NENA PSAP Readiness for Real-Time Text (RTT) Information Document

Abstract: This Information Document provides guidelines for the introduction of Real-Time Text (RTT) to include comparisons among texting alternatives and an RTT readiness check list that can be used by Public Safety Answering Points (PSAPs).

NENA PSAP Readiness for Real-Time Text (RTT) Information Document

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1 Executive Overview

Real-Time Text (RTT) technology allows consumers to send and receive text characters, as they are typed, as well as other simultaneous media[1]. To ensure that members of the community who are deaf, deafblind, hard of hearing as well as those with speech disabilities, and all 9-1-1 callers who are in need of assistance can obtain emergency services using RTT-enabled devices, the Public Safety Answering Point (PSAP) will need the ability to natively communicate through RTT as required by the current version of NENA-STA-010 [9].

The ability to communicate with the text caller requires the PSAP to be technologically and operationally capable of processing these calls. Each technology (Teletypewriter for the Deaf (TTY), Short Message Service (SMS), RTT, etc.) may require network, service, and equipment enhancements or changes. This Information Document describes what RTT is, identifies the differences between texting technologies, and highlights the technological and operational needs of the RTT call.

For RTT to work end-to-end, from the caller to the PSAP call-taker, in a full-duplex (simultaneous) mode, all five sections of the 9-1-1 call path, as shown below, must be available. If any of these is not available, the RTT call will be processed as a TTY call. This PSAP Readiness Information Document for RTT covers all five sections:

1. RTT-capable Devices or RTT Over the Top (OTT) Applications
2. Wireless Service Provider IP/Next Generation Network components supporting RTT
3. Next Generation Core Services (NGCS)/Emergency Services IP Network (ESInet)
4. PSAP IP Network
5. RTT functionality within the 9-1-1 Call Handling Equipment

The options for PSAPs to receive and handle RTT 9-1-1 calls will vary depending on each PSAP's technical capabilities. When a PSAP has taken the necessary measures to receive RTT communications, it must submit a request to a wireless carrier for the delivery of RTT, by submitting the RTT PSAP Readiness Questionnaire form found in Appendix A, following a similar process as a request for delivery of SMS-to-911. Appendix B **RTT Request for Service Sample Letter** contains an RTT Request for Service sample letter.

To provide uniformity and consistency in the handling of these calls, the Public Safety Answering Point should ensure the following subject areas are considered:

- identification of RTT calls

[1] ATIS-0700030 currently defines an RTT call as consisting of RTT plus voice media. ATIS-0700030 [12] currently restrict the use to RTT plus voice.

- technological and operational needs to support RTT
- standard operating procedures
- telecommunicator training
- deployment processes

This Information Document defines a Standard Operating Procedure model recommendation to establish guidelines for the call handling procedures used to support two main scenarios:

1. receiving an RTT request for assistance natively at the PSAP, and
2. receiving an RTT request for assistance that is converted and delivered as a TTY call to the PSAP.

This Information Document identifies areas of training that may be needed with the introduction of RTT. This implies the scenario when RTT has been converted to TTY and when end-to-end RTT is received at the PSAP. It provides an informative table that identifies tasks and responsibilities for the introduction of RTT-to 9-1-1 for PSAPs deploying NENA i3-compliant NG9-1-1 systems.

Stakeholders who are responsible for the management and operation of NG9-1-1 systems, 9-1-1 Authorities, and Wireless Service Providers have an obligation to be aware of the needs of RTT identified in this document and the overall impact to the RTT caller and the Public Safety Answering Point as it is a foundational element of effective 9-1-1 service delivery.

Table of Contents

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Reason for Issue/Reissue

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NENA-INF-042.1-2021	01/20/2021	Initial Document

2 Introduction

To ensure that members of the community who are deaf, deafblind, hard of hearing as well as those with speech disabilities, and all 9-1-1 callers who are in need of assistance can obtain emergency services, the Public Safety Answering Point (PSAP) will need the ability to communicate through non-voice means.

The ability to communicate with the text caller requires the PSAP to be technologically and operationally capable of processing these calls. Each technology (Teletypewriter for the Deaf (TTY), Short Message Service (SMS), RTT, etc.) may require specific network, service, and equipment enhancements or changes. Wireless carriers began deploying RTT capabilities in certain devices on their networks in January 2018, changing the landscape of 9-1-1 communication.

This document describes RTT, identifies the differences between the text technologies, and highlights the technological and operational needs of an RTT call. Recommendations regarding operational support of RTT calls will be in-step with the current recommended processes identified in the NENA SMS-to-911 documentation, as appropriate. Consistency in the way text calls are processed, regardless of how the call is delivered and received, is optimal, and is the goal of this document.

Real Time Text has been mandated by regulators in North America. The FCC mandate is described below. RTT is also being deployed in Canada and while the regulatory, technological and legal environments are different, this Information Document is believed to be a useful reference for Canadian PSAPs.

2.1 Federal Communications Commission (FCC) Order[2]

In 2016, the Federal Communications Commission (FCC) amended its rules to allow IP-based wireless carriers and manufacturers to support RTT on IP-based wireless networks and equipment, establish basic guidelines for RTT, and set implementation dates for the transition from TTY to RTT. Per 47 CFR Part 67, to support RTT, wireless carriers and manufacturers must enable users to initiate, send, transmit, receive, and display RTT communications in accordance with Commission rules.

2.2 Timelines

- Nationwide wireless carriers that have opted to provide RTT in lieu of TTY were required to provide a downloadable RTT application or plug-in that supports RTT or have RTT capability natively available in at least one handset model by December 31, 2017.

[2] See Federal Communications Commission [4][5][6]

- Manufacturers of handsets that support wireless IP-based voice services and that choose to support RTT in lieu of TTY must implement RTT in all such handsets manufactured on or after December 31, 2018.
- Nationwide wireless carriers opting to support RTT in lieu of TTY must support RTT on all their new wireless devices by December 31, 2019.
- Local and regional wireless carriers choosing to support RTT in lieu of TTY must provide a downloadable RTT application or plug-in that supports RTT or have RTT capability natively available in at least one handset model by June 30, 2020.
- Local and regional wireless carriers choosing to support RTT in lieu of TTY must support RTT on all their new wireless devices by June 30, 2021.

3 Why is RTT Important for Public Safety to Implement?

In an emergency, EVERY SECOND COUNTS! RTT capability provides PSAPs with text information in real-time, improves accessibility, and conveys a conversational tone with the 9-1-1 caller. With RTT, text is transmitted instantly while being typed, in general character by character. The RTT-capable receiving party can immediately read the text as it is written, without waiting for the person to finish typing and press "send" or waiting for the network to deliver the message, as is the case with SMS. If the sender is unable to complete a message, the receiving party will still be able to see the portion of the message the sender began, allowing the call taker to interrupt or insert conversation. RTT provides a way for consumers to incorporate conversational text along with audio (voice) during the call (including, for example, Hearing Carry-Over [HCO] and Voice Carry-Over [VCO]). RTT does not replace SMS but provides a way for consumers to incorporate conversational text along with voice in the call.

4 Defining RTT

4.1 What is RTT?

In the order from the FCC, Real-Time Text, referred to as RTT for this document, has been approved as an acceptable alternative to TTY technology for wireless carriers. RTT technology allows consumers to send and receive Internet Engineering Task Force (IETF) RFC 4103 [9] text characters, as they are typed, as well as audio simultaneously. Alliance for Telecommunications Industry Solutions (ATIS) has developed standards for RTT calling in North American networks, for use by device manufacturers and Commercial Mobile Service Providers. ATIS-1000068 [10], ATIS-0700029 [11] and ATIS-0700030 [12] leverage RFC 4103 standard from the IETF to convey conversational text end to end. As these standards address support for RTT calling in North America, it is advisable for PSAPs to get acquainted with them.

4.2 How RTT Works

As shown in the figures below, there are different and separate architectures to support SMS Text-to-911 and RTT. SMS Text-to-911 introduces a new network element called the Text Control Center (TCC) while RTT uses the existing IP-based voice architecture. Both architectures support connection to legacy emergency services networks and NG9-1-1 networks. In addition, SMS Text-to-911 has a vendor proprietary interface directly to the PSAP.

