Recommendation of the FCC Disability Advisory Committee
on the Report Prepared by the Real-Time Text Deployment in Wireline Networks Working
Group

Adopted by the Disability Advisory Committee on February 24, 2022

WHEREAS –

1. The Real-Time Text Deployment in Wireline Networks Working Group (Wireline RTT Working Group) of the Disability Advisory Committee was asked to develop recommendations that identify issues and potential accessibility opportunities for deployment of Real-Time Text (RTT) on Internet Protocol (IP) based wireline networks.

2. The Wireline RTT Working Group evaluated these issues, developing the attached Report.

NOW, THEREFORE, IT IS –

1. RECOMMENDED that the FCC consider ways to educate consumers about RTT capabilities to ensure consumers understand that the service is widely available on nearly ubiquitous wireless networks in the U.S., plus information on how RTT works, its benefits, and its limitations. In addition, as any new RTT functions or capabilities are developed and deployed – for instance, if new standards are adopted and deployed by industry – the FCC should consider ways to ensure consumer education remains up to date.

2. RECOMMENDED that the FCC issue a Notice of Inquiry considering ways to expand RTT availability and that any further FCC exploration of wireline RTT fully evaluate the benefits of RTT on wireline networks, the technical and practical challenges of implementing wireline RTT, and the issues for further consideration detailed in the attached Report.

Report of the
Real-Time Text Deployment in Wireline Networks Working Group

This Report, developed by the Real-Time Text Deployment in Wireline Networks Working Group (Wireline RTT Working Group), discusses issues and potential accessibility opportunities for deployment of real-time text (RTT) on IP-based wireline networks. In particular, the Report considers the benefits of wireline RTT for persons with disabilities; the state of wireline network technology and challenges to deploying wireline RTT natively[1]; over-the-top (OTT) approaches to RTT deployment over wireline facilities[2]; and ongoing RTT standards development. The Report is not intended to be an exhaustive discussion of these issues and raises additional questions for consideration with regard to deployment of RTT.[3]

Overview of Current Wireless RTT Requirements and Features

Although this Report addresses RTT over wireline networks, the Wireline RTT Working Group acknowledges that the RTT environment is not a blank slate and that discussion must be conducted against the backdrop of the FCC's existing rules on wireless RTT. The FCC adopted the current requirements for wireless RTT in its December 2016 *Wireless RTT Order*,[4] and the requirements went into effect February 22, 2017. In the *Wireless RTT Order*, the FCC adopted the following rules:

- Wireless service providers can choose to offer RTT as an alternative to TTY.
- RTT must be interoperable across networks and devices. This may be achieved through adherence to RFC 4103, as a "safe harbor" standard.
- RTT must be backward compatible with TTY until the FCC determines TTY is no longer necessary.

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[1] Native RTT is RTT provided by the voice service provider over the voice network and accessed either automatically on the handset or by activating the RTT option in the handset settings.

[2] Over-the-Top (OTT) RTT is RTT provided over a broadband connection and accessed via an app or other such user interface.

[3] This Report was compiled in response to a request from the FCC to develop recommendations that identify issues and potential accessibility opportunities for deployment of RTT on IP-based wireline networks. When the FCC last examined the use of RTT on wireline networks in 2016, questions raised included whether wireline networks can ensure interoperability of RTT calls, what types of equipment or peripheral devices would be needed by users, and how long it would take for PSAPs to incorporate RTT on wireline networks and what interim solutions would be needed.

[4] *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*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd. 13568 (2016).

- 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.
- A service provider who has opted to provide RTT must begin delivering RTT communications in an RTT format to a Public Safety Answering Point (PSAP)[5] within six months after receiving a request from the PSAP.

The FCC also adopted a staggered implementation schedule that gave smaller providers additional time to deploy support for RTT on their networks. As a result, for the first few years after the *Wireless RTT Order* was adopted, RTT was only available to customers of the largest wireless providers, which serve a very high percentage of wireless customers. However, as of September 30, 2021, all wireless providers opting to provide RTT must support RTT on all new authorized user devices (and all handsets sold after December 31, 2018, must have RTT capability). Accordingly, only recently has it become possible for all VoIP wireless subscribers to access RTT.[6]

RTT as implemented on wireless networks contains the following features:

- allows text characters to be sent as they are created and messages to be read and received in real time without turn-taking, enabling communication akin to a voice call or in-person conversation;
- permits simultaneous sending of text and voice;
- is available through off-the-shelf end user devices.

Although it is now possible for all VoIP wireless subscribers to access RTT, some individuals and/or businesses still use wireline service, as discussed in more detail in the following sections.

