questioning whether, at such later date, interoperability would still be possible).

¹⁶⁶ Proposal R1v3 at 13 (maintaining that postponing adoption of a common standard will raise the likelihood that companies will develop products and features that are incompatible with a standard eventually chosen, ultimately leading to higher retrofitting expenses).

¹⁶⁷ CTIA Comments at 9-11.

¹⁶⁸ *Id.* at 11 (*citing* 47 U.S.C. §§ 255, 617).

¹⁶⁹ TIA Comments at 6.

¹⁷⁰ Consumer Groups *Ex Parte* at 6.

¹⁷¹ Consumer Groups Reply Comments at 5; Proposal R1v3 at 16. Although TIA-825-A is used for the transmission of Baudot tones on TTYs used by all terminal devices and networks in the United States, the Technology Research Centers point out that approximately half a dozen TTY standards are used abroad, including V.21, EDT, and DTMF, and that this diversity of standards has “caused great problems with interoperability between countries.” Proposal R1v3 at 22.

¹⁷² Consumer Groups Reply Comments at 6 (explaining that, in the absence of a common standard, users have to figure out the type of IM used by the person they want to contact and then install a compatible application).

¹⁷³ See RTT Field Trial Report at 8 (warning that the problems of VRS interoperability should serve as a “cautionary tale”); *VRS Interoperability Declaratory Ruling*, 21 FCC Rcd at 5459, n.136.

¹⁷⁴ See Consumer Groups *Ex Parte* at 4-5; RERC-TA Comments at 7. The DAC encourages the Commission to expeditiously evaluate and examine possible protocols and standards for RTT interoperability. DAC Feb 2016 Recommendation at 4; DAC Oct 2015 Recommendations at 3 (requesting the Commission to explore how a transition to TTY alternative solutions should be coordinated across the ecosystem of TTY users, such as carriers,

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rules to incorporate “key principles of flexibility and technology neutrality” as recommended by industry commenters.¹⁷⁵ We tentatively conclude that a middle ground between these two approaches can be achieved by referencing a technical standard as a safe harbor. We believe that this approach will ensure RTT interoperability and product portability, while at the same time provide sufficient flexibility for covered entities adhering to different internal RTT standards – so long as their RTT support offers the same functions and capabilities as the selected standard, and is interoperable with the standard’s format where they connect with other providers.¹⁷⁶ We seek comment on this tentative conclusion and analysis.

52. To the extent that any commenter believes that reference to a safe harbor standard is unnecessary, we seek comment on how we can otherwise ensure that RTT communications are interoperable, not just among different implementations of RTT, but also with legacy interconnected TTY devices. In this regard, we note that the DAC asks whether RTT would remain an acceptable alternative to TTY technology “in the absence of conformity of networks and equipment to a common standard.”¹⁷⁷ Likewise, we ask commenters who support adoption of a mandatory technical standard to explain why a safe harbor, combined with performance objectives, would be insufficient to achieve effective and interoperable RTT communications. Further, will a safe harbor be sufficient to provide incentives for manufacturers and providers to invest in research and development of RTT functionalities?¹⁷⁸

b. Benefits of RFC 4103

53. For the reasons discussed below, we tentatively conclude that RFC 4103 is the appropriate standard to which covered entities should adhere as a safe harbor, conformity with which should be deemed to satisfy our interoperability requirements and certain of our performance objectives for RTT communications.¹⁷⁹ We seek comment on this tentative conclusion. Use of RFC 4103 for RTT communications is well supported by the record to date, as reflected in the comments on AT&T’s petition for rulemaking. First, RFC 4103 is a non-proprietary, freely available standard that has been widely referenced by leading standards organizations.¹⁸⁰ As various commenters have pointed out, this standard, developed by the IETF, has been adopted by the International Telecommunications Union Telecommunication Standardization Sector (ITU-T), the European Telecommunications Standards

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relay providers, and equipment manufacturers). In addition, the TEITAC recommended that a single RTT protocol or standard for each communications system be used to ensure RTT interoperability. TEITAC Report, Part 6, Subpart C, Recommendations 6-A, 6-B.

¹⁷⁵ TIA Comments at 2.

¹⁷⁶ Proposal R1v3 at 7; *see also id.* at 11 (claiming that any method can be used to provide RTT within a system “as long as it is reliable, and it transcodes the RTT into the RTT format of the other systems where their systems connect to other transport/call-handling technologies”). By way of example, Trace et al. state that “the WebRTC data channel real-time text should be converted to RFC 4103 where the WebRTC network connects to SIP or IMS networks.” RTT Field Trial Report at 42; *see also id.* at 4 (suggesting that, in environments where RFC 4103 is not used, conversion to this standard should be supported wherever other RTT technologies interface with SIP or IMS).

¹⁷⁷ *See* DAC Oct 2015 Recommendations at 3.

¹⁷⁸ *See generally* Consumer Groups *Ex Parte* at 6 (claiming that interoperability standards “catalyze innovation” by giving “entrepreneurs a degree of certainty that a market will exist for their work”) (citation omitted).

¹⁷⁹ As explained *supra* note 152, RFC 4103 is defined as the standard Internet Engineering Task Force (IETF) Request for Comments (RFC) 4103, Real-time Transport Protocol Payload for Text Conversation (2005) and its successor protocol as determined by a telecommunications industry setting body, such as IETF or the Alliance for Telecommunications Industry Solutions. RFC 4103 is available at: <http://www.ietf.org/rfc/rfc4103.txt>.

¹⁸⁰ *See* RTT Field Trial Report at 41. Because it is a non-proprietary standard, there does not appear to be any conflict between our proposed adoption of RFC 4103 and the CVAA’s proviso that “[n]o action taken by the Federal Communications Commission to implement this Act or any amendment made by this Act shall mandate the use or incorporation of proprietary technology.” CVAA, § 3.

Institute (ETSI), 3GPP, a partnership of seven telecommunications standards organizations,¹⁸¹ and Groupe Speciale Mobile Association (GSMA).¹⁸²

54. Second, RTT is already being used or has been widely designated for implementation by numerous carriers and other organizations, both domestic and foreign.¹⁸³ Domestically, both AT&T and Verizon have specified RFC 4103 as the standard protocol to be implemented in their IP-based wireless networks as the successor to TTY technology,¹⁸⁴ the National Emergency Number Association has specified RFC 4103 for interoperable use in IP-based Next Generation emergency text communications where SIP technology is used,¹⁸⁵ and the Access Board has proposed requiring RFC 4103 for federal procurements associated with the transmission of SIP-based RTT to achieve compliance with section 508 of the Rehabilitation Act.¹⁸⁶ In addition, RFC 4103 is specified in the SIP Forum's interoperability profile for VRS providers.¹⁸⁷

55. Trace et al. note that outside the United States, RFC 4103 has been implemented in text or video relay services in France, the Netherlands, Sweden, and Norway.¹⁸⁸ They further report that “[a]t least four communication technology providers and a number of communication service providers in Europe are providing terminals, terminal software, communication services, interoperability with other providers, interoperability with legacy PSTN text telephones, answering machine services, relay service access and emergency service access all using RFC 4103.”¹⁸⁹

56. Third, according to commenters, RFC 4103 has a number of features that make it particularly suitable for RTT. According to the Technology Research Centers, RFC 4103 eliminates the need to transcode at the borders of a network, permits a wide range of hardware, supports the international character set (Unicode), has built-in redundancy, is bandwidth efficient, is based on the same transmission protocol (RTP) as audio and video, and is supported by existing open source and commercial codecs.¹⁹⁰ We seek comment on the value of each of these features and the extent to which

¹⁸¹ According to the DAC, IMS multimedia telephony service allows for multiple media capabilities such as voice, real-time video, text, file transfer and sharing of pictures, audio and video clips. DAC Oct 2015 Recommendations at 1, n.3.

¹⁸² Proposal R1v3 at 28-32; AT&T Petition for Rulemaking at 11, n.19; Verizon Status Report at 3.

¹⁸³ RERC-TA Reply Comments at 4-7 (providing an extensive list of both standard organizations and products and services adopting RFC 4103); RTT Field Trial Report at 41 (noting that RFC 4103 is “the most widely cited standard for RTT”); Consumer Groups *Ex Parte* at 5; Omnitor Comments at 6.

¹⁸⁴ AT&T Petition for Rulemaking at 1; Verizon Status Report at 2. In this report, submitted in compliance with the Commission's conditions on Verizon's waiver from the Commission's TTY support obligations, Verizon notes that preliminary internal testing using RFC 4103 has shown “successful TTY calls between VoLTE devices with external devices attached.” *Id.* at 3.

¹⁸⁵ EAAC TTY Transition Report at 23.

¹⁸⁶ *Access Board NPRM*, 80 Fed. Reg. at 10900.

¹⁸⁷ RERC-TA Reply Comments at 6; Consumer Groups *Ex Parte* at 5. According to the Technology Research Centers, RFC 4103 is the only “real-time text standard in use today for [SIP] based products other than gateways.” Proposal R1v3 at 22.

¹⁸⁸ RTT Field Trial Report at 41.

¹⁸⁹ *Id.* Likewise, the RERC-TA states that RFC 4103 has been implemented by telecommunications industries and by international standards organizations for many years, and therefore maintains that it is a mature, rather than a nascent, standard as claimed by TIA. RERC-TA Reply Comments at 4.

¹⁹⁰ Proposal R1v3 at 20-21. In addition, Consumer Groups report that in a performance testing study commissioned in Sweden, RFC 4103 experienced less text loss in poor network conditions than a competing RTT protocol. Consumer Groups *Ex Parte* at 6-7.

they can contribute to making RFC 4103 a feasible and flexible means of achieving RTT interoperability and functionality. We also seek comment on which of the user functionalities necessary to an effective communications system, in addition to interoperability, can be made possible with adherence to RFC 4103.¹⁹¹ Further, to what extent can other RTT standards “coexist” with RFC 4103 in networks, technologies, and terminal equipment on which RTT is being used, to allow RTT to provide a universally accessible communications environment for people who are deaf, hard of hearing, speech disabled, or deaf-blind?¹⁹²

57. Next, we seek comment on whether RFC 4103 is sufficiently flexible to “spur innovation in accessibility solutions.”¹⁹³ Are there any non-SIP-based networks for which implementation of RTT would serve the public interest, and if so, how could RTT be implemented on such networks so as to be interoperable with networks adhering to RFC 4103? Finally, if any adverse effects would result from adopting RFC 4103 as a safe harbor, we ask commenters to identify these, and to explain specifically how such effects could be mitigated by modifying the standard or allowing an alternative protocol.

58. In the event that the Commission decides to adopt RFC 4103 as a safe harbor for RTT, we seek comment on how this standard can be updated and amended to accommodate successor non-proprietary RTT technologies that are developed in the future. The Technology Research Centers point out that the path for incorporating innovations into RTT can be the same as that used to update voice standards and codecs, i.e., by phasing in new formats and technologies while continuing to support the existing technology until its retirement.¹⁹⁴ How can we design our rules to allow these capabilities to continue evolving with technological advances and ensure the flexibility requested by industry, while not compromising the effectiveness of this technology for people with disabilities?

c. Authority

59. We believe that we have sufficient authority to adopt RFC 4103 as a safe harbor. Section 716 explicitly allows the Commission to “adopt technical standards as a safe harbor for such compliance if necessary to facilitate the manufacturers' and service providers' compliance with section [716] (a) through (c).”¹⁹⁵ Additionally, section 106 of the CVAA expressly authorizes the Commission “to promulgate regulations to implement the recommendations proposed by the EAAC, as well as any other regulations, *technical standards*, protocols, and procedures as are necessary to achieve reliable, interoperable communication that ensures access by individuals with disabilities to an Internet protocol-enabled emergency network, where achievable and technically feasible.”¹⁹⁶ We seek comment on this

¹⁹¹ See *infra* Part VI.C. for a discussion of functionalities proposed as necessary to ensure that RTT is accessible, usable, and effective for people with disabilities.

¹⁹² See RTT Field Trial Report at 42 (maintaining that RTT technologies can coexist and achieve interoperability as long as their providers convert their transmissions to RFC 4103 or an agreed internetworking standard for any other networks to which they connect because RFC 4103 makes use of the same basic media transport protocol as other real-time media).

¹⁹³ CTIA Comments at 10.

¹⁹⁴ RTT Field Trial Report at 46; Consumer Groups Comments at 7.

¹⁹⁵ 47 U.S.C. § 617(e)(1)(D).

¹⁹⁶ 47 U.S.C. § 615c(g) (emphasis added). Section 106 of the CVAA directed the EAAC to submit to the Commission recommendations to implement technologies and methods to enable access to emergency services by people with disabilities. Congress specified that such proposals shall include recommendations “for the establishment of technical standards for use by public safety answering points, designated default answering points, and local emergency authorities.” *Id.* § 615c(c)(3). In response, the EAAC recommended that the Commission remove the TTY support requirements for consumer devices that implement IP-based text RTT communications, EAAC TTY Transition Report at 4, and that “standards and functional requirements be adopted that are technically and economically feasible” to, among other things, enable consumers to “[h]ave direct access to NG9-1-1 using IP-based text communications (including real-time text, IM, and email),” “[h]ave the option to communicate in real-

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analysis. Further, we ask commenters who support a mandatory standard to provide legal authority for their proposal. CTIA points out that section 716 of the Act does not permit the Commission's regulations implementing that section to mandate technological standards, except as a safe harbor to facilitate the manufacturers' and service providers' compliance with section 716.¹⁹⁷ At the same time, as noted, section 106 of the CVAA expressly authorizes the Commission to adopt technical standards to ensure access by people with disabilities to an IP-based emergency network.¹⁹⁸ In the event that the Commission deems it necessary to adopt a mandatory RTT standard, would our specific standard-setting authority under section 106 of the CVAA, as well as our authority under section 225 of the Act,¹⁹⁹ provide sufficient authority for the Commission to establish a mandatory technical standard for RTT, notwithstanding the standard-setting restriction of section 716?

B. Backward Compatibility with TTY Technology

60. The DAC points out that while TTY usage continues to be in steady decline, some people who are deaf, hard of hearing, deaf-blind, or speech disabled, including senior citizens and rural residents, continue to rely on TTYs.²⁰⁰ In addition, some places of public accommodation currently offer TTYs or TTY access as their sole method of text-based communications access, and some may continue to do so even after RTT is deployed. Other parties to this proceeding note that TTY technology continues to be used by individuals who do not have or cannot afford high speed Internet access²⁰¹ or who rely on certain forms of TRS.²⁰² Consumer Groups also caution that some persons have kept their TTY devices to make emergency calls.²⁰³ In a survey conducted by Trace et al., ninety-six percent of respondents agreed on the importance of being able to interconnect TTY and IP-based RTT conversations so that TTY users would not be left behind during the migration to RTT.²⁰⁴

61. In order to avoid "sacrificing existing accessibility solutions as carriers and customers transition to RTT," AT&T proposes requiring IP-based wireless service providers to achieve backward capability with TTY technology as one of two requirements for launching RTT.²⁰⁵ Both AT&T and Verizon have indicated their intent to use RFC 4103 to achieve such compatibility.²⁰⁶ AT&T explains that an RTT-TTY "interworking gateway" being built into its network will enable RTT users to communicate with TTY users, without any added costs to the TTY user or PSAPs.²⁰⁷ Likewise, Verizon has conveyed its plans to conduct "batteries of formalized, systematic tests" to ensure that its RTT

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time text to NG9-1-1 bi-directionally," and communicate with NG9-1-1 in a variety of other ways that involve real-time text communication. EAAC Report and Recommendations at 22-23 (Recommendation P2.2: Types of Direct Access).

¹⁹⁷ CTIA Comments at 11, n.36 (*citing* 47 U.S.C. § 617(e)(1)(D)).

¹⁹⁸ 47 U.S.C. § 615c(g).

¹⁹⁹ *Id.* § 225(d).

²⁰⁰ DAC Oct 2015 Recommendations at 1.

²⁰¹ RTT Field Trial Report at 24, 37; Proposal R1v3 at 13, 18-19.

²⁰² RTT Field Trial Report at 25.

²⁰³ Consumer Groups Comments at 8.

²⁰⁴ RTT Field Trial Report at 18, 37; *see also* RERC-TA Reply Comments at 17 (reporting in a separate study, in which 97 percent of participants found it important for TTY and RTT users to be able to call each other); EAAC TTY Transition Report at 22.

²⁰⁵ AT&T Petition for Rulemaking at 6. The second requirement proposed by AT&T is for RTT to be interoperable with other VoIP networks. *Id.*

²⁰⁶ AT&T Petition for Rulemaking at 9-10; Verizon Status Report at 3-4.

²⁰⁷ AT&T Petition for Rulemaking at 9-10.

technology can work with the existing base of TTYs both within its network and between Verizon's network and other provider networks,²⁰⁸ and notes that initial testing use of RFC 4103 for this purpose has produced successful results.²⁰⁹

62. In order to ensure that TTY-reliant consumers continue to have a method of communicating during the transition to RTT technology, we propose that, to comply with the rules adopted in this proceeding, wireless service providers must ensure that their RTT technology is interoperable with TTY technology.²¹⁰ We seek comment on this proposal. Among other things, with this requirement, we believe it will remain possible for consumers to use their TTYs to communicate with a TRS call center that is set up to receive RTT calls and for consumers who use RTT technology to communicate with a TRS call center that is set up to provide traditional TTY-based TRS. The Technology Research Centers further explain that to achieve compatibility with TTY transmissions, VoIP networks or terminals only need to ensure that, when these networks or terminals connect to the PSTN for voice calls, gateways can transcode between the RTT and TTY formats.²¹¹ We seek confirmation on whether it is feasible to use gateways and RFC 4103 to achieve backward compatibility, and if not, how transcoding between RTT packets used with IP-based services and TTY Baudot tones can be achieved, in accordance with the accuracy criteria we propose for RTT.²¹² Is AT&T correct that such interoperability can be achieved without added costs to TTY users and PSAPs? We ask commenters to discuss the costs, benefits, and technical feasibility of using any alternative standards for this purpose.

63. A particular concern regarding backward compatibility with TTYs is the fact that TTYs can only send and display a small subset of Unicode characters, namely upper-case letters, numbers, the pound and dollar signs, and some punctuation marks.²¹³ Thus, gateways between RTT systems and legacy TTYs need to be able to convert the much larger Unicode set used with RTT into readable TTY characters. In general, such character conversion is called "transliteration."²¹⁴ Thus, accented characters may be rendered as multiple characters – e.g., "ä (a umlaut)" may become "AE." In some cases, words must be used in the transliteration, but all Unicode characters can be described unambiguously, if

²⁰⁸ Verizon Status Report at 3-4.

²⁰⁹ *Id.* at 3.