During transition, PSAPs may need to accommodate all three texting modalities: TTY, SMS, and RTT. RTT is intended to be a replacement for TTY[3]. TTY-to-911 is currently available from traditional analog landline providers, VoIP providers, and Wireless providers, whereas SMS-to-911 is only available to Wireless Service Provider users with an active subscription with text capabilities. RTT-to-911, at the time of document publication, is predominantly available by Tier 1 Wireless Service Providers that convert the RTT to TTY for the PSAP.

For RTT to work end-to-end, from the caller to the PSAP call-taker, in a full duplex (simultaneous) mode, all five sections of the 9-1-1 call path, as shown in Figure 1 below, must be NG9-1-1/IP/SIP-enabled (see shaded area). If one of these is not enabled, the RTT call will be processed as a TTY call at some point in the call flow. This information document covers all five areas.

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[3] See Federal Communications Commission [4][5][6]

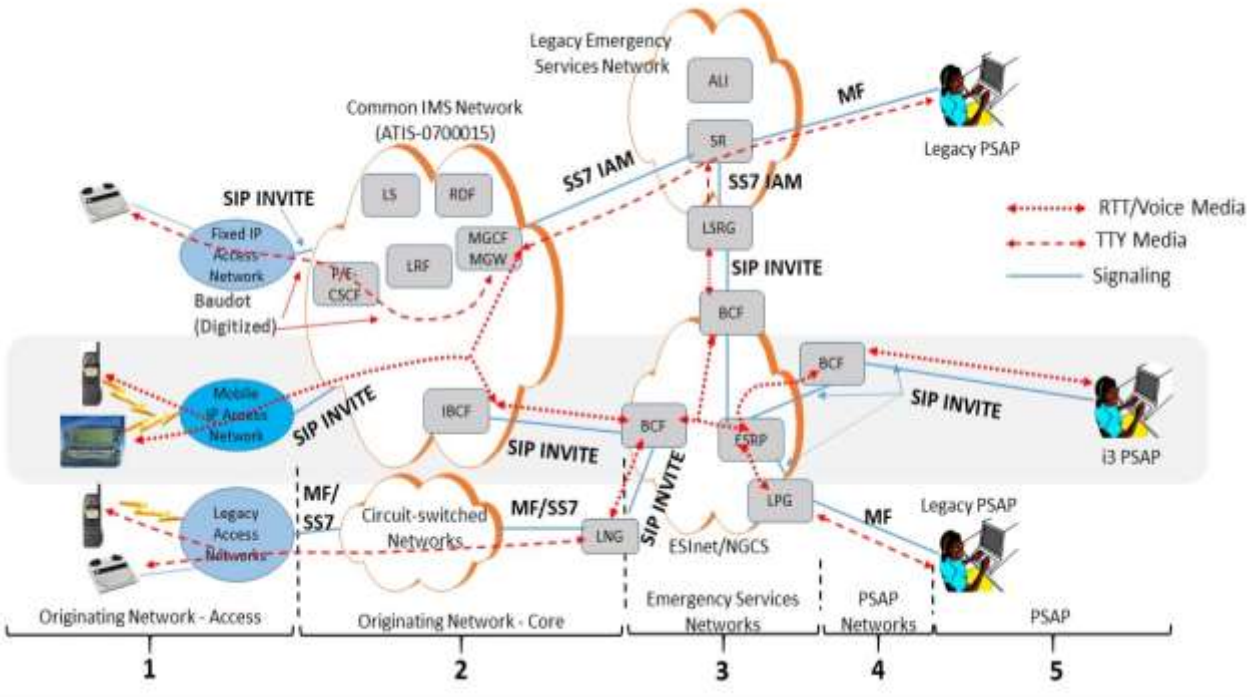

Figure 1 - Five Sections of TTY/RTT Call Path

4.2.1 Five Sections of Native RTT Call Path (Shaded Area)

1. Originating Network – Access: Native RTT-capable Devices or RTT Over-the-Top (OTT) Applications
2. Originating Network – Core: Originating Network Provider IP Next Generation Network components supporting RTT
3. Emergency Services Networks: Emergency Services IP Network (ESInet)/Next Generation Core Services (NGCS)
4. PSAP Networks: i3 PSAP IP Network
5. PSAP: RTT functionality with the i3 PSAP 9-1-1 Call Handling Equipment

4.2.2 Interim SMS Text to 9-1-1

The use of the word "interim" for Interim SMS Text to 9-1-1, from a technical perspective, refers to a best effort solution used to bridge a gap in the technology to deliver a text to 9-1-1. It is anticipated that newer messaging solutions (such as RTT, instant messaging once IM vendors support access to 9-1-1, etc.) will be developed in addition to Interim SMS Text to 9-1-1. Figure 2 (below) illustrates the conceptual architecture to support Interim SMS Text to 9-1-1. An emergency SMS message is initiated from a user on a wireless carrier network (e.g. Carrier A). That SMS message is forwarded to the Short Message Service Center (SMSC) and recognizing the short code of 9-1-1, the SMSC sends the text

message to the TCC. To route the text message, the TCC may have cell site location information available or have access to the carrier's Commercial Location-based Server (LS). This location is used to select the appropriate emergency services network or the PSAP, based upon implementation considerations.

Based upon ATIS J-STD-110.01.v002 [13], the TCC may have three egress protocols. The first provides a TTY connection to a Selective Router (SR) in a legacy emergency services network and requires that SMS be converted to TTY as Baudot tones. (Note that this interface may also connect to a Legacy Network Gateway (LNG), not shown, which in turn is connected to the ESInet/NGCS). The second interface is a proprietary Web Services interface that was specified in J-STD-110, but not standardized. The third interface supports Message Session Relay Protocol (MSRP) and requires that the TCC converts SMS to MSRP. The MSRP interface may connect directly to an IP-Capable PSAP (as an implementation option that supports IP connectivity to PSAP) or via an ESInet/NGCS to a NENA i3 PSAP (as specified in J-STD-110). In addition, a legacy PSAP may be connected to an ESInet/NGCS via a Legacy PSAP Gateway (LPG).

