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December 20, 2011

VIA ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: PS Docket Nos. 11-153, 10-255
Ex Parte Presentation

Dear Ms. Dortch:

On December 16, 2011, representatives from the Alliance for Telecommunications Industry Solutions' (ATIS) Interim Non-Voice Emergency Services (INES) Incubator met with representatives from the Commission's Public Safety and Homeland Security Bureau (PSHSB) and Consumer and Governmental Affairs Bureau (CGB). The purpose of this meeting was to discuss the INES Incubator's Report and Recommendations (attached hereto), which identifies an interim solution for text-based wireless communications to existing 9-1-1 services as an alternative to the text telephone system (TTY) while Next Generation 9-1-1 ("NG9-1-1") solutions are under development.

At this meeting, representatives from the INES Incubator discussed the process and technical criteria used to identify an interim solution, and explained that the Incubator's analysis was principally based on the technical characteristics of the proposals evaluated. The advantages and challenges associated with the recommended IP Relay Solution were discussed, as were the underlying reasons that the Incubator chose this solution over a SMS-to-National Clearinghouse solution. Discussion at this meeting was consistent with the presentation attached hereto.

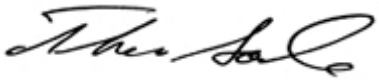
The following representatives from the FCC were present at this meeting: Patrick Donovan, Attorney, PSHSB; David Furth, Deputy Bureau Chief, PSHSB; Aaron Garza, Attorney, PSHSB; Timothy May, Analyst, PSHSB; Erika Olsen, Special Counsel, PSHSB; Karen Peltz Strauss, CGB; Cheryl King, CGB; Henning Schulzrinne, Engineering Fellow, PSHSB; David Siehl, Attorney, PSHSB; and Jerome Stanshine, Engineer, PSHSB.

Attending on behalf of the ATIS INES Incubator were: Jim Nixon, ENP, Director, National 9-1-1 Policy, T-Mobile and INES Chair; George Stanek, Senior Member of Technical Staff, AT&T, INES Vice-Chair; Praveen Goyal, Senior Director, Corporate & Government Relations, RIM; Roger Hixson, Technical Issues Director, NENA; Joe Marx, Assistant Vice President Federal Regulatory, AT&T; Ray Rothermel, Counsel-Legal/Government Affairs, Sprint; Nneka Ezenwa Director, Federal Regulatory Affairs, Verizon; Robert Morse, Assistant General Counsel, Verizon; Brian Scarpelli, Manager Government Affairs, TIA; Jim Turner, Director, ATIS and Thomas Goode, General Counsel, ATIS.

Pursuant to the Commission's rules, one copy of this letter is being filed electronically for inclusion in the public record of the above-referenced proceeding.

If there are any questions about this matter, please contact the undersigned.

Sincerely,



Thomas Goode
General Counsel

Ex-Parte Presentation to FCC

ATIS Interim Non-Voice Emergency Services Incubator (INES)

ATIS
December 16, 2011

The Challenge

TODAY:

- Existing emergency communications have not kept pace with the ways persons with disabilities prefer to use communications technologies.
  - With advancements in messaging services, the vast majority of persons with disabilities no longer utilize wireless TTY.
  - Yet new handsets for the past decade have built-in wireless TTY compatibility.
  - PSAPs have TTY devices under ADA.

FUTURE:

- Deployment of Multimedia Emergency Services for NG9-1-1 on CMRS communications systems is expected to provide integrated wireless voice, text and video in the long term.
- NG9-1-1 will deploy as local decisions are made and funding is available.
- These future IP-based emergency systems will deploy unevenly over a number of years.

The Need Now

- Identify and deploy the best technical interim solution for non-voice emergency communications on mobile networks and devices.
  - Identify now.
  - Deploy immediately.
  - Minimize impact to PSAPs, wireless service providers, and users so that future solutions are not delayed.

Mission of INES

- INES focused on the best technical recommendation to be implemented immediately.
  - Nationwide.
  - Usable with existing handsets and networks.
  - Minimal changes in PSAP training.
- Identify possible near-term non-voice emergency communications solutions.
  - Near Term = June 30th 2012.
  - Commercially available text based solutions.
- Identify the most promising technical solution to be implemented on existing networks and PSAPs.

Mission of INES (*cont'd*)

- Ensure near-term non-voice emergency communications solution is compatible with long-term 3GPP standards-based MMES solution and with NENA i3.
- Ensure FCC is engaged to coordinate policy and regulatory changes to support near-term non-voice emergency communications.

INES Participants

- Alcatel-Lucent
- APCO International
- AT&T
- CTIA-The Wireless Association®
- Intrado, Inc.
- National Emergency Number Association (NENA)
- Research In Motion Limited
- Samsung Telecommunications America
- Sprint
- T-Mobile
- TeleCommunication Systems, Inc.
- Telecommunications Industry Association (TIA)
- Verizon Wireless

INES Consultations with Consumer Advocates

- Consumer Advocate Organizations
  - Communication Service for the Deaf
  - Gallaudet University/TRACE R&D/RERC-Technology Access Project
  - HLAA
  - National Association of the Deaf, Telecommunications for the Deaf, Inc., & Norcal Center for Deaf and Hard of Hearing
  - NENA Accessibility Committee
  - NVRC for Hard of Hearing
  - Speech Communication Assistance for the Telephone, Inc.
  - TDI, Inc.
  - TRACE R&D Center, University of Wisconsin
- Dates of Consultations
  - July 7, 2011
  - October 13, 2011

INES Review Process

- Initially developed list of ideal requirements for near-term solution.
  - Minimal impact on users, other stakeholders.
  - Provision of Automatic Location Identification.
  - Nationwide.
  - Reliable.
  - Ability to connect directly to PSAPs.
- Developed list of all possible commercially available and non-propriety solutions.
- Consulted with consumer advocates and incorporated their feedback.
- Developed a matrix of 19 requirements and 18 possible solutions.

Observations

- No single possible near-term solution meets all ideal requirements.
- No existing text-based solution meets the public expectations associated with voice calls to 9-1-1.
- It is imperative that there be one interim solution that promotes public safety and will be useful until the nationwide deployment of 3GPP MMES and NENA i3 standards.
- Efforts should continue to identify technical improvements of the interim solution going forward.

Top Recommended Interim Solution: IP Relay

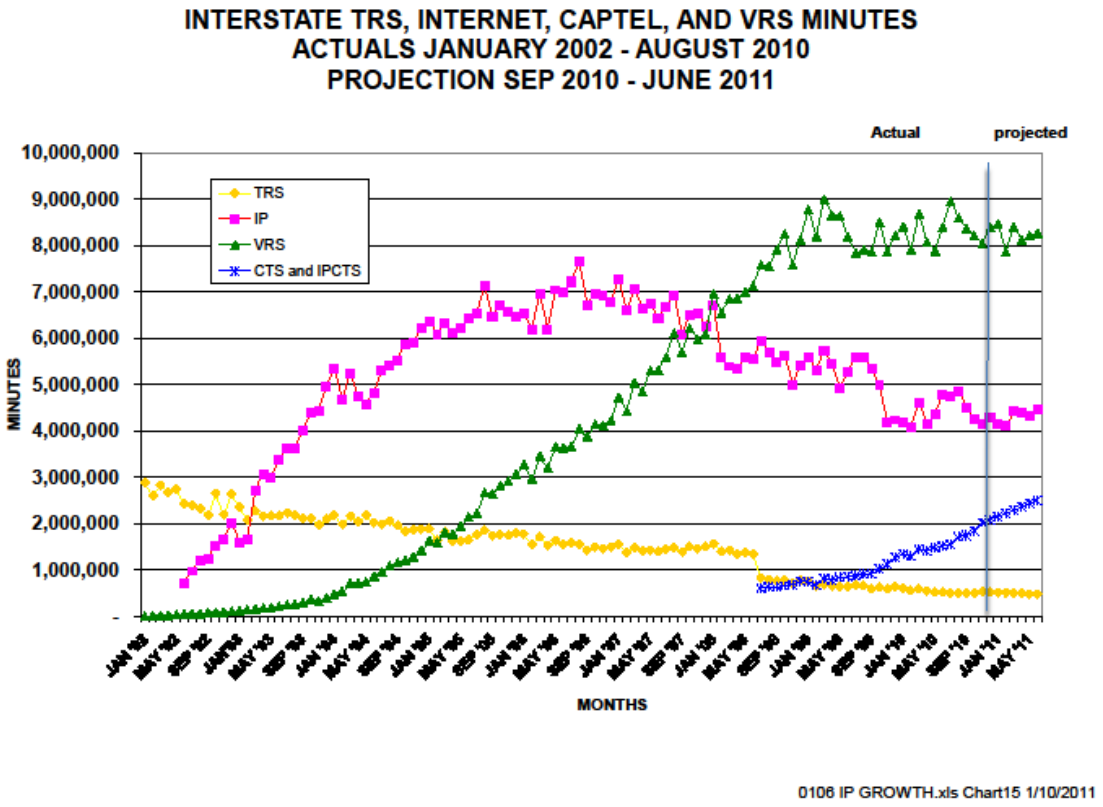
PROS:

- Available nationwide today.
- FCC already requires IP Relay to handle 9-1-1 calls.
- Widespread use should result in minimal impact to PSAPs.
- IP-capable devices are widely available across commercial networks with downward price points.
- Compatible with 3GPP standards-based MMES solution and NENA i3.