²¹⁰ For this purpose, we define TTY communications as governed by TIA-825-A, the TTY standard used in the United States. *See* Proposal R1v3 at 22 (explaining that "[t]he term TTY is used in U.S. telecom policies to refer to text telephone devices using Baudot TIA-825-A over the PSTN," and ITU-T V.18 is used in some other countries). Likewise, the DAC requests the Commission to "consider how transcoding between RTT and TTY should be performed with less than 1% character error rate end to end for all characters that are specified by TIA-825 A for emergency and non-emergency calls." DAC Feb 2016 Recommendations at 3 (Recommendation #4) (*citing* EAAC TTY Transition Report at 43, n.3, *and* NENA, Detailed Functional and Interface Standards for the NENA i3 Solution, Version NENA 08-003.v1 (and later versions, including NENA-STA-010), https://www.nena.org/?page=i3_Stage3).

²¹¹ Proposal R1v3 at 7, 19-20. The Technology Research Centers also explain that not every carrier would have to translate between IP RTT formats and TTY formats at every possible gateway; rather, dedicated gateways could be established for this purpose, along with mechanisms to ensure that calls are routed through these gateways. This is appropriate, they say, because too many gateways exist to make it technically feasible for all gateways to undertake this conversion function, and this would not be not justifiable, given the relatively small amount of RTT that would flow through the gateways from the PSTN side. *Id.* at 19.

²¹² *See id.* at 7; EAAC TTY Transition Report at 22. For our proposed accuracy criteria, *see infra* Part VI.C.3.

²¹³ *See infra* Part VI.C.5., where we seek comment on whether to require that service provider implementations of RTT support the full Unicode character set.

²¹⁴ *See* Unicode Common Locale Data Repository, <http://cldr.unicode.org/index/cldr-spec/transliteration-guidelines> (last visited Apr. 28, 2016) ("Transliteration is the general process of converting characters from one script to another, where the result is roughly phonetic for languages in the target script.").

necessary, by their Unicode character name.²¹⁵ According to the Unicode Consortium, transliterations should be standard, complete, predictable, pronounceable, and reversible.²¹⁶ Should our rules require a standard transliteration approach or standard table, or should each entity responsible for offering gateways between RTT and TTY choose its own transliteration approach? What standards should be referenced? If each gateway may choose its own transliteration approach, should it meet, for example, the general transliteration guidelines formulated by the Unicode Consortium or other standards body? Should there be a standard indicator that a character string is a Unicode emoji, e.g., “(* GOLFER *)” for Unicode U+1F3CC? With respect to PSAPs employing TTYs, what impact might transliteration have on PSAPs’ ability to handle the RTT 911 call?

64. We also seek comment on whether there are other assistive devices used with the PSTN, such as Braille-capable devices used by people who are deaf-blind, that would require or benefit from backward compatibility, and what additional steps are necessary to achieve this, beyond the steps necessary to achieve backward compatibility for TTYs.

65. Finally, we seek comment on what events or measures should trigger a sunset of the residual obligation for wireless networks to be backward compatible with TTY technology. In the CVAA, Congress explicitly asked the EAAC to consider “the possible phase out of the use of current-generation TTY technology to the extent that this technology is replaced with more effective and efficient technologies and methods to enable access to emergency services by individuals with disabilities.”²¹⁷ The EAAC recommended against “imposing any deadline for phasing out TTY at the PSAPs until the analog phone system (PSTN) no longer exists, either as the backbone or as peripheral analog legs, unless ALL legs trap and convert TTY to IP real-time text and maintain [Voice Carry Over] VCO capability.”²¹⁸ Since then, however, the DAC has requested the Commission to “consider a TTY sunset period when declining wireline TTY minutes reaches a certain threshold to be determined, while addressing the needs of people who are deaf-blind, speech disabled, and have cognitive impairments as well as for relay services and rural access.”²¹⁹ Consumer Groups also request that RTT remain backward compatible with TTY technology until the latter is no longer in use.²²⁰

66. We note that the NG911 Now Coalition has set a goal of transitioning to nationwide NG911 by the end of 2020.²²¹ We seek comment on whether this is an appropriate benchmark for terminating the requirement for backward compatibility, or whether a different indicator should be used to make this determination. Would it be more appropriate for the Commission to set the end date based on TTY usage falling below a threshold level? If the latter, should TTY usage be assessed based on usage of TTY-based forms of TRS, or a different indicator? We are concerned about ensuring that people with disabilities continue to have a means of using text to make emergency and non-emergency calls after a TTY phase-out and generally seek comment on safeguards needed to address these communications

²¹⁵ For example, the emoji “(U+1F600)” has the official name “grinning face” and thus could appear as “GRINNING FACE” on a TTY. See The Unicode Consortium, <http://unicode.org/charts/PDF/U1F600.pdf> (last visited Apr. 28, 2016). Some Unicode character names are more meaningful to linguists than to the general public: the letter “ä” is described as “lower-case A with diaeresis.” See, e.g., The Unicode Consortium, <http://www.unicode.org/L2/L2014/14140r-ctt-cyrillic-contr.pdf> (last visited Apr. 28, 2016).

²¹⁶ See Unicode Common Locale Data Repository, <http://cldr.unicode.org/index/cldr-spec/transliteration-guidelines> (last visited Apr. 28, 2016).

²¹⁷ 47 U.S.C. § 615c(c)(6); see also EAAC Report and Recommendations at 4, 37, 41; EAAC TTY Transition Report at 4.

²¹⁸ EAAC TTY Transition Report at 4 (emphasis in original).

²¹⁹ DAC Oct 2015 Recommendations at 1.

²²⁰ Consumer Groups *Ex Parte* at 3, 9.

²²¹ See NG911 Now Coalition, <http://www.ng911now.org/#about> (last visited Apr. 28, 2016).

needs.

C. Other RTT Functionalities for Wireless Services

67. In addition to ensuring interoperability, in this section we seek comment on a number of other features and capabilities that we believe will be necessary to ensure that RTT is as accessible, usable, and effective for people with disabilities as voice telephone wireless service is for people without disabilities.

1. Initiation of Calls Using RTT

68. As a preliminary matter, we propose that wireless service providers and manufacturers be required to configure their networks and devices so that RTT communications can be initiated and received to and from the same telephone number that can be used to initiate and receive voice communications on a given terminal device.²²² Among other things, we tentatively conclude that enabling access to ten digit telephone numbers is necessary to reach and be reached by any other person with a phone number, and to ensure that RTT users can access 911 services.²²³ We tentatively conclude that a similar ability is an essential part of the provision of RTT, and seek comment on this tentative conclusion and proposal, including its costs, benefits and technical feasibility.

2. Support for 911 Emergency Communications

69. As the Commission has previously stated, “[t]he ability of consumers to contact 911 and reach the appropriate PSAP and for the PSAP to receive accurate location information for the caller is of the utmost importance.”²²⁴ Given our longstanding commitment to ensuring effective emergency communications, we propose that the implementation of RTT in IP networks must be capable of transmitting and receiving RTT communications to and from any 911 PSAP served by the network in a manner that fully complies with all applicable 911 rules, and seek comment on this proposal. Are specific measures or rule amendments necessary to ensure that RTT supports legacy 911, text-to-911, and NG911 services? Given that RTT is in an all-IP environment, and that there may be outages during a loss of commercial power, or RTT may be unavailable due to the limited battery backup inherent in IP-based equipment, are there additional ways to ensure continued access to emergency communications in the event of a power failure to the same extent this will be guaranteed for voice telephone users?²²⁵

²²² See DAC Feb 2016 Recommendations at 4 (asking the Commission to consider whether RTT equipment and services should be able to initiate a communication session using the same procedures used in voice telecommunication endpoints on the system, e.g., by manually dialing a phone number or by selecting a number from a directory). We recognize that not all wireless users will have handsets capable of receiving calls from an RTT user, and that until such time as RTT is generally implemented on wireline networks as well, the ability to reach wireline telephone numbers using RTT will be limited. Thus, the requirement we propose is limited to configuring networks and services so that RTT communications *can* be initiated and received to or from any telephone number, but the ability to actually complete such communications end-to-end may depend on whether the person to whom the number belongs has a device and service capable of placing and receiving calls via RTT (or TTY) technology.

²²³ See *Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities; E911 Requirements for IP-Enabled Service Providers*, Report and Order and Further Notice of Proposed Rulemaking, 23 FCC Rcd 11591, 11602, para. 21 (2008) (requiring the assignment of North American Numbering Plan ten digit numbers for Internet-based forms of TRS to enable TRS users to reach and be reached by both hearing users of the PSTN and other Internet-based TRS, and to help ensure that persons using Internet-based TRS can promptly access functionally equivalent 911 service).

²²⁴ *Emerging Wireline Order and Further Notice*, 30 FCC Rcd at 9488, para. 225.

²²⁵ The provision of RTT by covered wireless service providers must be in compliance with the Commission’s back-up power and 911 location accuracy rules. See 47 CFR §§ 12.4, 20.18(h)-(k); see also, e.g., 47 CFR § 20.18(q)(1)-(11)(concerning the requirements for providing text-to-911 service).

3. Latency and Error Rate of Text Transmittal

70. Based on comments in the record, we propose that compliant RTT must be capable of transmitting text instantly, so that each text character appears on the receiving device at roughly the same time it is created on the sending device.²²⁶ To achieve this, we further propose requiring that RTT characters be transmitted within one second of when they are generated,²²⁷ with no more than 0.2 percent character error rate, which equates to approximately a one percent word error rate.²²⁸ We believe that this will allow text to appear character-by-character on the recipient's display while the sender is typing it, with a point-to-point transmission latency that is no greater than that provided for voice communication. We seek comment on these proposals, as well as whether the Commission should adopt other measures regarding the latency and error rate for RTT. For example, is it feasible, and necessary for effective communication, to provide users with the ability to edit individual characters or groups of words in real-time – for example, by backspacing and retyping?²²⁹

71. We also note that, according to the Technology Research Centers, any RTT system also can be programmed to first receive and hold the sender's communication while it is being composed, and to then send the entire message together when triggered to do so, in a manner akin to instant messaging.²³⁰ Is this "block mode" feature desirable for certain individuals? For example, would it alert people who are deaf-blind to incoming messages so that they know when it is appropriate to respond?²³¹ If so, should we allow or require that this capability be made available on compliant RTT technology? If such a feature is permitted or required, should we require nevertheless that RTT service revert to the character-by-character mode when 911 calls are detected by the IP network, in order to ensure the rapid exchange of information during such calls?²³²

72. We seek comment on any other relevant considerations pertaining to the transmission and delivery of RTT that may affect its utility and effectiveness for people with communication disabilities.

4. Multimedia and TRS

a. Simultaneous voice and text capabilities

73. We propose to require that, for a manufacturer's or service provider's implementation of RTT to be considered compliant with the rules the Commission adopts in this proceeding, users of RTT must be able to send and receive both text and voice simultaneously in both directions over IP on the same call and via a single device.²³³ We seek comment on this proposal.

74. According to the 3GPP Technical Specification for Global Text Telephony, which is

²²⁶ EAAC TTY Transition Report at 21; Proposal R1v3 at 6.

²²⁷ See RFC 4103, para. 5.4 (<http://www.ietf.org/rfc/rfc4103.txt>) (suggesting that the transmittal delay is no more than one second).

²²⁸ See Proposal R1v3 at 7; EAAC TTY Transition Report at 22.

²²⁹ AT&T Petition for Rulemaking at 9.

²³⁰ Proposal R1v3 at 7, 10 (noting that this capability is possible for all RTT formats).

²³¹ People who are deaf-blind currently have this capability when they use TTYs, which require that individuals take turns typing to one another during a call. TTY users become aware of the need to take certain actions on a telephone call when the person to whom they are speaking follows certain TTY protocols. Specifically, a party to a TTY call is alerted to the need to reply to an incoming message when the other party types "GA" for "go ahead," and to hang up when they see "SK" for "stop keying."

²³² Proposal R1v3 at 7.

²³³ See AT&T Petition for Rulemaking at 9 (RTT is full-duplex, allowing both parties to communicate simultaneously); Proposal R1v3 at 7.

cited by the DAC,²³⁴ RTT that is implemented under RFC 4103 allows text to be transported alone or in combination with other media, such as voice and video, in the same call session.²³⁵ The DAC therefore asks the Commission to consider “whether telecommunication and advanced communications systems can support the use of RTT simultaneously in conjunction with the other Real-Time media supported by the system.”²³⁶ The DAC also recommends that the Commission consider whether RTT equipment and services should support, among other features, the user’s ability to “intermix voice and text on the same call, including, for example, ‘Voice Carry Over’ [VCO] and ‘Hearing Carry Over’ [HCO].”²³⁷ Such “carry over” modes currently are available as types of TRS. VCO allows people who are deaf and hard of hearing to use their own voices (where possible) and receive text back during a captioned telephone or TTY-based relay call, while HCO generally allows people with speech disabilities on speech-to-speech relay calls to hear directly what the other party says and use the CA to repeat what the person with the speech disability says.²³⁸ However, in an RTT network, can these features also serve as a mode of direct point-to-point communications, reducing the need for reliance on TRS?²³⁹

75. Consumer Groups point out that simultaneous voice and text on the same call also would allow callers to initiate a call using either text or voice and to switch to the other mode at any time during the call.²⁴⁰ Users would be able to send text in one direction and speech in the other, speak in parallel with text for captioned telephony, and supplement speech for difficult-to-hear words, addresses, and numbers.²⁴¹ Trace et al. report findings that the quality, intelligibility, speed, and flow of communications improve when text is added to voice.²⁴² Finally, the Technology Research Centers point out that the ability to use synchronized voice and text transmissions can improve communications on TRS calls.²⁴³

²³⁴ DAC Feb 2016 Recommendations at 1.

²³⁵ 3GPP TS 23.226 Global Text Telephony, Stage 2, Version 5 at 5, 10 (2015), http://www.3gpp.org/ftp/specs/archive/23_series/23.226/.

²³⁶ DAC Feb 2016 Recommendations at 4 (Recommendation #9). The Technology Research Centers generally note that as more capabilities are associated with RTT – e.g., the ability to use video, to communicate with TTY users, to change text settings, and to use RTT when mobile – this technology becomes more valuable to its users. RTT Field Trial Report at 36.

²³⁷ DAC Feb 2016 Recommendations at 4 (Recommendation #8).

²³⁸ Proposal R1v3 at 9. On a speech-to-speech relay service call, the CA is trained to understand a variety of speech disabilities, and repeats what the person with the speech disability says to make his or her words clear and understandable to the other party.

²³⁹ For example, a person who is hard of hearing may be able to speak directly to the hearing party and receive text back from that party via RTT without going through a relay center. Conversely, a person with a speech disability could send RTT to the other party and hear responses directly from that individual. “In order to support users who require voice carry over,” the DAC recommends consideration of whether RTT should support the ability of “voice telecommunication endpoints that have a multi-line visual display . . . to receive and display time-synchronized RTT transmissions that [are] associated with active voice communication sessions.” DAC Feb 2016 Recommendations at 4 (Recommendation #8).

²⁴⁰ Consumer Groups Reply Comments at 3-4, 6.

²⁴¹ Consumer Groups Comments at 6; *see also* Consumer Groups *Ex Parte* at 8 (consumers will have “a complete range of calling functions” with RTT); AAPD Comments at 1; RERC-TA Reply Comments at 15 (reporting a study in which 83.3 percent of the participants responded that it was “very important” to be able to mix text and voice in the same call). An additional potential benefit of such simultaneous text and voice capabilities, which goes beyond the requirements of functional equivalence, could be the ability to receive simultaneous translation of voice into a different language.

²⁴² RTT Field Trial Report at 30, 32; DAC Feb 2016 Recommendations at 1 (noting that the EAAC proposed that IP-based RTT technology include the ability to interject a statement or interrupt the conversation at any time).

²⁴³ Proposal R1v3 at 9; *see also supra* para. 33.

We seek comment on these assertions and the extent to which synchronized voice and text transmission is necessary for effective communication via RTT.

b. RTT with video and other media

76. Next, we seek comment whether to require that, where covered service providers support the transmission of other media, such as video and data, simultaneously with voice, they also provide the capability for the simultaneous transmission of RTT and such other media.²⁴⁴ We note that in studies conducted by the Technology Research Centers, participants generally expressed the desire to add video to RTT calls, “to express feelings, and to provide for more natural communication with sign language and the possibility of lip reading.”²⁴⁵ In addition, some commenters highlight the benefits that multimedia capabilities can have in the TRS context, including the ability to supplement sign language communications with text on video relay calls.²⁴⁶ By enabling voice, text, and video to be delivered to users so that each of these types of media can be available at the same time, over the same call session, some parties also state that RTT can reduce overall reliance on TRS and also reduce or eliminate the need for TRS users to acquire the dedicated terminal equipment that is often needed to access these services.²⁴⁷ They claim that increasingly, people with and without disabilities would be able to converse with each other directly, using whichever mode of communication – voice, text, or video – is most suitable for getting their messages across.²⁴⁸

77. To what extent is requiring such multimedia capabilities necessary to achieve telephone communications for text users that are as effective as those available to voice users? To what extent can such capabilities enhance the accuracy and speed of TRS or reduce overall reliance on conventionally defined forms of TRS, to ensure that TRS is available “in the most efficient manner”?²⁴⁹ Would the inclusion of video capability with RTT be likely to lead to congestion problems, and how could such congestion be prevented or alleviated? For example, if simultaneous voice, RTT, and video are all available over the same telephone connection, could the parties to the call better simulate an in-person communication, which can be supplemented with RTT as needed, and thereby eliminate the need for a CA to serve as a communications bridge between the parties?

c. Requirements for TRS providers

78. We generally seek comment on how to integrate RTT into the provision of TRS.²⁵⁰ Specifically, should the Commission amend its TRS rules to authorize or require TRS providers to incorporate RTT capabilities into platforms and terminal equipment used for certain forms of TRS, in order to enhance its functional equivalence? For example, Omnitor asks the Commission to require relay providers to incorporate RTT into their systems, so that callers can use RTT terminals to access TRS with a single step, using ten digit numbers.²⁵¹ We note that at present, some forms of TRS are provided over the PSTN, while others are made available via IP networks. In light of the ongoing migration of communications from the circuit-switched PSTN to IP-based technologies, it appears that ultimately all

²⁴⁴ DAC Feb 2016 Recommendations at 3 (Recommendation #9).

²⁴⁵ RTT Field Trial Report at 35.

²⁴⁶ Proposal R1v3 at 9 (noting if text is used to supplement sign language for complex data information, such as numbers, codes, and URLs, “total communication” will be achieved).

²⁴⁷ See, e.g., AAPD Comments at 1; Proposal R1v3 at 6, 9, 16.