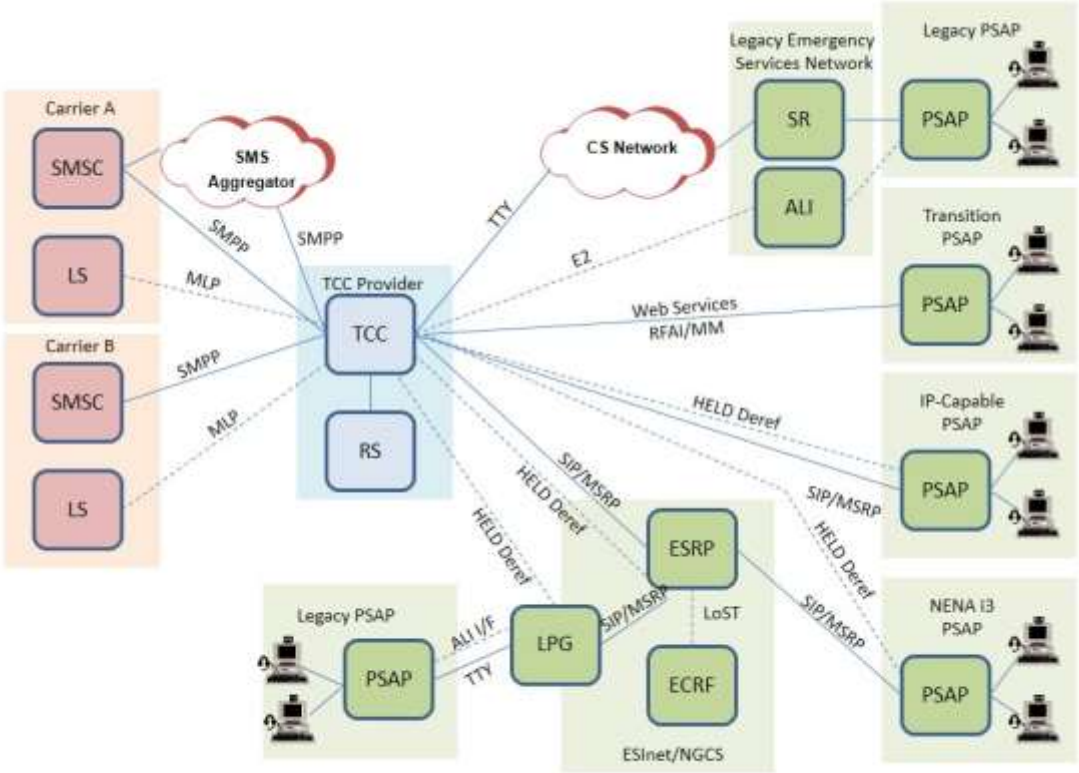

Figure 2 - Interim SMS to 9-1-1 Architecture

4.2.3 Real-Time Text

Figure 3 represents the transitional and end-to-end architecture for RTT. The IP Multimedia Subsystem (IMS) architecture shown represents the same one used by modern originating networks for voice calls. An emergency session is initiated from a user on a wireless carrier network and that session is expected to provide support for simultaneous voice and RTT text media. While both media paths are established, the PSAP may not receive both audio and RTT text media. For example, a caller that is unable to speak may only communicate via RTT. The "call" enters the Common IMS Network via the Proxy/Emergency Call Session Control Functions (P/E-CSCF) which provide the routing functions. The Common IMS Network will acquire location using the Location Retrieval Function (LRF) and Location Server (LS) and determine the routing using the Routing Determination Function (RDF) [14]. Based upon the location of the caller (or the cell site location receiving the 9-1-1 call), the call may be routed to a legacy emergency services network via a Media Gateway Control Function (MGCF) or it may be routed to an i3 ESInet/NGCS. If the call is routed to a legacy emergency services network, the Media Gateway (MGW) will convert the RTT plus audio to TTY Baudot tones plus potentially other audio (e.g., VCO, background noise, etc.). If the call is routed to an ESInet/NGCS through a Border Control Function (BCF), the media will continue to be RTT plus audio. It is then up to the NG9-1-1 Core Services (NGCS) to route the call to the PSAP. If it routes the call to a legacy PSAP supported by a Legacy PSAP Gateway (LPG), the LPG would have to convert the RTT to Baudot tones. The PSAP 9-1-1 Call Handling Equipment may have the ability to manage the other audio.

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Figure 3 Transitional and End-to-End RTT Architecture

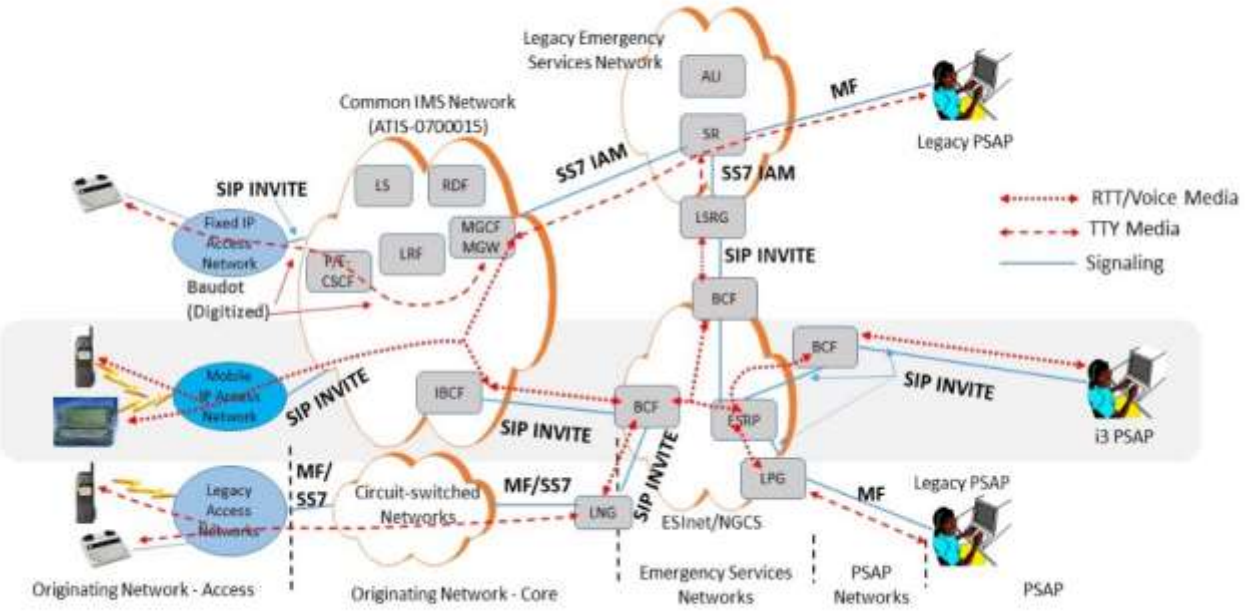

Figure 3 - End-to-End RTT Architecture

4.2.3.1.1 Diagram Description

- Commercial Mobile Service Provider (CMSP) Common IMS Network
  - Interconnecting Border Control Function (IBCF) – Border function that handles signaling and media interconnection
  - Location Server (LS) – Determines location
  - Location Retrieval Function (LRF) – Acquires and caches location
  - Media Gateway Control Function/Media Gateway (MGCF/MGW) – Interworks IP Voice/RTT to/from TDM Voice/Baudot
  - Proxy/ Emergency Session Control Function (P/E-CSCF) – SIP Proxies that route calls
  - Routing Determination Function (RDF) – Determines Route based on location (e.g., ESInet/NGCS vs Legacy E9-1-1)
- NENA i3 NGCS
  - Border Control Function (BCF) – Border function that handles signaling and media interconnection

- Emergency Service Routing Proxy (ESRP) – SIP element that acquires mobile location (from LRF - not shown) and routes calls by interacting with an Emergency Call Routing Function (not shown)
- Legacy PSAP Gateway (LPG) – Interworks Audio/RTT to/from Audio/Baudot
- Legacy Network Gateway (LNG) – Interworks Audio/Baudot to/from Audio/RTT
- Legacy Selective Router Gateway (LSRG) – Interworks between Audio/Baudot and Audio/RTT

4.3 What are the Differences between RTT and other Texting Alternatives?

Table 1 provides the different characteristics of each texting alternative.

Table 1 - Comparison of Texting Alternatives

Topic	TTY	SMS Text-to-911	Native Real-Time Text
Media	Audio Media – TTY characters transmitted via Baudot tones over audio channel	Text only	Text transmitted in one media stream plus audio on a separate media stream
Character Mode	Character at a time (Conversational)	Block Mode (Message-based)	Character at a time (Conversational)
Turn-Taking	• Turn-Taking required (to avoid Character Collision) • Half-Duplex, only one party can transmit at a time	• No Turn-Taking Required • Two-way simultaneous transmission possible	• No Turn-Taking Required • Full-Duplex, two-way simultaneous transmission possible
Call-Taker Procedures	One caller, one session	Multiple callers, multiple sessions possible at each workstation or OTT login, with limits set by PSAP	One caller, one session
Latency	Real Time	Store and Forward	Real Time

Topic	TTY	SMS Text-to-911	Native Real-Time Text
Connectivity	Originating Service Provider to SR or i3 LNG	TCC to SR, TCC to ESInet/NGCS or TCC to PSAP	Originating Service Provider to ESInet/NGCS, ESInet/NGCS to the PSAP
Routing	Same as Voice calls	By TCC using Cell or Commercial Location Based Services	Same as any i3-compliant call
Protocol	TTY/Baudot (TIA-825a) [15] over standard voice call	Delivery mechanisms from TCC Provider: • TTY • Web Interface (HTTPS) • MSRP	Delivery Mechanism from Next Generation 9-1-1 SSP: • i3 compliant via RTT/RTP (RFC 4103) [9]
Character Set	Limited Character Set	Full character set	Full character set
Handset	TTY/TDD Device or application	SMS Text Capable Devices	RTT Capable Devices • App • Native OS
Delivery Method to PSAP	Legacy	• Legacy • Proprietary Client (Over-the-Top) • NG9-1-1	NG9-1-1 (including gateways as needed)
Location Retrieval	Same as voice	E2 or HELD Dereferencing	Same as voice

5 Planning

5.1 Technology

The options for PSAPs to receive and handle RTT 9-1-1 calls will vary depending on each PSAP's technical capabilities. End-to-End RTT 9-1-1 communications will become more widely available as PSAPs transition to Next Generation 9-1-1.

Wireless carriers that implement RTT are required to support RTT calls to 9-1-1. The FCC requires wireless carriers who choose to support RTT to make RTT backward-compatible with TTY devices. This will enable PSAPs without end-to-end RTT capability to use their

existing TTY terminals to handle RTT 9-1-1 calls until such time that they can receive end-to-end RTT calls [7].