CONS:

- Places a CA (communications assistant) between Caller and PSAP.
- Emergency call processing is inherently slower through a relay.
- Existing voice 9-1-1 requirements are inapplicable (e.g., automatic location, all calls rule).

Top Recommended Interim Solution: IP Relay (*cont'd*)



Sourced from R-L-S-A.com

Alternate Approach Considered: SMS to National 9-1-1 Clearinghouse

PROS:

- SMS technologies are the preference of Advocates, though not unanimous.
- SMS widely available on mobile devices.
- SMS widely used today.
- Potentially provides all callers a text option.

CONS:

- SMS not designed for emergency communications.
- Existing voice 9-1-1 requirements are inapplicable (e.g., automatic location, all calls rule).

CONS (*cont'd*):

- Latency issues and no assurance message will be delivered.
- SMS to 9-1-1 Clearinghouse would require funding, development, staffing, and maintenance.
- Clearinghouse may require Congressional action.
- Would not meet June 30, 2012 timeframe.
- Not compatible with 3GPP standards-based MMES solution and NENA i3.
- Places a CA (communications assistant) between Caller and PSAP.
- Emergency call processing inherently slower through a relay.

Phase-Out of Wireless TTY

- CVAA envisions a phase-out of TTY technologies for equipment supporting new forms of text-based communications on IP networks and devices.
- INES recommends that FCC permit devices that support the interim solution be granted a waiver of TTY requirements going forward.
  - PSAP records show virtually non-existent use of TTY on wireless devices today.
- Legacy wireless devices with TTY compatibility will continue to be supported.

FCC High Level Considerations

- For IP Relay Interim Solution:
  - Issue a Public Notice clarifying that TRS is “an other communication provider” under the NET 911 Act.
  - Develop an educational program promoting IP Relay interim solution.
  - Determine if IP Relay is available to general public or only persons with disabilities.
- Begin the process to remove wireless TTY compatibility mandate.
- For SMS to National 9-1-1 Clearinghouse:
  - Study whether this new service involves the use of TRS Funding and presents organizational issues to be resolved.
  - Determine if SMS to National 9-1-1 Clearinghouse is available to general public or only persons with disabilities.
  - Address liability concerns.

Conclusion

- The industry stands ready to continue fast track improvements to the interim solution.
- We seek FCC feedback on the ATIS INES recommendation.

Thank you

ATIS-I-0000026

ATIS Interim Non-Voice Emergency Services (INES) Report and Recommendations

December 12, 2011

Abstract

This report documents the ATIS Interim Non-Voice Emergency Services (INES) Incubator efforts to perform a technical review of commercially available text-based communications solutions to enable emergency communications to existing PSAPs for persons with disabilities by June 30th 2012. From a detailed evaluation of a variety of possible candidates, the report recommends IP Relay as the best interim solution candidate for non-voice emergency communications on mobile networks and devices.

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Executive Summary

This report documents the ATIS Interim Non-Voice Emergency Services (INES) Incubator efforts to perform a technical review of commercially available text-based communications solutions to enable emergency communications to existing PSAPs for the persons with disabilities by June 30th 2012. It identifies IP Relay as an approach that is already deployed nationally to address individual needs, but according to Advocate input to ATIS INES, IP Relay is not widely used today in routine communications. It also identifies Short Message Service (SMS) to a national 9-1-1 clearinghouse as an approach that would require significant FCC, and potentially Congressional action, to implement. Due to latency and other technical issues, the use of SMS poses significant risk to individuals' safety and well-being. In addition, SMS is not is compatible with the long-term 3GPP standards-based Multimedia Emergency Services (MMES) solution. Lastly, the clearinghouse will take time and funding to create, staff, and maintain. Should SMS be used, it would likely require significant broadening of the scope of the FCC's current Telecommunications Relay Service (TRS) program.

The deployment of IP Multimedia Subsystem (IMS) on Long Term Evolution (LTE) or equivalent services (referred to as IMS) that comprise MMES for NG9-1-1 on CMRS communications systems is expected to provide integrated wireless voice, text and video capabilities in the long term. Wireless carriers are already beginning their LTE network and handset deployments, and widespread availability is expected within the next 3 to 4 years. Also, Public Safety is in the very early stages of its roll-out of Next Generation 9-1-1 (NG9-1-1) system capabilities, which are expected to leverage originating services LTE capabilities to provide end-to-end 9-1-1 communications via voice, text and video. NG9-1-1 deployment will occur through a phased-in approach and be dependent on local decisions and funding. These advances will enable unprecedented levels of access to emergency communications for persons with disabilities, and will also provide new capabilities to the general public. Achieving these significant improvements will require time, funding and other resources.

In an effort to identify candidate solutions capable of improving the current level of emergency access for persons with disabilities, the ATIS INES examined mobile text-based solutions that could be deployed in the near-term. For the review, ATIS INES targeted June 30th 2012 as a deployment date because this would allow the ATIS INES to focus on candidate solutions that could reasonably be expected to be deployed soon, thus providing short term improvements in emergency access while awaiting more robust improvements promised under IMS and NG9-1-1. Having a fixed target date also forced the ATIS INES to very carefully evaluate the maturity, ease of deployment and complexity of candidate solutions. ATIS INES explored a wide variety of approaches, many of which ATIS INES eventually eliminated due to their impacts on users, PSAPs, carriers, and manufacturers or due to the time needed to complete the standards or integration work necessary before evaluating their suitability for addition to the communications and 9-1-1 networks, with the intent of avoiding potential disruptions to these critical infrastructure elements. It should be noted that other options are available that are perceived to provide a solution with better, more direct emergency text communications, and more effective transition capabilities, but would require longer than June 30th 2012 to prepare and implement nationally. Since the timeframe for national implementation of the long term MMES solution[1] in conjunction with NG9-1-1 availability is a matter of years, interim text methods will continue to be used for years. The ATIS INES recommends that further work to evaluate and establish an improved interim emergency texting solution be considered. The benefits of improving the interim solution should be weighed against the risk of delay in addressing the development of the long term NG9-1-1 solution. At a minimum, however, effort should also be dedicated to identifying how the interim solution will transition to the long term NG9-1-1 solution offering MMES capabilities as they become available.

Early in the efforts, the ATIS INES developed a list of ideal requirements that an interim solution should possess in order to maximize its effectiveness. Critical technical concepts included minimal impact on users and other stakeholders, the provision of automatic location information, the ability to directly connect users to PSAPs, and a high level of reliability to ensure consistent emergency communications. During the course of the review a number of additional candidate solutions were offered consideration and ATIS INES included these in the review until there was simply not enough time remaining to perform full evaluations prior to the December 2011 report goal. As described more fully below, ATIS INES developed a matrix which depicted characteristics of the individual candidate solution relative to the list of ideal requirements in order to develop a side by side direct comparison. ATIS INES also held face-to-face meetings with advocates for persons with disabilities (Advocates) to discuss their needs and concerns in order to gauge the viability of candidate solutions. ATIS INES gained

[1] The term "MMES" is defined in Appendix A.1 Definitions

valuable insight through these discussions and their input significantly impacted and improved the findings. ATIS INES appreciates the time and effort they contributed to the efforts.

Hearing Carry Over (HCO) and Voice Carry Over (VCO) were discussed but not considered as requirements for the ATIS INES solution since the objective is a text alternative to Teletype (TTY). Some IP Relay providers do support Captioned Telephone Service which allows voice to be used with text. This is an emerging solution that is currently available with a limited number of relay providers and supported by the FCC's TRS program.

It quickly became apparent that no single candidate solution met all of our criteria. A major component of the review thus became balancing the relative merits of the candidate solutions in terms of availability, reliability, impact on stakeholders (user experience, cost of new handsets, PSAP operational impact, impact on stability of other system elements, etc.). ATIS INES eventually developed a short list of three candidate solution which performed best against our requirements list. Following the final meeting with the Advocates, ATIS INES decided to keep two of these as part of our recommendations. However, these options require methods for handling the actual text messages outside the call path until NG9-1-1 is in place.

From a technical perspective, IP Relay is the best alternative for interim emergency communications by the June 30th 2012 target timeframe. This result is driven largely by the fact that IP Relay is available nationwide today and widespread use should result in minimal impact to PSAPs – nonetheless ATIS INES recognizes this alternative is not perfect. First, automatic location is not possible with IP Relay so users and communications assistants (CAs) must spend time verifying the registered location or determining the location of the emergency before the 9-1-1 call can be routed to a PSAP. Second, Advocates report that IP Relay is used by only a subset of users for routine communications, due in part to the cost of smartphones that primarily support the required functionality. Greater user adoption of IP Relay for daily communications would improve familiarity with this approach, making its use in emergency situations more natural and potentially saving time. Third, some users reported that the level of IP Relay CA performance in handling emergencies is lower than their performance handling daily communications. A review of CA training and qualifications could address this concern. Fourth, emergency call processing is inherently slower through a relay third party than methods that deliver the initial emergency call from the caller directly to the 9-1-1 system and the PSAP, typically requiring minutes rather than seconds.