²⁴⁸ Proposal R1v3 at 16.

²⁴⁹ 47 U.S.C. § 225(b)(1).

²⁵⁰ Although we ask these general questions now, the Commission may need to address the application of RTT to the provision of TRS in a separate proceeding.

²⁵¹ Omnitor Comments at 6.

PSTN-based TRS will be phased out and all TRS will be IP-based. If this occurs, should we authorize or require IP Relay or other TRS providers to support an RTT mode between the user and the CA? If so, what timeline would be appropriate for implementing such capability? The Technology Research Centers suggests this is needed to improve the functional equivalence of the IP Relay interface, as well as to facilitate relay service modes, such as VCO and HCO.²⁵² Should we also authorize or require IP Captioned Telephone Service (IP CTS) or other TRS providers to support RTT transmission in any voice channels they provide and in any off-the-shelf equipment provided to IP CTS users? Finally, should we authorize or require VRS providers to support an RTT mode between the user and the CA, so that RTT can be used to supplement communications in sign language with text during VRS calls? What other requirements are appropriate to assign to RTT or TRS providers to ensure the compatibility of their services as the transition to RTT takes place?

5. Character and Text Capabilities

79. Commenters in this proceeding point out that one advantage of RTT is that it allows communications using the full Unicode character set, as compared with the more limited character set available on TTY transmissions.²⁵³ They point out that besides facilitating communication in languages other than English, this capability allows users to transmit emoticons, graphic symbols that represent ideas or concepts – independent of any particular language – and specific words or phrases that have become integral to text communications in our society.²⁵⁴ In addition, commenters report that RTT can be equipped with the ability for users to control text settings such as font size and color,²⁵⁵ to adjust text conversation windows,²⁵⁶ and to set up text presentation.²⁵⁷

80. We seek comment on the technical feasibility, costs, and benefits of requiring that these features of RTT be supported by a covered service provider's implementation of RTT. How can each of these capabilities meet the needs of people with specific disabilities? For example, can the availability of emoji characters help people with cognitive disabilities better communicate with and receive information from others? How well do special characters and emoji's translate into voice, and what are the challenges of and best practices for enabling this capability? Is it necessary or desirable to have characters based on Unicode for them to be accessible to screen readers used by people who are blind, visually impaired or deaf-blind?²⁵⁸ Similarly, to what extent can the ability to set text style and text presentation layout contribute to usability, readability and comprehension of RTT?²⁵⁹ Should there be an option for the user, depending on preferences and needs, to configure the display of incoming and outgoing text in a certain way? Finally, we seek comment on the extent to which these capabilities are affected by the properties of network transmissions.

²⁵² Proposal R1v3 at 9; *see also* DAC Feb 2016 Recommendations at 3 (Recommendation #8). IP Relay allows a person with a hearing or speech disability to communicate with someone by phone by typing messages on a computer or other similar device over a broadband connection to the CA and having the CA voice these messages to the receiving party, and then type that party's responses back to the other party to the call.

²⁵³ Proposal R1v3 at 11; AT&T Petition for Rulemaking at 9.

²⁵⁴ RTT Field Trial Report at 34.

²⁵⁵ *See id.* at 47.

²⁵⁶ *Id.* at 34 (noting that some options are to have two columns for IP-based RTT to RTT (one per conversation partner) or a single window for conversations with a TTY user).

²⁵⁷ *Id.* (for example, the presentation of text can be split via the automatic insertion of new lines as appropriate).

²⁵⁸ *See generally* Proposal R1v3 at 11.

²⁵⁹ For example, does it make a difference whether typed text is located side by side with incoming text, or instead is displayed alternately with incoming text line by line? *See* RTT Field Trial Report at 34 (indicating that certain displays of text conversations can be "hard to follow and inconvenient to read").

6. Accessibility, Usability, and Compatibility with Assistive Technologies

81. We believe that RTT is appropriately classified as an “electronic messaging service” and that as such, both RTT services and the equipment used with them are subject to the requirements of section 716 of the Act and part 14 of the Commission’s rules.²⁶⁰ Therefore, we believe that, independently of any rules specific to RTT that are adopted in this proceeding, RTT services and end user equipment used with them must be accessible, usable, and compatible with assistive technologies, as defined by part 14, to the same extent as is currently required for telecommunications and advanced communications services and equipment under the Commission’s accessibility regulations.²⁶¹ We seek comment on this position.

82. We also seek comment on whether it is possible to identify, more specifically than is currently identified by our part 14 rules, certain RTT features or functional capabilities that are needed to meet the communication needs of individuals who are deaf-blind, people with cognitive disabilities, or other specific segments of the disability community. For example, should we require compatibility with certain assistive technologies used by people who are deaf-blind, such as refreshable Braille displays or screen enlargers?²⁶² In addition to providing emoji’s, are there other measures that can be taken or required to make RTT effective for people with cognitive disabilities? For example, should there be a mechanism for slowing up the receipt of text, or an option to enable message turn-taking to make it easier for these individuals to receive and read incoming messages? What features should be incorporated on terminal equipment used by these individuals to allow easy activation and operation of RTT functions?

7. Other Features

83. In addition to the above specific capabilities, the DAC recommends that the Commission consider whether compliant RTT equipment and services should be required to support the following telecommunications functions that are available to voice-based telephone users:

- The ability to “transfer a communication session using the same procedures used in voice telecommunication endpoints on the system”;
- The ability to “initiate a multi-party teleconference using the same procedures used in voice telecommunication endpoints on the system”;
- The ability to “use messaging, automated attendant, and interactive voice response systems”; and
- The ability to use caller identification and similar telecommunication functions.²⁶³

We tentatively conclude that such functions should be available to RTT users as necessary for effective communication, and we seek comment on this tentative conclusion, including the costs, benefits, and technical feasibility of supporting these functions.²⁶⁴ We also seek comment on the extent to which the availability of each of these functions may be affected by how a service provider implements RTT in an

²⁶⁰ 47 CFR § 14.10(i).

²⁶¹ See 47 U.S.C. § 617(a)-(b); 47 CFR § 14.21.

²⁶² Proposal R1v3 at 11, 15; see also DAC Oct 2015 Recommendations at 3 (recommending that the Commission consider whether RTT should “undergo testing to ascertain whether, and to what degree it will support the communications needs of the deaf-blind including those who use Braille”).

²⁶³ DAC Feb 2016 Recommendations at 3-4 (Recommendation #8).

²⁶⁴ See EAAC TTY Transition Report at 22-23 (proposing that all telecommunications functions available to voice-based users be made available to users of RTT); see also 36 CFR § 1194.23 (describing the electronic and information technology accessibility standards for telecommunication products procured by federal agencies). These and other features are also recommended for inclusion in RTT technology by the Technology Research Centers. See generally Proposal R1v3 at 17.

IP network.

84. Additionally, we seek comment on whether to require that compliant RTT provide the ability to participate on multiple calls simultaneously and to leave and access voice and text mail, both of which are also telecommunications functions that must be made accessible to people with disabilities by federal agencies under section 508 of the Rehabilitation Act.²⁶⁵ Trace et al. explain that when retrieving messages from voice mail, text information, including the name of the caller, return number (from caller ID), length of the call, time of the call, and related details could be sent and be viewable on screens.²⁶⁶ For IVR prompts, they report, instant text of all the choices could be made available to callers.²⁶⁷

D. Support of RTT Functionalities in Wireless Devices

1. Features and Functionalities

85. We propose to require that handsets and other end user devices subject to an RTT support requirement be required to support each of the RTT functionalities discussed above for service providers. We seek comment on this proposal, including its costs, benefits, and technical feasibility. To what extent are these features and functions under the service provider's or manufacturer's control? Are there other features and functionalities that should be required for end user devices to effectively support RTT?²⁶⁸ Further, to what extent can such features and functionalities and their associated benefits be obtained if RTT is not fully incorporated as a native function of end user devices, but is merely available for users to download or install as an over-the-top application? To what extent would it make a difference if an RTT application is installed as a "default" app prior to sale of a handset or end user device?

2. Device Portability and Interface with Third-Party Applications

86. In order to ensure that individuals can use a single device on multiple networks, to the same extent as is currently possible with voice communications,²⁶⁹ there must be a stable interface between user equipment and VoIP networks. For example, if subscribers to one wireless provider were to lose RTT communication capability when they insert a subscriber identity module (SIM) card for another wireless provider into their smartphones, then the inter-network portability achieved for voice users' smartphones would be unavailable to RTT users, and our rules may fail to achieve functional equivalence in this critical respect. Therefore, we propose to require, at a minimum, that covered service providers enable device portability for their RTT services to the same extent as they enable device portability for voice services. We seek comment on this proposal.

87. We also seek comment on the extent to which all necessary functionalities for effective use of RTT can be made available through provider-approved devices and applications, or whether third party software applications will be needed for some RTT features and functions. To what extent will consumers need access to third party RTT software applications on user devices to supplement native

²⁶⁵ See 36 CFR §§ 1194.23, 1194.31(c), (e) (setting forth technical requirements for accessibility of IVR, voice mail, caller identification, and similar telecommunication functions for federal agencies).

²⁶⁶ Proposal R1v3 at 17.

²⁶⁷ *Id.*

²⁶⁸ One such feature might be text prediction, which allows one key or more keys to result in the display of the entire word. See *generally id.* at 10. Similarly, a device that supports the character set for a given language for its operating system might be capable of also support the use of the same character set for RTT.

²⁶⁹ Consumers are generally able to port their mobile handsets from one network to another technologically compatible network. See FCC, <https://www.fcc.gov/general/cell-phone-unlocking> (last visited Apr. 28, 2016). In addition, some handsets may be designed to support multiple network technologies, enabling porting even between otherwise incompatible networks. See, e.g., PCMag, <http://www.pcmag.com/article2/0,2817,2333905,00.asp> (last visited Apr. 28, 2016) (stating that "[t]he Apple iPhone 6/6s, the Google Nexus phones, and the Motorola Moto X Pure work on all four major carriers").

RTT capabilities that are integrated into such devices, in order to achieve functional equivalence with voice communications? Should the Commission require providers to offer an “app interface” to facilitate access to third party applications?²⁷⁰

88. In the event that the Commission adopts requirements for device portability or the enabling of third party applications, or both, we seek comment on the availability or feasibility of a safe-harbor standard for a user-network interface that could support the RTT capabilities of user devices and applications from multiple manufacturers and providers. Alternatively, are there reasonable performance criteria that could be applied to ensure that a network-user interface can support multiple third party devices and applications?²⁷¹

3. Minimizing Costs Incurred by Consumers

89. Last, we seek comment on equipment costs to consumers that may result from the transition from TTY to RTT technology. In response to the *Emerging Wireline Notice*, various parties noted the importance of taking into consideration the affordability of such devices as IP-based technologies take the place of legacy communications systems.²⁷² For example, AARP pointed out that “not all TTY users may currently have the necessary mobile devices, and the broadband data plans, necessary to make them operate.”²⁷³ Additionally, some individuals may have severe or multiple disabilities that will necessitate assistive technologies along with mainstream RTT-capable devices to connect to an IP network.²⁷⁴ AARP cautioned that the Commission should proceed carefully so as not to “leave some users behind, or place them in a position where the technology alternative is prohibitively expensive.”²⁷⁵ Similarly, the Michigan Public Service Commission noted the importance of ensuring that a customer’s current assistive equipment is compatible with the substitute service, and suggests that “if the consumer must purchase new equipment . . . to accommodate the new service, the issue of who will be responsible for the cost needs to be addressed.”²⁷⁶ Other parties responding to the *Emerging Wireline Notice*, however, opposed inclusion of affordability as a criterion for determining the adequacy of a replacement service in the transition to IP networks. AT&T stated that there is “no evidence that wireless and IP replacement are generally less affordable than the TDM service they replace.”²⁷⁷ In addition, AT&T and others pointed to the availability of support under Universal Service programs to qualifying customers.²⁷⁸

²⁷⁰ For example, many mobile operating systems allow users to install alternative applications for handling SMS text and multimedia messaging service (MMS) messages.

²⁷¹ See also *supra* Parts VI.A., VI.C., and VI.D., on interoperability and on minimum functionalities.

²⁷² See e.g., Disability Coalition for Technology Transition, Comments, GN Docket No. 13-5 et al., at 2 (filed Oct. 26, 2015); Communication Workers of America, Reply Comments, GN Docket No. 13-5 et al., at 1-2 (filed Nov. 24, 2015); Michigan PSC et al., Reply Comments, GN Docket No. 13-5 et al., at 15 (filed Nov. 24, 2015).

²⁷³ AARP Emerging Wireline Comments at 17.

²⁷⁴ For example, as noted above, people who are deaf-blind often rely on devices that provide Braille output or enlarge text. See *supra* para. 82 and note 108.

²⁷⁵ AARP Emerging Wireline Comments at 17.

²⁷⁶ Michigan PSC, Comments, GN Docket No. 13-5 et al., at 6 (filed Oct. 26, 2015) (Michigan PSC Emerging Wireline Comments); see also National Association of State Utility Consumer Advocates (NASUCA), Reply Comments, GN Docket No. 13-5 et al., at 8 (filed Nov. 24, 2015) (for a service to be considered an adequate substitute for legacy service, it must be at least as adequate and affordable as existing technologies). NASUCA adds that “[i]t is also important for technological transitions not to diminish the functionality of specialized equipment used for healthcare or accessibility purposes.” *Id.* at 11.

²⁷⁷ AT&T, Reply Comments, GN Docket No. 13-5 et al., at 9-10.

²⁷⁸ *Id.* at 10 (referencing Lifeline support for “customers that need it”); NTCA, The Rural Broadband Association, WTA – Advocates for Rural Broadband, Eastern Rural Telecom Association, and National Exchange Carrier

(continued....)

90. We seek comment on whether there are measures the Commission could take in the context of this proceeding to ensure the affordability of new terminal equipment or assistive devices that may be needed as a consequence of the migration to RTT technology, and whether such measures are appropriate. We expect that many off-the-shelf VoIP devices will be usable with RTT – eliminating altogether the need for specialized equipment. In addition, we note that several states have programs that distribute specialized communications equipment to people, often based on their economic need.²⁷⁹ Similarly, the Commission administers the National Deaf-Blind Equipment Distribution Program, which provides funding for certified state programs to distribute communications equipment and provide related services to low income individuals who are deaf-blind across the United States.²⁸⁰ AARP recommends that carriers seeking to transition to IP systems be required to work with governmental agencies that distribute such assistive equipment to qualified individuals with disabilities.²⁸¹ We seek comment on the appropriateness of this suggestion, and other ways that the Commission can alleviate any burdens that might be associated with acquiring new equipment or software, particularly for those who do not qualify for existing state and federal equipment distribution programs or for those will need to replace devices not covered by such programs.²⁸²

VII. CONSUMER OUTREACH AND NOTIFICATIONS

91. To ensure a seamless TTY-RTT transition, we seek comment on the best means of informing the public, including businesses, governmental agencies, and individuals with disabilities who will be directly affected by the transition, about the migration from TTY technology to RTT and the mechanics of how this technology will work.²⁸³ To be effective, RTT must be usable by people with and without disabilities. Accordingly, we tentatively conclude that such outreach should not only focus on people with disabilities, but also on the general public that will be communicating with such individuals, and seek comment on this tentative conclusion. We seek comment on whether the statutory authority on which the Commission proposes to rely for the purpose of regulating the provision of RTT is sufficient to authorize outreach requirements with respect to RTT.²⁸⁴ We note that the Commission has previously

(Continued from previous page) _____

Association, Inc., Reply Comments, GN Docket No. 13-5 et al., at 6-7 (filed Nov. 24, 2015) (referencing the High Cost universal service support program for rural customers).

²⁷⁹ See TEDPA, <http://www.tedpa.org> (last visited Apr. 25, 2016).

²⁸⁰ 47 CFR § 64.610.

²⁸¹ AARP Emerging Wireline Comments at 17 (also recommending that applications to the Commission seeking approval to transition to IP-based services be required to include, “in the event that consumers will be required to purchase new technologies, the cost per consumer of alternative, compatible equipment”). *But see* Verizon, Comments, GN Docket No. 13-5 et al., at 14-16 (filed Oct. 26, 2015) (noting that because service providers do not control the regions or criteria used by governmental programs to distribute equipment, “the Commission should not rely on such programs to determine whether service providers can offer and consumers can use new, updated services and equipment”).

²⁸² See, e.g., *Emerging Wireline Order and Further Notice*, 30 FCC Rcd at 9487, para. 222 (by analogy, seeking comment regarding the replacement of medical devices incompatible with IP service).

²⁸³ The DAC requests that the Commission consider whether “the TTY-RTT transition [should] include public outreach efforts to educate consumers of potential issues with respect to using RTT and other next-generation text based solutions for 911 communications.” DAC Oct 2015 Recommendations at 3; see also Pennsylvania Public Utilities Commission, Comments, GN Docket No. 13-5 et al., at 11 (urging that to reduce the burden of obtaining new equipment because of technology transitions, carriers should provide notice to people with disabilities regarding the potential for disruption in service and information regarding the availability of IP-enabled devices that can be distributed to qualifying recipients under applicable state and federal programs); Michigan PSC Emerging Wireline Comments at 7 (agreeing with the Commission that it is important to address education as an “essential” component of the “transition to IP”).

²⁸⁴ See, e.g., *AT&T TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 10863-65, paras. 17-19; *E911 Order*, 12 FCC Rcd 22665; *1997 WTB E911 Order*, 12 FCC Rcd 20224; *1998 WTB E911 Order*, 14 FCC Rcd 694.

used its authority under section 225 to require service providers to conduct outreach about TRS, and we ask whether we can rely upon such authority to require outreach on RTT.²⁸⁵ What are the most effective methods to provide such notification, and to what extent should covered entities coordinate with consumer and industry stakeholders to develop effective messaging and outreach initiatives? Further, to what extent should the outreach conducted by manufacturers and service providers include outreach to the operators of public TTYs and Wi-Fi phone installations?