Accessibility Opportunities for Wireline RTT

RTT is not currently available natively on wireline voice networks, which instead make available TTY. TTY has fewer functionalities than RTT. Specifically, unlike RTT, TTY requires users to take turns, does not permit simultaneous use of voice, is much slower, has a smaller character set than RTT, and requires specialized end-user equipment. Many consider TTY technology increasingly obsolete.

Although an estimated 68% of American adults rely on wireless service as their sole telephone service, 29.3% of American adults still retain wireline voice service alongside wireless service,

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[5] PSAPs are sometimes also referred to as Emergency Communications Centers or 911 Call Centers.

[6] RTT only works on an IP network. Wireless providers still have a small percentage of non-IP (3G) networks. Most providers are scheduled to sunset their 3G networks in 2022.

and 1.9% of adults are wireline-only.[7] It also remains the case that many businesses and government agencies use wireline voice service, not wireless, to communicate with the public. An RTT solution for these use cases, especially when wireless is not a practical option, would improve the accessibility of communications services for persons who are Deaf, Hard of Hearing, DeafBlind, or have a speech disability and could also significantly reduce the need for relay service by enabling users to communicate directly. In addition, for persons with disabilities who maintain only wireline voice service, a wireline RTT solution could enable more effective and efficient communication with emergency services, such as 911.

Additional accessibility opportunities may arise if wireline RTT were to be implemented more broadly—*i.e.*, on all standard wireline phones, on an interoperable basis with wireless RTT. This type of broad implementation could enable seamless, real-time text-based communication between all persons with phones and could in certain cases eliminate the need for relay service.

Additional Questions for Consideration:

- Only recently has it become possible for all VoIP wireless subscribers to access RTT, and although use of wireless RTT is growing, uptake has progressed slowly. Could further education regarding the availability and features of wireless RTT help address some of the accessibility gaps identified above – *e.g.*, by encouraging consumers to communicate directly via wireless RTT and businesses and government agencies to provide consumers a means of contacting them via wireless RTT?
- The FCC should consider how best to coordinate with other federal, state, and local agencies to promote the use of RTT and direct communications access for government services.
- If wireline RTT reduces the need for telecommunications relay services, is that limited to text-based relay services?

Possibilities and Challenges for Native RTT Deployment in Wireline Networks

Technical Requirements for RTT. Whether implemented natively on voice networks or provided over-the-top, RTT has certain baseline technical requirements. In order to evaluate possible approaches to implementing RTT in wireline environments, it is essential to first understand these requirements.

First and foremost, RTT requires an Internet Protocol (IP) end-to-end call path. In other words, not only must a caller's own provider's network be IP, but the entire call path between the caller's provider through the terminating provider must be IP. RTT also requires use of the

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[7] CDC Wireless Substitution Report, data as of June 2021. https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless202111.pdf. Among children, 79.1% are in wireless only households, 19.8% are in households with both wirelines and wireless phone service, and 0.4% are in wireline only households. *Id.*

Session Initiation Protocol (SIP) standard for signaling. In addition, terminal (end-user) equipment must support RTT protocols and user interface requirements.

Moreover, in order for an RTT call to be passed between providers, there are requirements for supporting interoperation ("Interop") - the interop connection must be IP, engineered to support two media types (audio and text) simultaneously, and support SIP signaling standards, with the provider partners on either side agreeing on interoperability configurations. For interoperation with or among telephony networks, SIP signaling must follow telephony standards (e.g., use telephone numbers for addressing). All media elements must adhere to RFC 4103 since the telephone service providers adopted the 4103 safe harbor.

RTT Implementation Challenges in Wireline Networks. Wireline networks have been evolving for over 100 years. Because they rely on physical connections and multiple technologies, they evolve very slowly. This presents many challenges for deploying RTT on wireline networks.

First, while it is a shrinking number of end users, there are many consumers still being served by analog wireline voice networks. Analog network equipment supports TTY and it is not possible for analog telephone terminals and copper wire transport to be upgraded to support RTT. More significantly, many providers' networks still contain substantial amounts of analog legacy infrastructure along with IP infrastructure. And, even if individual providers have upgraded their own networks to IP (as a growing number have), their customers' home wiring and equipment and the interconnection points between providers may still be non-IP. As a result, transitioning wireline networks to IP is a long and ongoing process that requires replacing legacy network infrastructure and finding solutions for non-IP interconnection points. Wireless networks, by contrast, are on the verge of transitioning completely to IP. Indeed, wireless LTE networks were designed as end-to-end IP networks from the start and have IP-based end-user equipment more closely integrated with the IP network.

Second, wireline IP networks must be enhanced to meet RTT requirements, meaning they must support RTT over SIP, support simultaneous text and audio transport, and implement the necessary RFC 4103 industry standard. Similarly, but perhaps with less difficulty, OTT VoIP services would need enhance software and implement RTT interoperable standards to meet RTT requirements.