Table 2 - Comparison of Technology Impacts

PSAP Equipment	Legacy	NG9-1-1
Call Handling	No changes to the call handling equipment since there are no changes to the legacy network. RTT conversion happens in CMSPs' networks to TTY.	Technical capability to receive. Call handling enhancements may be needed. Work with your call handling provider to determine needs.
Mapping	No changes are expected.	No changes are expected.
CAD	No standard exists today.	The impacts of RTT to CAD functionality and data exchange are unknown.
Recording Equipment	CPE/MIS captures TTY dialogue today.	Should be done according to the i3 standard [16].

End-to-End RTT 9-1-1 communications will become more widely available as PSAPs transition to Next Generation 9-1-1. PSAPs should verify with their vendors whether their Call Handling equipment supports RTT functionality natively (i.e., without interworking to TTY). Considering the 48 million Americans who are deaf, hard of hearing or have speech disabilities, PSAPs are strongly encouraged to upgrade to NG9-1-1 to include end-to-end RTT capability, which will help ensure accessible emergency communications for individuals with disabilities, and with the general public when users determine texting is their best choice of communication for their particular emergency.

The FCC requires wireless carriers who choose to support RTT to make RTT backward-compatible with TTY devices. This will enable PSAPs without RTT-to-RTT capability to use their existing TTY terminals to handle RTT 9-1-1 calls.

Where a wireless carrier delivers RTT 9-1-1 calls to a legacy PSAP served by a selective router, the wireless carrier is responsible for converting the calls to TTY before delivering the calls to the selective router. For RTT 9-1-1 calls to a legacy PSAP served by an

ESInet/NGCS through an LPG, the conversion to TTY is the responsibility of the LPG provider. For legacy carrier networks that deliver TTY 9-1-1 calls to an RTT-capable PSAP through an LNG, the conversion from TTY to RTT is the responsibility of the LNG provider. The FCC also encourages state and local governments to conduct RTT testing and training in consultation with consumers, and to share the results with other jurisdictions to facilitate the transition to end-to-end RTT.

When a PSAP has taken the necessary measures to receive RTT communications natively, it must submit a request to a wireless carrier for the delivery of RTT following the same process as a request for delivery of SMS-to-911. If requested by a PSAP, a wireless carrier must begin delivering RTT communications in an RTT format within six months after the request [7].

5.1.1 ESInet/NGCS Networks

The i3 standard encompasses the needs of the ESInet/NGCS networks to support RTT. The 9-1-1 Authority should ensure that their 9-1-1 System Service Provider has reviewed the i3 standards and has incorporated, or will incorporate, the necessary network components for the implementation and support of RTT.

5.1.2 9-1-1 Call Handling Equipment (CHE)[4]

The legacy Call Handling Equipment, and ancillary logging systems, may or may not support RTT features, since the NENA-STA-027.3-2018, NENA E9-1-1 PSAP Equipment Standards document does not define the RTT interfaces. However, NENA i3-compliant Call Handling Equipment that adopts NENA-STA-023 (forthcoming) will support the RTT interface. Call Handling Equipment vendors for premise or cloud solutions may have some features that should be fully explained and defined for testing with the associated NGCS Provider.

The 9-1-1 Authority should ensure that their 9-1-1 Call Handling Equipment Provider has reviewed the appropriate i3 standards[5] and has incorporated or will incorporate prior to sending a Request for Service to the Wireless Service Provider (WSP) for RTT services, the necessary CHE capabilities for the native support of RTT.

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[4] The NENA NG9-1-1 PSAP Systems Working Group is developing content to identify PSAP specifications for NG9-1-1 (NENA STA-023.1-201x NG9-1-1 PSAP Specifications for the NENA i3 Solution). At the time of this document, the working group is addressing RTT CHE capabilities as part of their scope.

[5] NENA-STA-010.3-202Y*, NENA i3 Standard for Next Generation 9-1-1*, (forthcoming) [22]. The Media specification within the PSAP Interface Section of the draft provides that "All i3 PSAPs MUST support all media, voice, video, and text. If a PSAP receives an Offer containing both MSRP and RTT, it SHOULD send an Answer with only one of them. If the PSAP receives an Answer containing both RTT and MSRP, it MUST be prepared to deal with both simultaneously. When placing callbacks, PSAPs SHOULD offer all supported media choices, subject to operational considerations."

5.1.3 Testing

If the NG9-1-1 PSAP has completed implementation testing for the introduction of NG9-1-1 (i3-compliant) then testing for the introduction of RTT should be an incremental testing effort. There may be two categories of testing: integration and carrier testing. The first is the initial introduction of RTT within a jurisdiction on a carrier basis and the second is the introduction of RTT within a specific PSAP on a carrier basis. Each of these testing efforts would follow a PSAP request to a carrier for RTT service. This testing should be coordinated with each wireless carrier, NGCS Provider, and CHE Provider.

The first category of testing where this is the first application of RTT within a jurisdiction may be more extensive than the second category where follow-on PSAPs introduce RTT. The first category must assure the interaction of the wireless carrier functionality, the NGCS provider functionality and the CHE provider functionality are tested. In the second category the interaction between wireless carrier and the NGCS provider may be assumed and the focus of the testing should be upon the interaction between the NGCS provider and the CHE provider, and the functionality at the PSAP.

Testing preconditions:

- Specific wireless carrier has implemented RTT
- NGCS Provider has implemented RTT
- CHE Provider has implemented RTT
- PSAP has issued letter of intent to specific wireless carrier (Request for Service)

In either category the following attributes must be included in the testing and analysis. These should be considered basic testing elements. More testing may be needed given the individual PSAP environment.

- Specific Carrier – implies specific implementation of how the carrier offers RTT (native vs. app)
- Ability to receive location with call – similar to generic NG9-1-1 testing
    - Geodetic or Civic
- Ability to do rebid (location update) – similar to generic NG9-1-1 testing
- Appropriate Service Method (equivalent to COS in E9-1-1) is indicated dependent on implementation (May be CHE dependent)
- Ability of the Telecommunicator to text to caller (e.g., What is your emergency)
- Ability of the caller to text to Telecommunicator (e.g., Intruder in the house)
- Ability for caller and Telecommunicator to simultaneously text, and text is not garbled.
- Ability to support Hearing Carry Over where Telecommunicator talks and caller can hear.
- Ability to support Voice Carry Over where caller talks and Telecommunicator can hear.

- Ability for the Telecommunicator to talk and type at the same time and caller is able to receive communication without garble or text errors.
- Ability for the caller to talk and type at the same time and Telecommunicator is able to receive communication without garble or text errors.
- Ability to verify that text and conversation is recorded/logged and that the RTT stream can be played back.

It should be noted that RTT call transfer (bridging) is not fully supported in NENA-STA-010.2 [16]. The standard supports the capability to transfer calls, but the parties may not be able to distinguish where a specific text originated. It is expected that NENA-STA-010.3 [22] will address mixing multiple RTT streams for bridging by identifying the source of transmission for characters (it is up to the User Interface at the receiver to display the incoming text, identifying the different participants on the call). However, there is ongoing work to resolve technical issues in support of an end-to-end solution. Specifically,

the Internet Engineering Task Force (IETF) is in the process of developing specifications to address RTT mixing in order. In addition, further work has been identified to support multi-party aware devices, potentially in 3GPP and ATIS. It is currently unknown when the RTT mixing standard will become available.

The PSAP doing the testing should consult its NGCS and CHE providers regarding transfer capabilities. Testing of transfers is recommended so that the PSAP is aware of what happens during a transfer scenario. Consideration should be made as to the capabilities of the NGCS provider network, the ability to support this type of transfer, and the capability of the PSAPs (i3 or legacy). Incomplete transfers are not indicative of a wireless carrier limitation or programming.

5.1.4 General Technology Considerations

As part of RTT implementation, other factors impacting the delivery of native RTT that are beyond the scope of this document should be considered by the PSAP and inquired upon with the various implementation stakeholders. The list below describes potential aspects that would require further testing once RTT-to-RTT implementations have occurred.

1. What are the material differences in display of RTT, if any, between app-based RTT and RTT-embedded devices?
2. Are there cybersecurity considerations for handling RTT? For example, between the two device solutions, location spoofing, etc.
3. How RTT works in roaming scenarios, under a legitimate roaming arrangement and when not? In international roaming scenarios?
4. What happens to the dialog if the caller's device moves out of LTE coverage and re-attaches to a 3G sector?

   a. This consideration may have an operational impact as well. Consider adding how the PSAP responds to this scenario as part of the standard operating procedure (SOP) and training.

