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In the Matter of)

Facilitating the Deployment of Text-to-911 and) PS Docket No. 11-153
Other Next Generation 911 Applications)

Framework for Next Generation 911) PS Docket No. 10-255
Deployment)

**Reply-To Comments of the Rehabilitation Engineering
Research Center on Telecommunications Access**

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I. Introduction

The Telecom RERC (RERC-TA) is a joint project of the Technology Access Program at Gallaudet University and the Trace Center at the University of Wisconsin-Madison. The RERC-TA is funded by the U.S. Department of Education, National Institute on Disability and Rehabilitation Research, to carry out a program of research and development focused on technological solutions for universal access to telecommunications systems and products for people with disabilities.

II. Interim Mobile Text-to-9-1-1 Solution

II.A. An SMS-based solution is needed now

The case is advanced that there is no need for SMS based solutions since IMS-based technologies will become available a few years¹. However, that is the moment when IMS will start to be rolled out in the ‘first markets’ and phones, not when the last phone will switch over to IMS. The principle of equal access implies that all people, including the ones with disabilities, must have direct access to 9-1-1, not only first adopters who are lucky enough to live in the pioneering areas and able to afford the equipment. Moreover, when IMS capable phones come out, the phones will not be IMS-only phones, but also support legacy protocols, because otherwise no mainstream customer would buy them. Mainstream customers would know (or be quickly told by newspapers) that the IMS capabilities would only work sometimes in some areas. Nor would mainstream customers buy any phones if 9-1-1 calling were limited to IMS, because they would

¹ Comments by T-Mobile, PS Dockets 10-255 and 11-153, 12/12/2011, p. 2.

never know when they could or could not call 9-1-1 (when IMS would work vs when they would be calling on old network technology). We should not ask our deaf, hard-of-hearing, deaf-blind, late-deafened, and speech impaired citizens to wait for and then rely on a system to call 9-1-1 that will only work in some places on some phones for the next decade or more (the amount of time that NENA estimates an interim solution will be needed²). There is not a single phone company that would even consider offering such a package to its mainstream customers, because they know it would be totally unacceptable to them.

Americans who are deaf or hard of hearing (and those with speech impairments) have already been at risk of life and limb for too long. Telling them to wait another decade or longer while IMS becomes available in all markets and in all locations is neither appropriate, nor necessary. No one is asking for a whole new technology to be developed or deployed; only that an existing, widely used technology (SMS) be connected to 9-1-1. There are multiple practical proposals on the table for doing this, including the ones by Neustar³ and Intrado⁴.

II.B. Need to allow people to call 9-1-1 using the text communication they use every day

In an emergency, people are panicked and stressed. They will not be able to successfully remember, much less operate, some new technology for the first time. All of the surveys (including the EAAC Report on Emergency Calling for Persons with

² Comments by NENA, PS Dockets 10-255 and 11-153, 12/12/2011, p. 2.

³ Comments by Neustar, PS Dockets 10-255 and 11-153, 12/12/2011.

⁴ Comments by Intrado, PS Dockets 10-255 and 11-153, 12/12/2011.

Disabilities Survey Review and Analysis) and research show that people need to be able to call 9-1-1 using a familiar technology and mode of operation that they use every day. Today SMS is the only type of text communication that works on all phones and is used consistently by people who rely on text. In fact, there is a strong call for SMS to 9-1-1 for people without disabilities as well.

We will need an SMS-9-1-1 solution for as long as people are relying on SMS for their everyday communication. When everyone has moved to new IMS based text communication for their daily needs, then is the time to rely on it exclusively for calling 9-1-1. That moment will be a decade or more off even in the best case where industry rolls out IMS in all (even rural) regions of the country at a rate much faster than any previous technology rollout.

II.C. IP-Relay fails as a proposed interim text-to-911 solution

We will not detail the inadequacy of IP Relay as an interim solution for text-to-9-1-1, since TDI and the other consumer groups have already performed a good analysis in their reply-to comments⁵.

IP Relay fails on many fronts, especially due to unacceptable call routing delays. However, its key failure is that it does not work on non-smartphones, nor on ANY phone in those numerous areas of the country where reliable IP connections are not available. It also requires users to have an expensive data plan and will not work without one - even in an emergency. This would never be deemed acceptable for mainstream users and it is an indication that the problem of access for people with disabilities is not being taken

⁵ Reply-to comments by TDI et al., PS Dockets 10-255 and 11-153, 02/09/2012.

seriously. That the recommendation in favor of IP Relay was made over the objection of every disability group, and supported by numerous industry commenters, is an indication that consumer input is not being taken seriously, either.