Although there was not unanimous agreement, Advocates generally stated a preference during our meetings for SMS to a national relay center dedicated to handling emergency calls. The Advocates reported that SMS is widely used for daily communications and is available on a wide array of handsets, making it a natural choice for emergency communications. The Advocates also supported SMS because it is commonly used across the entire population and it would enable all callers a text option for 9-1-1 calls. This option also has significant shortfalls, however, because SMS was not designed for emergency communications and thus has a wide variety of documented problems if used as an emergency communication tool. First, the latency issues associated with its store and forward architecture provide no assurance that emergency messages will be delivered in order, in a timely manner or even at all. This may have life threatening implications to the end users. Second, it is not designed to provide automatic location information. The time required to develop solutions to overcome this shortfall clearly makes it unsuitable for deployment by June 30th 2012. Third, SMS is not is compatible with the long-term 3GPP standards-based MMES solution and can not be transitioned to the long-term solution. Fourth, this approach would require funding, deploying, staffing and maintaining a national SMS to 9-1-1 clearinghouse to make it effective. This would require significant support from the FCC, which oversees and largely funds the relay function nationally. Additionally, the size and scope of a national clearinghouse would grow exponentially, and probably require Congressional action, if SMS to 9-1-1 was expected to support calls from the entire texting public.

As Congress intended under the Communications and Video Accessibility Act (CVAA), the TTY mandate should be phased out for wireless equipment supporting alternate forms of text-based communications to 9-1-1. Therefore, it is recommended that the Commission permit devices that support the interim solution to be waived of the TTY requirements in order to devote resources to the development of NG9-1-1 technologies.

As part of the evaluation criteria, the ATIS INES considered whether the FCC's existing rules and policies for 9-1-1 emergency communications could be satisfied through the evaluated solutions. The ATIS INES attempted to recommend solutions that most closely align with these rules and policies while recognizing that none of the existing solutions meet all of the FCC's rules and policies for 9-1-1 emergency communications. In order to implement the recommended ATIS INES solutions, the FCC must determine whether the benefits of an interim text-based communications to 9-1-1 solution for persons with disabilities outweighs the cost of waiving the application of many of the FCC's existing rules and policies for 9-1-1 emergency communications.

The FCC should recognize that any existing solution will not be able to meet the broad set of public expectations that are associated with voice calls to 9-1-1. The ATIS INES recommended 3rd Party IP Relay solution, however, will provide a mode of emergency communications that exists today but may be underutilized by persons with disabilities. Alternatively, if the FCC decides to support a National SMS Relay Center rather than IP Relay, then a number of issues will require FCC action to create this new service, including significant funding and organizational issues if it is made available to the entire population. If the FCC adopts any of the ATIS INES evaluated solutions, the FCC should take the regulatory steps necessary to provide the certainty needed to ensure the efficient and expedited deployment and adoption of a text-based emergency 9-1-1 communication solution for persons with disabilities.

The ATIS INES recognizes that the 3GPP MMES standards on the originating network side and the NENA I3 standards on the Public Safety side will provide the long term solution for non-voice emergency services that the disabled community wants and needs. No interim solution should delay or impede the deployment of the long term solution. TTY functionality will be replaced in next generation networks with IP-based text communications and thus does not warrant extensive changes to support an interim emergency services solution.

1 Introduction

1.1 Mission

The mission of the ATIS INES Incubator shall be to:

- Identify possible interim non-voice emergency communication solutions. Identify gaps for an end-to-end interim non-voice emergency communication solution, including impacts to subscribers and upgrades to PSAPs.
- Identify the most promising solution(s) for interim implementation on deployed wireless networks today.
- Leverage existing work in ATIS committees addressing interworking with the National Emergency Number Association (NENA) i3 network.
- Ensure that the interim non-voice emergency communication solution is compatible with the long-term 3GPP standards-based MMES solution.
- Create an interoperability test specification for the interim solution.
- Perform interoperability tests - once devices, applications, and infrastructure (including PSAP) enhancements are available.
- Coordinate this activity with other relevant industry and government groups (e.g., ATIS, NENA, FCC, PTCRB).
- Ensure the FCC is engaged to coordinate policy and regulatory changes to support the interim non-voice emergency communications.

1.2 Scope

The FCC mandated in June 2002 that all digital cell phones have the capability to support TTY/ Telecommunications Device for the Deaf (TDD), through a 2.5 mm jack. The purpose of the TTY mandate was to ensure that persons with disabilities could contact Public Safety utilizing digital cell phones and portable TTY/TDDs. This user community soon learned that texting was a much better way to communicate than utilizing the TTY/TDD technology. Unfortunately, the wireless networks do not support texting to 9-1-1 nor can every PSAP in the country receive text messages. This leaves the disabled mobile users without a viable way to contact 9-1-1.

The industry recognized this condition exists and realized the condition is solved with MMES and NG9-1-1; when LTE is fully deployed and all PSAPs are connected through Internet Protocol (IP). Some carriers have already started the migration to LTE – Fourth Generation (4G). Some PSAPs have the capability to support NG9-1-1 today. However, it will take years to complete the migration to LTE and NG9-1-1. Similar migrations have happened in the past, such as moving from analog to digital wireless and TDMA to GSM.

The ATIS INES Incubator was formed to identify a technical solution that would enable persons with disabilities to contact Public Safety in the interim time period before MMES is nationally available. As Public Safety is of critical concern, the ATIS INES selected the target date of June 30th 2012 to have a viable technical solution available.

2 TTY/TDD Wireless Access Mandate Transition

For the device and manufacturing community, removal of the legacy TTY mandate for future mobile handsets will facilitate increased innovation for product and devices. Therefore, it is fundamental to the successful transition to MMES, the ATIS INES believes nothing should impede or slow the migration to MMES for NG9-1-1. As long as TTY is mandated in every handset, it acts as a disincentive to deploying more modern and user friendly IP-based capabilities in new handsets.

2.1 TTY/TDD Issues

There are many problems with TTY/TDD in general. The following list identifies some of these issues:

1. Many PSAP agents mistakenly think a TTY/TDD call is an automated fax dialing machine call and disconnect when they hear the Baudot tones.
2. Baudot was developed to send stock quotes over telegraph lines to ticker machines. It works at 50 baud, a very slow speed for modern communications.
3. TTY/TDD is asynchronous. When two users communicate though TTY/TDDs, only one can type at a time. If both users type at the same time the results are garbled on the TTY display and difficult to decipher. Many PSAPs will automatically send a response message, e.g., “9-1-1 what is your emergency?”, when it recognizes the Baudot code on the call. If the TTY/TDD user continues to type, overlapping the PSAPs automatic response, the resulting conversation becomes confusing which is problematic in an emergency situation.
4. There are etiquette rules that users of TTY/TDDs must be aware of. For example, when a person has finished speaking, the term "Go Ahead" (GA) is used to denote the end of a thought, as silence or a pause is ambiguous to a hearing impaired TTY/TDD user. Many PSAP agents are not familiar with this etiquette.

2.2 Digital Cellular TTY/TDD Issues

Cellular TTY/TDD has issues in addition to general TTY issues. Some of these issues are:

1. Users find it inconvenient to carry a cellular device and a portable TTY/TDD that would only be used in an emergency.
2. Portable TTY/TDDs require batteries to operate, and are thus another device for the user to remember to maintain and keep charged.
3. Newer cellular devices use a 3.5 mm jack that is not compatible with Legacy TTY 2.5 mm connectors, necessitating a converter between the two.
4. The cellular device has to be put in TTY mode to operate with a TTY/TDD. Since TTY is not the normal way of communicating (texting is) in an emergency situation, the user has not only to react to put the phone in TTY mode but then connect the portable TTY/TDD before communication with Public Safety can occur.
5. Some hearing users accidentally put their phone in TTY mode. This results in higher TTY server traffic in some networks and generates user complaints about voice quality. Usage studies of TTY servers consistently find the majority of users are people who mistakenly put their phones in TTY mode.
6. Indiana’s data shows that out of the 11 million wireless 9-1-1 calls made over the past 5 years, only 11 calls were TTY (these were more than likely PSAP test calls).

Every mobile device manufacturer is required to support TTY on every handset. As evidenced by the lack of its usage, this requirement of actually testing TTY capabilities, fixing problems that do not pass these tests, and utilizing phone resources (memory), wastes resources that could be put to alternative use. Removal of the TTY mandate would allow these resources to focus on MMES.

2.3 Transition Plan for Cellular TTY Mandate Removal

For current landline and cellular TTY/TDD users, the networks and PSAPs will continue to support legacy TTY. However, the handset manufacturers should not be required to implement the process to support legacy TTY technology on every handset. This requirement is so seldom utilized that its intended benefit of connecting the hearing impaired community with Public Safety resources is all but nullified. The legacy TTY mandate requires resources to focus on an outdated service, when these resources could be better used focusing on an interim solution and progression to NGN.

For these reasons, it is the recommendation of the ATIS INES that the FCC remove the legacy TTY requirement from handset manufactures.

3 Goals

The goals of the ATIS INES incubator project are as follows:

1. ATIS INES is technology focused, looking at developing recommendations to meet the requirements based upon the capabilities of the existing devices, underlying networks, and PSAPs.
2. ATIS INES is not focusing on specific vendor implementations and will not make a specific recommendation or endorsement of a vendor implementation.
3. ATIS INES has the goal of identifying a single, nationwide technical solution to meet its criteria.
4. ATIS INES is focused on an interim solution to enable non-voice emergency communications on mobile devices.