5. Are there any differences in the call characteristics when the RTT call is using a WiFi access vs an LTE access?

It is the current understanding of the working group members that an RTT call received at the PSAP (regardless of the device used to initiate the call) will provide a similar experience. It is recommended that the PSAP consider including various devices during implementation testing to verify the experience and the impact to operations, training, and standard operating procedures.

5.2 Operations

Until RTT is fully implemented, to include the five sections of the RTT call path discussed in Section 4.2.1, an RTT call will be converted to TTY (i.e. RTT-to-TTY). Today, RTT-to-TTY and TTY-to-RTT conversions are available to legacy and i3 PSAPs, respectively.

Since an RTT call is both voice and RTT text media, the operational guidance to support an RTT-to-TTY call was sought from NENA TTY/TDD Communications Standard Operating Procedure Model Recommendation NENA-STA-037-2018 [24]). The legacy PSAP's experience of the RTT call (TTY) may not be similar to the RTT caller's experience (text), as noted in the following sections. The goal is for consistency in procedures associated with the PSAP handling of RTT calls, where similarities in technology and operations exist.

5.2.1 RTT-to-TTY Standard Operating Procedures (SOP)

Guidelines for the operation of the equipment and call handling procedures used when receiving a Real-Time Text (RTT) request for service that is converted and delivered as a TTY call should be developed for use in each PSAP. These SOPs should be based on NENA-STA-037-2018, NENA TTY/TDD Communications Standard Operating Procedure Model Recommendation.

Based on the RTT text media available during an RTT-to-TTY call, in addition to the existing standards, it is recommended the PSAP create pre-programmed messaging that helps the RTT caller to understand the limitations to the PSAP during an RTT-to-TTY call.

Example:

- First message: 9-1-1 Where is your Emergency Q GA
- Second message: Your call has been received as TTY, which cannot receive emoticons, pictures, or multimedia messages (MMS) GA

An RTT call can be placed by any 9-1-1 caller; therefore, the PSAP should consider additional messages regarding the caller's ability to speak, whether it is safe for them to speak, and whether they are able to place a voice call instead.

5.2.2 RTT-to-TTY Call Handling Process Best Practice

- Telecommunicators should be aware that RTT users may be any caller including citizens who are deaf, deafblind, hard of hearing, or people with speech disabilities.
- Identification of an Incoming RTT Call.
  - When initially answering the emergency calls, telecommunicators should follow the established phone answering procedures. However, if the telecommunicator is unable to immediately (within two attempts by voice) establish voice communications, and determines the line is open or silent, or the telecommunicator hears beeping tones, they should immediately initiate a TTY/TDD call response.
  - Automatic call detection equipment may only detect when TTY/TDD tones are present. Not all RTT calls will be auto detected.
  - Accordingly, all open / silent calls should be challenged with a TTY/TDD call response.
  - An RTT call could show a class of service (COS) denoting VoIP, Wireless, etc. The location of the device will be the same as received with the wireless or VoIP call, therefore location shall be verified.
  - Pre-programmed statements used in an RTT session include the following:
    - First message: 9-1-1 Where is your Emergency Q GA
    - Wait for a response from the caller, then
      - Refer to agency policy regarding how long to wait for a response from a caller before proceeding with the second message or terminating the call.
    - Second message: Your call has been received as TTY, which cannot receive emoticons, pictures, or multimedia messages (MMS).
- Hearing Carry Over (HCO) and Voice Carry Over (VCO) functionality may be limited dependent on call handling equipment specifications.
- Like traditional TTY/TDD, RTT calls may display garbled messages. Refer to agency policy on how to handle garbled messages.
- If a response is not received within a specified time period, process the call as defined by the agency policy.

5.2.3 Testing Best Practice

- TTY/TDD equipment should be tested in accordance with the NENA Managers Guide to the ADA Title II, NENA-STA-035.2-2018 (originally 52-002) and NENA TTY Phone

Pal Program (PPP) Operational Information Document (OID) Document 52-501 [23], and that testing should be documented.

- Documentation should include:
  - Name & Title of employee conducting the test call
  - Date & Time
  - Open / Silent Call and/or beeping tones
  - Time required to establish contact
  - Initiated from internal (inside center) or external (from field) location
  - Format of Call (English vs. American Sign Language)
  - Location of the caller; preferably based on the caller's location (WPH2, dispatchable location, etc.)
  - Class of Service (VoIP, Wireless, etc.)
  - Transfer of call to legacy and i3 PSAPs, if applicable
  - Copies of TTY/TDD printout should be attached to documentation as evidence of the testing procedure

5.2.4 Special Characters

RTT-to-TTY conversion and limitations present unique challenges for telecommunicators. Additionally, PSAP TTY equipment may not work the same way in all scenarios. When a PSAP uses a TTY to receive a 9-1-1 call originated by an RTT user, the communication session will be limited by the TTY capabilities (for example, emojis). Limitations may be related to the delivery of special characters, garbled or missing characters; and other symbols that cannot be converted from RTT-to-TTY. The testing of emojis during the testing phase of an implementation can provide clarification to the PSAP as to how the special characters are converted.

The FCC Emergency Access Advisory Committee (EAAC) Report [17] on procedures for calls between TTY users and NG9-1-1 PSAPs discusses the supported special characters and are identified in the following table.

RTT	TTY
At sign character "@"	Replace with "(at)"
Octothorpe or hash sign character "#"	Replace with dollar sign character "$"
Percentage character "%"	Replace with slash character "/"
Ampersand character "&"	Replace with plus sign character "+"
Asterisk character "*"	Replace with a period character "."
Underscore character "_"	Replace with space character " "

RTT	TTY
Less than sign character "<"	Replace with left parenthesis character "("
Greater than sign character ">"	Replace with right parenthesis character ")"
National character	Replace with the closest companion in the a-z character range (e.g., "ñ" => "n")
Unknown character[6]	Replace with apostrophe character '

PSAPs should be aware that traditional TTY conventions may not be adhered to by callers for calls that originate as RTT (such as GA [Go Ahead], SK [Stop Keying]). The PSAP is responsible for the training of staff to interpret (or not interpret) allowable characters that are communicated by callers (e.g. emoji or emoticons, slang, foreign characters, etc.). PSAPs should consider a public education initiative on the use of special characters.

5.2.4.1 Language Translation Services

Limitations exist for the transfer of RTT calls to a third-party language translation service. Current versions of the NENA i3 standard acknowledge activities in IETF focused on defining procedures to support "conferencing" in an RTT environment. Future versions of the i3 standard are expected to provide further details addressing the mixing of RTT media to support conference bridging. Additional limitations may exist on the abilities of the third-party language service provider. The PSAP should inquire with their NGCS Provider and their language translation service provider regarding the ability to support language services using RTT. It is also recommended that the PSAP consider these limitations in their testing, training and standard operating procedures.

5.2.4.2 Silent or Open Line Calls in RTT

Because RTT supports simultaneous text and voice, an incoming RTT call may appear to a legacy PSAP as a "silent" 9-1-1 voice call, and the text portion of the call may not appear unless the telecommunicator queries the silent call with TTY tones. Thus, it is important that legacy PSAPs make querying of silent 9-1-1 calls with TTY tones a standard practice. For this reason and more, PSAPs need to develop training.

5.2.5 Public Education

RTT access to 9-1-1 is now available for consumers via certain mobile phone devices and service offered by wireless carriers. Some carriers offer RTT as a downloadable app that

[6] Other characters not in the TTY character set

can be installed on a smartphone (or a tablet under applicable circumstances), with other carriers offering certain mobile handsets supporting RTT in the operating system, leveraging the native dialer of the device. The availability of RTT-supported devices will increase over time.

A comprehensive public education program must be planned carefully to notify the public of this important technological advancement and the proper way that 9-1-1 should be used in an emergency. There are various issues related to RTT technology that need to be properly expressed to various audiences. End-to-end RTT requires deployment with the wireless service provider, the NGCS Provider, and the CHE Provider; therefore, ubiquitous service may not be available until there is full deployment of all components for all PSAPs. Today, RTT-to-TTY and TTY-to-RTT conversions are available to legacy and i3 PSAPs, respectively. The public must be made aware of the availability of RTT, possible associated costs (e.g. – voice plan requirements) and the potential limitations.