Last, most voice connections into the customer premises are on analog copper phone lines even when the customer's broadband service network is all IP. Thus, a telephone-centric approach must overcome the "last foot" copper connection to the existing POTS terminals (residential and small business) or PBX terminals (medium and large businesses). These terminals (e.g., phones) cannot support RTT so another device or client over a fully IP network must be used. OTT services that already use software clients can bypass this "last foot" and terminal equipment issues, while some IP-based phone terminals may be enhanced.

Efforts to address IP interconnection. As noted above, non-IP interconnection is one hurdle to end-to-end IP.[8] This is also a topic of discussion related to other communications policies, such as robocall mitigation. In an October 2021 report on the deployment of STIR/SHAKEN call authentication, the Call Authentication Trust Anchor (CATA) Working Group (established as a working group of the North American Numbering Counsel) recommended that the industry work together to propose a solution to the SIP interconnection issue within 6-12 months. The report further recommends that an industry group be established comprised of representatives from the associations that represent service providers. At the end of the 6-12 month period the industry group would submit a final report to the FCC with any agreed upon solutions, FCC rules that need changing, and recommendations for unresolved issues, if any, to be addressed in an NPRM. While this will not help with copper at the end points, to the extent solutions are agreed upon, it may make it possible for RTT when there is copper in the middle, such as an interconnection point. Once the industry makes its recommendations, the FCC will need to take comment on the identified issues by initiating a rulemaking. Implementation of any solutions will require additional time to develop new processes, amend interconnection agreements, and conduct testing prior to moving traffic.

Additional Questions for Consideration:

- Although it remains that case that many businesses and government agencies use wireline voice service to communicate with the public, residential wireline voice use is declining, and currently only 1.9% of adults are wireline-only. Is it necessary to determine the extent to which wireline-only households are on copper or IP networks?
- Moreover, the above discussion indicates that deploying RTT natively will require replacing network infrastructure and may also require upgrading home wiring. These costs to providers – and possibly to homeowners – will likely be substantial costs and require further analysis. The FCC should weigh these costs and wireline voice usage as it determines how to proceed with regard to RTT over wireline networks. The analysis must be done separately for copper and IP wireline networks.
- Input is needed to develop a realistic timeline for deployment – including considering what steps are required, such as an industry solution for IP interconnection; any needed development of FCC rules; standards development; and infrastructure changes, testing, and deployment.
- Would new end-user devices be required for consumers and businesses? What would be required to design and deploy end-user devices? With regard to uptake, people and organizations do not upgrade wireline end-user equipment as often as they may upgrade wireless phones. Would end-users upgrade their devices?
- What type of network signaling or other protocols are useful or needed in a wireline network to indicate whether a called party is RTT-capable, or if the call must be converted to TTY?

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[8] As discussed above, end-to-end IP means the entire call path from call origination to termination is IP regardless of how many service providers are in the call path.

- What are the last foot issues? More information is needed before potential solutions can be identified.
- Wireless RTT is required to be backward compatible with TTY because some end-users currently use only TTY. But as noted above, TTY does not support all of the features of RTT. Accordingly, calls between RTT and TTY users are constrained by TTY's more limited functionalities. Are there reasons to eliminate the requirement for backward compatibility to TTY, or are there experiences with RTT/TTY backward compatibility that weigh against requiring backward compatibility?
  - If yes, how will RTT users communicate with a PSAP or others still using TTY?
  - What needs to be in place before eliminating the backward compatibility requirement?
  - Should the FCC consider how best to provide direct end-to-end or point-to-point RTT across the voice ecosystem?

Possibilities and Challenges for Over-the-Top Wireline RTT Services

Although native RTT is not available on wireline networks at this time, a few companies have begun testing or offering over-the-top (OTT) wireline RTT services in the United States. As with non-facilities-based VoIP service, these RTT services operate over a broadband connection. Hamilton Relay, for example, is conducting user trials of over-the-top RTT service that connects to its relay service. For these trials, Hamilton Relay provides the end user an RTT capable phone that contains a large screen and an attached keyboard, a ten-digit phone number, and the OTT VoIP connection. nWise is another company deploying OTT solutions for RTT. It offers RTT applications for use on smartphones and internet-connected tablets. Notably, implementation of wireline RTT in Europe has largely been via app-based OTT services, rather than through native telephone network or device functionality, and these app-based offerings are interoperable with relevant relay and emergency services.

Companies considering offering over-the-top RTT services will need to consider how best to achieve interoperability with other over-the-top RTT services, with wireless RTT, and with 911 call centers. The vast majority of existing RTT endpoints are on cellular networks, which only support telephone number addressing. However, not all OTT services (whether RTT or VoIP) use telephone number addressing. To the extent an OTT RTT service does not use telephone number addressing, a possible solution would be for the OTT service to provide telephone number gateways and assign telephone numbers temporarily or permanently to their subscribers for the purpose of interoperability.