4 Assumptions

The ATIS INES assumptions are divided into the following two categories:

- ATIS INES ideal assumptions
- ATIS INES conditional assumptions

4.1 ATIS INES Ideal Assumptions

1. Recommended solution is targeted for deployment by June 30th 2012.
2. Solution should have minimal impact to mobile phones, network equipment, network service providers, PSAPs, application service providers, and 3rd party providers.
3. No new hardware or device platform software requirements for mobile phones (including OS).
4. Text-based solution for emergency services targeted for the persons with disabilities (may or may not be usable by the general public).
5. A common solution which will be supported nationally.
6. Meets specified non-proprietary technical, interoperability, and performance standards.
7. Use commercially available[2] Information Communications Technology (ICT) mobile terminals with no hardware or platform software changes.
8. Software solutions made through a downloadable application shall have no negative impact to handset embedded software.
9. Nominal end user cost for the feature.
10. This feature is not expected to work on non-service initialized phones.
11. Platform independent solution available on capable new or existing commercially available ICT.
12. Support availability of at least coarse[3] end user location information to allow an emergency call to be routed.
13. Resolution of the following policy issues is required prior to the deployment of the interim solution:
    a. Removal of the TTY mandate for future ATIS INES solution (and ultimately MMES) enabled mobile phones.
    b. Coordinated education effort between all stakeholders including Public Safety, consumer groups, wireless industry and the FCC.
    c. Liability protection equivalent to current 9-1-1 policies and extended as needed to support non-voice methods.
    d. Rules to permit non-voice methods—acknowledgement of regulatory paradigm shift, differing from

[2] The term “commercially available” is defined in Appendix A.1 Definitions.

[3] Defined in section 3.1 of NENA 57-501 *NENA Wireless Phase I & II Features and Functions* [Ref 9]

voice 9-1-1 (e.g., location and reliability).

4.2 ATIS INES Conditional Assumptions

1. ATIS INES should not impact legacy mobile device functions including legacy TTY.
2. Needs to be available for a variety of mobile phones (Example – smartphones, messaging devices, feature phones).
3. Solution does not need to support emergency mode restrictions in the network and mobile device.
4. Solution does not have to support simultaneous voice and text.
5. Support for the ability for the PSAP to re-contact the mobile phone in a non-voice manner is desirable.
6. Desirable for best available location to be delivered to entity receiving emergency call.

5 Requirements

The ATIS INES requirements are divided into the following two categories:

- ATIS INES Ideal Requirements
- ATIS INES Conditional Requirements

HCO and VCO were discussed but not considered as requirements for the ATIS INES solution since the objective is a text alternative to TTY. Some IP Relay providers do support Captioned Telephone Service which allows voice to be used with text. This is an emerging solution that is currently available with a limited number of relay providers and supported by the FCC's TRS program.

5.1 ATIS INES Ideal Requirements

The ATIS INES solution SHALL meet all of the following ideal requirements:

1. The ATIS INES solution *shall* be commercially available[4] to end users on or before June 30th 2012. ATIS INES targeted June 30th 2012 as a deployment date because this would allow the ATIS INES to focus on candidate solutions that could reasonably be expected to be deployed soon, thus providing short term improvements in emergency access while awaiting more robust improvements promised under IMS and NG9-1-1.
2. The ATIS INES solution *shall* be available as a third party download, available via browser, and/or generally available without any mobile phone hardware or platform software changes on commercially available[4] mobile interactive consumer terminal platforms.
3. The ATIS INES solution *shall* be supported on existing mobile cellular communications networks.
4. The ATIS INES solution *shall* route to the identified appropriate PSAP based upon coarse location obtained.
5. The ATIS INES solution *shall* support communication with a Public Safety Answering Point (PSAP) to the call takers position, using communications technology already supported today, teletypewriter (TTY) Baudot 45.45 bits per second and voice-based telephony.
6. The ATIS INES solution *shall* provide publicly available operational training and support documentation without cost as needed on or before June 30th 2012.
7. The ATIS INES solution *shall* be as accessible and usable by persons with disabilities as are existing communications technology solutions already used for emergency services in the United States today.
8. The ATIS INES solution *shall* be a single nationwide solution available to all wireless operators.

[4] The term "commercially available" is defined in Appendix A.1 Definitions.

9. The ATIS INES solution SHALL be implemented using standard, cross-platform, non-proprietary standards.
10. The ATIS INES solution that is available through third party download, available via browser, and/or generally available[4] *shall* have minimal negative impact to mobile phone features or functions.
11. The ATIS INES solution *shall not* require more than nominal end user cost to access the solution. Note: ATIS INES solution require the subscriber to have an appropriate service plan supporting the chosen solution.
12. The ATIS INES solution *shall* provide coarse location, directly or indirectly, through standard, cross-platform, non-proprietary standards to a PSAP.
13. The ATIS INES solution *shall not* disrupt or disable activated features of other products that are identified as accessibility features.
14. The ATIS INES solution *shall* support one access number nationally.
15. The ATIS INES solution *shall* confirm that the communication session completed successfully.
16. The ATIS INES solution *shall* support multiple simultaneous independent calls/sessions at the PSAP.
17. The ATIS INES solution *shall not* require an upgrade to the PSAP logging capability.
18. The ATIS INES solution *shall* maintain association between end user and the PSAP for related multiple message communications.
19. The ATIS INES solution *shall* only function on devices that are currently service initialized (FCC rules currently require delivery of only voice 9-1-1 on "non-service initialized" devices).

5.2 ATIS INES Conditional Requirements

The following ATIS INES conditional requirements are not mandatory requirements, but may improve the overall usefulness of the successful ATIS INES solution:

1. The ATIS INES solution *should* be implemented in such a way as to be easy to use, robust, avoid failure, and otherwise not impede the fundamental or essential characteristics and performance of the network and device. For example, the system impacts from the ATIS INES solution should be comparable to similar solutions currently available.
2. The ATIS INES solution *should not* be required to support various emergency modes inconsistently implemented in the existing networks and mobile devices.
3. The ATIS INES solution *should not* be required to support the use of simultaneous voice and text.
4. The ATIS INES solution *should* provide the ability for the PSAP to contact or “call back” the mobile ICT device that had previously placed an emergency call, preferably in a non-voice manner.
5. The ATIS INES solution *should* provide the best location information available to the PSAP.
6. The ATIS INES solution *should not* require pre-registration.
7. The ATIS INES solution *should not* add significant delay to end-to-end communications, including those that incorporate queuing or store and forward techniques.
8. The ATIS INES solution *should not* be device dependent.

6 Evaluation of Near-Term Candidate Solutions

The ATIS INES incubator project identified candidate interim solutions which are described in *Appendix C: Landscape of Near-Term Candidate Solutions*. This section of the report provides a comparison of these candidate interim solutions with the requirements identified in section *ATIS INES Ideal Requirements*.

This comparison is provided in the form of a Requirements Solution Matrix. Because of the size of this Requirements Solution Matrix, the Matrix is divided into three tables with each table having the same general same format and structure. Each table contains the requirement number, the abbreviated requirement

description, and six of the candidate interim solutions. The allocation of candidate interim solutions to the Requirement Solution Matrix is as follows:

Requirement Solution Matrix (table 1 of 3)

- Real Time Text (RTT) Direct to PSAP – Wireless Operator based (Appendix C.8)
- Real Time Text (RTT) Direct to PSAP – 3rd Party based (Appendix C.8)
- RTT with TTY to PSAP – Wireless Operator based (Appendix C.9)
- RTT with TTY to PSAP – 3rd Party based (Appendix C.9)
- RTT to Relay Service – Wireless Operator based (Appendix C.10)
- RTT to Relay Service – 3rd Party based (Appendix C.10)

Requirement Solution Matrix (table 2 of 3)

- SMS Direct to PSAP – Wireless Operator based (Appendix C.5)
- SMS Direct to PSAP – 3rd Party based (Appendix C.5)
- Voice Emergency Call then SMS (Appendix C.6)
- National SMS Relay Center (Appendix C.7)
- Central All Text (CAT) (Appendix C.14)
- Video Relay Service – 3rd Party based (Appendix C.2)

Requirement Solution Matrix (table 3 of 3)

- IP Relay Service – 3rd Party based (Appendix C.3)
- Home PSAP Relay (Appendix C.12)
- Voice 9-1-1 Call then Web-Based Non-Voice Communications (Appendix C.13)
- Instant Messaging (IM) (Appendix C.4)
- TTY Emulation (Appendix C.11)
- Video American Sign Language (Appendix C.1)

For each requirement for each of the candidate interim solution, the Requirement Solution Matrix will contain one of the following evaluations:

- ***Acceptable*** – The candidate interim solution could immediately comply with the requirement.
- ***Partial*** – The candidate interim solution could comply with the requirement but some development was needed or some limitations apply.
- ***Unacceptable*** – The candidate interim solution could not comply with requirement and extensive development work would be needed.
- ***Not Applicable*** – This requirement is not applicable to the evaluation comparison of this candidate interim solution.

Any of the above evaluations could have an associated note. References to the associated note would be provided in the format of (#nn) where nn is the specific note being referenced. The list of notes referenced in any of the Requirement Solution Matrix tables is provided after the last Requirements Solution Matrix table.