5.3 RTT-to-RTT Operational Considerations

At the date of publication of this document, it is unknown whether a native RTT solution (RTT-to-RTT) has been tested or deployed due to a lack of full NG9-1-1 capabilities from the Wireless Service Provider through to the PSAP 9-1-1 call handling equipment. Without having direct experience, it is difficult to determine a standard operating procedure or to recommend specific call handling procedures. PSAP management should identify, review, and address all potential operational impacts associated with RTT.

As part of the deployment of RTT-to-RTT, the following recommendations can be considered and tested as part of the implementation.

- Respond with a standard text phrase and end with a new line
- Respond with the spoken standard phrase
- Assess if the call is an RTT call
    - Inquire of Wireless Service Provider, ESInet Provider, NGCS Provider and 9-1-1 Call Handling Equipment Provider as to whether identification of an RTT call is possible
- During initial communication, assess how the user wants to communicate
    - RTT to and from the PSAP
    - RTT to the PSAP and voice back to the caller
    - Voice to the PSAP and RTT back to the caller
    - Or generally with voice with typing by both caller and PSAP occasionally to clarify items

- If text is used by both the caller and the PSAP, the following conventions should be considered:
  - Use common typing habits with sentences starting with capital and then containing mainly lower case
  - End your entries by new line (Enter), and then expect the caller to type. Do not use common TTY communication (e.g. GA, Q, SK, etc.)
  - Wait for the user to end an entry by new line (Enter)
  - Type against turn only when it is of importance for proceeding well and efficient with the case

6 Real-Time Text (RTT) PSAP Deployment Tasks

This informative table identifies tasks and responsibilities for the introduction of RTT-to 9-1-1 for PSAPs deploying NENA i3 compliant systems. Entities may be either owners of a task (O) or involved (I) with the completion of the task. Those entities are the CMSP, the NGCS provider, the PSAP or 9-1-1 Authority and the CHE Provider (combined under "PSAP" in the table). The tasks are divided into categories: Initial Service Request, Project Kickoff, Training, Field Testing, and Deployment.

Legend for Responsibilities Columns of Deployment Tasks Table

"I" indicates involved in the deployment task.

"O" indicates the owner of the deployment task.

Table 3: Real-Time Text (RTT) PSAP Deployment Tasks

Task Description	Responsibility		
	CMSP	NGCS PROVIDER	PSAP
1 - Initial Service Request			
1.1 - PSAP request for service	I	I	O
1.2 - CMSP acknowledgement of service request	O	I	I
1.3 - CMSP sends questionnaire to PSAP	O		I
1.4 - PSAP completes questionnaire	I		O
2 - Project Kick-Off			
2.1 - Confirm details from questionnaire	O		I

Task Description	Responsibility		
	CMSP	NGCS PROVIDER	PSAP
2.2 - Obtain PSAP Admin Contact	O		I
2.3 - Obtain NGCS provider contact	O	I	
2.4 - Obtain PSAP/NGCS provider boundaries	O	I	I
3 – Training			
3.1 - System Admin training			O
3.2 - Public Safety Telecommunicator (PST) training			O
4 – Wireless Service Provider (drive) Testing			
4.1 - Pre-production testing	O	I	I
4.2 - Provide PSAP Readiness / Test Plan	O	I	I
4.3 - Network cutover	O	I	I
4.4 - Schedule and Complete RTT Test Cases	I	I	O
4.5 - PSAP signs off on completed Test Cases			O
5 – Deployment			
5.1 - Carrier sends "Live" notification to PSAP	O	I	I
5.2 - Public Announcement / Public Education			O

7 Request for Service

When a PSAP has taken the necessary measures to receive end-to-end RTT communications, it must submit a request to a wireless carrier for the delivery of RTT by submitting the RTT PSAP Readiness Questionnaire form (Appendix A) and a Request for Service letter (Appendix B
RTT Request for Service Sample Letter). If requested by a PSAP or tis designee, a wireless carrier who chooses to support RTT must begin delivering RTT communications in an RTT format within six months after the request as specified by the FCC.

8 Wireless Service Provider (WSP) Testing

Wireless Service Provider Testing, commonly referred to as "drive testing", is the last phase of testing for the implementation of RTT. Per the requirements set by the FCC, the WSP will test with each PSAP that has requested RTT service. Coordination between the 9-1-1 Authority, the WSP and the PSAP are necessary for testing completeness. Although it can be assumed that RTT functionality is supported between the WSP, the NGCS Provider, and the CHE Provider, as this testing should have already been completed prior to the Request for Service (see Section 5), it is recommended that a representative from each be included in the PSAP testing coordination.

To assist in the WSP Testing process, a sample PSAP Wireless Test Plan and testing considerations have been provided for preparation and testing use.

8.1 PSAP/RTT Operational Testing Considerations

The PSAP should perform testing to ensure that RTT support is in place. This testing should be coordinated with the wireless carrier, NGCS Provider, and Call Handling Equipment (CHE) Provider. This testing can be considered an equivalent to "drive testing" with the wireless carrier. The PSAP should consider whether all, or any, of this list is desired to test. As well, the PSAP should be educated on who is the "responsible party" for challenges experienced as part of the testing process as not all testing "errors" may be related to the wireless carrier, the NGCS Provider, or the CHE Provider, respectively.

- What does the 9-1-1 screen show?
    - Service Tokens (equivalent of Class of Service in E9-1-1) presented?
    - Location Received
        - What type of location was received?
            - Geodetic (latitude/longitude) or Civic (physical)
    - Is Confidence & Uncertainty, if applicable respectively, presented?
        - Did the call map?
        - Verify location accuracy with drive tester
- Rebid Successful (Yes/No)
- Distortions (Yes/No)
    - Voice garbled?
    - Message received distorted or missing elements?
- Transfer Successful (Yes/No)
    - Identify types of transfers performed
        - Internal transfer
        - PSAP to PSAP
            - Legacy and i3
        - Variables such as RTT-to-RTT, or RTT to outside the NGCS, such as to language translations, etc.

    - Note: Specifications are currently being developed to support the bridging of RTT calls including the identification of who is communicating in a conference call scenario (3 or more people). The purpose of this test is to support the PSAP's familiarity with service limitations and to plan appropriately for the handling of bridged RTT calls until such time as technical functionality is fully available.
- International Characters
    - PSAP received from caller?
    - PSAP sent to caller?
- Special Characters
    - PSAP received from caller?
    - PSAP sent to caller?
- WiFi Calling (Note: The PSAP should identify a WiFi device to be used for testing as remote testing of VoWiFi may not be technically feasible for all WSPs.)
    - Was a call successful utilizing VoWiFi?
    - Was the experience with VoWiFi different than other call originations?
- HCO
- VCO
- Recording
- MIS
- Telecommunication Relay Service (TRS) Call
- Anomalies? Other conditions that may need consideration?

8.2 Wireless Service Provider RTT FAQs

- AT&T:
    - FAQs: https://www.att.com/esupport/article.html#!/wireless/KM1233828?gsi=s917YXUI
    - Other: https://www.att.com/esupport/article.html#!/wireless/KM1233824?gsi=QfpyQoc9
- T-Mobile: https://www.t-mobile.com/responsibility/consumer-info/accessibility-policy?filter=auditory
- Sprint: https://www.sprint.com/en/shop/services/accessibility/wireless.html
- Verizon: https://www.verizon.com/about/accessibility/auditory-support#real-time-text

9 Implementation

The implementation of RTT includes the completion and testing of all five (5) sections of the RTT call path (see Figure 1) and the equipment to support RTT (as discussed in section 4.2 How RTT Works), as well as WSP Testing, and the completion of agency SOPs, training, and public education. During the implementation of SMS-to-911, PSAPs found a benefit in

implementing a "soft launch" period that allowed the PSAP to test functionality under more controlled conditions prior to a larger public education effort and launch.

A "soft launch" is a period in which the technology has been deployed but with no public announcement of the new services. During this time where the technology is available but not publicly known, the PSAP can work with their agency emergency response providers to test the technology, train PSAP and emergency response personnel, enhance SOPs, and educate internally on the new capabilities. The time frame of an agency's soft launch should be coordinated with agency administration, Public Information Officers, or other partners involved in public awareness and education. Upon completion of the soft launch, the agency can continue with their "hard launch" with their public education, awareness, and media efforts. While soft launch is not a requirement, the PSAP may want to consider adopting similar efforts.

10 Conclusion

Professional and public reliance on wireless and mobile devices is growing which clearly indicates the need for updated technological infrastructure in emergency services. In emergencies, every second counts, and accessibility is vital. Real-Time Text provides a timely and innovative solution for both the industry and citizens. As such, it is imperative that PSAPs address the capability to process RTT calls natively in their RFI/RFP for i3-compliant systems to provide the best user experience to the caller.

