

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)	
)	
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
)	

To: Secretary, FCC
For: The Commission

COMMENTS OF HAMILTON RELAY, INC.

Hamilton Relay, Inc. ("Hamilton") is pleased to submit these comments concerning the *Notice of Proposed Rulemaking* ("*NPRM*") which proposes rule changes to facilitate a transition from text telephone ("TTY") technology to real-time text ("RTT") technology over Internet Protocol ("IP") enabled networks and services.¹

As a provider of Telecommunications Relay Services ("TRS") to individuals who are deaf, deaf-blind, hard of hearing and speech disabled, Hamilton believes that RTT is an important development, and is excited about the potential for RTT to improve technology access to individuals who rely on TRS and to serve as an augmentation of existing TRS technologies.

As the *NPRM* acknowledges, however, backward compatibility is a key component of this

¹ *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, FCC 16-53 (rel. Apr. 29, 2016) ("NPRM").*

proceeding.² In these comments, Hamilton describes ways in which TRS providers can best serve as gateways between RTT and TTY for backward compatibility purposes.

As the Commission transitions industry and consumers to RTT, it must be mindful of the need to protect individuals who, through necessity or otherwise, continue to rely on TTY during the transition. RTT is not a realistic option for everyone, including standard wireline and wireless telephone users who are unable or do not want to type their communications. To this end, as the *NPRM* acknowledges, remaining TTY users should not be disenfranchised by the adoption of RTT. For this reason, Hamilton believes that the RTT transition and backward compatibility requirements should last for as long as it takes all TTY users to make the transition, i.e., until the Public Switched Telephone Network (“PSTN”) sunsets.

In addition, Hamilton believes that any rules authorizing RTT may need to address the jurisdiction of calls that make use of RTT and relevant federal law that provides for the continuing jurisdiction of state TRS programs over intrastate forms of TRS. Finally, Hamilton believes that most if not all TRS-specific issues related to RTT can and should be resolved in this proceeding, without the need for a separate TRS-RTT proceeding.

I. The Commission Must Ensure RTT Backward Compatibility with TTY, and Should Allow TRS Providers to Serve as Gateways

In the *NPRM*, the Commission asked whether it is feasible to use “gateways and [the proposed RTT standard] RFC 4103 to achieve backward compatibility [with TTY], 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.”³

² *NPRM*, ¶¶ 60-66; *see also* Separate Statement of Commissioner Clyburn, at 75.

³ *NPRM* ¶ 62.

There are a number of complicated issues regarding the use of gateways to achieve backward compatibility. Hamilton wishes to highlight the potential limitations with using gateways implemented by individual wireless IP carriers, and instead recommends that the gateway function could be more efficiently performed by TRS providers rather than individual wireless IP providers.⁴ As such, Hamilton is prepared to incorporate RTT using the RFC 4103 standard, which Hamilton supports as the standard for RTT, including accuracy criteria proposed in the *NPRM*.

Under the existing statutory framework, carriers may elect to provide TRS themselves, or they may provide TRS through a designee or competitively selected vendor.⁵ The vast majority of carriers do not provide TRS directly but instead rely on third party vendors. Hamilton believes that the use of TRS providers to serve as gateway providers between TTY and RTT for wireless and wireline IP carriers, until the sunset of TTY, would be a natural extension of this statutory framework. Wireless and wireline IP providers would avoid significant costs in building and maintaining their own gateways, the costs for which would inevitably be passed on to consumers. Moreover, there are funding mechanisms in place – the Interstate TRS Fund or state-based Intrastate TRS Funds – for the buildout of gateways by TRS providers. This solution would be a benefit to wireless and wireline IP providers and their consumers, and would result in a more rapid and cost-effective deployment of the necessary gateways. While wireless and wireline IP providers should be free to construct their own gateways should they choose to do so,

⁴ Having TRS providers serve as gateways to wireless IP providers can easily be extended to having TRS providers serve as gateways to wireline IP providers, to the extent that RTT requirements are extended to wireline IP providers.