Additional Questions for Consideration:

- The FCC should consider whether the timing on deploying OTT solutions may be much faster, making RTT available in wireline contexts more quickly.

- Do businesses and government agencies have broadband connections over which they can use OTT RTT services? Would promoting OTT RTT encourage businesses and government agencies to make that option available to consumers? Would businesses or government agencies need to purchase additional equipment in order to use OTT RTT?
- Off the shelf devices that could be or are already being used for OTT RTT are widely available – *e.g.*, tablets. Could OTT RTT be made available via additional devices, such as a computer, as opposed to just through apps-based environments?
- In evaluating solutions for meeting consumers' text telephony communication needs, the FCC should consider issues of broadband access. The FCC estimates that, as of year-end 2019, approximately 96% of the overall population had coverage from fixed terrestrial broadband at speeds of 25/3 Mbps, the FCC's current benchmark for fixed advanced telecommunications capability.[9] However, some people, especially in rural and Tribal areas, do not have access to broadband at these speeds – specifically, the FCC estimates that nearly 14.5 million Americans do not have access to fixed terrestrial broadband with at least 25/3 service. Are lower speeds sufficient for RTT? The FCC should further investigate the bandwidth requirements for OTT RTT and the type of connection that a consumer may need to make effective use of the service. It may also be that people using text telephony in unserved or underserved areas are currently using TTYs, since TTYs do not require broadband. Recent legislation allocating funding for broadband deployment may help reduce this digital divide.
- Would OTT RTT be more cost effective for PSAPs to implement?
- Would an OTT RTT provider's 911 obligations mirror those of a wireless RTT voice provider?
- How do we expect OTT RTT providers to build 911 support? Would they use a 911 connectivity service that supports RTT? Is that service now available, e.g., from Wireless RTT? Or would wireline voice providers need to help with routing & connectivity?
- What location should be provided on an OTT RTT 911 call? OTT handsets move and E911 needs location for routing & dispatch. Should the call use the wireline method (the subscriber's provisioned address)? Or use a registered address like an interconnected VOIP service (like Vonage) to determine location? Or would detailed location information like that provided by mobile providers be required? And would this change if the wireline RTT service is provided by a relay service provider? See 47 CFR 9 Subparts B-E.
- Will every wireline voice provider need to provide a specific RTT solution, or would one or more providers of OTT RTT service that is available to all broadband subscribers meet this accessibility requirement? What are the pros and cons of each approach, including general interoperability, interoperability with 911 PSAPs, consistent and improving customer experience, etc.?

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[9] Communications Marketplace Report, 2020 Communications Marketplace Report, 36 FCC Rcd. 2945, Figure III.A.3e (2020)

- Will traditional telephone numbering for both inbound and outbound RTT calling be required, or are other addressing methods permissible if they enable interoperability? What are the pros and cons of using an addressing scheme other than telephone numbers?

Standards Development

As noted above, the current safe harbor standard for compliance with wireless RTT interoperability requirements and certain performance objectives is IETF RFC 4103. Standards development has continued since this safe harbor was adopted. For instance, RTT as implemented in the United States does not support conference calling, but IETF RFC 9071 – which has reached "proposed standard"[10] status and builds off RFC 4103 (which was also in "proposed standard" status when adopted by the FCC as a safe harbor after its rulemaking process) – specifies how RFC 4103 can be used for multiparty RTT. Multiparty RTT is required to support conference calling, including digital meetings, and to permit 911 telecommunicators to conference in additional first responders or agencies.[11]

Work is also being conducted on RTT and WebRTC. WebRTC is an open-source standard used to embed communications into web-based applications. IETF RFC 8865 specifies how the WebRTC data channel can be used as a transport mechanism for RTT. Regardless of the type of network, standards development and implementation is a complex process – testing and deploying new or updated RTT standards requires substantial time and resources to ensure smooth functioning of any new features.

Additional Questions for Consideration:

- Are there specific use cases for which the standards under development would be particularly useful?
- The above discussion of native and OTT wireline RTT deployment was based on existing standards. Would incorporation of additional standards and features increase difficulty and costs and/or delay deployment? Would additional standards be consistent/compatible with safe harbor standards upon which wireless implementation was based?

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[10] "Proposed standard" and other maturity levels are defined in RFC 2026: https://www.rfc-editor.org/rfc/rfc2026.html#section-4.1

[11] The Wireline RTT working group respectfully refers to the concurrent Integration of TRS into Video Conferencing WG discussion of digital meeting accessibility.