II.D. Criteria for an interim text-to-911 solution

The following are the criteria the RERC-TA has assembled for the selection of an interim text-to-9-1-1 solution in rough order of priority (though all are deemed essential). These are based on listening to consumers and PSAPs, as well as those in industry focused on access to 9-1-1.

1. it must work on all phones (with and without data plans) at all price levels (for phone and for plan)
2. it must work in all areas of the country where voice 9-1-1 calls can be made (it cannot be limited to urban or densely populated areas)
3. it must use a text communication method (technology and way of using it) that people are familiar with and can operate in a panic, under deadly stress, even if it is the first time they have every thought of calling 9-1-1
4. It must connect the user to the 9-1-1 telecommunicator within seconds of origin of the call, not minutes (except under exceptional circumstances such as a disaster). (A delay of minutes is often fatal and the caller may no longer be online when the telecommunicator comes online).
5. It must not require that the person pre-register. People with disabilities will not know they have to pre-register any more than people without disabilities would think to.
6. Nor can it be limited to people with disabilities. PSAP personnel (indeed none) should be in a position of telling a text caller to 9-1-1 that their call for help will not be handled because they do not have a disability even if they cannot or it is unsafe to call by voice for some reason.
7. It must not require the person to memorize or remember some special number or need to call different numbers depending on where they are at the moment.
8. The users must get immediate and certain feedback at each step so that they know that their communications are getting through – especially if the approach has communication delays in it once established.

The following 7 items are requirements assembled by consumers⁶. The RERC-TA supports these requirements. Any interim solution for text to 911 that violates one of the items below will have difficulty meeting the requirements above.

1. Provide direct access to 911;
2. Permit the end user to initiate first contact with 911 by sending an SMS text (i.e., Do not require the end user to make a voice call);
3. Accomplish routing of the SMS session to the appropriate PSAP within a reasonable time (i.e., seconds, not minutes);
4. Provide nationwide access to 911 through the three digit code of 9-1-1;
5. Once an end user texts the code 9-1-1, there must be an immediate reply (by an SMS gateway or other mechanism) that informs the user whether or not the emergency system has received the SMS text message and has begun process the message;
6. Reasonable turn-around times (e.g., Assume the end user sends an SMS message, the PSAP responds with an SMS message, and the end user responds again. How long a time period is acceptable for the PSAP and the end user to wait to receive each other's messages?); and
7. The interim direct SMS text-to-911 solution should be available to the general public (i.e., pre-registration of end users is not mandatory)

III. Response to other points made by commenters that impact the accessibility of 9-1-1

III.A. Real-time text

Real-time text does not impose an undue burden on the network

Motorola Mobility asserts that “[b]ecause RTT involves sending an IP packet for every character typed, it lacks the efficiency of some other text-based communications platforms and its effectiveness under network overload conditions, such as during a

⁶ TDI reply-to comments, pp. 22-23.

natural disaster, has yet to be evaluated.⁷ The RERC-TA strongly disagrees with this assessment. RFC 4103 does not send character by character. Rather, it samples the text that has been typed 2 to 3 times per second sending the text as one packet, and its behavior under network congestion is documented in the standards document itself⁸.

The expected network load of RFC 4103 in typical communication with 9-1-1 in the United States can be quantified using the following assumptions:

1. The maximum possible human typing speed is 120 words per minute, which equals 600 characters per minute.
2. The language used to communicate with the PSAP is English or Spanish (one byte per character in UTF-8)
3. The RTP packet overhead is approximately 60 bytes

600 characters per minute under assumption 1 equal 10 characters per second, which equals 10 bytes per second under assumption 2. Sampling every 300 ms equals roughly three samples per second, times 10 bytes, which equals 30 bytes per second in three packets. With the RTP overhead of assumption 3, this translates into 180 to 200 bytes per second, or 1.6 kBit/s at 3 packets per second for the combined payload and overhead. In contrast, the G.711 audio codec clocks in at 82.8 kBit/s and 50 packets per second under similar RTP overhead assumptions⁹. Hence, in a typical use case in 9-1-1 in the

⁷ Comments by Motorola Mobility, PS Dockets 10-255 and 11-153, 12/12/2011, page 5.