92. We propose that the conditions imposed in the Bureaus' waiver orders remain in effect, until the full implementation of rules adopted in this proceeding. These conditions include a requirement for waiver recipients to apprise their customers, through effective and accessible channels of communication, that (1) until TTY is sunset, TTY technology will not be supported for calls to 911 services over IP-based wireless services, and (2) there are alternative PSTN-based and IP-based accessibility solutions for people with communication disabilities to reach 911 services.²⁸⁶ These notices must be developed in coordination with PSAPs and national consumer organizations, and include a listing of text-based alternatives to 911, including, but not limited to, TTY capability over the PSTN, various forms of PSTN-based and IP-based TRS, and text-to-911 (where available).²⁸⁷ We tentatively conclude that the provision of this information is necessary to ensure that, during the transition period, there is no expectation on the part of consumers with disabilities that TTY technology will be supported by IP-based wireless services, and to ensure that these consumers know that alternative accessible telecommunications options exist, and seek comment on this belief.²⁸⁸ We further propose that all information and notifications about the RTT transition be provided in accessible formats, such as large print, Braille, and other appropriate means to make information accessible to people with disabilities.²⁸⁹ We seek comment on this proposal. Are any different or additional notices needed to ensure that consumers are aware of potential issues regarding 911 communications during a TTY-RTT transition?²⁹⁰

93. Finally, we tentatively conclude that, consistent with the usability requirements of our rules implementing sections 255 and 716²⁹¹ as well as previous actions by the Commission to educate consumers about TRS,²⁹² covered entities should be required to implement a mechanism to provide

²⁸⁵ See 47 CFR § 64.604(c)(3) (requiring carriers to provide information in their directories, billing inserts, and through directory assistance services to callers in their service areas to make them aware of the availability and use of TRS).

²⁸⁶ See *AT&T TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 10863, para. 18; *Verizon TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 12760, para. 14; *Cellular South TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 14408-09, para. 12. This information must be conveyed to subscribers prominently and in plain language on company websites, billing statements, promotional materials, in communications with national consumer organizations, and via other effective means. A similar obligation was imposed on wireless carriers in 1997, as these providers migrated from analog to digital wireless services. See generally *E911 Order*, 12 FCC Rcd at 22695, para. 60 (“Carriers whose systems are not compatible with TTY calls must make every reasonable effort to notify current and potential subscribers that they will not be able to use TTYs to call 911 with digital wireless devices and services.”).

²⁸⁷ See *AT&T TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 10863, para. 18; *Verizon TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 12760, para. 14; *Cellular South TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 14408-09, para. 12.

²⁸⁸ *AT&T TTY-RTT Transition Waiver Order*, 30 FCC Rcd at 10863, para. 18.

²⁸⁹ See, e.g., *id.* (explaining that notification to customers must be made “through effective and accessible channels of communication”).

²⁹⁰ See DAC Oct 2015 Recommendations at 3.

²⁹¹ See 47 CFR § 6.11(a)(3); *id.* § 7.11(a)(3).

²⁹² See 47 CFR § 64.604(c)(2) (requiring TRS providers to designate a contact person for TRS consumer information and complaints about state TRS programs).

information and assistance during business hours to their consumers regarding the TTY-RTT transition, and seek comment on this tentative conclusion. We seek comment on how this can best be achieved. For example, to what extent should covered entities be required to designate staff trained to assist consumers with the complex issues related to the TTY-RTT transition? Are there additional mechanisms for outreach education and assistance that should be adopted?

VIII. OTHER MATTERS

94. *Security Concerns.* We seek comment on security risks that may be associated with the adoption of RTT technology and that require the Commission's attention. The Technology Research Centers point out the availability of technical methods to secure SIP calls, both for call control security and media security.²⁹³ They also caution against "blocking of RTT," which they say could occur where security or IT management personnel are not aware the need to support of real-time text.²⁹⁴ They explain that this can be remedied by the use of a "SIP-aware firewall," which will allow the proper pass-through of RTT once deployed.²⁹⁵ We seek comment on these and other security concerns that should be addressed through this proceeding, including the costs, benefits and technical feasibility of implementing specific security measures.

IX. RTT IMPLEMENTATION IN IP-BASED WIRELINE NETWORKS AND EQUIPMENT

95. We seek comment on whether, in addition to requiring the implementation of RTT by wireless service providers, we should amend our rules to require the implementation of RTT in IP-based wireline networks. As discussed above, problems associated with TTY transmissions are not limited to those that occur over IP wireless networks.²⁹⁶ Because TTYs were not designed for the IP environment, they have not performed well in any IP-based system; in fact, many of the problems associated with TTY use over IP-enabled wireless networks – *e.g.*, dropped packets and data connection stability issues – also occur in wireline networks.²⁹⁷ Thus, as an initial matter, we seek comment on the extent to which wireline IP networks can reliably support TTY communications.

96. Moreover, there is considerable information in the record that in any communications environment, TTYs remain inadequate with respect to their speed, their limited character set, and their failure to allow the simultaneous communication enjoyed by voice communications users.²⁹⁸ We thus next seek comment on whether we should amend our rules at Parts 6, 7, 14, and 64, to allow or require wireline VoIP service providers to support RTT, as we are proposing to do for wireless services. What would be the costs, benefits and technical feasibility of such requirements? We believe that for RTT to effectively replace TTYs, and allow full integration by people with disabilities into our nation's mainstream communications system, the ability to access our nation's wireline VoIP services using RTT will be just as important as the ability to access wireless services, especially if TTY technology is phased out. Many, if not most businesses, government agencies, and retail establishments continue to rely on wireline services, and having telephone access to such enterprises will be necessary for people with disabilities who rely on text to maintain their independence, privacy, and productivity.

97. If we do amend our rules governing wireline services to incorporate RTT support obligations, how can the Commission ensure that end users can readily connect to and use such RTT

²⁹³ The Technology Research Centers state that a method called SRTP, specified in IETF RFC 3711, shall be used for purposes of call control security and media security. Proposal R1v3 at 14.

²⁹⁴ *Id.*

²⁹⁵ *Id.*; *see also generally* RTT Field Trial Report at 43.

²⁹⁶ *See supra* Part III.A.

²⁹⁷ AT&T Petition for Rulemaking at 5; *see supra* Part III.A.

²⁹⁸ Thus, we do not adopt TIA's suggestion to limit this *Notice* to "issues surrounding the transition of cellular networks from time-division multiplexing ('TDM') to IP." TIA Comments at 4.

capabilities in wireline IP networks? For example, given that wireline Part 68 customer premise equipment such as wired and cordless phones currently cannot readily support real-time text, would it be feasible and practical for wireline VoIP service providers to offer over-the-top RTT applications downloadable to text-capable devices such as smartphones, tablets, and computers, that could then be used to connect to the carrier's VoIP service platform? Should wireline VoIP providers be required to ensure the compatibility of their services with third-party RTT applications present in stand-alone devices or downloaded onto text-capable devices such as smartphones, tablets, and computers? To what extent should wireline VoIP manufacturers have RTT support obligations for their equipment that is otherwise capable of sending, receiving and displaying text? To the extent that IP-based wireline service providers and manufacturers have an obligation under our rules to support RTT, should they be required to adhere to the same interoperability requirements, minimum functionalities, and outreach obligations that we propose to require for wireless VoIP services and end user devices? Finally, is RFC 4103 an appropriate standard to reference as the safe harbor for wireline VoIP services and text-capable end user equipment to ensure interoperability and compliance with the rules proposed for wireless services?

98. We also seek comment on the appropriate timing for incorporation of RTT capabilities into wireline VoIP services and end user devices, in the event that rules requiring such capabilities are adopted, and the extent to which such timing should be determined by the manufacture or sell date of new devices. Similarly, should requirements for RTT support also be triggered at "natural opportunities"?²⁹⁹ We also seek comment on whether RTT would be particularly beneficial in the context of Inmate Calling Services (ICS), particularly given the problems ICS users have encountered in trying to use TTYs, and whether there are specific issues the Commission would need to consider in relation to the use of RTT by inmates.

99. Finally, how should TTY support obligations be modified as wireline networks discontinue their circuit-switched services? Should wireline providers that support RTT on their IP networks be permitted to cease supporting TTY technology at all, and if so, on what timetable? In comments filed in response to the *Emerging Wireline Order and Further Notice*, AARP has raised concerns about establishing firm dates for the sunset of TTY technology, given that a large number of carriers "serving millions of subscribers, may continue to deliver voice services over legacy facilities for an extended period."³⁰⁰ AARP claims that "[a]dopting hard and fast sunset dates may lead to customer confusion, and place undue burdens on some service providers and their customers" and urges that, if the Commission establishes a termination date for TTY technology, it do so only for specific carriers that have filed for section 214 relief.³⁰¹ We seek comment on these claims and how we should consider the needs of consumers who still use TTYs in framing rules to address a transition to wireline implementation of RTT.

X. LEGAL AUTHORITY

100. We believe that the Commission has sufficient legal authority to adopt the proposed rules to specify support for RTT communications by wireless IP-based services and equipment. We also believe that we have sufficient legal authority, should the Commission so decide, to amend the Commission's rules to similarly specify support of RTT technology by wireline IP-based services and equipment. Further, we believe the Commission may rely on the sources of authority identified above, as well as the specific authorities discussed below to require that RTT provided pursuant to the proposed rule amendments must meet the interoperability, minimum functionality and outreach requirements proposed above.³⁰² We seek comment on these views, as well as whether there are other sources of

²⁹⁹ See *supra* para. 29.

³⁰⁰ AARP Emerging Wireline Comments at 19-20.

³⁰¹ *Id.* at 20.

³⁰² See also Appendix A (Proposed Rules).

authority beyond those described herein to support the proposals herein.

A. Amendment of Section 20.18

101. We believe our proposal to amend section 20.18(c) to require wireless VoIP service providers to ensure that their services, handsets, and other authorized devices are capable of transmitting 911 calls through RTT technology over IP networks, in lieu of transmitting 911 calls from TTYs,³⁰³ is within the Commission's Title III authority to regulate wireless service providers. Title III authorizes the Commission, among other things, to prescribe the nature of the service to be rendered by licensed service providers and to modify the terms of existing licenses where such action will promote the public interest, convenience, and necessity.³⁰⁴ The Commission relied on Title III in regulating the location capabilities of wireless services and handsets³⁰⁵ and in adopting the rule requiring wireless providers to transmit 911 calls from individuals made on non-handset devices such as TTYs.³⁰⁶ The Commission further relied on Title III in requiring wireless providers to support text-to-911 service, concluding that Title III confers broad authority to prescribe the nature of the emergency service obligations of wireless providers, including deployment of text-to-911 capabilities.³⁰⁷

102. We further believe that our RTT-related proposed rule amendments to section 20.18 are within the Commission's direct statutory authority under section 106 of the CVAA to implement recommendations proposed by the EAAC,³⁰⁸ as well as "to promulgate . . . any other regulations, technical standards, protocols, and procedures as are necessary to achieve reliable, interoperable communication that ensures access by individuals with disabilities to an Internet protocol-enabled emergency network, where achievable and technically feasible."³⁰⁹ The Commission relied on this authority to impose text-to-911 requirements on wireless providers and interconnected text service providers,³¹⁰ as well as to require bounce-back messaging when a PSAP is unable to accept a text call.³¹¹ The Commission's determination rested on two grounds: (1) that it was a proper exercise of the agency's

³⁰³ 47 CFR § 20.18(c).

³⁰⁴ 47 U.S.C. §§ 303(b), 303(g), 316(a)(1). The Supreme Court has emphasized that Title III endows the Commission with "expansive powers" and a "comprehensive mandate to 'encourage the larger and more effective use of radio in the public interest.'" *National Broadcasting Co. v. United States*, 319 U.S. 190, 219 (1943) (quoting 47 U.S.C. § 303(g)). See also *Cellco Partnership v. FCC*, 700 F.3d 534, 541-42 (D.C. Cir. 2012) ("Title III affords the Commission 'broad authority to manage spectrum . . . in the public interest'") (quoting *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services*, Second Report and Order, 26 FCC Rcd 5411, 5440, para. 62 (2011)).

³⁰⁵ See, e.g., *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 18676 (1996).

³⁰⁶ *Id.* at 18682-83, para. 10.

³⁰⁷ *Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications*, PS Docket Nos. 10-255 and 11-153, Report and Order, 28 FCC Rcd 7556 (*Bounce-Back Order*), recon. granted, 28 FCC Rcd 14422 (2013); *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9878-80, paras. 71-80.

³⁰⁸ As noted above, see *supra* note 17, the EAAC was established under the CVAA to produce recommendations to determine necessary actions designed to ensure access by people with disabilities as part of the migration to a national, IP-enabled emergency network. 47 U.S.C. § 615c(c).

³⁰⁹ 47 U.S.C. § 615c(g).

³¹⁰ See *T911 Second Report and Order and Third Further Notice*, 29 FCC Rcd at 9879-80, paras. 74-76 (explaining that "extending text-to-911 requirements . . . will support the widespread availability of text-to-911 to those who are deaf, hard of hearing, or speech-disabled, serve to eliminate consumer confusion about the reliability of text-to-911, and thereby assist the Commission in achieving its mandate under the CVAA").

³¹¹ See *Bounce-Back Order*, 28 FCC Rcd at 7592-7600, paras. 100-27.

authority to promulgate EAAC recommendations,³¹² and (2) that it was a lawful exercise of the agency's CVAA authority to promulgate certain "other regulations."³¹³

103. The EAAC submitted several recommendations to the Commission that appear to be particularly relevant to this proceeding. For example, the EAAC recommended "that the FCC adopt requirements that ensure that the quality of video, text and voice communications is sufficient to provide usability and accessibility to individuals with disabilities based on industry standards for the environment."³¹⁴ The EAAC also recommended "that the FCC remove the requirement for TTY (analog real-time text) support for new IP-based consumer services that implement IP-based text communications that include at a minimum real time text or, in an LTE environment, IMS Multimedia Telephony that includes real-time text."³¹⁵ We seek comment on whether these or other of the EAAC's recommendations, including those involving the migration to a national IP-enabled network," provide an additional basis for the Commission to rely on its authority under section 615c(g) to adopt the amendments proposed here. We also seek comment generally on the scope of the Commission's authority under section 106 with respect to adoption of rules governing access to emergency services via RTT.³¹⁶

104. The Commission also has been granted broad authority to ensure effective telephone access to emergency services that may be relevant here, given the suggested importance of RTT as a means of securing emergency assistance. This includes, for example, the specific delegation of responsibility to the Commission under section 251 of the Act to "designate 911 as the universal emergency telephone number for reporting an emergency to appropriate authorities and requesting assistance,"³¹⁷ the Wireless Communications and Public Safety Act of 1999,³¹⁸ and the NET 911 Improvement Act of 2008.³¹⁹ We seek comment on the possible relevance of these sources of authority to this proceeding.

105. Generally, we tentatively conclude that the sources of legal authority for the actions taken in connection with the above-described 911 initiatives support the initiative we are launching today, given the similarities – and despite the differences – between them. Major objectives of these 911 initiatives have been to ensure that (1) CMRS and other covered wireless providers provide an interim mobile text solution for this important constituency during the transition to NG911, and (2) the needs of people with disabilities do not get left behind as technology develops. The proceeding here addresses a current gap in the availability of emergency communications services by people with disabilities vis-à-vis those now widely available to the population at large, namely, the disparity in the opportunity to engage in real-time communications with emergency providers. To rectify this deficiency, RTT offers the opportunity to engage in text communications on a real-time basis, which comes much closer to voice than the currently available text-based communications vehicles. Analogous to the earlier 911 initiatives, the above-cited

³¹² See *id.* at 7593-98, paras.106-20.

³¹³ See *id.* at 7598-7600, paras. 121-27 (*quoting* 47 U.S.C. § 615c(g)).

³¹⁴ EAAC Report and Recommendations at 23 (Recommendation P2.3).

³¹⁵ *Id.* at 28 (Recommendation P6.5) and 31 (Recommendation T2.2).

³¹⁶ 47 U.S.C. § 615c.

³¹⁷ *Id.* § 251(e)(3).

³¹⁸ Pub. L. No. 106-81, 113 Stat. 1286 (Oct. 26, 1999) (codified at 47 U.S.C. §§ 615-615b).

³¹⁹ Pub. L. No. 110-283, 122 Stat. 2624 (July 23, 2008) (codified at 47 U.S.C. § 615a). In taking action to promote the reliability and resiliency of communications infrastructure that is essential for 911 service, the Commission relied on these sources of authority, among others, noting judicial recognition of "[t]he broad public safety and 911 authority Congress has granted the FCC." *Improving 911 Reliability et al.*, Report and Order, 28 FCC Rcd 17476, 17529, para. 148 (2013) (*quoting Nuvio Corp. v. FCC*, 473 F.3d 302, 311 (D.C. Cir. 2007) (Kavanaugh, J., concurring)).

legal authorities support our use of the measures proposed here to provide people who are deaf, hard of hearing, deaf-blind, and speech-disabled with the opportunity to access real time communications service in emergency situations when the need for such capabilities is most pressing. We seek comment on our tentative conclusion and assessment.

B. Amendment of Parts 6, 7, and 14

106. We believe that it is within the Commission's authority under sections 251, 255, and 716 of the Communications Act to amend Parts 6 and 7 of the Commission's rules to require providers of interconnected wireless VoIP service (as well as manufacturers of equipment used with such services) to support RTT, if readily achievable (under Parts 6 and 7), and to amend Part 14 to require wireless providers of VoIP service (as well as manufacturers of equipment used with such services) not subject to parts 6 and 7 to support RTT, unless this requirement is not achievable (under Part 14).³²⁰ Likewise, given that the Commission seeks comment above on whether to provide for support of RTT on wireline networks, we note our belief that the Commission has sufficient authority under these provisions to amend its rules to similarly require providers of wireline VoIP services and manufacturers of equipment used with such services to support RTT, should the Commission so decide. We further believe that these sections provide sufficient authority to impose requirements to ensure that RTT is compatible with assistive technologies used by people with disabilities, such as refreshable Braille displays used by people who are deaf-blind, and seek comment on this position.

107. Section 255 of the Act requires providers of telecommunications service and manufacturers of telecommunications and customer premises equipment to ensure that their services and equipment are accessible to and usable by individuals with disabilities, if readily achievable.³²¹ Section 251(a)(2) provides that telecommunications carriers may not install network features, functions, or capabilities that do not comply with the guidelines and standards established pursuant to section 255.³²² Section 716 requires providers of advanced communications services (ACS) and manufacturers of equipment used with ACS to ensure that their services and equipment are accessible to and usable by individuals with disabilities, unless such requirements are not achievable, and directs the Commission to promulgate implementing regulations.³²³ ACS, in turn, is defined to include interconnected and non-interconnected VoIP service, as well as electronic messaging service and interoperable video conferencing service.³²⁴ Both section 255 and section 716 require that, to the extent that it is not achievable to make a service accessible and usable, service providers "shall ensure that [their] equipment or service is compatible with existing peripheral devices or specialized customer premises equipment commonly used by individuals with disabilities to achieve access," if readily achievable, under section 255, or unless not achievable, under section 716.³²⁵ We seek comment on whether these statutory provisions provide sufficient authority to establish RTT requirements for wireless and wireline services and equipment.

108. Congress intended for these provisions collectively to ensure access by people with

³²⁰ ACS and equipment used with ACS must ensure TTY connectability and TTY signal compatibility, unless compliance is not achievable. 47 U.S.C. § 617; 47 CFR §§ 14.20(a)(3), 14.21(a), (d)(3)-(4).