11 Impacts, Considerations, Abbreviations, Terms, and Definitions

11.1 Operations Impacts Summary

With the implementation of Real-Time Text, PSAPs will experience a new method of receiving and processing requests for emergency services. This will require the PSAP to develop operational policies for managing these requests as well as incorporate new techniques into the telecommunicator training curriculum. The implementation of RTT including the completion and testing of all five (5) sections of the RTT call path (see Figure 1) and equipment to support RTT (as discussed in section 4.2 How RTT Works) may create new, possibly additional, tasks for telecommunicators that will impact a PSAP's current operations. PSAP management should identify, review, and address all potential operational impacts associated with RTT.

11.2 Technical Impacts Summary

This NENA Information Document has been developed to provide information on how the PSAP prepares for and implements RTT. These recommendations are derived from the technical capabilities that have been deployed and are available to a PSAP to implement RTT to include the five (5) sections of the RTT call path:

1. RTT-capable Devices
2. Wireless Service Provider

3. Next Generation Core Services (NGCS)/Emergency Services IP Network (ESInet)
4. PSAP IP Network
5. RTT functionality with the 9-1-1 Call Handling Equipment

11.3 Security Impacts Summary

Security impacts for RTT are similar to those impacts experienced with the implementation of an end-to-end Next Generation 9-1-1 solution as RTT is reliant on this environment for implementation.

11.4 Recommendation for Additional Development Work

This document is intended to inform the reader about the current state and future needs of RTT. At the time of publication of this version of the document, neither an end-to-end RTT deployment by the WSP and PSAP or a full transition of TTY to RTT capabilities (per the FCC requirements) on behalf of the Wireless Service Provider has been completed. Additional development work will be necessary as further progress is made in these areas. Specifically, the Working Group identified the following areas that need attention.

- Clarification on the needs of the 9-1-1 Call Handling Equipment to support MSRP and RTT functionality as identified in NENA-STA-010.3-202Y*, NENA i3 Standard for Next Generation 9-1-1* [22] (i3v3), Section 4.6.2, Media (forthcoming). A request has been made to the NENA NG9-1-1 PSAP Systems Working Group for consideration.
- Attendant transfer of an RTT call is defined in NENA i3 v3 although some aspects (e.g. the ability to clearly identify who is communicating by text when more than one party is present in a call) are still being addressed in the IETF [25].
- Additional Standard Operating Procedure and training work for NG9-1-1 application and native RTT call handling.

11.5 Anticipated Timeline

While the FCC has identified a timeline for RTT availability via the device and for support by wireless service providers, full implementation of the recommendations presented in this informational document are dependent on multiple factors including:

- Ability of the device to support RTT
- Wireless Service Provider or VoIP network support of RTT
- Implementation of an NG9-1-1 network
- Connectivity of the WSP to the NG9-1-1 network
- Connectivity of the PSAP to the NG9-1-1 network
- PSAP deployment of 9-1-1 Call Handling Equipment with the ability to support RTT natively
- PSAP readiness for native RTT (See Appendix A)
- Request for Service of the WSP (See Appendix B

- **RTT Request for Service Sample Letter**)
- SOP and telecommunicator training (See Section 5.2.1 and 5.2.2)
- Public Education program (See Section 5.2.4)

Until full implementation, the PSAP should be prepared to receive RTT-to-TTY calls with the appropriate procedures and training available for support.

11.6 Cost Factors

The potential cost factors associated with the implementation of RTT are unknown short of the necessary costs associated with the implementation of an NG9-1-1 network, 9-1-1 Call Handling Equipment upgrades, and potential cost recovery associated with the Request for Service of the wireless service providers.

11.7 Cost Recovery Considerations

Cost recovery mechanisms are dependent on local PSAP or 9-1-1 Authority governance models.

11.8 Additional Impacts (non-cost related)

The information contained in this NENA document is expected to have both 9-1-1 technical and operational impacts, based on the needs for implementation. At the date of publication of this document, it is unknown whether a native RTT solution has been tested or deployed due to a lack of full NG9-1-1 capabilities from the WSP through to the PSAP 9-1-1 call handling equipment. Additional analysis may be necessary to determine if there are any non-cost related impacts that were not considered during the development of this document once information is made available as a result of first adopter implementation.

11.9 Abbreviations, Terms, and Definitions

See NENA Master Glossary of 9-1-1 Terminology, NENA-ADM-000 [1], for a complete listing of terms used in NENA documents. All abbreviations used in this document are listed below, along with any new or updated terms and definitions.

Term or Abbreviation (Expansion)	Definition / Description
9-1-1 CHE (9-1-1 Call Handling Equipment)	Equipment used by the PSAP for call handling (See Call Handling)
9-1-1 SSP (9-1-1 System Service Provider)	An entity that provides systems and support necessary to enable 9-1-1 calling for one or more Public Safety Answering Points (PSAPs) in a specific geographic area. A 9-1-1 SSP may provide the systems and support for either E9-1-1 or NG9-1-1. In the context of E9-1-1, it is typically,

	but not always, an Incumbent Local Exchange Carrier (ILEC). This includes: • A method of interconnection for all telecommunications providers including but not limited to the wireline, wireless, and VoIP carriers • A method and mechanism for routing a 9-1-1 call to the Public Safety Answering Point (PSAP) with no degradation in service regardless of the technology used to originate the call • A method to provide accurate location information for an emergency caller to a PSAP and if required, to other emergency response agencies • Installation of PSAP call handling equipment and training of PSAP personnel when contracted to do so • Coordinating with PSAP authorities and other telecommunications entities for troubleshooting and on issues involving contingency planning, disaster mitigation and recovery Ref: NENA-STA-015.10-2018 NENA Standard Data Formats for E9-1-1 Data Exchange & GIS Mapping
BCF (Border Control Function)	Provides a secure entry into the ESInet for emergency calls presented to the network. The BCF incorporates firewall, admission control, and may include anchoring of session and media as well as other security mechanisms to prevent deliberate or malicious attacks on PSAPs or other entities connected to the ESInet.
CAD (Computer Aided Dispatch)	A computer-based system, which aids PSAP Telecommunicators by automating selected dispatching and record keeping activities.

Call Handling	A Functional Element concerned with the details of the management of calls. It handles all communication from the caller. It includes the interfaces, devices and applications utilized by the Agents to handle the call.
CMRS (Commercial Mobile Radio Service)	A US FCC designation for any carrier or licensee whose wireless network is connected to the public switched telephone network.
CSCF (Call Session Control Function)	General term for a functional entity within an IMS core network that can act as Proxy CSCF (P-CSCF), Serving CSCF (S-CSCF), Emergency CSCF (E-CSCF).
E-CSCF (Emergency Call Session Control Function)	The entity in the IMS core network that handles certain aspects of emergency sessions, e.g. routing of emergency requests to the correct emergency center or PSAP.
EIDO	A JSON-based (JavaScript Object Notation) object that is used to share emergency incident information between and among authorized entities and systems.
ESRP (Emergency Service Routing Proxy)	An i3 functional element which is a SIP proxy server that selects the next hop routing within the ESInet based on location and policy. There is an ESRP on the edge of the ESInet. There is usually an ESRP at the entrance to an NG9-1-1 PSAP. There may be one or more intermediate ESRPs between them. • Originating ESRP: The first routing element within the Next Generation Core Services (NGCS). It receives calls from the BCF at the edge of the ESInet. • Terminating ESRP: The last ESRP for a call in NGCS.

FCC (Federal Communications Commission)	An independent U.S. government agency overseen by Congress, the commission is the United States' primary authority for communications law, regulation and technological innovation. The FCC regulates interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia and U.S. territories. For details see http://www.fcc.gov/
HCO (Hearing Carry Over)	A method which utilizes both voice and text communications on the same call, allowing a person who has a speech disability to listen to the other party's conversation and respond by typing via a TTY or other means of text communications.
LNG (Legacy Network Gateway)	An NG9-1-1 Functional Element that provides an interface between a non-IP originating network and a Next Generation Core Services (NGCS) enabled network.
LPG (Legacy PSAP Gateway)	A signaling and media interconnection point between an ESInet and a legacy PSAP. It plays a role in the delivery of emergency calls that traverse an i3 ESInet to get to a legacy PSAP, as well as in the transfer and alternate routing of emergency calls between legacy PSAPs and NG9-1-1 PSAPs. The Legacy PSAP Gateway supports an IP (i.e., SIP) interface towards the ESInet on one side, and a traditional MF or Enhanced MF interface (comparable to the interface between a traditional Selective Router and a legacy PSAP) on the other.