⁸ <http://www.rfc-editor.org/rfc/rfc4103.txt>

⁹ Voice Over IP - Per Call Bandwidth Consumption - Cisco Systems, Document Id 7394. Online:

United States, RFC 4103 uses less than 2% of the bandwidth and only 6% of the packet rate per second of the G.711 audio codec, which has been included in the NENA i3 specification¹⁰.

Even in the worst-case scenario of transmitting Chinese (4 bytes per character in UTF-8) in bursts of 30 characters per second, the required bit rate is only 4 kBit/s, at 3 packets per second. Moreover if no text is typed, nothing is transmitted under RFC 4103, in contrast to audio and video. There is no factual basis for Motorola Mobility's assertion that RTT will have a harmful impact on the network; on the contrary, under congestion RFC 4103 can be expected to hold up much better than any audio codec.

It also compares well with other messaging techniques that cannot meet the requirements for text outlined by the EAAC (as summarized below under "Checklist for NG9-1-1 text"). Finally, if any text-messaging technologies are used to try to meet the text requirements, RFC 4103 uses much less bandwidth in comparison.

Real-time text must be supported as part of SIP calls in next-generation 9-1-1

The Voice on the Net Coalition speaks out against real-time text as an accessibility solution, asserting that

“[a]lthough RTT may someday be an option for reaching emergency services personnel in a fully deployed NG 911 network, RTT as designed in the RFC 4103 standard has significant limitations as an accessibility

http://www.cisco.com/en/US/tech/tk652/tk698/technologies_tech_note09186a0080094ae2.shtml. Retrieved on 2/8/2012.

¹⁰ NENA i3 Detailed Functional and Interface Standards for the NENA i3 Solution, NENA 08-003.

solution. First, as a general observation, VON supports Neustar's contention that special purpose mechanisms for people with disabilities do not work well as accessibility solutions [...]”¹¹,

First, no one is proposing RFC 4103 as an interim solution (other than Industry in its report where it listed it as an option). RFC 4103 meets almost none of the 8 requirements we list above for an interim solution. So VON is posing a non-issue and arguing against it.

Second – Neustar's proposal IS an interim solution and not an NG9-1-1 solution, so it also is not clear why it is being compared to RFC 4103.

Mixed in with this is the statement that “*the RFC 4103 standard has significant limitations as an accessibility solution.*” If they mean it has significant limitations as an *interim* solution, then we agree. In fact it doesn't just have limitations, it fails multiple critical criteria for the interim-mobile text solution and we do not support it for those reasons.

If they mean that it has significant limitations as an NG9-1-1 solution for text communication, then it is unclear what the basis for “the” is. RFC 4103 is the standard developed by the industry standard group IETF specifically to meet both disability and mainstream text communication needs on SIP based networks.

We note that Real-time text is mandatory to ensure accessibility. One key tenet of the NG-9-1-1 architecture is the principle of total conversation with the possibility of having simultaneous audio, video, and text during a conversation, which is affirmed by the

¹¹ Reply-to Comments of the Voice on the Net Coalition, PS Dockets 10-255 and 11-153, 02/09/2012, p. 9.

EAAC recommendation P2.2: “[consumers can] [c]all NG9-1-1 using different forms of data, text, video, voice, and/or captioned telephony individually or **any combination thereof**” (emphasis ours)¹². As part of this model, RTT is an option that must be available during an audio or video-initiated call, which as per NENA i3 is based on SIP. The **only** real-time text format for SIP communication is RFC 4103. We also note that a significant portion of respondents in the EAAC survey expressed their desire to have simultaneous voice and text¹³, or simultaneous video, voice, and text at their disposal¹⁴.

Spam

Voice on the Net Coalition also expresses security concerns about the use of RFC 4103, stating that

“[t]o avoid the potential for SPAM, IP-based text messaging features typically incorporate consent mechanisms (e.g., approval of presence subscription prior to allowing an IM to be displayed) or include per-message charges sufficient to discourage those who would send SPAM. If RFC 4103 is implemented in general use without per-message charges or presence integration, there is a significant potential for introduction of SPAM over RTT.¹⁵”

While this is true for messaging technologies, RFC 4103 is not a messaging but rather a real-time communication medium like voice and video. Spam would be controlled for a

¹² Emergency Access Advisory Committee (EAAC) report and recommendations, 12/12/2011, PS Dockets 10-255 and 11-153, Recommendation P2.2, p. 22.