³²¹ 47 U.S.C. § 255; *see also* 47 CFR parts 6, 7; *Section 255 Report and Order*, 16 FCC Rcd 6417 (1999).

³²² 47 U.S.C. § 251(a)(2).

³²³ *Id.* § 617.

³²⁴ *Id.* § 153(1).

³²⁵ *Id.* §§ 255(d), 617(c). Specialized customer premises equipment is defined as "customer premises equipment which is commonly used by individuals with disabilities to achieve access." 47 CFR § 7.3(i). An example of such equipment would be a TTY. *See Section 255 Report and Order*, 16 FCC Rcd 6417, 6443-44, para. 30.

disabilities to our nation's telecommunications and advanced communications services,³²⁶ and gave the Commission broad authority to determine how to achieve this objective. For example, section 716 directs the Commission to prescribe regulations that “include performance objectives to ensure the accessibility, usability, and compatibility of advanced communications services and the equipment” and “determine the obligations under this section of manufacturers, service providers, and providers of applications or services accessed over service provider networks.”³²⁷ Given the limitations of TTY technology, we believe that RTT is best suited to replace TTY technology for rendering voice IP services accessible to people who are deaf, hard of hearing, deaf-blind, or speech-disabled. We seek comment on this analysis.

C. Amendment of Part 64

109. We believe that the Commission has sufficient authority under the Communications Act to adopt the proposed amendments to Part 64 of its rules to require wireless VoIP service providers to support the provision of and access to TRS via RTT. We also believe that the Commission has sufficient authority under these provisions to adopt similar amendments to require wireline VoIP service providers to support RTT for the provision of and access to TRS.

110. Section 225 of the Act directs the Commission to “ensure that interstate and intrastate telecommunications relay services are available, to the extent possible and in the most efficient manner, to hearing-impaired and speech-impaired individuals in the United States,”³²⁸ and further to prescribe implementing regulations, including functional requirements and minimum standards.³²⁹ Congress initially placed the obligation to provide TRS on common carriers “providing telephone voice transmission services,” either on their own or through a state-supported TRS program, in compliance with the implementing regulations prescribed by the Commission.³³⁰ Pursuant to the Commission's ancillary jurisdiction, the Commission extended the TRS obligations to interconnected VoIP providers.³³¹ Included in the TRS obligations of carriers and interconnected VoIP service providers is the obligation to support access to TRS call centers, including through abbreviated 711 dialing access for TRS calls initiated by TTYs.³³² We believe that the Commission has sufficient authority under these provisions to require VoIP service providers to support TRS access via RTT in lieu of requiring support for TTY technology. Section 225 does not require that TRS be provided or accessed with TTYs.³³³ Further, section 225 expressly directs the Commission to “ensure that regulations prescribed to implement this section encourage . . . the use of existing technology and do not discourage or impair the development of

³²⁶ See, e.g., Senate Report at 1; H.R. Rep. No. 111-563 at 19 (2010) (House Report) (stating that the purpose of the CVAA is to “update the communications laws to help ensure that individuals with disabilities are able to fully utilize communications services and equipment and better access video programming”); see also 47 U.S.C. § 154(i) (“The Commission may perform any and all acts, make such rules and regulations, and issue such orders, not inconsistent with this chapter, as may be necessary in the execution of its functions.”).

³²⁷ 47 U.S.C. § 617(e)(1)(A), (C).

³²⁸ *Id.* § 225(b)(1).

³²⁹ *Id.* § 225(d)(1).

³³⁰ *Id.* § 225(c).

³³¹ *VoIP Accessibility and TRS Order*, 22 FCC Rcd at 11292-93, paras. 34-35.

³³² See *supra* para. 5 & note 8. Subsequently, in adopting section 715 of the Act, added by the CVAA, Congress further expanded the scope of section 225 by requiring both interconnected and non-interconnected VoIP service providers to “participate in and contribute to the Telecommunications Relay Services Fund . . . in a manner prescribed by the Commission by regulation to provide for obligations of such providers that are consistent with and comparable to the obligations of other contributors to such Fund.” 47 U.S.C. § 616.

³³³ See 47 U.S.C. § 225(a)(3) (defining TRS).

improved technology.”³³⁴ We seek comment on this analysis.

XI. PROCEDURAL MATTERS

A. Comment Filing Procedures

111. Pursuant to sections 1.415 and 1.419 of the Commission’s rules,³³⁵ interested parties may file comments and reply comments regarding the *Notice*, identified by CG Docket No. 16-145, on or before the dates indicated on the first page of this document.

112. *Electronic Filers*: Comments may be filed electronically using the Internet by accessing the Commission’s Electronic Comment Filing System (ECFS): <http://apps.fcc.gov/ecfs>.³³⁶

113. *Paper Filers*: Parties who choose to file by paper must file an original and one copy of each filing.

114. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission’s Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission’s Secretary must be delivered to FCC Headquarters at 445 12th St., SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

115. Documents in CG Docket No. 16-145 and GN Docket No. 15-178 will be available for public inspection and copying during business hours at the FCC Reference Information Center, Portals II, 445 12th Street SW, Room CY-A257, Washington, D.C. 20554. The documents may also be purchased from BCPI, telephone (202) 488-5300, facsimile (202) 488-5563, TTY (202) 488-5562, e-mail fcc@bcpiweb.com. Documents may also be viewed using the Internet by accessing the Commission’s Electronic Document Management System (EDOCS) at https://apps.fcc.gov/edocs_public/edocsLink.do and Electronic Comment Filing System (ECFS) at <http://apps.fcc.gov/ecfs>, or under Quick Links on the Commission’s web page at www.fcc.gov.

B. Ex Parte Presentations

116. This proceeding shall be treated as a “permit-but-disclose” proceeding in accordance with the Commission’s *ex parte* rules.³³⁷ Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral

³³⁴ *Id.* § 225(d)(2). Elaborating on this point, the Senate Report accompanying the passage of the original TRS mandate stated that “this legislation is not intended to discourage innovation regarding telecommunications services to individuals with hearing and speech [disabilities]. These individuals] should be allowed to benefit from advancing technology. As such, the provisions of this section do not seek to entrench current technology but rather to allow for new, more advanced, and more efficient technology.” S. Rep. No. 116, 101st Cong., 1st Sess. at 78 (1989) (emphasis added).

³³⁵ 47 CFR §§ 1.415, 1.419.

³³⁶ See *Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

³³⁷ 47 CFR §§ 1.1200–1.1216.

ex parte presentations are reminded that memoranda summarizing the presentations must (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter's written comments, memoranda or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and must be filed consistent with rule 1.1206(b).³³⁸ In proceedings governed by rule 1.49(f)³³⁹ or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission's *ex parte* rules.

C. Regulatory Flexibility Act

117. As required by the RFA, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities of the policies and rules addressed in this item. The IRFA is set forth in Appendix C. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the *Notice* provided on or before the dates indicated on the first page of this *Notice*. The Commission will send a copy of the *Notice*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration.³⁴⁰ In addition, the *Notice* and IRFA (or summaries thereof) will be published in the Federal Register.³⁴¹

D. Paperwork Reduction Act Analysis

118. The *Notice* seeks comment on proposed new information collection requirements. If the Commission adopts any new information collection requirement, the Commission will publish another notice in the *Federal Register* inviting the public to comment on the requirements, as required by the PRA.³⁴² In addition, pursuant to the Small Business Paperwork Relief Act of 2002,³⁴³ the Commission will seek specific comment on how it might further reduce the information collection burden for small business concerns with fewer than 25 employees.

E. Materials in Accessible Formats

119. To request materials in accessible formats (such as Braille, large print, electronic files, or audio format), send an e-mail to fcc504@fcc.gov or call the Consumer and Governmental Affairs Bureau at (202) 418-0530 (voice) or (202) 418-0432 (TTY). This *Notice* can also be downloaded in Word and Portable Document Formats (PDF) at <http://www.fcc.gov/cgb/dro/trs.html>.

120. For further information regarding this *Notice* contact Bob Aldrich, Consumer and Governmental Affairs Bureau (CGB), (202) 418-0996, e-mail Robert.Aldrich@fcc.gov, or Suzy Rosen Singleton, CGB, Disability Rights Office, (202) 510-9446, e-mail Suzanne.Singleton@fcc.gov.

³³⁸ *Id.* § 1.1206(b).

³³⁹ *Id.* § 1.49(f).

³⁴⁰ *See id.* § 603(a).

³⁴¹ *Id.*

³⁴² Pub L. No. 104-13. *See* 44 U.S.C. §§ 3501-3520.

³⁴³ Pub L. No. 107-198. *See* 44 U.S.C. § 3506(c)(4).

XII. ORDERING CLAUSES

121. Accordingly, IT IS ORDERED that, pursuant to sections 4(i), 225, 255, 301, 303(r), 316, 403, 715, and 716 of the Communications Act of 1934, as amended, and section 106 of the CVAA, 47 U.S.C. §§ 154(i), 225, 255, 301, 303(r), 316, 403, 615c, 616, 617, this *Notice of Proposed Rule Making* IS ADOPTED.

122. IT IS FURTHER ORDERED that pursuant to applicable procedures set forth in sections 1.415 and 1.419 of the Commission's Rules, 47 CFR §§ 1.415, 1.419, interested parties may file comments on this *Notice of Proposed Rulemaking* on or before 45 days after publication of the *Notice of Proposed Rulemaking* in the *Federal Register* and reply comments on or before 60 days after publication in the *Federal Register*.

123. IT IS FURTHER ORDERED that the Commission's Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of the *Notice of Proposed Rulemaking*, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

PROPOSED RULES

PART 6—ACCESS TO TELECOMMUNICATIONS SERVICE, TELECOMMUNICATIONS EQUIPMENT AND CUSTOMER PREMISES EQUIPMENT BY PERSONS WITH DISABILITIES

1. The authority citation for part 6 continues to read as follows:

Authority: 47 U.S.C. 151–154, 251, 255, and 303(r).

2. Amend § 6.3 by:

- a. Adding new paragraphs (a)(3), (m) and (n); and
- b. Revising paragraph (b).

The additions and revisions read as follows:

§ 6.3 Definitions.

(a) The term *accessible* shall mean that:

* * * * *

(3) *Real-Time Text*. Effective December 31, 2017, for wireless VoIP services and text-capable user devices used with such services, the service or device supports real-time text communications, in accordance with 47 CFR part 67.

(b) * * *

* * * * *

(5) *Wireless VoIP Exemption*. Wireless VoIP services and equipment used with such services are not required to provide TTY connectability and TTY signal compatibility if such services and equipment support real-time text, in accordance with 47 CFR part 67.

* * * * *

(m) The term *real-time text* shall have the meaning set forth in § 67.1 of this chapter.

(n) The term *text-capable user device* means customer premises equipment that is able to send, receive, and display text.

PART 7—ACCESS TO VOICEMAIL AND INTERACTIVE MENU SERVICES AND EQUIPMENT BY PEOPLE WITH DISABILITIES

1. The authority citation for part 7 continues to read as follows:

Authority: 47 U.S.C. 1, 154(i), 154(j), 208, and 255.

2. Amend § 7.3 by:

- a. Adding new paragraphs (a)(3), (n), and (o); and
- b. Revising paragraph (b).

The additions and revisions read as follows:

§ 7.3 Definitions.

(a) The term *accessible* shall mean that:

* * * * *

(3) *Real-Time Text*. Effective December 31, 2017, for wireless VoIP services and text-capable user devices used with such services, the service or equipment supports real-time text communications, in accordance with 47 CFR part 67.

(b) * * *

* * * * *

(5) *Wireless VoIP Exemption*. Wireless VoIP services and equipment are not required to provide TTY connectability and TTY signal compatibility if such services and equipment support real-time text, in accordance with 47 CFR part 67.

* * * * *

(n) The term *real-time text* shall have the meaning set forth in § 67.1 of this chapter.

(o) The term *text-capable user device* means customer premises equipment that is able to send, receive, and display text.

PART 14—ACCESS TO ADVANCED COMMUNICATIONS SERVICES AND EQUIPMENT BY PEOPLE WITH DISABILITIES

1. The authority citation for part 14 continues to read as follows:

Authority: 47 U.S.C. 151–154, 255, 303, 403, 503, 617, 618, 619 unless otherwise noted.

2. Amend § 14.10 by adding new paragraphs (w) and (x) to read as follows:

§ 14.10 Definitions

* * * * *

(w) The term *real-time text* shall have the meaning set forth in § 67.1 of this chapter.

(x) The term *text-capable user device* means end user equipment that is able to send, receive, and display text.

3. Amend § 14.21 by:

a. Adding a new paragraph (b)(3); and

b. Revising paragraph (d).

The additions and revisions read as follows:

§ 14.21 Performance Objectives.

* * * * *

(b) *Accessible*. The term *accessible* shall mean that:

* * * * *

(3) *Real-Time Text*. Effective December 31, 2017, for wireless VoIP services and text-capable user devices used with such services, the service or device supports real-time text communications, in accordance with 47 CFR part 67.

* * * * *

(d) * * *

* * * * *

(5) *Wireless VoIP Exemption.* Wireless VoIP services and equipment are not required to provide TTY connectability and TTY signal compatibility if such services and equipment support real-time text, in accordance with 47 CFR part 67.

PART 20—COMMERCIAL MOBILE SERVICES

1. The authority citation for part 20 continues to read as follows:

Authority: 47 U.S.C. 151, 152(a), 154(i), 157, 160, 201, 214, 222, 251(e), 301, 302, 303, 303(b), 303(r), 307, 307(a), 309, 309(j)(3), 316, 316(a), 332, 615, 615a, 615b, 615c.

2. Amend § 20.18 by revising paragraph (c) to read as follows:

§ 20.18 911 Service.

* * * * *

(c) *Access to 911 services.*

(1) Except as provided in paragraph (c)(2) of this section, CMRS providers subject to this section must be capable of transmitting 911 calls from individuals who are deaf, hard of hearing, speech-disabled, and deaf-blind through the use of Text Telephone Devices (TTY), except that CMRS providers transmitting over IP facilities are not subject to this requirement if the CMRS provider supports real-time text communications, in accordance with 47 CFR Part 67.

(2) Notwithstanding any other limitation of coverage in this section, the requirements of this paragraph (c)(2) apply to providers of digital mobile service in the United States to the extent that they offer terrestrial mobile service that enables two-way real-time voice communications among members of the public or a substantial portion of the public. Effective December 31, 2017, such service providers transmitting over IP facilities shall support 911 access via real-time text communications for individuals who are deaf, hard of hearing, speech-disabled, and deaf-blind, in accordance with 47 CFR Part 67.

* * * * *

PART 64—MISCELLANEOUS RULES RELATING TO COMMON CARRIERS

1. Revise the authority citation for part 64 to read as follows:

Authority: 47 U.S.C. 154, 225, 403(b)(2)(B), (c), 715, ***

2. Amend § 64.601 by:

- a. revising paragraphs (a)(13), (a)(15), and (a)(42); and
- b. adding a new paragraph (a)(46).

The revisions and additions read as follows:

§ 64.601 Definitions and provisions of general applicability.

* * * * *

(a)(13) *Hearing carry over (HCO).* A form of TRS where the person with the speech disability is able to listen to the other end user and, in reply, the CA speaks the text as typed by the person with the speech disability. The CA does not type any conversation. Two-line HCO is an HCO service that allows TRS users to use one telephone line for hearing and the other for sending TTY messages. HCO-to-TTY allows a relay conversation to take place between an HCO user and a TTY user. HCO-to-RTT is an HCO service that allows a relay conversation to take place between an HCO user and an RTT user. HCO-to-HCO allows a relay conversation to take place between two HCO users.

* * * * *

(a)(15) *Internet-based TRS (iTRS)*. A telecommunications relay service (TRS) in which an individual with a hearing or a speech disability connects to a TRS communications assistant using an Internet Protocol-enabled device via the Internet, rather than the public switched telephone network. Except as authorized or required by the Commission, Internet-based TRS does not include the use of a text telephone (TTY) or real-time text (RTT) over an interconnected voice over Internet Protocol service.

* * * * *

(a)(42) *Voice carry over (VCO)*. A form of TRS where the person with the hearing disability is able to speak directly to the other end user. The CA types the response back to the person with the hearing disability. The CA does not voice the conversation. Two-line VCO is a VCO service that allows TRS users to use one telephone line for voicing and the other for receiving TTY messages. A VCO-to-TTY TRS call allows a relay conversation to take place between a VCO user and a TTY user. VCO-to-RTT is a VCO service that allows a relay conversation to take place between a VCO user and an RTT user. VCO-to-VCO allows a relay conversation to take place between two VCO users.

* * * * *

(a)(46) *Real-Time Text (RTT)*. The term *real-time text* shall have the meaning set forth in § 67.1 of this chapter.

3. Amend § 64.603 to read as follows:

§ 64.603 Provision of services.

Each common carrier providing telephone voice transmission services shall provide, in compliance with the regulations prescribed herein, throughout the area in which it offers services, telecommunications relay services, individually, through designees, through a competitively selected vendor, or in concert with other carriers, including relay services accessed via RTT communications. Interstate Spanish language relay service shall be provided. Speech-to-speech relay service also shall be provided, except that speech-to-speech relay service need not be provided by IP Relay providers, VRS providers, captioned telephone relay service providers, and IP CTS providers. In addition, each common carrier providing telephone voice transmission services shall provide access via the 711 dialing code to all relay services as a toll free call. Wireless VoIP service providers are not required to provide such access to TTY users if they provide 711 dialing code access by supporting real-time text communications, in accordance with 47 CFR Part 67. Effective December 31, 2017, wireless VoIP service providers shall provide 711 dialing code access by supporting real-time text communications, in accordance with 47 CFR Part 67.

* * * * *

4. Amend § 64.604 by revising paragraph (a)(1) to read as follows:

§ 64.604 Mandatory Minimum Standards.

(a) *Operational Standards*—(1) *Communications Assistant (CA)*.

* * * * *

(v) CAs answering and placing a TTY- or RTT-based TRS call or VRS call shall stay with the call for a minimum of ten minutes.

* * * * *

(vii) TRS shall transmit conversations between TTY or RTT callers and voice callers in real time.

* * * * *

PART 67 – REAL-TIME TEXT

Sec.

67.1 Definitions.

67.2 Service Provider and Manufacturer Obligations; Minimum Functionalities.

1. Add a new Part 67 to read as follows:

Authority: 47 U.S.C. 151-154, 225, 251, 255, 301, 303, 307, 309, 316, 615c, 616, 617.

§ 67.1 Definitions. (a) “Authorized user device” means a handset or other end user device that is authorized by the provider of a covered service for use with that service and is able to send, receive, and display text.