LRF (Location Retrieval Function)	The IMS associated functional entity that handles the retrieval of location information for the emergency caller including, where required, interim location information, initial location information and updated location information. The LRF may interact with a separate RDF or contain an integrated RDF in order to obtain routing information for an emergency call.
LSRG (Legacy Selective Router Gateway)	Provides an interface between a 9-1-1 Selective Router and an ESInet, enabling calls to be routed and/or transferred between Legacy and NG networks. A tool for the transition process from Legacy 9-1-1 to NG9-1-1.
MIS (Management Information System)	A computer system that collects, stores and correlates data from multiple systems and allows users to readily access data support to operational and strategic decision making on performance, trends, traffic capacities, etc.
MSRP (Message Session Relay Protocol)	A standardized mechanism for exchanging instant messages using SIP where a server relays messages between user agents.
NGCS (Next Generation 9-1-1 Core Services)	The base set of services needed to process a 9-1-1 call on an ESInet. Includes the ESRP, ECRF, LVF, BCF, Bridge, Policy Store, Logging Services and typical IP services such as DNS and DHCP. The term NG9-1-1 Core Services includes the services and not the network on which they operate.
P-CSCF (Proxy Call Session Control Function)	The first contact point for the user equipment (UE) within the IMS core network. For an IMS-based emergency call, the P-CSCF detects the emergency call and forwards it to an E-CSCF.

RDF (Routing Determination Function)	The IMS-associated functional entity, which may be integrated in a Location Server (e.g. GMLC) or in an LRF and provides the proper outgoing address to the E-CSCF for routing the emergency request towards a PSAP. It can interact with a location functional entity (e.g. GMLC) to manage ESQK allocation and management and deliver location information to the PSAP.
RTT (Real-Time Text)	Text transmission that is character at a time, as in TTY. Technology that allows consumers to send and receive Internet Engineering Task Force (IETF) RFC 4103 text characters, as they are typed, as well as audio simultaneously.
Service Provider	An entity providing one or more of the following 9-1-1 elements: network, CPE, or database service.
SMS (Short Message Service)	A service typically provided by mobile carriers that sends short (160 characters or fewer) messages to an endpoint. SMS is often fast but is not real time.
TTY (Teletypewriter)	A device or application used to send or receive character by character communication using Baudot signaling. Also known as: TDD (Telecommunications Device for the Deaf) Ref: NENA-STA-027, E9-1-1 PSAP Equipment Standards http://www.gallaudet.edu/dpn-home/tty-relays-and-closed-captions.html

VCO (Voice Carry Over)	A technology which utilizes both voice and text or video communications, allowing a person with a hearing disability to speak to the other party and read their responses simultaneously as typed or signed by the communications assistant via a text or video-capable device. Ref: NENA-STA-027, E9-1-1 PSAP Equipment Standards
WSP (Wireless Service Provider)	Cellular, satellite or other radio-based telephony or data transport commercial entity.

12 References

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Appendix A: RTT to 9-1-1 PSAP Readiness Questionnaire

This Appendix contains the form that may be used by the PSAP or 9-1-1 Authority to convey PSAP-specific information to the Wireless Service Providers (WSP) related to its readiness to support Real-Time Text (RTT). Specifically, it identifies the PSAP, primary contacts, and technical characteristics related to the PSAP. Analysis of this form by the Wireless Service Provider informs recommendations to the PSAP or 9-1-1 Authority as to the appropriate technology choice for RTT to 9-1-1.

The following RTT to 9-1-1 PSAP Readiness Questionnaire is available in Microsoft®[7] Word document format and is electronically packaged with this Standard.

Table 4 – RTT TO 9-1-1 PSAP READINESS QUESTIONNAIRE

RTT to 9-1-1 PSAP Readiness Questionnaire Please fill out & return this completed form to each Wireless Service Provider for RTT:	
1. PSAP Information.	
1a. Name of PSAP	
1b. PSAP FCC ID (PSAP FCC ID Master List)	
1c. Contact info:	
Street	
Street	
City	
State	
ZIP	
1d. PSAP Primary Point of Contact:	
First Name	
Last Name	
Desk Phone	
Cellular Phone	
Email address	
PSAP Admin Line	

[7] Microsoft® Word is a trademark of Microsoft.

2. Connectivity Does your PSAP have an ESInet/NGCS[1] for SIP/RTT network connectivity? ***Please note:*** *Support for IP networks that are not NENA i3 ESInet compliant are handled on a case-by-case basis*	Yes ☐, continue to 2a. No ☐, Please resubmit this form after the SIP/RTT network connectivity has been enabled within the PSAP's NGCS Service Provider.
2a. If Yes:	
i. Is the NGCS Service Provider (SP) ready to support the ingress/egress of RTT-to-RTT per IETF RFC 4103 and backward compatibility to TTY as identified in NENA-STA-010[2]?	ii. If Yes to 2a(i), complete NGCS SP Info below: NGCS Service Provider Name: _____ NGCS SP Point of Contact: Name: _____ Phone: _____ Email: _____ Address: _____ _____ _____
2b. If No to 2a(i): i. The NGCS capability must be in place before full RTT service can be turned up for a PSAP. Please resubmit this form after the RTT capability has been enabled within the PSAP's NGCS Service Provider.	

[1]Next Generation Core Services (NGCS) – The base set of services needed to process a 9 1 1 call on an ESInet. Includes the ESRP, ECRF, LVF, BCF, Bridge, Policy Store, Logging Services and typical IP services such as DNS and DHCP. The term NG9 1 1 Core Services includes the services and not the network on which they operate.

[2] NENA-STA-010.2-2016, *NENA Detailed Functional and Interface Standards for the NENA i3 Solution* (September 2016), Section 4.1.8 (Media), Section 7.1.1.4 (Legacy Network Gateway), Section 7.2.1.4 (Legacy PSAP Gateway); NENA-STA-010.3-202Y*, NENA i3 Standard for Next Generation 9-1-1*, Section 3.1.8, 3.1.8.3, 3.1.8.4, 3.1.8.5 (Media), Sections 6.1.1.4, 6.1.2.2, 6.1.2.3 (Legacy Network Gateway), Sections 6.2.1.4, 6.2.2.4, 6.2.2.5 (Legacy PSAP Gateway) (forthcoming).

3. PSAP Call Handling Equipment (CHE) Has your PSAP implemented an RTT capability within your CHE at the PSAP? Yes ☐, complete the CHE Provider info (3a) No ☐, Please resubmit this form after the RTT capability has been enabled within the CHE at your PSAP.	CHE Service Provider Name: _____ CHE Product Name and Version No: _____ Ver. _____ CHE SP: Point of Contact Name: _____ Phone: _____ Email: _____ Address: _____ _____ _____
4. 9-1-1 Authority Coordination: Has the PSAP coordinated the RTT implementation with the appropriate 9-1-1 Authority in terms of interoperability? Yes ☐ If not, please explain briefly _____ _____	

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Appendix B

RTT Request for Service Sample Letter

{9 1 1 Authority Letterhead}

Date:

[insert CMSP Contact Name]
[insert CMSP Contact Title]
[insert CMSP Name]
[insert CMSP Street Address]
[insert CMSP City, State & Zip]

Dear _____:

The ___ [insert Requesting Entity]____hereby formally requests and authorizes [CMSP Name] to provide Real-Time Text (RTT) to 9 1 1 based on other emergency communications service as defined in FCC 16-169 Paragraph 45 and Footnote 181. The Public Safety Answering Point(s) to be deployed is/are:

[insert PSAP Name]	[insert FCC PSAP ID][3]	[insert PSAP Location]
[insert PSAP Name]	[insert FCC PSAP ID]	[insert PSAP Location]
[insert PSAP Name]	[insert FCC PSAP ID]	[insert PSAP Location]

Please begin deployment activities upon receipt of this letter. Your point of contact will be:

Mr./Ms. _____
Title: _____
Address: _____
Email: _____
Phone: _____

Regards,

[insert 9 1 1 Authority signature]

[3] FCC's PSAP ID registry: https://www.fcc.gov/general/9-1-1-master-psap-registry

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