¹³ EAAC Report on Emergency Calling for Persons with Disabilities Survey Review and Analysis, question #18, p. 25. 07/21/2011. Online: <http://transition.fcc.gov/cgb/dro/EAAC/EAAC-REPORT.pdf>

¹⁴ Same, question #15, p. 22.

¹⁵ Reply-to Comments of the Voice on the Net Coalition, p. 12.

call that involved RFC 4103 in the same way it is controlled for voice or video. In fact RFC 4103 is not its own call mechanism, but a way to add real-time text to a call that can use voice, video and/or real-time text. The typical way to control spam consists of no-call lists. Since RFC 4103 is just another channel on a SIP call, it would fall under that no-call list, since a voice SIP call and an RFC 4103 SIP call are identical and can involve voice, text or video at any time in the call.

RTT is not a replacement for IM

Several commenters assumed that SIP-based RTT is destined to supplant IM. This is based on a fundamental misunderstanding – while RFC 4103 allows sending text both in real time and in sentences, RFC 4103 is a session-based protocol analogous to audio and video calls, and designed to behave like audio and video call sessions, or to augment them by adding a text channel. In contrast, IM is not session-based, and addresses a different mode of conversation – as the name says, it is “instant messaging.”

IM is used by many of us who use real-time communication (voice), and we would expect that people who use RFC 4103 for real-time communication on calls, will continue to use messaging (email, SMS, IM) as well like everyone else.

Real-time text will not lead to misunderstandings any more than voice calls

Motorola Mobility asserts that

“expressly because of its real-time nature, RTT could create dangerous confusion due to mistyping or other misunderstandings.¹⁶”

By this argument, voice calls also must be subject to the same type of dangerous misunderstandings, because they are real-time in nature. Yet, no one argues that voice calls must be turn-based because of this possibility. In fact, commenters have stated that a benefit of voice calls is that the telecommunicator can interrupt the caller¹⁷. Why voice and RTT should be different in this respect defies logic. Note that real-time text can be corrected when there are errors. Speech cannot and must be re-spoken to correct it.

III.A. CHECKLIST for NG9-1-1 text

Lost in the many of the discussions about the use of IM in place of real-time text is the fact that **messaging technologies cannot meet the text communication needs** of people with disabilities. The following checklist is therefore supplied to allow different text communication methods to be evaluated to determine if they can be used to meet the NG9-1-1 needs outlined by the EAAC and other groups studying this topic

NG9-1-1 Text Communication Requirements Checklist

- 1. Can be used to caption real-time voice.** Captioned telephony on SIP networks requires that voice and real-time text be possible on the same phone call so that a person can make a call and both hear the other person and see real-time captions.
- 2. Can the person make a single call to a single number – and have the option to communicate in voice, video, or text in any combination at any point in the call.** This is called total conversation. It is important to allow people who are talking but

¹⁶ Motorola Mobility Comments, p. 5

¹⁷ BRETSA comments, p. 14.

cannot always be understood (limited speech on one end or limited hearing on the other) to be able to supplement the speech with text. Also those signing often need to convey number or email addresses etc where it is impossible to look at the signer and accurately write down what you are seeing. For individuals who are deaf-blind they may be able to sign to communicate with others but must receive the communication back in text so that they can read it on their braille display.

3. **Text must be able to be seen as it is being created.** In emergency and other rapid communication sessions it is important to be able to see what the person is saying while they are saying it to speed up communication and (in emergency situations) steer the individual away from less useful topics or information and focus them on what is critical. This is especially important for people who type slowly.
4. **Text must be able to flow in both directions and be interruptible.** Both users must be able to type at the same time. 9-1-1 centers cannot be prevented from interrupting and guiding communications from a person who may be rambling or confused.
5. **People must be able to call 9-1-1 using the text method they use every day.** Thus there should not be just ONE format for text communication that is acceptable. Although real-time text is needed to meet other requirements (above) for some who rely on text, for others messaging may be the method they use every day. So neither real-time text nor messaging can meet the needs of all users and both should be supported. [Note: today there is no single common Messaging format besides SMS which is decidedly inferior in all other respect to IM. Hopefully a mechanism for interoperable Instant Messaging will emerge – or a gateway that can allow 9-1-1 centers to access whichever instant messaging format is used by people every day. For SIP, there is fortunately one format developed and promoted by IETF for real-time text on SIP (RFC 4103).