(b) “Covered service” means a VoIP or other service that is permitted or required to support RTT pursuant to Part 6, 7, 14, 20, or 64 of the Commission’s rules.

(c) “RFC 4103” means standard Internet Engineering Task Force (IETF) Request for Comments (RFC) 4103, Real-time Transport Protocol Payload for Text Conversation (2005) and any successor protocol published by the IETF. RFC 4103 is available at: <http://www.ietf.org/rfc/rfc4103.txt>.

(d) “RFC 4103-conforming” service or user device means a covered service or authorized user device that enables initiation, sending, transmission, reception, and display of RTT communications in conformity with RFC 4103.

(e) “RFC 4103-TTY gateway” means a gateway that is able to reliably and accurately transcode communications between (1) RFC 4103-conforming services and devices and (2) circuit-switched networks that support communications between TTYs.

(f) “Real-time text (RTT)” or “RTT communications” means text communications that are transmitted over Internet Protocol (IP) networks immediately as they are typed, *e.g.*, on a character-by-character basis.

(g) “Support RTT” or “support RTT communications” means to enable users to initiate, send, transmit, receive, and display RTT communications in accordance with the applicable provisions of this part.

§ 67.2 Service Provider and Manufacturer Obligations; Minimum Functionalities.

(a) *Service Provider Obligations.* A provider of a covered service shall ensure that its service and all authorized user devices using its service support RTT in compliance with this section.

(b) *Manufacturer Obligations.* A manufacturer shall ensure that its authorized user devices support RTT in compliance with this section.

(c) *RTT-RTT Interoperability.* Covered services and authorized user devices shall be interoperable with other services and devices that support RTT in accordance with this part. RFC 4103-conforming services and user devices shall be deemed to comply with this paragraph (a). Other covered services or authorized user devices shall be deemed to comply if RTT communications between such service or user device and an RFC 4103-conforming service or user device are reliably and accurately transcoded (1) to and from RFC 4103, or (2) to and from an internetworking protocol mutually agreed-upon with the owner of the network serving the RFC 4103-conforming service or device.

(b) *RTT-TTY Interoperability.* Covered services and authorized user devices shall be interoperable with TTYs connected to other networks. Covered services and authorized user devices shall be deemed to comply with this paragraph (b) if communications to and from such TTYs (1) pass through an RFC 4103-TTY gateway, or (2) are reliably and accurately transcoded to and from an internetworking protocol mutually agreed-upon with the owner of the network serving the TTY.

(c) *Device Portability.* Authorized user devices shall be portable among service providers for RTT communications to the same extent as for voice communications.

(d) *Features and Capabilities.* Covered services and authorized user devices shall enable the user to:

- (1) initiate and receive RTT calls to and from the same telephone numbers for which they initiate and receive voice calls;
- (2) transmit and receive RTT communications to and from any 911 public safety answering point (PSAP) in the United States;
- (3) transmit text instantly, so that each text character appears on the receiving device within one second of when it is generated on the sending device, with no more than 0.2 percent character error rate;
- (4) send and receive text and voice simultaneously in both directions on the same call using a single device;
- (5) transfer RTT calls and initiate conference calls using the same procedures used for voice communication;
- (6) use RTT to communicate with and retrieve messages from messaging, automated attendant, and interactive voice response systems; and
- (7) transmit caller identification and conduct similar telecommunication functions with RTT communications.

APPENDIX B**List of Commenting Parties****Comments (Due August 24, 2015)**

American Association of People with Disabilities (AAPD)

Consumer Groups

Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI)

American Association of the Deaf-Blind (AADB)

Association of Late Deafened Adults (ALDA)

California Coalition of Agencies Serving the Deaf and Hard of Hearing, Inc. (CCASDHH)

Cerebral Palsy and Deaf Organization (CPDO)

Deaf Seniors of America (DSA)

Hearing Loss Association of America (HLAA)

National Association of the Deaf (NAD)

Rehabilitation Engineering Research Center on Telecommunications Access (RERC-TA)

CTIA – The Wireless Association®

IDT Telecom, Inc.

Omnitor AB

Telecommunications Industry Association (TIA)

Verizon

Reply Comments (Due September 8, 2015)

AT&T Services, Inc. (AT&T)

Consumer Groups (TDI, AADB, ALDA, CCASDHH, CPDO, Deaf and Hard of Hearing Consumer Advocacy Network, DSA, HLAA, NAD, and RERC-TA)

Michigan Public Service Commission (MPSC)

RERC-TA

APPENDIX C

Initial Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act, as amended (RFA),¹ the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this Notice of Proposed Rule Making (*Notice*). Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments specified in the *Notice*. The Commission will send a copy of this *Notice*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).² In addition, the *Notice* and IRFA (or summaries thereof) will be published in the Federal Register.³

A. Need for, and Objectives of, the Proposed Rules

2. In this *Notice*, the Commission proposes amendments to its rules to facilitate a transition from outdated text telephony (TTY) technology to a reliable and interoperable means of providing real-time text (RTT) communication over Internet Protocol (IP) enabled networks and services for people who are deaf, hard of hearing, speech disabled, and deaf-blind. Real-time text is a mode of communication that permits text to be sent immediately as it is being created. The Commission's proposals would replace existing requirements mandating support for TTY technology with rules for wireless IP-based voice services to support RTT technology instead. The Commission's action seeks to ensure that people who are deaf, hard of hearing, speech disabled, and deaf-blind can fully utilize and benefit from twenty-first century communications technologies as the United States migrates from legacy circuit-switched systems to IP-based networks and services.

3. The Commission seeks comment on the following:

- Its proposal to replace the Commission's rules that require wireless service providers and equipment manufacturers to support TTY technology⁴ with rules defining the obligations of these entities to support RTT technology over IP-based voice services.
- Its tentative conclusions that the technical and functional limitations of TTYs make this technology unsuitable as a long-term means to provide full and effective access to IP-based wireless telephone networks, that there is a need to provide individuals who rely on text communication with a superior accessibility solution for the IP environment, and that RTT can best achieve this goal because it can be well supported in the wireless IP environment, will facilitate emergency communications to 911 services, allows for more natural and simultaneous interactions on telephone calls, will largely eliminate the need to purchase specialized or assistive devices that connect to mainstream technology, and may reduce reliance on telecommunications relay services.
- Its proposal to make the above amendments effective by December 31, 2017, for large wireless service providers and manufacturers of user devices authorized for their services, its proposal to give additional time for compliance by smaller service providers and manufacturers of user devices authorized for their services, and the amount of additional time that would be appropriate.

¹ See 5 U.S.C. § 603. The RFA, see 5 U.S.C. § 601 et seq., has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² See 5 U.S.C. § 603(a).

³ See *id.*

⁴ 47 CFR §§ 6.3(b)(3)-(4), 6.5, 7.3(b)(3)-(4), 7.5, 14.20, 14.21, 20.18(c), 64.603; 64.604.

- Its tentative conclusions that deployment of RTT on IP networks will offer functionality greatly superior to that of TTY technology; that the ability to acquire off-the-shelf RTT-capable devices will be beneficial for text communication users; and that RTT will be more effective than messaging-type services such as SMS in meeting the communication needs of consumers with disabilities, including their emergency communication needs.
- Its tentative conclusion that for effective RTT communications across multiple platforms and networks, such communications and the associated terminal equipment must be interoperable with one another.
- Its proposal to adopt a standard developed by the Internet Engineering Task Force (IETF), RFC 4103, as a safe harbor technical standard, adherence to which will be deemed to satisfy the interoperability requirement for RTT communications.⁵
- Its proposal that service providers should be required to make their RTT services interoperable with TTY technology supported by circuit-switched networks, and when that requirement should sunset.
- Its proposal to require that wireless providers and equipment manufacturers implementing RTT support the following telecommunications functions:
 - use of the same North American Numbering Plan numbers used for voice, to initiate and receive calls;
 - 911 emergency communications in full compliance with all applicable 911 rules;
 - transmission of characters within one second of when they are generated, with no more than a 0.2 percent character error rate, which equates to approximately a one percent word error rate;
 - simultaneous voice and text transmission;
 - TRS access;
 - a comprehensive character set and the ability to control text settings such as font size and color, to adjust text conversation windows, and to set up text presentation;
 - compliance with the Commission’s existing accessibility regulations for “electronic messaging services”; and
 - other calling features such as call transfer, teleconferencing, caller identification, voice and text mail, and interactive voice response systems.
- Its proposal to require wireless service providers implementing RTT to enable device portability for their RTT services to the same extent as for voice services and whether to require such providers to enable the use of third party RTT software applications on user devices to supplement the native RTT capabilities.
- Measures that may be needed to ensure the affordability of new terminal equipment or assistive devices that may be needed as a consequence of the migration to RTT technology.
- Its proposal to require wireless service providers to notify their customers about the inability to use TTYs with IP-based services and about alternative means of reaching 911 services.

⁵ RFC 4103 is defined as the standard Internet Engineering Task Force (IETF) Request for Comments (RFC) 4103, Real-time Transport Protocol Payload for Text Conversation (2005) and its successor protocol as determined by a telecommunications industry setting body, such as IETF or the Alliance for Telecommunications Industry Solutions. RFC 4103 is available at: <http://www.ietf.org/rfc/rfc4103.txt> (June 2005, last visited Apr. 28, 2016).

- The best means of informing the public, including businesses, governmental agencies, and individuals with disabilities who will be directly affected by the transition, about the migration from TTY technology to RTT and the mechanics of how this technology will work.
- Security risks that may be associated with the adoption of RTT technology and that require the Commission’s attention.
- Whether to require the implementation of RTT in IP-based wireline networks, including:
 - Whether to require wireline VoIP service providers to support RTT, as the Commission is proposing to do for wireless services;
 - How to ensure that end users can readily connect to and use RTT capabilities in wireline networks, and whether it would be feasible and practical for wireline VoIP service providers to offer downloadable over-the-top RTT software applications;
 - Whether to require VoIP providers to ensure the compatibility of their services with third-party RTT software applications downloaded onto text-capable devices such as smartphones, tablets, and computers;
 - The extent to which wireline VoIP manufacturers should have RTT support obligations for their equipment that is otherwise capable of sending, receiving, and displaying text;
 - Whether IP-based wireline service providers and manufacturers should be required to adhere to the same interoperability requirements, minimum functionalities, and outreach obligations as those proposed for wireless VoIP services and end user devices;
 - Whether RFC 4103 is an appropriate standard to reference as the safe harbor for wireline VoIP services and end user equipment to ensure interoperability and compliance with the rules proposed for wireless services; and
 - The appropriate timing for incorporation of RTT capabilities into wireline VoIP services and end user devices.

B. Legal Basis

4. The proposed action is authorized under sections 1, 2, 4(i), 225, 255, 303, 316, and 716 of the Communications Act of 1934, as amended, section 6 of the Wireless Communications and Public Safety Act of 1999, and section 106 of the CVAA; 47 U.S.C. §§ 151, 152, 154(i), 225, 255, 303, 316, 615a-1, 615c, 617.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

5. The RFA directs agencies to provide a description and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.⁶ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁷ In addition, the term “small business” has the same meaning as the term “small-business concern” under the Small Business Act.⁸ A “small-business

⁶ See 5 U.S.C. § 603(b)(3).

⁷ 5 U.S.C. § 601(6).

⁸ See 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity

(continued....)

concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.⁹

6. The majority of our proposals in the *Notice* will affect obligations on telecommunications carriers and providers, VoIP service providers, wireline and wireless service providers, ACS providers, and telecommunications equipment and software manufacturers. Other entities, however, that choose to object to the substitution of RTT for TTY technology under the Commission’s new proposed rules may be economically impacted by the proposals in this *Notice*.

7. A small business is an independent business having less than 500 employees. Nationwide, there are a total of approximately 28.2 million small businesses, according to the SBA.¹⁰ Affected small entities as defined by industry are as follows.

1. Wireline Providers

8. *Wired Telecommunications Carriers*. The Census Bureau defines this industry as comprising “establishments primarily engaged in operating and/or providing access to transmission facilities and infrastructure that they own and/or lease for the transmission of voice, data, text, sound and video using wired telecommunications networks. Transmission facilities may be based on a single technology or a combination of technologies. Establishments in this industry use the wired telecommunications network facilities that they operate to provide a variety of services, such as wired telephony services, including VOIP services, wired (cable) audio and video programming distribution; and wired broadband Internet services. By exception, establishments providing satellite television distribution services using facilities and infrastructure that they operate are included in this industry.”¹¹ The SBA has developed a small business size standard for Wired Telecommunications Carriers, which consists of all such companies having 1,500 or fewer employees.¹² According to Census Bureau data for 2007, there were 3,188 firms in this category, total, that operated for the entire year.¹³ Of this total, 3,144 firms had employment of 999 or fewer employees, and 44 firms had employment of 1000 employees or more.¹⁴ Thus, under this size standard, the majority of firms can be considered small.

9. *Local Exchange Carriers (LECs)*. Neither the Commission nor the SBA has developed a size standard for small businesses specifically applicable to local exchange services. The closest applicable size standard under SBA rules is for Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.¹⁵ According to Commission data,

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for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

⁹ See 15 U.S.C. § 632(l).

¹⁰ See SBA, Office of Advocacy, *Frequently Asked Questions* (March 2014), http://www.sba.gov/sites/default/files/FAQ_March_2014_0.pdf.

¹¹ U.S. Census Bureau, 2007 NAICS Code definitions, 517110 Wired Telecommunications Carriers, <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517110&search=2007%20NAICS%20Search> (last visited Apr. 28, 2016). This 2007 U.S. Census definition and the associated U.S. Census data apply to *infra* paras. 8-14.

¹² 13 CFR § 121.201, NAICS code 517110.

¹³ U.S. Census Bureau, 2007 Economic Census, Information: Subject Series – Establishment and Firm Size: Table 5, “Employment Size of Firms for the United States: 2007, NAICS Code 517110,” http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ5&prodT ype=table (last visited Apr. 28, 2016).

¹⁴ See *id.*

¹⁵ 13 CFR § 121.201, NAICS code 517110.

1,307 carriers reported that they were incumbent local exchange service providers.¹⁶ Of these 1,307 carriers, an estimated 1,006 have 1,500 or fewer employees and 301 have more than 1,500 employees.¹⁷ Consequently, the Commission estimates that most providers of local exchange service are small entities.

10. *Incumbent Local Exchange Carriers (Incumbent LECs)*. Neither the Commission nor the SBA has developed a small business size standard specifically for incumbent local exchange services. The closest applicable size standard under SBA rules is for the category Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.¹⁸ According to Commission data,¹⁹ 1,307 carriers reported that they were incumbent local exchange service providers.²⁰ Of these 1,307 carriers, an estimated 1,006 have 1,500 or fewer employees and 301 have more than 1,500 employees.²¹ Consequently, the Commission estimates that most providers of incumbent local exchange service are small entities.

11. We have included small incumbent LECs in this present RFA analysis. As noted above, a “small business” under the RFA is one that, *inter alia*, meets the pertinent small business size standard (e.g., a telephone communications business having 1,500 or fewer employees), and “is not dominant in its field of operation.”²² The SBA’s Office of Advocacy contends that, for RFA purposes, small incumbent LECs are not dominant in their field of operation because any such dominance is not “national” in scope.²³ We have therefore included small incumbent LECs in this RFA analysis, although we emphasize that this RFA action has no effect on Commission analyses and determinations in other, non-RFA contexts.

12. *Competitive Local Exchange Carriers (Competitive LECs), Competitive Access Providers (CAPs), Shared-Tenant Service Providers, and Other Local Service Providers*. Neither the Commission nor the SBA has developed a small business size standard specifically for these service providers. The appropriate size standard under SBA rules is for the category Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.²⁴ According to Commission data, 1,442 carriers reported that they were engaged in the provision of either competitive local exchange services or competitive access provider services.²⁵ Of these 1,442 carriers, an estimated 1,256 have 1,500 or fewer employees and 186 have more than 1,500 employees.²⁶ In addition, 17 carriers have reported that they are Shared-Tenant Service Providers, and all 17 are estimated to have

¹⁶ Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service*, tbl. 5.3 (Sept. 2010), https://apps.fcc.gov/edocs_public/attachmatch/DOC-301823A1.pdf (*Trends in Telephone Service*).

¹⁷ *See id.*

¹⁸ 13 CFR § 121.201, NAICS code 517110.

¹⁹ *See Trends in Telephone Service* at tbl. 5.3.

²⁰ *See id.*

²¹ *See id.*

²² 5 U.S.C. § 601(3).

²³ Letter from Jere W. Glover, Chief Counsel for Advocacy, SBA, to William E. Kennard, Chairman, Federal Communications Commission (filed May 27, 1999). The Small Business Act contains a definition of “small business concern,” which the RFA incorporates into its own definition of “small business.” 15 U.S.C. § 632(a); 5 U.S.C. § 601(3). SBA regulations interpret “small business concern” to include the concept of dominance on a national basis. 13 CFR § 121.102(b).

²⁴ 13 CFR § 121.201, NAICS code 517110.

²⁵ *See Trends in Telephone Service* at tbl.5.3.

²⁶ *See id.*

1,500 or fewer employees.²⁷ In addition, 72 carriers have reported that they are Other Local Service Providers.²⁸ Of the 72, seventy have 1,500 or fewer employees and two have more than 1,500 employees.²⁹ Consequently, the Commission estimates that most providers of competitive local exchange service, competitive access providers, Shared-Tenant Service Providers, and other local service providers are small entities.

13. *Interexchange Carriers.* Neither the Commission nor the SBA has developed a small business size standard specifically for providers of interexchange services. The appropriate size standard under SBA rules is for the category Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.³⁰ According to Commission data,³¹ 359 carriers have reported that they are engaged in the provision of interexchange service. Of these, an estimated 317 have 1,500 or fewer employees and 42 have more than 1,500 employees. Consequently, the Commission estimates that the majority of IXC are small entities.

14. *Other Toll Carriers.* Neither the Commission nor the SBA has developed a size standard for small businesses specifically applicable to Other Toll Carriers. This category includes toll carriers that do not fall within the categories of interexchange carriers, operator service providers, prepaid calling card providers, satellite service carriers, or toll resellers. The closest applicable size standard under SBA rules is for Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.³² According to Commission data, 284 companies reported that their primary telecommunications service activity was the provision of other toll carriage.³³ Of these, an estimated 279 have 1,500 or fewer employees and five have more than 1,500 employees.³⁴ Consequently, the Commission estimates that most Other Toll Carriers are small entities.

2. Wireless Providers

15. *Wireless Telecommunications Carriers (except Satellite).* Since 2007, the Census Bureau has placed wireless firms within this new, broad, economic census category.³⁵ The Census Bureau defines this industry as comprising “establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular phone services, paging services, wireless Internet access, and wireless video services.”³⁶ Under the present and prior categories,

²⁷ See *id.*

²⁸ See *id.*

²⁹ See *id.*

³⁰ 13 CFR § 121.201, NAICS code 517110.