⁵ 47 U.S.C. § 225(c).

the option of using a TRS provider for gateway connections should be made available to those providers.

TRS providers are in many ways best suited to serving as gateway providers between TTY and RTT. In addition to already having expertise in TTY communications and strong ties to the deaf and hard of hearing community, TRS providers would not need to construct a gateway from scratch, because much of the necessary infrastructure and functionality is already in place. This approach would also leverage that existing infrastructure, which is likely superior to most gateways that would be built from scratch with little incentive for robust architecture. In this way, a more reliable and higher quality of service experience for customers would be ensured. Hamilton is prepared to serve as an optional gateway provider, and in doing so Hamilton would support the RFC 4103 standard for RTT. Hamilton's gateway functionality, if authorized, would be capable of compatibility with that standard.⁶ Using TRS providers as gateway providers will solve several issues that will arise between TTY and RTT communications, as discussed below.

A. Conversation Speed

TTY machines are limited to the average speed at which text can be transmitted. This is typically in the range of 2 characters per second.⁷ This is often slower than the typing speed of the typist composing the text to be transported. TTY machines typically will buffer text to allow a typist to continue to type while transmission occurs. Whereas communication between two RTT endpoints have an opportunity to negotiate the maximum speed measured in characters per

⁶ In certain call types, a communications assistant ("CA") may be needed to perform relay functions to ensure functional equivalency.

⁷ RFC 4103 – 9. Congestion Considerations “common mean character transmission rate, during a complete PSTN text telephony session, is around two characters per second.”

second for that specific communication session. If unspecified, the default “speed” is 30 characters per second.⁸ Therefore, there is a significant disparity between Baudot and RTT communication speeds.

One option is to slow down the negotiated speed of RTT communication to match the speed of Baudot communication. The main benefit of this approach is that the RTT user will then have visibility of the speed at which text is received by the TTY user. Another option would allow the RTT endpoint to transmit/receive at the default speed (30 characters per second) and buffer text within the gateway. This approach is problematic in that the RTT endpoint user would have no visibility into the speed at which text is received by the TTY user, and would likely have an inaccurate perception that the text is received at RTT speeds. This can also result in a large block of text coming across the TTY with no way for the TTY user to interrupt. Additionally, this could lead to buffer overflow problems at the gateway, in which RTT text is held until the TTY catches up. These issues contribute to a less than functional equivalence experience for both users.

Negotiating characters per second is an optional aspect of RFC 4103, meaning that RFC 4103 compliant software need not support this feature of the protocol. Character per second negotiation requires support from both the RTT endpoint as well as the RTT gateway in order for the negotiation to be successful. This “optional” aspect, if not implemented, can lead to confusion between the call participants regarding the timing of when content is transmitted and received. And if this optional feature is not implemented in a standard manner by all wireless and wireline providers, communication problems may arise for those continuing to use TTYs to

⁸ See RFC 4103 – 10.1 Registration of MIME Media Type text/t140, which states that “characters per second” is an optional parameter, with the default being 30 characters per second.

communicate.

Potentially TRS providers could implement automated call processing techniques to manage the conversation speed so that character per second negotiation becomes far less of an issue. As a backup, TRS CAs would have the ability to engage either call participant at whatever speed is appropriate for that call leg.

B. Conversation Character Usage, Etiquette and Transliteration

Due to technical limitations in the Baudot protocol (half-duplex, limited character set, slow transmission/reception, garbling), a number of common etiquette practices have evolved among users of TTYs to mitigate the effects of the technical limitations. Among these are:

1. Turn-taking Etiquette
 - a) Use of GA (Go ahead) to signal end of a single user's transmission
 - b) Use of one or more SK (stop keying) to signal the desire to terminate a conversations
 - c) Infrequent use of long sentences or paragraphs, to allow turn-taking
2. Slow transmission/reception Etiquette
 - a) Use of abbreviations or succinct language to convey message (e.g., "PLS" instead of "PLEASE")
 - b) Omission of punctuation symbols or use of character sequences for punctuation (e.g., "Q" instead of "?" to signify a question)
 - c) Uncommon use of backspace character to correct misspellings - use of a sequence of "XXX" followed by the replacement word
3. Garbling Etiquette (Garbling is more common when switching between letters and punctuation/numbers)
 - a) Using mostly letters for conversation (e.g., spelling numbers instead of using the numeric keypad)
 - b) Use of "PLS REPEAT" or "MSG WAS GARBLED"

As RTT to RTT does not currently have widespread usage, it is speculative to assess the nature of RTT to RTT conversation etiquette and symbol usage. It would be a reasonable

assumption that the conversation etiquette would take advantage of the technical capabilities of the protocol, including interrupting, emoji and other expanded symbol usage available within the character set.

The *NPRM* has correctly illustrated the difficulties in transliteration between RTT and TTY.⁹ Transliteration is only a portion of the overall issue, and a subset of the overall conversation etiquette incompatibilities that are likely to limit the effectiveness of using a gateway for transcoding.

With respect to transliteration, there are pros and cons to the various modes of mapping content from one character set to the other. Without sufficient research data available regarding “best practices,” it is likely that any initial transliteration mapping practices would require ongoing changes as more real-world usage data is collected. A fragmented system where each wireless or wireline IP provider maintains their own gateways would require an administrative infrastructure to ensure that gateways remain consistent with each other and compliant with current best practices for transliteration, in order to provide legacy TTY users with a consistent experience.

A better approach is for TRS providers to implement gateway functionality, since there is already administrative infrastructure in place to ensure consistent and compliant transliteration procedures.¹⁰ An oversight committee such as the TRS Advisory Council or the Disability

⁹ *NPRM* ¶63.

¹⁰ For example, if an RTT-enabled user who is willing to type and is familiar with TTY etiquette contacts a TTY user, once the CA has established the correct communications protocol, the CA may release the call so that there is no longer a CA on the call. In contrast, if an RTT-enabled user is unwilling to type or is unfamiliar with TTY etiquette, a CA may be needed for the entire call. A wireless or wireline IP gateway may not even be capable of determining when a CA is necessary in such situations. More examples are provided in the chart below.

Advisory Committee could be tasked with ensuring that functionally equivalent service is provided through TRS provider gateways.

C. Other Considerations

Admittedly, all parties are hoping that TTY usage will continue to decline as newer technologies, including RTT, become available. One effect of the decline of TTY usage is the general scarcity of TTY communication expertise available. TRS providers are likely one of the few remaining types of organizations that have significant daily TTY experience and that have invested ongoing development resources in maintaining support for not only Baudot, but also other federally- and state-mandated communication protocols for PSTN text-based communications, including TurboCode and various ASCII modem protocols.

While Hamilton does not doubt the ability of wireless and/or wireline IP providers to build and maintain RTT to TTY gateways on their individual networks, Hamilton believes that the engineering costs to do so and to continue to maintain those gateways would be better spent on future improvements to their individual networks. If wireless and wireline IP providers are responsible for providing and maintaining their own gateways, there may be questions regarding accountability for ensuring adequate and consistent service levels. In addition, a new structure would have to be created to certify, monitor and resolve issues.

TRS providers have existing mechanisms in place to ensure that users have consistent service availability. Transliteration rules and other “best practices” could be easily incorporated by TRS providers through normal FCC mechanisms that manage all TRS-related practices.

TRS providers also have an existing robust customer resolution infrastructure. All customer complaints are reported to the FCC, and the FCC has a wealth of precedent in working with TRS providers on ensuring that customers receive a high level of service. This type of

oversight has proven to be an effective mechanism to ensure that TRS providers maintain a very high level of service and a commitment to the deaf and hard of hearing customer base. If wireless or wireline IP providers are responsible for customer issue resolution, a similar infrastructure may need to be created, which would raise questions regarding who would make sure that the customers of such gateways (a large percentage of whom are deaf or hard of hearing) would have their issues resolved in a timely fashion.