Table 1: Requirement Solution Matrix (table 1 of 3)

Rqmt	Abbreviated Requirement Description	RTT Direct to PSAP		RTT with TTY to PSAP		RTT to Relay Service	
		Wireless Operator	3rd Party	Wireless Operator	3rd Party	Wireless Operator	3rd Party
1	SHALL be commercially available to end users on or before June 30th 2012	Unacceptable	Partial (#01)	Unacceptable	Partial (#01)	Unacceptable	Partial (#01)
2	SHALL be available without any mobile phone hardware or platform software changes on commercially available mobile ICT platforms	Unacceptable	Acceptable	Unacceptable	Acceptable	Unacceptable	Partial (#10)
3	SHALL be supported on existing mobile cellular communications networks	Unacceptable	Acceptable	Unacceptable	Acceptable	Unacceptable	Acceptable
4	SHALL route to the identified appropriate PSAP based upon coarse location obtained	Unacceptable	Partial (#11)	Unacceptable	Partial (#11)	Unacceptable	Partial (#11)
5	SHALL support communication with a Public Safety Answering Point (PSAP) to the call taker's position using communications technology already supported today	Unacceptable	Unacceptable	Acceptable	Acceptable	Acceptable	Acceptable
6	SHALL provide publicly available operational training and support documentation without cost as needed on or before June 30th 2012	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
7	SHALL be as accessible and usable by persons with disabilities as are existing communications technology solutions already used for emergency	Partial (#13)	Partial (#13)	Partial (#13)	Partial (#13)	Partial (#13)	Partial (#13)
8	SHALL be a single nationwide solution available to all wireless operators	Unacceptable	Acceptable	Unacceptable	Acceptable	Unacceptable	Acceptable
9	SHALL be implemented using standard, cross-platform, non-proprietary standards	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
10	SHALL have minimal negative impact to mobile phone features or functions	Partial (#06)	Partial (#06)	Partial (#06)	Partial (#06)	Partial (#06)	Partial (#06)
11	SHALL NOT require more than nominal end user cost to access the solution	Partial (#14)	Partial (#14)	Partial (#14)	Partial (#14)	Partial (#14)	Partial (#14)
12	SHALL provide coarse location, directly or indirectly, through standard, cross-platform, non-proprietary standards to a PSAP	Partial (#07)	Partial (#07)	Partial (#07)	Partial (#07)	Partial (#07)	Partial (#07)
13	SHALL NOT disrupt or disable activated features of other products that are identified as accessibility features	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
14	SHALL support one access number nationally	Unacceptable	Acceptable	Unacceptable	Acceptable	Acceptable	Acceptable
15	SHALL confirm that the communication session completed successfully	Acceptable	Acceptable	Unacceptable	Unacceptable	Acceptable	Acceptable
16	SHALL support multiple simultaneous independent calls/sessions at the PSAP	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
17	SHALL NOT require an upgrade to the PSAP logging capability	Unacceptable	Unacceptable	Acceptable	Acceptable	Acceptable	Acceptable
18	SHALL maintain association between end user and the PSAP for related multiple message communications	Partial (#09)	Partial (#09)	Acceptable	Acceptable	Acceptable	Acceptable
19	SHALL only function on devices that are currently service initialized	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 2: Requirement Solution Matrix (table 2 of 3)

Rqmt	Abbreviated Requirement Description	SMS Direct to PSAP		Voice Emergency Call then SMS	National SMS Relay Center	Central All Text (CAT)	Video Relay Service – 3rd Party
		Wireless Operator	3rd Party				
1	SHALL be commercially available to end users on or before June 30th 2012	Unacceptable	Partial (#01)	Unacceptable	Partial (#15)	Unacceptable	Unacceptable
2	SHALL be available without any mobile phone hardware or platform software changes on commercially available mobile ICT platforms	Acceptable	Acceptable	Partial (#10)	Partial (#10)	Unacceptable	Acceptable
3	SHALL be supported on existing mobile cellular communications networks	Partial (#02)	Partial (#03)	Unacceptable (#18)	Partial (#03)	Unacceptable	Unacceptable
4	SHALL route to the identified appropriate PSAP based upon coarse location obtained	Unacceptable	Partial (#04)	Acceptable	Partial (#11)	Partial (#11)	Partial (#11)
5	SHALL support communication with a Public Safety Answering Point (PSAP) to the call taker's position using communications technology already supported today	Unacceptable	Unacceptable	Unacceptable	Acceptable	Partial (#17)	Acceptable
6	SHALL provide publicly available operational training and support documentation without cost as needed on or before June 30th 2012	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
7	SHALL be as accessible and usable by persons with disabilities as are existing communications technology solutions already used for emergency	Acceptable	Acceptable	Acceptable	Acceptable	Partial (#13)	Partial (#13)
8	SHALL be a single nationwide solution available to all wireless operators	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Unacceptable
9	SHALL be implemented using standard, cross-platform, non-proprietary standards	Acceptable	Partial (#05)	Acceptable	Acceptable	Acceptable	Unacceptable
10	SHALL have minimal negative impact to mobile phone features or functions	Partial (#06)	Partial (#06)	Partial (#06)	Partial (#06)	Unacceptable	Partial (#06)
11	SHALL NOT require more than nominal end user cost to access the solution	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Partial (#14)
12	SHALL provide coarse location, directly or indirectly, through standard, cross-platform, non-proprietary standards to a PSAP	Unacceptable	Partial (#07)	Acceptable	Unacceptable	Partial (#07)	Unacceptable
13	SHALL NOT disrupt or disable activated features of other products that are identified as accessibility features	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
14	SHALL support one access number nationally	Unacceptable	Acceptable	Acceptable	Partial (#16)	Partial (#16)	Acceptable
15	SHALL confirm that the communication session completed successfully	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Acceptable
16	SHALL support multiple simultaneous independent calls/sessions at the PSAP	Partial (#08)	Partial (#08)	Partial (#08)	Partial (#08)	Acceptable	Acceptable
17	SHALL NOT require an upgrade to the PSAP logging capability	Unacceptable	Unacceptable	Unacceptable	Acceptable	Unacceptable	Acceptable
18	SHALL maintain association between end user and the PSAP for related multiple message communications	Unacceptable	Partial (#09)	Partial (#09)	Acceptable	Acceptable	Acceptable
19	SHALL only function on devices that are currently service initialized	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 3: Requirement Solution Matrix (table 3 of 3)

Rqmt	Abbreviated Requirement Description	IP Relay Service – 3rd Party	Home PSAP Relay	Voice 9-1-1 Call then Web Non-Voice Comm	Instant Messaging (IM)	TTY Emulation	Video American Sign Language (ASL)
1	SHALL be commercially available to end users on or before June 30th 2012	Acceptable	Partial (#01)	Partial (#01)	Partial (#01)	Unacceptable	Unacceptable
2	SHALL be available without any mobile phone hardware or platform software changes on commercially available mobile ICT platforms	Acceptable	Acceptable	Partial (#10)	Acceptable	Unacceptable	Unacceptable
3	SHALL be supported on existing mobile cellular communications networks	Acceptable	Acceptable	Unacceptable (#18)	Acceptable	Acceptable	Unacceptable
4	SHALL route to the identified appropriate PSAP based upon coarse location obtained	Partial (#04)	Partial (#04)	Acceptable	Partial (#11)	Acceptable	Partial (#04)
5	SHALL support communication with a Public Safety Answering Point (PSAP) to the call taker's position using communications technology already supported today	Acceptable	Unacceptable	Unacceptable	Unacceptable	Acceptable	Unacceptable
6	SHALL provide publicly available operational training and support documentation without cost as needed on or before June 30th 2012	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
7	SHALL be as accessible and usable by persons with disabilities as are existing communications technology solutions already used for emergency	Acceptable	Acceptable	Partial (#13)	Acceptable	Partial (#13)	Partial (#13)
8	SHALL be a single nationwide solution available to all wireless operators	Acceptable	Acceptable	Acceptable	Partial (#12)	Acceptable	Unacceptable
9	SHALL be implemented using standard, cross-platform, non-proprietary standards	Acceptable	Acceptable	Unacceptable (#19)	Unacceptable	Acceptable	Unacceptable
10	SHALL have minimal negative impact to mobile phone features or functions	Partial (#06)	Partial (#06)	Partial (#06)	Partial (#06)	Partial (#06)	Partial (#06)
11	SHALL NOT require more than nominal end user cost to access the solution	Partial (#14)	Acceptable	Partial (#14)	Acceptable	Partial (#14)	Partial (#14)
12	SHALL provide coarse location, directly or indirectly, through standard, cross-platform, non-proprietary standards to a PSAP	Partial (#07)	Unacceptable	Acceptable	Unacceptable	Acceptable	Unacceptable
13	SHALL NOT disrupt or disable activated features of other products that are identified as accessibility features	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
14	SHALL support one access number nationally	Acceptable	Unacceptable	Acceptable	Unacceptable	Acceptable	Unacceptable
15	SHALL confirm that the communication session completed successfully	Acceptable	Unacceptable	Acceptable	Acceptable	Unacceptable	Acceptable
16	SHALL support multiple simultaneous independent calls/sessions at the PSAP	Acceptable	Partial (#08)	Acceptable	Acceptable	Acceptable	Acceptable
17	SHALL NOT require an upgrade to the PSAP logging capability	Acceptable	Unacceptable	Unacceptable	Unacceptable	Acceptable	Unacceptable
18	SHALL maintain association between end user and the PSAP for related multiple message communications	Acceptable	Partial (#09)	Partial (#09)	Partial (#09)	Acceptable	Partial (#09)
19	SHALL only function on devices that are currently service initialized	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Notes Referenced in the Requirement Solution Matrix Tables

01 - Supported by some but not all PSAPs

02 - Requires a large number of short codes

03 - Requires a SMS code for 9-1-1

04 - Manual

05 - Offered as a standard but implemented as a proprietary solution

06 - Training required

07 - Method different from voice 9-1-1 location

08 - Not a session based protocol

09 - Assumes changes to the PSAP call handling

10 - Does not operate identically on all mobile devices or service platforms

11 - Manual or through 3rd party application

12 - Not all PSAPs have access to all Instant Messaging (IM) service providers

13 - Conditional support

14 - Subscriber may have to replace their mobile device

15 - National SMS relay center would need to be created and maintained

16 - National platform needs to be developed

17 - Supports if desired by the PSAP

18 - Not supported on CDMA

19 - Requires manual or automatic termination of emergency mode on CDMA

7 Evaluation of Short-List of Near-Term Candidate Solutions

This section of the report describes first how the entire landscape of candidate solutions that were considered by ATIS INES was reduced to a short-list of candidate solutions. Then this section provides a more detailed side-by-side comparison of the short-list of candidate solutions that was used for the determination of the ATIS INES solution recommendation.