³¹ *Trends in Telephone Service* at tbl. 5.3.

³² See 13 CFR § 121.201, NAICS code 517110.

³³ See *Trends in Telephone Service* at tbl. 5.3.

³⁴ See *id.*

³⁵ U.S. Census Bureau, 2012 NAICS Definitions, 517210 Wireless Telecommunications Categories (Except Satellite), <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517210&search=2012%20NAICS%20Search> (last visited Apr. 28, 2016).

³⁶ U.S. Census Bureau, 2007 NAICS Definitions, 517210 Wireless Telecommunications Carriers (Except Satellite), <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517210&search=2007%20NAICS%20Search> (last visited Apr. 28, 2016).

the SBA has deemed a wireless business to be small if it has 1,500 or fewer employees.³⁷ For the category of Wireless Telecommunications Carriers (except Satellite), census data for 2007 show that there were 1,383 firms that operated for the entire year.³⁸ Of this total, 1,368 firms had employment of 999 or fewer employees.³⁹ Since all firms with fewer than 1,500 employees are considered small, given the total employment in the sector, we estimate that the vast majority of wireless firms are small entities.

3. Cable Service Providers

16. *Cable Companies and Systems (Rate Regulation)*. The Commission has developed its own small business size standards for the purpose of cable rate regulation. Under the Commission's rules, a "small cable company" is one serving 400,000 or fewer subscribers nationwide.⁴⁰ Industry data indicate that there are currently 4,600 active cable systems in the United States.⁴¹ Of this total, all but nine cable operators nationwide are small under the 400,000-subscriber size standard.⁴² In addition, under the Commission's rate regulation rules, a "small system" is a cable system serving 15,000 or fewer subscribers.⁴³ Current Commission records show 4,600 cable systems nationwide.⁴⁴ Of this total, 3,900 cable systems have fewer than 15,000 subscribers, and 700 systems have 15,000 or more subscribers.⁴⁵ Thus, under this standard, we estimate that most cable systems are small entities.

4. All Other Telecommunications

17. *All Other Telecommunications*. The Census Bureau defines this industry as including "establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems. Establishments providing Internet services or Voice over Internet Protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry."⁴⁶ The SBA has developed a small business size standard for this category; that size standard is \$32.5 million or less in average annual receipts.⁴⁷ According to Census Bureau data for

³⁷ 13 CFR. § 121.201, NAICS code 517210 (2012 NAICS). The now-superseded, pre-2007 CFR citations were 13 CFR § 121.201, NAICS codes 517211 and 517212 (referring to the 2002 NAICS).

³⁸ U.S. Census Bureau, Subject Series: Information, Table 5, "Establishment and Firm Size: Employment Size of Firms for the United States: 2007 NAICS Code 517210," http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ5&prodType=table (last visited Apr. 28, 2016).

³⁹ *See id.*

⁴⁰ 47 CFR § 76.901(e).

⁴¹ Data contained in the Commission's Cable Operations and Licensing System (COALS), August 15, 2015 (COALS Data). *See* <https://apps.fcc.gov/coals/>.

⁴² *See* SNL KAGAN at <https://snl.cominteractiveXtopcableMSOs.aspx?period2015Q1&sortcol=subscribersbasic&sortorder=desc>.

⁴³ 47 CFR § 76.901(c).

⁴⁴ COALS Data.

⁴⁵ *Id.*

⁴⁶ U.S. Census Bureau, 2012 NAICS Definitions, 517919 All Other Telecommunications, <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?>

⁴⁷ *See* 13 CFR § 121.201, NAICS code 517919.

2007, there were 2,383 firms in this category that operated for the entire year.⁴⁸ Of these, 2,346 firms had annual receipts of under \$25 million.⁴⁹ Consequently, we estimate that the majority of these firms are small entities.

18. *TRS Providers.* These services can be included within the broad economic category of All Other Telecommunications. Seven providers currently receive compensation from the Interstate Telecommunications Relay Service (TRS) Fund for providing TRS: ASL Services Holdings, LLC; CSDVRS, LLC; Convo Communications, LLC; Hamilton Relay, Inc.; Purple Communications, Inc.; Sprint Communications, Inc. (Sprint); and Sorenson Communications, Inc. However, because Sprint's primary business fits within the definition of Wireless Telecommunications Carriers (except Satellite), Sprint is not considered to be within the category of All Other Telecommunications. As a result, six of the authorized TRS providers can be included within the broad economic census category of All Other Telecommunications. The SBA has developed a small business size standard for All Other Telecommunications, which consists of all such firms with gross annual receipts of \$32.5 million or less.⁵⁰ Under this category and the associated small business size standard, approximately half of the TRS providers can be considered small.

5. Equipment Manufacturers

a. Manufacturers of Equipment to Provide VoIP

19. Entities manufacturing equipment used to provide interconnected Voice Over Internet Protocol (VoIP), non-interconnected VoIP, or both are generally found in one of two Census Bureau categories, "Electronic Computer Manufacturing"⁵¹ or "Telephone Apparatus Manufacturing."⁵² While the Commission recognizes that the manufacturers of equipment used to provide interconnected VoIP will continue to be regulated under section 255 rather than under section 716,⁵³ we include here an analysis of the possible significant economic impact of our proposed rules on manufacturers of equipment used to provide both interconnected and non-interconnected VoIP because it was not possible to separate available data on these two manufacturing categories for VoIP equipment. In light of this situation, our estimates below are in all likelihood overstating the number of small entities that manufacture equipment used to provide interconnected VoIP and which are subject to our proposed section 716 rules. However, in the absence of more accurate data, we present these figures to provide as thorough an analysis of the impact on small entities as we can at this time, with the understanding that we will modify our analysis as more accurate data becomes available in this proceeding.

20. *Electronic Computer Manufacturing.* The Census Bureau defines this category to include "... establishments primarily engaged in manufacturing and/or assembling electronic computers, such as mainframes, personal computers, workstations, laptops, and computer servers. Computers can be analog, digital, or hybrid. Digital computers, the most common type, are devices that do all of the following: (1)

⁴⁸ U.S. Census Bureau, 2007 Economic Census, Information: Subject Series – Establishment and Firm Size: Table 4, "Receipts Size of Firms for the United States: 2007, NAICS Code 517919," http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ4&prodType=table (last visited Apr. 28, 2016).

⁴⁹ *See id.*

⁵⁰ *See* 13 CFR § 121.201, NAICS Code 517919.

⁵¹ U.S. Census Bureau, 2007 NAICS Definitions, "334111 Electronic Computer Manufacturing"; <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334111&search=2007%20NAICS%20Search>.

⁵² U.S. Census Bureau, 2007 NAICS Definitions, "334210 Telephone Apparatus Manufacturing"; <http://www.census.gov/naics/2007/def/ND334210.HTM>.

⁵³ *See* 47 U.S.C. § 617(f) (stating that the requirements of section 716 shall not apply to any equipment or services, including interconnected VoIP service, subject to section 255 as of the date of enactment of section 716 and such equipment and services shall instead remain subject to the requirements of section 255); *see also* 47 CFR § 14.2(c).

store the processing program or programs and the data immediately necessary for the execution of the program; (2) can be freely programmed in accordance with the requirements of the user; (3) perform arithmetical computations specified by the user; and (4) execute, without human intervention, a processing program that requires the computer to modify its execution by logical decision during the processing run. Analog computers are capable of simulating mathematical models and contain at least analog, control, and processing elements. The manufacture of computers includes the assembly of or integration of processors, co-processors, memory, storage, and input/output devices into a user-programmable final product. The manufacture of computers includes the assembly or integration of processors, coprocessors, memory, storage, and input/output devices into a user-programmable final product.”⁵⁴ In this category, the SBA has deemed an electronic computer manufacturing business to be small if it has fewer than 1,000 employees.⁵⁵ According to Census Bureau data for 2007, there were 425 establishments in this category that operated that year. Of these, 419 had less 1,000 employees.⁵⁶ Consequently, we estimate that the majority of these establishments are small entities.

21. *Telephone Apparatus Manufacturing.* The Census Bureau defines this category to comprise “establishments primarily engaged in manufacturing wire telephone and data communications equipment.” The Census Bureau further states: “These products may be stand alone or board-level components of a larger system. Examples of products made by these establishments are central office switching equipment, cordless telephones (except cellular), PBX equipment, telephones, telephone answering machines, LAN modems, multi-user modems, and other data communications equipment, such as bridges, routers, and gateways.”⁵⁷

22. In this category, the SBA has deemed a telephone apparatus manufacturing business to be small if it has fewer than 1,000 employees.⁵⁸ For this category of manufacturers, Census data for 2007 show that there were 398 such establishments that operated that year.⁵⁹ Of those 398 establishments, 393 (approximately 99%) had fewer than 1,000 employees and, thus, would be deemed small under the applicable SBA size standard.⁶⁰ Accordingly, the majority of establishments in this category can be considered small under that standard. On this basis, the Commission continues to estimate that approximately 99% or more of the manufacturers of equipment used to provide VoIP in this category are small entities.

23. *Computer Terminal Manufacturing.* This category “comprises establishments primarily engaged in manufacturing computer terminals. Computer terminals are input/output devices that connect with a central computer for processing.”⁶¹ The SBA has developed a small business size standard for this

⁵⁴ U.S. Census Bureau, 2007 NAICS Definitions, “334111 Electronic Computer Manufacturing”; <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334111&search=2007%20NAICS%20Search>.

⁵⁵ 13 CFR § 121.201, NAICS Code 334111.

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http://factfindercensus.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_31SG3&prodType=table, (last visited Oct. 28, 2015).

⁵⁷ U.S. Census Bureau, North American Industry Classification System, Definition of NAICS Code 334210. *See* <http://www.census.gov/cgi-bin/sssd/naics/naicsrch>.

⁵⁸ 13 CFR § 121.201, NAICS Code 334210.

⁵⁹ U.S. Census Bureau, American FactFinder, 2007 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334111 (rel. Nov. 16, 2010); <http://factfinder.census.gov>.

⁶⁰ *Id.*

⁶¹ U.S. Census Bureau, 2007 NAICS Definitions, 334113 Computer Terminal Manufacturing, <[http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334113&search=2007 NAICS Search](http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334113&search=2007%20NAICS%20Search)> (last visited Oct. 28, 2015). As of December 2, 2014, the category “Computer Terminal Manufacturing, NAICS Code 334113, was superseded by a new NAICS Code classification, “Computer Terminal and Other Computer Peripheral

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category of manufacturing; that size standard is 1,000 or fewer employees.⁶² According to Census Bureau data for 2007, there were 43 establishments in this category that operated that year. Of this total, all 43 had less than 500 employees.⁶³ Consequently, we estimate that the majority of these establishments are small entities.

b. Manufacturers of Equipment to Provide Electronic Messaging

24. Entities that manufacture equipment (other than software) used to provide electronic messaging services are generally found in one of three Census Bureau categories: “Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing,” “Electronic Computer Manufacturing,” or “Telephone Apparatus Manufacturing.”

25. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* The Census Bureau defines this industry as comprising “establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by the establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”⁶⁴ The SBA has established a size standard for this industry that classifies any business in this industry as small if it has 750 or fewer employees.⁶⁵ Census Bureau data for 2007 indicate that in that year 939 such businesses operated. Of that number, 912 businesses operated with less than 500 employees.⁶⁶ Based on this data, we conclude that a majority of businesses in this industry are small by the SBA standard.

26. *Electronic Computer Manufacturing.* This category “comprises establishments primarily engaged in manufacturing and/or assembling electronic computers, such as mainframes, personal computers, workstations, laptops, and computer servers. Computers can be analog, digital, or hybrid. Digital computers, the most common type, are devices that do all of the following: (1) store the processing program or programs and the data immediately necessary for the execution of the program; (2) can be freely programmed in accordance with the requirements of the user; (3) perform arithmetical computations specified by the user; and (4) execute, without human intervention, a processing program that requires the computer to modify its execution by logical decision during the processing run. Analog computers are capable of simulating mathematical models and contain at least analog, control, and programming elements. The manufacture of computers includes the assembly or integration of processors, coprocessors, memory, storage, and input/output devices into a user-programmable final product.”⁶⁷ The SBA has developed a small business size standard for this category of manufacturing; that size standard is

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Manufacturing,” NAICS Code 334118. See 13 CFR § 121.201. However, since this rulemaking concerns only computer terminal manufacturing, only national data from the 2007 Census has been used to provide information about that industry. The SBA size standard, defining a firm within that industry as small if it has 1,000 or less employees, remained unchanged when NAICS Code 334113 was changed to NAICS Code 334118.

⁶² 13 CFR § 121.201, NAICS code 334113.

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http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_31SG3&prodType=table (last visited Oct. 28, 2015).

⁶⁴ U.S. Census Bureau, North American Industry Classification System, Definition of NAICS Code 334220. See <http://www.census.gov/cgi-bin/sssd/naics/naicsrch> (last visited Oct. 28, 2015).

⁶⁵ 13 CFR § 121.201, NAICS Code 334220.

⁶⁶ *Id.*

⁶⁷ U.S. Census Bureau, North American Industry Classification System, Definition of NAICS Code 334111. See <http://www.census.gov/cgi-bin/sssd/naics/naicsrch> (last visited Oct. 28, 2015).

1,000 or fewer employees.⁶⁸ According to Census Bureau data for 2007, there were 425 establishments in this category that operated that year. Of these, 419 had less 1,000 employees.⁶⁹ Consequently, we estimate that the majority of these establishments are small entities.

c. Manufacturers of Equipment to Provide Interoperable Video Conferencing Services

27. *Other Communications Equipment Manufacturing.* Entities that manufacture equipment used to provide interoperable and other video conferencing services are generally found in the Census Bureau category: “Other Communications Equipment Manufacturing.” The Census Bureau defines this category to include: “...establishments primarily engaged in manufacturing communications equipment (except telephone apparatus, and radio and television broadcast, and wireless communications equipment).”⁷⁰ In this category, the SBA has deemed a business manufacturing other communications equipment to be small if it has fewer than 750 employees.⁷¹ For this category of manufacturers, Census data for 2007 show that there were 452 such establishments that operated that year.⁷² Of those 452 establishments, all 452 (100 %) had fewer than 1,000 employees and 448 of those 452 (approximately 99%) had fewer than 500 employees.⁷³ Between these two figures, the Commission estimates that about 450 establishments (approximately 99.6%) had fewer than 750 employees and, thus, would be considered small under the applicable SBA size standard. Accordingly, the majority of establishments in this category can be considered small under that standard. On this basis, Commission estimates that approximately 99.6% or more of the manufacturers of equipment used to provide interoperable and other video conferencing services are small entities.

d. Manufacturers of Software

28. Entities that publish software used to provide interconnected VoIP, non-interconnected VoIP, electronic messaging services, or interoperable video conferencing services are found in the Census Bureau category “Software Publishers.”

29. *Software Publishers.* This category “comprises establishments primarily engaged in computer software publishing or publishing and reproduction. This industry comprises establishments primarily engaged in computer software publishing or publishing and reproduction. Establishments in this industry carry out operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software purchasers. These establishments may design, develop, and publish, or publish only.”⁷⁴ The SBA has developed a small business size standard for software publishers, which consists of all such firms with gross annual receipts of \$38.5 million or less.⁷⁵ For this category, census data for 2007 show that there were 5,313 firms that operated for the entire year. Of those firms, a total of 4,956 had gross annual

⁶⁸ 13 CFR § 121.201, NAICS Code 334111.

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http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_31SG3&prodType=table, (last visited Oct. 28, 2015).

⁷⁰ U.S. Census Bureau, 2007 NAICS Definitions, “334290 Other communications equipment manufacturing;” <http://www.census.gov/econ/industry/def/d334290.htm>.

⁷¹ 13 CFR § 121.201, NAICS Code 334220.

⁷² U.S. Census Bureau, American FactFinder, 2007 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334290 (rel. Nov. 16, 2010); <http://factfinder.census.gov>.

⁷³ *Id.*

⁷⁴ U.S. Census Bureau, North American Industry Classification System, Definition of NAICS Code 511210. *See* <http://www.census.gov/cgi-bin/sssd/naics/naiaacsrch> (last visited Oct. 28, 2015).

⁷⁵ *See* 13 CFR § 121.201, NAICS Code 511210.

receipts less than \$25 million.⁷⁶ Thus, a majority of software publishers potentially affected by the proposals in the *Notice* can be considered small.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

30. Although the *Notice* proposes to require support for RTT in lieu of TTY technologies in all IP-based wireless services, and seeks comment on whether to require the implementation of RTT in IP-based wireline networks, the *Notice*, for the most part, does not propose or seek comment on new or modified reporting, recordkeeping, and other compliance requirements. However, the *Notice* seeks comment on the best means of informing the public, including businesses, governmental agencies, and individuals with disabilities who will be directly affected by the transition, about the migration from TTY technology to RTT and the mechanics of how this technology will work.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

31. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.”⁷⁷

32. The *Notice* proposes rules intended to replace obsolete TTY technology with RTT to ensure consumer access to IP services via wireless text-based communications and seeks comment on whether to do the same for wireline text-based communications. RTT technology may simplify the accessibility obligations of small businesses, because RTT allows calls to be made using the built-in functionality of a wide selection of off-the shelf devices, and thus may alleviate the high costs and challenges faced by small businesses and customers in locating dedicated external assistive devices, such as specialty phones. Additionally, with the proposal to phase out TTY technology, the burden is reduced for small entities and emergency call centers to maintain such technology in the long term.

33. The Commission proposes an implementation deadline for RTT technology of December 31, 2017, for the wireless providers that offer nationwide service, and manufacturers of end user devices authorized for their services, and to reduce the burden and relieve possible adverse economic impact on small entities, seeks comment on an appropriate deadline for all other wireless providers and equipment manufacturers. In addition, the Commission seeks comment from providers of wireline VoIP services, including small entities, on the appropriate timing for incorporation of RTT capabilities into wireline VoIP services and end user devices.

34. In the *Notice*, while the Commission proposes a “safe harbor” technical standard to ensure RTT interoperability, it proposes to allow service providers and carriers to use alternative protocols for RTT, provided that they are interoperable. Further, throughout the item, flexibility is integrated in the proposed requirements in order to take into consideration the limitations of small businesses. For instance, the proposed requirement that equipment manufacturers supporting RTT offer certain functions as native features on VoIP-enabled terminal devices that can send, receive, and display text is subject to the condition that such features be achievable. As such, the Commission anticipates that

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http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ4&prodT ype=table (last visited Oct. 28, 2015).