TRS providers are experts in providing education and outreach services to all types of relay users, including standard telephone users. TRS providers are best suited to continue to perform these functions as it relates to distributing gateway information. Wireless and wireline IP providers could maintain their current outreach requirements as it relates to TRS, for example by making use of billing inserts.

Finally, there are existing funding mechanisms with state and federal TRS funds to ensure that TTY users are not left behind through this transition period. Wireless and wireline IP providers do not need to expend financial and other resources on gateways and pass these unwanted costs on to consumers when these entities are already contributing to intrastate and interstate TRS programs.

The following table illustrates the various combinations of users with different communication needs when one party to a two-party conversation is using an RTT-enabled wireless or wireline IP network, and the other party is using a legacy PSTN network. The table depicts when relay services may need to be enabled:

RTT-enabled wireless or wireline IP User	Legacy PSTN User	Use Relay	Notes
Standard Telephone user	Standard Telephone user	No	Just like a PSTN phone does not receive a text message today, these characters will not be received.
Standard Telephone user	Deaf or hard of hearing	Yes	
Standard Telephone user	Speech Disabled	Yes	
Deaf or hard of hearing	Standard Hearing	Yes	
Deaf or hard of hearing	Deaf or hard of hearing	Yes	This call may or may not require a CA
Deaf or hard of hearing	Speech Disabled	Yes	
Speech Disabled	Standard Telephone user	Yes	
Speech Disabled	Deaf or hard of hearing	Yes	
Speech Disabled	Speech Disabled	Yes	Use TRS instead

The majority of calls between a wireless or wireline IP network and a legacy PSTN network consist of conversations between two people with standard hearing, requiring no assistive technology. If a deaf or hard of hearing user is on a wireless or wireline IP network and participates in a call with a RTT standard telephone user who is able or willing to type, that call would not require relay services.

If TRS providers are to serve as gateways for 911 calls, wireless and wireline IP network providers would need to provide relevant geographic coordinates for the location of the 911 RTT caller in order to ensure that an appropriate PSAP is reached. Once PSAPs are capable of receiving RTT directly, wireless and wireline IP providers can route 911 calls directly to an

appropriate PSAP. If in future a PSAP is no longer capable of receiving a TTY 911 call, the gateway functionality provided by a TRS provider may be necessary.

II. TTY Support and Backward Compatibility Requirements Should Continue Until the PSTN Sunsets

Many individuals who rely on TTY are seniors who may not be comfortable with accessing the Internet, or are individuals who live in areas that lack the broadband access that is necessary to make IP-based technologies a possibility. Or they simply can't afford the cost of broadband access. Hamilton believes that it is important for all of these individuals not to be left behind as the FCC transitions to RTT and other IP-based technologies.¹¹

The *NPRM* offers three different scenarios for ending the backward compatibility requirement: 1) when declining TTY minutes of use reach a certain undetermined threshold; 2) when the transition to nationwide NG911 occurs; and 3) until the PSTN no longer exists.¹² Hamilton believes that the first two options may lead to some TTY users being stranded. Just because TTY minutes of use continue to decline annually, the remaining minutes of use each year (some of which are to 911 services) are not less important because of the decline. The only acceptable threshold under this standard would be zero minutes of TTY use. The second alternative is potentially equally arbitrary: even if all PSAPs are successfully transitioned to NG911, there will still be some users who will continue to rely on TTY. The only rational option at this point is the third option – sunset TTY when the PSTN itself sunsets. Until then,

¹¹ This includes voice users who do not have RTT capability or do not want to use RTT but who nonetheless want to communicate with a deaf or hard of hearing user who has RTT capabilities.