7.1 Short-List of Near-Term Solutions

In its evaluation of the complete set of candidate solutions, identified in Appendix C: Landscape of Near-Term Candidate Solutions, the ATIS INES agreed that the best approach was to first narrow down the list of candidate solutions to a “short list”.

The Requirements-Solution Matrix, described in Section Evaluation of Near-Term Candidate Solutions, was the primary evaluation tool used to narrow down the complete landscape of candidate solutions to a short list. Each of the candidate solutions was evaluated against the list of requirements that was created by the ATIS INES. A determination was made as to the degree that each of the candidate solutions was able to meet a given requirement, and was then labeled as acceptable, partially acceptable, or unacceptable.

- *Acceptable* meant that the candidate solution could immediately comply with the requirement.
- *Partially acceptable* meant that the candidate solution could comply with the requirement but that some development was needed.
- *Unacceptable* meant that the candidate solution could not comply with requirement and that extensive development work would be needed.

After summing up the requirement labeling determinations for each of the candidate solutions, the ATIS INES was able to separate out a few candidate solutions that met most of the requirements labeled as acceptable, and only had a few partially acceptable requirements that needed some development. Most importantly, the highest scoring candidate solutions had minimal or no requirements that were identified as being unacceptable.

Resulting from this evaluation, the ATIS INES participants were able to clearly identify a few candidate solutions that could be considered as short list. This evaluation of the complete landscape of candidate solutions yielded a short list of three candidate solutions for the ATIS INES to evaluate further in determining a recommended solution.

The three short list candidate solutions that were identified are:

- 3rd Party IP Relay Service
- SMS from Handset to National SMS Relay Center
- 3rd Party RTT from Handset to 3rd Party Relay Service

7.2 Further Evaluation of Short-List of Near-Term Candidate Solutions

The next step for the ATIS INES in evaluating the list of candidate solutions with the goal of coming up with a recommended solution was to do a further evaluation of the short list. This further evaluation resulted in a lengthy face-to-face discussion by ATIS INES participants. Participants were asked to identify specific concerns that they considered to be associated with a given solution. The following list of concerns was identified:

3rd Party IP Relay Service

- Users must have an IP-capable mobile device
- Registered location must be verified or location must be manually derived
- Determination of the appropriate PSAP to route the call
- Training requirements (e.g., relay service location determination)
- Some relay services may not be national (per 4G Americas report [Ref 1])
- Voice call from relay center to PSAP may be through 9-1-1 network or through ten-digit emergency lines

SMS from Handset to National SMS Relay Center

- SMS is a store & forward technology and does not allow for real time communication
- SMS is a best effort service with no delivery or performance guarantees
- SMS platforms are not built for robust, reliable emergency communications and could result in delayed messages, lost messages, and out of sequence messages
- SMS to 9-1-1 messages should be less than 160 characters in length to eliminate the need for the message to broken down into a sequence of independent messages
- SMS platforms are not capable of querying positioning servers for location
- SMS platforms can only route to a single location for a given short code
- No security, authentication, or non-repudiation of any SMS message is provided
- The originating network will not prevent any spam, SMS spoofing, or denial of service (DoS) attacks
- A national SMS relay platform does not exist today and must be developed and staffed
- A funding model must be created that allows for the creation, staffing and maintenance of the national platform
- Voice call from relay center to PSAP may be through 9-1-1 network or through ten-digit emergency lines

- SMS is not compatible with long-term 3GPP standards-based MMES Solution

3rd Party RTT from Handset to 3rd Party Relay Service

- Users must have an IP-capable mobile device
- Requires application on handset and therefore not available for all operating systems and devices
- Registered location must be verified or location must be manually derived
- Determination of the appropriate PSAP to route the call
- Training requirements (e.g., relay service location determination)
- Not directly supported by wireless carriers – must use 3rd party downloaded applications
- The 3rd party applications operate differently depending on application vendor, mobile device used and service platform
- Not directly supported by wireless carriers – must use 3rd party downloaded applications
- The 3rd party applications operate differently depending on application vendor, mobile device used and service platform
- Some relay services may not be national (per 4G Americas report [Ref 1])
- Voice call from relay center to PSAP may be through 9-1-1 network or through ten-digit emergency lines

Additional factors taken into consideration in the short list evaluation were that neither the RTT Relay, nor the Nationwide SMS Relay solutions are available today, requiring development and funding that would push their deployment well past the June 30th 2012 deployment target date.

National SMS Relay is the most preferable interim choice of the Advocates providing input to the ATIS INES. National SMS Relay is desirable because it is the dominate communication method used, not only by persons with disabilities, but also by the general public. In addition, most mobile devices (both feature phones and smart phones) have SMS capability. Use of a five or six digit short code to route SMS emergency calls to a single, nationwide SMS Relay center could currently be supported by wireless carrier SMS platforms. Also, a relay center dedicated to handling SMS emergency communications would allow for the hiring of personnel who are trained and experienced in handling emergency communications. However, SMS is not compatible with long-term 3GPP standards-based MMES Solution that the disabled community wants and needs.

8 ATIS INES Solution Recommendation

No candidate solution met all of the pre-established fundamental and technical criteria identified by the ATIS INES to be essential for the interim non-voice solution that would provide nationwide 9-1-1 accessibility on mobile devices without the use of an external TTY keyboard. While the ATIS INES was able to narrow the list to three solutions that met the largest number of key criteria, the Incubator members were unable to come to unanimous agreement on a single solution.

However, IP Relay is the only interim solution that meets most of the key criteria, including the June 30th 2012 deployment date that members of the ATIS INES felt critical for an interim solution. In fact, IP Relay is currently deployed and in use on a nationwide basis. Therefore, ATIS INES was compelled to select IP Relay as the recommended interim solution for 9-1-1 accessibility on mobile devices.

SMS Relay was identified by ATIS INES as second choice, because the advocates of persons with disabilities (Advocates) indicated a strong preference for this solution in the interim. However, as discussed in Section 7.2, this solution could not be chosen as the INES solution.

In consideration of the Advocates' position and the overall need for improved parity of service for persons with disabilities, the industry has agreed to continue working these issues.

8.1 Most Promising Near-Term Implementation on Deployed Networks

IP Relay was chosen as the primary interim solution because it met the following key criteria:

- IP Relay is available currently to anyone who has access to the Internet via a computer, personal digital assistant (PDA), Web-capable telephone, or other device.
- IP Relay applications are available for popular mobile device operating systems, as well as IM applications.
- IP Relay allows consumers to make emergency calls without having to purchase, carry, and connect TTY equipment.
- IP Relay allows bidirectional text communications with the CA.
- Transmission quality may be faster via IP Relay than via a TTY.
- Some IP Relay services also support other media besides text such as video or voice.
- The ATIS INES solution *shall* be commercially available[5] to end users on or before June 30th 2012.
- The ATIS INES solution *shall* be a single nationwide solution available to all wireless operators.

However, IP Relay is not without its shortcomings, that including the fact that Users must have an IP-capable mobile device and would be required to verify their registered location or manually provide location to the IP Relay center. In addition, Advocate feedback on the three solutions identified in the short list indicated that IP Relay was the least desirable solution and is not widely used. In addition, due to the requirements of the TRS funding mechanism, IP Relay would only be available to persons with disabilities and would not be available to the general public who might need to make a silent 9-1-1 call. Also, Advocate input indicated that relay providers are only minimally experienced in handling emergency calls.

8.2 Usage of ATIS INES Interim Solution by General Public

The ATIS INES members engaged discussion as to whether or not the recommended IP Relay solution would be appropriate for use by the general public. It was determined that there are no obvious technical issues preventing IP Relay from being used by persons other than those with disabilities. There are, however, operational concerns, specifically delays in emergency call processing. Below is an explanation for why this is very likely to occur.

Relay solutions require a third party to insert himself/herself into the emergency call handling process. The third party, in these cases a Relay Center call taker, will receive a non-voice call for assistance from a consumer and will then verbally pass on (relay) this information to the appropriate PSAP. The Relay Center call taker will then provide an interface between the PSAP and the consumer until the emergency call concludes.

Introducing a third party into an emergency call presents challenges to both the PSAP and the caller. During an emergency, callers are often upset and not able to effectively communicate critical information such as their location and the nature of the emergency. In these cases, PSAP call takers are trained to control the call as effectively as possible to assure that all necessary information is gathered. Relying on a third party to manage the conversation between the PSAP and the caller adds delay into the call handling process. In addition, 9-1-1 Relay calls do not provide any automatic location information thus requiring the relay call taker to verify the callers registered location or rely on the caller to provide location information. Relay Centers must obtain this location information before the relay call taker can identify the correct PSAP to handle the emergency. This also adds delay.