III.B. PSAPs must accept video calls, or NG-9-1-1 will not be accessible

The Boulder Regional Emergency Telephone Service Authority (BRETSA) and Colorado 9-1-1 Task Force jointly assert that the costs of allowing video calls are not worth the potential benefits. They further assert that the task of extracting the nature of the emergency and confirming its location can “be best accomplished by audio call; a plain old telephone call” and that “the transmission of video will not expedite but will in most cases delay the provision to the PSAP of the necessary information to dispatch the appropriate First Responders, and delay the First Responders arriving on scene when seconds count.¹⁸”

These assertions discount the need of people with disabilities to have direct access to 9-1-1 through their normal communication medium. In fact, in the case of people with disabilities, rejecting video calls will lead to exactly the scenario that the commenters strive to avoid: delays in obtaining the appropriate information and dispatching first responders, due to communication barriers. These assertions are also in direct conflict with recommendation P2.2 of the EAAC, which states the types of direct access that are needed for accessible NG-9-1-1, including the ability to engage in direct video calls and three-party calls among the caller, the telecommunicator at the PSAP, and a sign language interpreter, and video calls with voice and captioned telephony capability¹⁹.

¹⁸ Comments of the Boulder Regional Emergency Telephone Service Authority (BRETSA) and Colorado 9-1-1 Task Force, PS Dockets 10-255 and 11-153, 12/12/2011, page 23.

¹⁹ EAAC, Recommendation P2.2, p. 22.

Without the ability of the PSAPs to receive direct video calls, NG-9-1-1 will not be fully accessible, counter to the principle of equal access to emergency services. In particular, in the following scenario there are no alternatives for the PSAP but to accept direct video calls, and to watch the video during the initial communication and assessment phase: A person who is unable to use her voice or text calls NG-9-1-1 on borrowed telecommunication equipment, which has not been associated with a caller profile in advance. In this case, it is impossible to signal to the PSAP in advance as to what kind of communication assistance will be needed during the call (e.g. sign language interpretation or speech-to-speech assistance). The only way for the telecommunicator to assess the situation and obtain needed communication assistance would then be to watch the person sign or gesture on screen.

It is also worth noting that in case of relay calls, only the voice of the communication assistant is recorded and logged, rather than the actions of the caller. Any mistakes by communication assistants in rendering what the caller has to say can have fatal consequences, and may go unnoticed under the current 9-1-1 system. EAAC recommended that “individuals with disabilities calling NG9-1-1 have the same privacy, security, and monitoring safeguards as well as evidentiary records as individuals without disabilities who call NG9-1-1.²⁰” This goal can be accomplished only if PSAPs have the ability to receive direct multimedia calls, and if all media are recorded and logged.

BRETSA also raised the concern that requiring PSAP telecommunicators to view “videos of incidents is likely to adversely affect the effectiveness, health, number of

²⁰ Same, Recommendation P5.2, page 26.

stress related health claims, and retention of PSAP personnel.²¹” We note that this is the situation that sign language interpreters at video relay services currently have to endure, with the difference that video relay interpreters receive far less training and support for dealing with such incidents compared PSAP employees. It seems reasonable that PSAPs should be the ones to carry the brunt of the burden, rather than less trained video relay interpreters. However, the comments underscore the need for having a pool of video interpreters specifically trained for handling emergency calls, in addition to having PSAP training for handling video emergency calls.

In response to the security and privacy concerns of PSAPs with respect to accepting video calls, EAAC noted that “[a] concern was raised with regard to whether telecommunicators would want to be seen by 9-1-1 callers due to safety or other issues, as well as the impact not seeing the telecommunicator might have on deaf sign language users calling in. The committee decided it needed more information on this and will be turning in a report later on this topic.²²” It is clear that the needs of people with disabilities have to be balanced against the needs of PSAPs, but the balance must be upheld in such a way that the equal access principle holds.

Respectfully submitted,

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²¹ BRETSA, page 29.

²² EAAC, Recommendation P2.2, page 23.

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