¹² *NPRM*, ¶¶ 65-66.

there will continue to be a concern that users who rely on TTY have been left stranded by a premature sunset of TTY backward compatibility requirements.¹³

III. The Commission Should Clarify the Continuing Role of FCC-Certified State TRS Programs, and the Jurisdictional Separations for RTT

Section 225(d)(2) of the Communications Act of 1934, as amended (the “Act”) requires the Commission to establish regulations which generally provide that costs caused by interstate TRS shall be recovered from all subscribers for every interstate service, and costs caused by intrastate TRS shall be recovered from the intrastate jurisdiction. Since 2000, on an interim basis, the Commission has been funding both intrastate and interstate IP-based relay services from the interstate TRS Fund.¹⁴ As a result, TTY and non-IP Captioned Telephone Services are the only forms of TRS regulated by the Commission-certified intrastate TRS programs in all States and Territories. Hamilton agrees with the *NPRM*’s conclusion that the Commission has sufficient authority under the Act to require both wireline and wireless Voice over Internet Protocol (“VoIP”) providers to support TRS access via RTT in lieu of requiring support for TTY technology. The plain language of Section 225 provides broad authority to the Commission over interstate TRS issues generally, particularly in light of the decision by Congress to expand

¹³ Conceivably an RTT-capable equipment distribution program could be established for legacy TTY users. This concept was suggested in the *NPRM*. See *NPRM* ¶¶ 89-90. However, not all states have such programs, and it is not clear what jurisdiction would be responsible for, or willing to pay for, the costs of an equipment distribution program.

¹⁴ *Telecommunications Relay Services and Speech-to-Speech Services for Individuals with Hearing and Speech Disabilities*, Report and Order and Further Notice of Proposed Rulemaking, 15 FCC 5140, ¶ 26 (2000) (“We believe the word ‘generally’ [in Section 225(d)(2) of the Act] gives to the Commission some discretion to fund intrastate service from the interstate jurisdiction. We believe that our action, intended as an interim arrangement, is an appropriate exercise of this discretion.”). The Commission subsequently agreed to fund the two other forms of IP-based relay, IP Relay and IP Captioned Telephone Service (“IP CTS”), in the same manner.

Section 225 to in order to require interconnected and non-interconnected VoIP providers to participate in and contribute to the TRS Fund, with comparable TRS obligations to other carriers.¹⁵

However, the Commission should address in this proceeding the role that state TRS programs will have in transitioning TTY users to RTT. The Commission should also address whether those state TRS programs will have a role in regulating intrastate forms of RTT if RTT is defined in part as an intrastate service.

IV. RTT Should Serve as a Complement to, But Not a Substitute for, IP CTS and Other Forms of TRS

The *NPRM* seeks comment on the Commission's assumptions that RTT has the potential to serve as a substitute for TRS or as an enhancement of the ability of TRS to provide functionally equivalent telephone service.¹⁶ With RTT, as with TTY, a user must elect to type the words they wish to convey. With other forms of TRS, such as IP CTS, the user may elect to speak the words instead. To the extent that users elect to type rather than speak their communicated words, there should be a reduced need for such users to use IP CTS. However, there will continue to be a significant number of users, particularly older users, who are unable or unwilling to type their chosen words. Individuals with dexterity or motor coordination issues, and individuals with cognitive disabilities, may be unable to type or may find difficulty in doing so. In addition, even regular users of RTT may not always be in an IP-enabled environment, and may need to rely on non-IP forms of TRS on occasion, including during emergency situations when IP access may not be available. Accordingly, Hamilton believes that RTT will serve as an

¹⁵ See *NPRM* ¶ 110 & n.332 (citing 47 U.S.C. § 616).

¹⁶ *NPRM*, ¶¶ 35-36.

important augmentation to other forms of TRS, but should not be viewed as a wholesale substitution for other forms of TRS due to the inability of all users to take advantage of RTT's capabilities at all times.