IP Relay is only available for persons with hearing and speech disabilities to communicate with emergency services. Extending the IP Relay to the general public could introduce call processing delays for persons with disabilities and adversely impact their use of IP Relay. This will also cause operational and funding issues at the IP Relay Center. The number of staff needed to handle relay calls and the amount of equipment, including the

[5] The term “commercially available” is defined in Appendix A.1 Definitions.

number of IP and telephone line connections, will grow as the number of inbound calls grows. The increased costs associated with these additional resources would probably not be covered by current FCC funding programs since these programs are focused on providing emergency access to persons with disabilities, not the general public. Thus, an overhaul of the IP Relay funding support programs would be required if the general population were allowed access to the current IP Relay system.

8.3 Compatibility with MMES

As previously noted, the scope of the ATIS INES Incubator is to identify an interim non-voice emergency services solution to address the near-term needs of persons with disabilities. However, developing a solution that does not also consider the long term needs of persons with disabilities, especially those with hearing loss or speech impairments, would be shortsighted.

MMES is the label used by the telecommunications industry to identify standards development of next generation emergency services utilizing multimedia capabilities. MMES is being developed to address the non-voice emergency service needs of the general public, as well as the long term needs of persons with disabilities. MMES is IP-based and is an extension of non-emergency multimedia services. Users will have IP capable devices and use IP multimedia services for both non-emergency as well as emergency calls. The IP Relay and RTT Relay solutions are compatible with MMES.

As an enhancement to next-generation emergency capabilities, MMES will have significant impacts on the entire next generation 9-1-1 system resulting from the changes in networks and devices. It is expected that end user devices and origination networks will ultimately evolve, and that the next generation 9-1-1 solution will allow this evolution to take place over time. Many systems in the PSAPs must also eventually change. New end-to-end messaging relationships between origination networks and PSAPs must be established. Because not all networks, devices, and PSAPs will be enhanced at the same time, a migration plan will need to be developed.

An MMES migration plan will need to take into consideration the recommendations of ATIS INES and develop a migration strategy that will be a seamless a transition as possible from the ATIS INES interim solution to a long term MMES solution. Implementation of the INES recommended solution is targeted for June 30th 2012. The long term MMES solution standards development is taking place now, but initial implementation is not expected for at least three or four more years. Even after MMES starts to become available, it will only be available in certain service areas and where it is available it may not provide full multimedia services for some time. It will take a significant amount of time before full deployment of MMES can be achieved. During this large window of transition between the initial deployment of ATIS INES solution and full deployment of MMES is where significant transition planning will be needed on the part of all emergency services stakeholders. Also during this time of transition, emergency callers will encounter environments where the emergency service capabilities that will be available to them will provide voice 9-1-1 emergency calling, limited non-voice ATIS INES capability, some degree of MMES capability, or full MMES capability.

Development of this transition strategy must be given careful thought by all stakeholders (e.g., origination network providers, Public Safety, manufacturers), and must effectively be conveyed to all consumers, who will be dependent on these 9-1-1 emergency services throughout the transition period.

8.4 Policy & Regulatory Change Coordination

As part of the evaluation criteria, the ATIS INES considered whether the FCC's existing rules and policies for 9-1-1 emergency communications could be satisfied through the evaluated solutions. The ATIS INES attempted to recommend a solution that most closely aligns with these rules and policies while recognizing that none of the existing solutions meet all of the FCC's rules and policies for 9-1-1 emergency communications. In order to implement the recommended ATIS INES solution, the FCC must determine whether the benefits of an interim text-based communication to 9-1-1 emergency services solution for persons with disabilities outweighs the cost of waiving the application of many of the FCC's existing rules and policies for 9-1-1 emergency communications.

The FCC should recognize that any existing solution will not be able to meet the broad set of public expectations that are associated with voice calls to 9-1-1. The ATIS INES recommended 3rd Party IP Relay solution, however, will provide a mode of emergency communications that exists today, but may be underutilized by persons with disabilities. Alternatively, if the FCC decides to support a National SMS Relay Center rather than IP Relay, then a number of issues will require FCC action to create this new service (including an acknowledgement that there are significant life-threatening implications, significant funding and organizational issues) if it is made available to the

entire population. If the FCC adopts any of the ATIS INES evaluated solutions, the FCC should take the regulatory steps necessary to provide the certainty needed to ensure the efficient and expedited deployment and adoption of a text-based emergency 9-1-1 communication solution for persons with disabilities.

8.4.1 General Policy Considerations for Near-Term Text-Based Communications to Public Safety Answering Points (PSAPs)

a. Commercially Available by June 30th 2012

In order to support the ATIS INES solution by the suggested date, the FCC should take the appropriate steps to expedite any regulatory processes needed to adopt the solution. Any significant delay may minimize the utility of the ATIS INES recommended solution as industry and PSAPs work to implement NG9-1-1 technologies.

b. "All-Calls" Rule

FCC rules require that all voice 9-1-1 calls be delivered to the appropriate PSAP, regardless of whether a consumer's device is "service initialized" (i.e. has active service). In the voice communications mode, existing wireless equipment, services and networks support this requirement because significant resources were devoted to develop the necessary standards and technical and operational requirements. Some ATIS INES evaluated solutions function only on devices that are currently service-initialized because, without established standards in place for those technologies, it is technically infeasible to identify a non-voice emergency call on a device that is not service-initialized. Therefore, the FCC's "all calls" rule cannot be applicable to the ATIS INES solution, because it will be necessary for a caller to maintain an active service plan in order to complete a text-based emergency communication to 9-1-1.

c. Location Information

While the FCC rules require that wireless equipment and services support E-9-1-1 location information for requesting PSAPs, none of the evaluated ATIS INES solutions currently support existing E-9-1-1 Phase-II location capabilities such as automatic location information ("ALI") and measurable accuracy standards. As part of the ATIS INES evaluation process, however, the ATIS INES did consider whether "coarse" location information could be included with any of the solutions, but the recommended 3rd Party IP Relay solution and the national SMS relay solution rely on caller provided location information. While neither 3rd Party IP Relay services nor the national SMS relay will be able to provide the ALI of the calling wireless device, user provided location information will aid in the delivery of a text-based emergency call to the appropriate PSAP.

d. Liability

Liability concerns have been consistently raised by industry and Public Safety representatives with respect to any new 9-1-1 services offered directly by service providers, as well as service providers' support of third-party solutions to 9-1-1. Under the NET 911 Act, "other emergency communications" are afforded the same liability protections as wireline 9-1-1 emergency calls are under state law. The FCC should find that the ATIS INES recommended solution is an "other emergency communications" service to affirm Congress's intent that all entities supporting the solution, including service providers, manufacturers and PSAPs, are entitled by law to liability protection consistent with wireline, wireless and interconnected VoIP 9-1-1 communications.

e. TTY Requirements for Wireless Handsets

Today, wireless carriers transmit and wireless handsets support 9-1-1 calls from individuals with speech or hearing impairments through the use of Text Telephone devices ("TTY") compatible with wireless handsets. However, the incidence of TTY usage through compatible wireless handsets for 9-1-1 calling purposes has been exceptionally limited. The ATIS INES evaluated solutions that

provide text-based communication solutions that should be acceptable interim substitutes of TTY through wireless handsets. While PSAPs and wireless networks should support TTY services for the foreseeable future, the TTY requirement for wireless handsets may be a redundant communication modality for future wireless handsets that support the recommended ATIS INES solution.

Recognizing this issue, Congress has contemplated the phase-out of TTY services for 9-1-1 purposes in favor of accessible advanced communications services and equipment by charging the EAAC with making recommendations to accomplish the migration from legacy TTY services and equipment. See CVAA § 106(c)(6). As Congress envisioned under the CVAA, the FCC should waive the TTY requirement for new wireless handsets if such handsets support the ATIS INES recommended solution.

f. Education

Public education will be necessary to ensure that user expectations about the ATIS INES solution match the technical and operational realities. As a national solution, users will be at limited risk of confusion about where the ATIS INES solution is available because the solution will exist wherever 9-1-1 services and necessary wireless equipment and services are supported. Collaboration among industry, Public Safety, the accessibility community and federal and state entities will be needed to promote public awareness of, and manage expectations regarding, the new capabilities and limitations of ATIS INES recommended solution.

g. PSAP Operational Procedures

The FCC should work with industry, Public Safety, the accessibility community and federal and state entities to develop reasonable operational procedures to ensure that ATIS INES recommended solution adoption proceeds smoothly and timely among PSAPs.

8.4.2 Specific Policy Considerations for ATIS INES Short List Solutions

a. 3rd Party IP Relay

i. Governance

The FCC's existing rules require relay services, including IP Relay, to support emergency calls. Indeed, IP Relay is the only text-based communications system for which the Commission has explicitly set forth emergency calling requirements. As outlined above, the adoption of the IP Relay solution will require the FCC to modify or waive certain requirements for service providers and manufacturers, but the general regulatory framework is already available to support IP Relay as an emergency communications service for persons with disabilities.

ii. Funding

In order to quickly focus on an interim text-based emergency communications solution, the ATIS INES evaluated solutions would have to have minimal impact on existing 9-1-1 funding mechanisms by limiting the use of the interim solution to persons with disabilities. For example, the FCC's rules permit the use of TRS only by persons with disabilities for general and emergency calling purposes. The impact to the TRS Fund would be minimal because relay providers may already seek reimbursement to support 9-1-1 calls by persons with disabilities.