⁷⁷ See 5 U.S.C. § 603(c)(1)-(4).

these proposals will have little to no impact on small entities that are eligible to claim that the requirement is not achievable.

35. The Commission believes that any requirement for service providers and manufacturers to implement outreach and notification to consumers about the transition from TTY to RTT will not require significant additional resources for small entities, and in any event would be outweighed by the need for consumers to understand the changes in the services and associated equipment that they will be receiving.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Commission's Proposals

36. None.

**STATEMENT OF
CHAIRMAN THOMAS E. WHEELER**

Re: *Transition from TTY to Real-Time Text Technology*, CG Docket No. 16-145; *Petition for Rulemaking to Update the Commission’s Rules for Access to Support the Transition from TTY to Real-Time Text Technology*, and *Petition for Waiver of Rules Requiring Support of TTY Technology*, GN Docket No. 15-178, Notice of Proposed Rulemaking.

For the past three years the Commission’s agenda has been guided by a set of over-arching goals that include ensuring accessibility, promoting public safety, accelerating the transition to IP-based technologies, updating outdated regulations, and encouraging market-driven solutions. Today’s item to promote real-time text (RTT) checks every one of these boxes.

In the 20th century, the text telephone, or TTY, was a breakthrough for communications accessibility. For the past 50 years, people who are deaf, hard-of-hearing, speech-disabled and deaf-blind have been using TTYs to communicate by text over the phone. But TTY use has been declining steadily over the past decade. Consumer and industry stakeholders agree that this technology is outdated and slow. It was developed for use on the legacy public switched telephone network and doesn’t work well in the IP environment. There are numerous technical challenges associated with supporting TTY transmissions over IP networks, including susceptibility to packet loss, distortion, and transmission errors, which degrade the quality of these communications.

If TTYs don’t work in an IP-environment, how can we make sure that the population that uses this technology can continue to communicate over the telephone in real-time using text in the future? The answer proposed by consumers and industry is real-time text.

RTT allows text to be sent immediately as it is being created. It is unlike SMS or other text messaging services in that it does not require a party to a call to first complete a message and press “send” before the message is transmitted to its recipient. Because it allows text to be immediately conveyed as it is being composed, RTT is the only type of text communication that allows a natural flow of conversation akin to voice telephone calls, enabling call recipients to see what the sender is thinking as his or her thoughts are sent by text.

Real-time text is designed for today’s IP networks, and it is considered to be superior to TTY technology with respect to its speed, latency, reliability, features, and ease of use. RTT can also be built right into off-the-shelf devices, such as smartphones, tablets, and computers that already have the ability to send, receive and display text – unlike TTYs, which are specialized assistive devices that have to be attached to phones via a coupler.

This compatibility with off-the-shelf devices will finally allow the millions of Americans who have been in the TTY “silo” to communicate in real-time over mainstream IP networks – just like the rest of the public. Not only can this reduce third-party relay services, it will enhance the independence and privacy of callers using RTT. When we talk about real-time text we are talking about an opportunity to integrate this population into our communications networks – an opportunity we should seize.

Among the chief benefits of RTT is that it can facilitate emergency communications by providing a reliable means of sending text communications to 911 services in an IP world. It also ensures that incomplete messages will be sent in an emergency, even if the 911 caller is cut off before pressing the “send” key. Bottom line, RTT technology can save lives, and takes a significant step in our migration to next generation 911 services.

Several wireless carriers, including AT&T and Verizon, have already made a commitment to deploy RTT as the successor technology to TTYs. In addition, public interest and industry stakeholders, along with the Commission’s Disability Advisory Committee, have called for Commission action to facilitate RTT deployment.

Clearly, TTY is the past and real-time text is the future. It's time the FCC updated its rules to speed the transition to more accessible communications.

This is just the start of a proceeding, and we are seeking answers to a lot of questions. But our goal is to make sure that millions of Americans with disabilities who rely on text to communicate have accessible and effective telephone access as communications technologies make the transition from circuit-switched to IP-based technologies.

**STATEMENT OF
COMMISSIONER MIGNON L. CLYBURN**

Re: *Transition from TTY to Real-Time Text Technology*, CG Docket No. 16-145; *Petition for Rulemaking to Update the Commission's Rules for Access to Support the Transition from TTY to Real-Time Text Technology*, and *Petition for Waiver of Rules Requiring Support of TTY Technology*, GN Docket No. 15-178, Notice of Proposed Rulemaking.

I strongly support today's *Notice of Proposed Rulemaking*, not only because it is one of those rare gems that enjoys the unmitigated endorsement of a broad base of stakeholders, including consumer organizations, telecommunications providers, and trade associations, but it also significantly furthers my desire to connect communities and promote universal opportunities for all.

There is no question that TTY was a transformative and welcomed technology when it was developed over fifty years ago. Prior to its introduction, those in the deaf and hard of hearing community were unable to truly harness the benefits of communication by telephone. They had to rely on the assistance of family, friends and neighbors to make calls or travel great distances to engage in face-to-face conversations, and too many lacked the means to contact 911 emergency services in times of distress. TTY radically improved the quality of life for those who were separated from the rest of society when it came to Alexander Graham Bell's great invention.

Like so many other inventions, this technology has evolved, making TTY obsolete in today's IP-based communications environment. So we officially and enthusiastically embrace a more modern solution that takes advantage of the technological innovations and services developed over the last five decades, and better enables those consumers who are deaf, hard of hearing, deaf-blind, or speech disabled to conduct business and stay connected with their friends, family and emergency services.

The benefits of real-time text are myriad and notable. Designed for IP networks, it is faster, more reliable and easier to use. It facilitates real-time interaction and enables a greater range of possibilities for communication, including the seamless integration of voice and text, the ability to communicate in languages other than English, and most importantly, the ability to contact 911 emergency services in real time without having to press send to initiate the dispatch of assistance.

Available on smartphones, tablets or any other Internet-connected device that has a keyboard and a screen, real-time text, unlike TTY, does not require the procurement of a separate device. It is a highly mobile accessibility solution that provides *all* consumers a 21st century means of keeping in touch and seamlessly connects users to their community.

But TTY, still the only technology of its type used on the PSTN, remains a vital lifeline for those who rely on it, including senior citizens, rural residents and those who do not have or cannot afford high speed Internet access. Because of this, the *Notice* correctly proposes a backward compatibility requirement to ensure non-interrupted access for those consumers who continue to depend on TTY. The *Notice* also seeks comment on whether it would be particularly beneficial for ICS providers to offer real-time text to inmates. I specifically requested the inclusion of this line of inquiry because I am ever mindful of the unique challenges deaf and hard of hearing inmates face connecting with loved ones outside of prison walls.

The Consumer and Governmental Affairs Bureau, once again, should be applauded for its leadership and stellar work on this item. We are on the path to providing consumers who are deaf, hard of hearing, deaf-blind, or speech disabled greater privacy and independence, more portable and less expensive options, and the ability to take advantage of novel communications services as they emerge. That is no small feat – and the hard work of everyone involved to get to this point is commendable.

**STATEMENT OF
COMMISSIONER JESSICA ROSENWORCEL**

Re: *Transition from TTY to Real-Time Text Technology*, CG Docket No. 16-145; *Petition for Rulemaking to Update the Commission's Rules for Access to Support the Transition from TTY to Real-Time Text Technology*, and *Petition for Waiver of Rules Requiring Support of TTY Technology*, GN Docket No. 15-178, Notice of Proposed Rulemaking.

Earlier this year, two University of Washington college students on a \$100 budget designed a pair of gloves. Now these gloves—still just a prototype—were about function, not fashion. Armed with wireless sensors, they can translate sign language into text and speech in real time. This is exciting stuff. It allows the deaf and speech disabled to communicate in sign language with those who do not sign. Earlier this month these students were awarded the Lemelson-MIT Student Prize to further develop their gloves—which currently recognize only a limited set of signs. But on a \$100 budget, hey, you can understand.

Think about this development—and then think about text telephone technology, or TTY. TTY is a relic. TTY was first widely deployed in the 1970's to help deaf, hard-of-hearing, and speech-disabled individuals send and receive person-to-person text over telephone lines. There was a time when it was revolutionary—but that date has long since passed. The machines are bulky and cumbersome devices, with none of the sleek features of today's smartphones. Moreover, TTY is ill-suited for transmission over new IP networks. Technology is marching on—and gloves may even be leading the way. But no matter where we go, it is clear that it is time to move beyond TTY systems and embrace the future.

So today we adopt a rulemaking to improve text-to-text communications options for those who are deaf, hard-of-hearing, deaf-blind, and speech disabled. We seek comment on the possibilities of Real-Time Text. Real-Time Text offers immediate transmission of text and allows for both parties to type at once—a definite improvement over traditional TTY. Even better, this technology is generally available on off-the-shelf devices making larger market scale and more innovation more possible. So goodbye to 1970's-era TTY hardware—and hello to communications technology that reflects the digital age.

I look forward to the record that develops and thank both the carriers and the disabilities community who have pressed the case for Real-Time Text. Thank you also to the Consumer and Governmental Affairs Bureau and Disability Rights Office for your willingness to embrace what is new and move disability access policies forward.

**STATEMENT OF
COMMISSIONER AJIT PAI**

Re: *Transition from TTY to Real-Time Text Technology*, CG Docket No. 16-145; *Petition for Rulemaking to Update the Commission’s Rules for Access to Support the Transition from TTY to Real-Time Text Technology*, and *Petition for Waiver of Rules Requiring Support of TTY Technology*, GN Docket No. 15-178, Notice of Proposed Rulemaking.

Last week, I had the privilege of visiting Gallaudet University. There, I met with Dr. Christian Vogler, the Director of Gallaudet’s Technology Access Program, as well as Research Associate Paula Tucker and Senior Research Engineer Norman Williams. They educated me about the innovative work being done to ensure that communications technologies meet the needs of people with hearing and speech disabilities.

In particular, Dr. Vogler described the research his team has been doing on how real-time text (RTT) is improving the lives of people with disabilities. We even saw some of that technology for ourselves when Dr. Vogler and I had a conversation using RTT. One real advantage of RTT is that text is transmitted instantaneously. Unlike TTY, SMS, or other legacy messaging services, you don’t need to type out an entire message with RTT and then press “send” or use an intermediary to communicate. Dr. Vogler explained that this allows for a more natural conversation, since you can see and anticipate what the other person is trying to communicate. It also lets you communicate much more quickly and efficiently than you can with those other messaging services. This is particularly important when it comes to public safety, since 911 exchanges that would take minutes using a legacy technology can be completed in seconds using RTT.

RTT has other benefits as well. It is based on the Internet Protocol, or IP, which means it is a highly adaptable digital technology. It is interoperable across networks and devices, which means that consumers do not need to find or, in some cases, purchase specialized equipment. And it is far more reliable than legacy offerings, which means those who use it can have comfort that it’ll work in a moment of need.

Based on my meeting at Gallaudet, the Technology Access Program’s meticulous December 2015 technical report on RTT, and other record evidence, I believe RTT represents a significant step forward over legacy technologies, such as TTY.

But as is too often the case, regulation has not kept pace with technological change. An issue I’ve stressed during my time at the Commission is the need to embrace the IP Transition—to update the FCC’s regulations to recognize and encourage the migration from legacy technologies to new ones.

That need is acute in this context. For despite the many benefits of RTT, our rules still require carriers to support antiquated TTY technology. This harms consumers who want to use advanced IP-based offerings, such as Wi-Fi calling or Voice over LTE (VoLTE). That’s because TTY does not work—or does not work very well—on IP-based networks. As a result, our TTY requirement has slowed down the deployment of next-generation IP-based offerings. Thankfully, today’s *Notice of Proposed Rulemaking (Notice)* proposes to eliminate the TTY requirement, which will bring us closer to an all-IP world. So the *Notice* has my support, and I will be voting to approve.

I am also pleased that the FCC takes a far different approach to text-to-911 than it did just a short while ago. In 2014, I dissented from the Commission’s decision to impose a text-to-911 requirement based on fading SMS technology. I noted that “SMS has inherent limitations that, for 911 purposes,

render it inappropriate for use as anything other than an interim, stop-gap measure.”¹ I pointed out that “SMS messages can be delayed, lost, or delivered out of sequence.”² I also pointed out that adopting an SMS-based requirement would take us ““off the path to NG911”” by diverting resources that could otherwise be devoted to IP-based offerings, including reliable, real-time text.³ I thus urged my colleagues to focus instead on “allow[ing] all consumers, including those with speech or hearing disabilities, to have reliable, real-time text communication with emergency responders.”⁴

My views did not carry the day back then, but I’m glad that they are reflected in this rulemaking. The *Notice* acknowledges what it describes as “major concerns” with SMS-based text messaging. It tentatively concludes that RTT will be a more reliable solution for emergency communications. It also recognizes the view that RTT can have a broader and beneficial impact on the NG911 transition. We are finally moving in the right direction on these issues, and I hope that we’re able to finish our work with dispatch for the benefit of all Americans with hearing and speech disabilities.

¹ *Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications*, PS Docket No. 11-153, Second Report and Order and Third Further Notice of Proposed Rulemaking, 29 FCC Rcd 9846, 9945 (2014) (Dissenting Statement of Commissioner Ajit Pai).

² *Id.*

³ *Id.* at 9946.

⁴ *Id.* at 9945.

**STATEMENT OF
COMMISSIONER MICHAEL P. O'RIELLY
APPROVING IN PART, DISSENTING IN PART**

Re: *Transition from TTY to Real-Time Text Technology*, CG Docket No. 16-145; *Petition for Rulemaking to Update the Commission's Rules for Access to Support the Transition from TTY to Real-Time Text Technology*, and *Petition for Waiver of Rules Requiring Support of TTY Technology*, GN Docket No. 15-178, Notice of Proposed Rulemaking.

The time is long past to dispose of the antiquated 1970s TTY technology. This outdated system has been largely abandoned by people with disabilities in favor of new, commercially available solutions tailored to a world of mobile devices, the Internet and applications. One study shows that only nine out of 49 participants, or 18 percent,¹ regularly use TTY to meet their communications needs, and this seems exceptionally overstating its usefulness given the plethora of other communication technologies. Moreover, this number will continue to decline, because TTY is not truly compatible with wireless IP networks. For this reason, I fully support a proceeding to eliminate the Commission's obsolete wireless TTY requirements.

At the same time, I have serious concerns about the proposal to implement rules to replace TTY with Real-Time Text (RTT) requirements. The same study I just referenced, which the Commission cites in the underlying item, found that 98 percent of the participants regularly communicate using standard SMS text messaging, 69.4 percent use other instant messaging services, and 55.1 percent take advantage of video conferencing applications, among others.² Americans with hearing loss are already huge adopters of existing alternatives that are exceptionally popular among those without hearing loss. In sum, the private sector has created technologies – better known as apps – preferred by people with disabilities and that far exceed the functionality of government-mandated TTY – all without a single regulation. Instead of allowing marketplace solutions to continue to improve the communications landscape for the disabled, the Commission is going to mandate the functionality and design of RTT and require that all mobile devices are enabled with RTT, a technology that has yet to be deployed. While this technology shows promise, regulation is problematic.

Regulation seems even more dubious when large providers have committed to developing this technology – which is of interest to people with and without disabilities – and making it interoperable. But this is just not good enough for some people here at the Commission. Instead, the Commission is prepared to require that wireless providers and manufacturers make this technology a native function in a device or, at a minimum, provide it as a pre-installed application, without any actual evidence that it is truly needed. RTT could be poised to develop into a fully competitive platform to SMS, instant messaging services and video calling applications, or it may fall flat on its face. The Commission's current proposals would clearly pick a favored technology over these others or those yet to be developed. In my mind, that is the very definition of a violation of technological neutrality.

The Commission doubles down on its effort to pick technology winners and losers by incorporating a specific standard into our rules as a safe harbor. As I have said many times, I generally oppose technology mandates, even under the guise of a safe harbor and even if it may be permitted (not required) under the law.

To make matters worse, the Commission is asking questions that could dictate the functions and

¹ Trace Center, University of Wisconsin-Madison, Omnitor & Gallaudet University Technology Access Program, *Real-time text Interoperability, Status and Field Trial*, at 24 (Dec. 17, 2015), available at <http://apps.fcc.gov/ecfs/document/view?id=60001388386>.

² *Id.* at 26.

development of RTT. For instance, there are proposals and questions regarding character and text capabilities; quality standards for latency and error rates; abilities to perform simultaneous voice, text and video functions; whether standard interfaces are needed to promote device portability; and should RTT characters, such as emoji, be converted into text to promote backwards compatibility to TTY. This is the Commission, in effect, selecting design specifications for software products.

Many of these ideas seem to exceed the standard of providing functional equivalency for voice communications. In fact, they seem to focus on establishing a principle that functional equivalency means a quality that is better than what is offered to non-disabled persons, a definition and concept not found in the letter or spirit of the law. Additionally, setting standards and mandating technologies appears to go beyond ensuring that equipment and services are accessible and usable by individuals with disabilities. Therefore, I am not convinced of our statutory authority for many of the concepts in this notice. I look forward to engaging with stakeholders on this particular issue.

I am also skeptical that the benefits of such regulation would exceed the costs. And, the costs could expand well beyond the wireless technology mandate. The item also seeks input about equipment subsidies, consumer outreach to ensure that all Americans know about the capabilities of RTT and the transition away from TTY, and extending RTT to wireline systems. On the cost front, if RTT develops as some people expect, maybe we should have taken the time to inquire as to whether TRS funding can be reduced and the program eliminated either in whole or in part. What a novel concept.

Let me be clear, people with disabilities have certain legal protections intended to ensure that they benefit from modern technologies. The problem becomes determining the best means to achieve this goal. In today's world of text, IM and videoconferencing apps, I cannot support the broad conclusory statements that the proposals contained in the item are necessary to ensure that people with disabilities continue to have effective access to wireless communications or that RTT is the only technology that is functionally equivalent to voice. Nor am I convinced that RTT is necessary for disabled persons because SMS is an insufficient means to contact emergency services – an ironic argument when the Commission implemented text-to-911 based on current SMS technologies. And it's why I requested that these statements be converted into questions and that neutral comment be sought on many of the ideas raised in this notice. My request was rejected.

Simply put, I want to ensure that private sector investment and innovation continue to provide communications solutions that make lives easier not only for those with disabilities but for all Americans. This is exactly how we arrived at the functionalities that the disability community enjoys today; many of which will be integrated into RTT. By providing preferential treatment and mandated implementation of a particular commercially-available technology, we will hinder competition, future investment, and the next generation of texting or accessibility offerings. At a minimum, history is bound to repeat itself – RTT or any other mandated service will be surpassed over time, but our rules and the technologies that industry are required to support will remain ingrained in a bygone era, far outliving their usefulness. For this reason, I must dissent in part.