V. RTT Should Not Be Construed as a Potential Replacement for IP CTS

The *NPRM* asks whether the Commission should authorize or require 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[.]”¹⁷ While Hamilton agrees that RTT should be implemented by TRS providers, it does not agree that RTT in general or the RFC4013 standard specifically should be required of IP CTS providers as a mechanism by which captioned telephone service must be delivered.

IP CTS is unique among the various forms of relay services. Other forms of relay use a CA within the call path between a user and a remote party, whereas IP CTS enables users and remote parties to engage in direct phone calls. The CA's role in an IP CTS call is limited to generating and delivering captions based on the remote party's portion of the conversation. IP CTS phone devices typically have both a PSTN and Internet connection, the former to facilitate a direct phone call between a user and a remote party, and the latter to facilitate an adjacent communication between the phone device and a CA. This adjacent communication between the phone device and the CA is not a phone call; it is simply a network communication over the Internet that allows a CA to generate and deliver captions back to the phone based on the remote party's portion of the conversation, in a manner that is optimized to deliver captions as quickly and as reliably as possible.

RTT in general, and the RFC4013 standard in particular, are not well suited for the

¹⁷ *NPRM* ¶ 78.

delivery of captions and do not provide any benefit to a user over existing mechanisms for delivering captions. As stated in the *NPRM*, RTT gives call recipients “an opportunity to follow the thoughts of the sender as they are formed into words.”¹⁸ While this can be beneficial for direct communication between participants, in the case of the delivery of captions via RTT it can lead to confusion, as the words are formed by a CA, not the sender, and any “following of thoughts” would be the thoughts of a CA as captions are generated. Additionally, RFC4013 is very limited in terms of its ability to allow additional information to be transmitted in conjunction with text, which may lessen a user’s ability to understand the captions. In contrast, an IP CTS phone is capable of displaying word corrections with different presentation attributes (i.e. font, color, etc.). While RFC 4103 has some limited presentation capabilities,¹⁹ supporting these presentation capabilities are optional²⁰ and are ultimately based on the graphics rendition capabilities of ISO/IEC 6429. ISO/IEC 6429 was last updated in 1992, and does not incorporate many modern concepts regarding graphics rendering, such as animation, color gradients, and fade-in/fade-out, etc. Thus while RTT/RFC 4103 are great choices for a TTY replacement technology, they are not appropriately suited for caption delivery, and therefore should not be construed as a potential replacement for IP CTS.

VI. The Application of RTT to TRS Providers Should be Addressed in This Proceeding

The *NPRM* seeks comment on how to integrate RTT into the provision of TRS, but acknowledges that the Commission “may need to address the application of RTT to the provision

¹⁸ *NPRM* ¶ 37 (quoting RTT Field Trial Report, at 7).

¹⁹ Recommendation T.140 Section 6.2 states: “Display characteristics as defined in SGR of ISO/IEC 6429.” ISO/IEC 6429 was published in 1992.

²⁰ Recommendation T.140 Section 8.8 states: “The receiving terminal may or may not obey the display attribute, depending on both its capabilities and the preferences of the user.”

of TRS in a separate proceeding.”²¹ Hamilton believes that most if not all TRS-specific issues applicable to RTT may be addressed in this proceeding, such as the backward compatibility and gateways issues. In addition, the jurisdictional issues discussed above, and the appropriate reimbursement rate from the interstate TRS Fund for TRS calls involving RTT, can and should be addressed in this proceeding.²² Even if a separate proceeding is initiated, however, Hamilton believes that these issues need to be resolved before RTT becomes a mandatory service that must be supported by TRS providers.

Respectfully submitted,

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²¹ *NPRM*, ¶ 78 & n.250.

²² Hamilton believes that the appropriate reimbursement rate for RTT-to-voice relay calls, which calls will necessarily involve a CA, should be the Multistate Average Rate Structure (“MARS”) traditional TRS rate, because RTT is a direct replacement for TTY and would use the same CAs. For this reason, the reimbursement rate for RTT should not be the IP Relay rate.