Alternatively, if the FCC were to offer 3rd Party IP Relay for use by the general population, the FCC would need to review the TRS Fund rules for how a relay provider verifies the appropriate users. In addition, the cost to the wireless industry, Public Safety, and the public to support a National SMS Relay Center are unknown but are likely to be more significant if such a solution were offered to the general population. While the ATIS INES recommended 3rd Party IP Relay solution for persons with disabilities is likely to have the least economic impact to support, the FCC should carefully consider the economic impact that any interim text-based communications solutions may have on the wireless industry, Public Safety, and the public.

iii. Liability Protection

In order to provide the legal and regulatory certainty needed to support IP Relay for emergency calls, the FCC should find that IP Relay providers are "other communications providers" for the purposes of the NET 911 Improvement Act. While liability protection may be available for IP Relay providers and entities supporting IP Relay as an emergency service that are "specifically authorized" by the appropriate PSAP to provide other emergency communications services, the FCC should affirm that all entities supporting IP Relay as an emergency service are afforded the same liability protections as wireline 9-1-1 emergency calls are afforded under state law.

iv. Operational Procedures

The FCC should work with the relay provider community to ensure the communication assistants ("CAs") are properly trained in the handling and routing of emergency communications. Similarly, the FCC should work with appropriate Public Safety and accessibility community entities to develop reasonable operational procedures to ensure that IP Relay is a reliable and effective method of emergency calling for persons with disabilities.

b. National SMS Relay Center

i. Governance

The establishment of a National SMS Relay Center by the FCC would require significant changes to the rules and policies governing today's emergency communications services. By its very nature, SMS is not a session-based communications service comparable to voice communications. As SMS functions are wholly distinct from voice communications, the FCC's policies and rules surrounding voice calls to 9-1-1 would be inapplicable to an SMS-based solution. Given the policy and regulatory uncertainty surrounding the adoption of an SMS-based solution, the ATIS INES concluded that it would be infeasible to recommend a solution that would require new rules and policies to be developed by June 30th 2012.

ii. Funding

As the ATIS INES only considered the technical requirements of a National SMS Relay Center, further study is needed to determine the cost to industry, Public Safety and consumers to implement and maintain such a solution. In addition further cost analysis would be needed to consider the additional cost of providing SMS relay to the general public.

iii. Liability Protection

In order to provide the legal and regulatory certainty needed to support a National SMS Relay Center for emergency communications, liability protection for the wireless industry, the National SMS Relay Center operator, and Public Safety would need to be significantly strengthened, given the characteristics of SMS versus voice communications. If the FCC were to permit use of a National SMS Relay Center solution, the FCC should at minimum find that any entities supporting the National SMS Relay Center are specifically deemed to be "other communications providers" for the purposes of the NET 911 Improvement Act. While liability protection is available if local PSAPs "specifically authorize" the use of SMS as an "other emergency communications service", the FCC should take the appropriate steps to help ensure that all entities supporting a National SMS Relay Center as an emergency service are afforded the same liability protections as wireline 9-1-1 emergency calls are under state law.

8.5 Interoperability Test Specification

The ATIS INES mission called for the creation of a test specification and then hosting an interoperability test event. The selection of IP Relay as the ATIS INES recommended solution has eliminated the need for a test specification and a test event. IP Relay is an existing, proven technology, which is already widely deployed.

9 ATIS INES Recommended Next Steps

The conclusion of the ATIS INES efforts to review interim text to 9-1-1 solutions does not signal the completion of all work needed to make text to 9-1-1 a reality. Many tough issues and hard choices remain. During its examination and evaluation of the candidate interim solutions, ATIS INES identified some key steps that still require action. The following high level list of Next Steps attempts to capture significant thoughts that arose repeatedly during this collaborative discussion.

A decision must be made on which interim approach will be implemented

Numerous studies have addressed the need for an interim text to 9-1-1 solution that will fill the gap until IMS, LTE and NG9-1-1 are widely deployed. The time has come for decision makers in government, industry, Public Safety and the disabled community to select a single approach that can be deployed nationally. Failure to act could result in the deployment of competing solutions, further confusing users about how they can get assistance in an emergency.

Policy review

Current policies, rules and regulations must be reviewed to ensure the selected approach can be accommodated. It is very likely policy and rule changes must be made to support the differences between voice and text 9-1-1 calls. Certainty must be provided to developers, manufacturers, Public Safety and users if the interim approach is to succeed. A list of some policy issues is contained above in section 8.4.

Action must be taken to deploy the selected approach

Issues from funding to staffing to operational choices must be addressed in order to provide certainty that the selected solution will, in fact, be deployed nationally. Without decisive action the current situation could linger indefinitely, continuing to frustrate users who have no realistic access to emergency services.

Continuous review of technical options

As technology advances there is a very real potential for improvement of whatever interim approach is selected. This includes improvements to daily operations but also encompasses improvements in how the interim approach will eventually migrate into the long term solution under IMS and NG9-1-1. The benefits of improving the interim solution should be weighed against the risk of delay in addressing the development of the long term NG9-1-1 solution.

Review viability of the TTY rules

As the interim solution is deployed, the need for TTY compatibility in every wireless handset will become redundant. Care should be taken to ensure that resources currently devoted to TTY compliance can be redirected to other activities, including identifying how the chosen interim solution will transition to MMES and NG9-1-1 as they become available.

Appendix A: Acronyms and Definitions

A.1 Definitions

A.1.1 Commercially Available. Commercially available, in the ATIS INES context, means that necessary equipment and software is available to the industry and Public Safety by more than one vendor.

A.1.2 Commercial Mobile Service Provider. A Commercial Mobile Service Provider (CMSP) is an FCC licensee providing commercial mobile service as defined in section 332 (d)(1) of the Communications Act of 1934 (47 U.S.C. 332(d)(1)). Section 332(d)(1) defines the term commercial mobile service as any mobile service (as defined in 47 U.S.C. 153) that is provided for profit and makes interconnected service available (a) to the public; or (b) to such classes of eligible users as to be effectively available to a substantial portion of the public, as specified by regulation by the Federal Communications Commission.

A.1.3 Multimedia Emergency Services (MMES). MMES are next generation emergency services utilizing real-time session based text and other multimedia, in addition to voice, that are based on trusted applications in support of non-voice communications between citizens and Public Safety. MMES provide secure transport of messaging and media content, and location information of the reporting device to Public Safety, in addition to providing two-way voice emergency communications between citizens and Public Safety. MMES do not preclude the support of specialized emergency services designed for persons with disabilities without two-way emergency voice communications..

A.1.4 3rd Party Service Provider. A 3rd party service provider is any service provider which supports the ATIS INES solution and which is not a Commercial Mobile Service Provider.

A.1.5 Wireless Operator. A wireless operator for the ATIS INES solution is a Commercial Mobile Service Provider.

A.2 Acronyms

4G	IP-Based Fourth Generation Wireless Networks
ASL	American Sign Language
ATIS	Alliance for Telecommunications Industry Solutions
CA	Communications Assistant
CTM	Cellular Text Modem
DoS	Denial of Service
FCC	Federal Communications Commission
HCO	Hearing Carry Over
ICT	Information Communications Technology
IETF	Internet Engineering Task Force
IM	Instant Messaging
IMS	IP Multimedia Subsystem
INES	Interim Non-voice Emergency Services
ITU-T	International Telecommunication Union - Telecommunication standardization sector
LTE	Long Term Evolution (4G)
MMES	Multimedia Emergency Services
NENA	National Emergency Number Association
NG9-1-1	Next Generation Emergency Services (9-1-1)
OS	Operating System
OTT	Over The Top
PDA	Personal Data Assistant
PSAP	Public Safety Answering Point

PTCRB	PCS Type Certification Review Board
RERC	Rehabilitation Engineering Research Center
RTP	Real-time Transport Protocol
RTT	Real Time Text
SMS	Short Message Service
SMSC	Short Message Service Center
TCER	Total Character Error Rate
TDD	Telecommunications Device for the Deaf
ToIP	Text over IP
TRS	Telecommunications Relay Service
TTY	Teletype
VCO	Voice Carry Over
VideoASL	Video American Sign Language
VRS	Video Relay Service

Appendix B: References

[Ref 1] 4G Americas, *Texting to 9-1-1: Examining the Design and Limitations of SMS*, October 2010.[6]

[Ref 2] 3GPP TS 26.114, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction*.[7]

[Ref 3] 3GPP TS 26.231, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Cellular text telephone modem; Minimum performance requirements*.[7]

[Ref 4] IETF RFC 4103, *RTP Payload for Text Conversation*, June 2005.[8]

[Ref 5] IETF RFC 5194, *Framework for Real-Time Text over IP Using the Session Initiation Protocol (SIP)*, June 2008.[8]

[Ref 6] ITU-T Recommendation F.703, *Multimedia Conversational Services*, November 1, 2000.[9]

[Ref 7] ITU-T Recommendation V.18, *Operational and interworking requirements for DCEs operating in the text telephone mode*, November 2000.[9]

[Ref 8] U.S. Department of Transportation Intelligent Transportation Systems, *Next Generation 9-1-1 (NG9-1-1) System Initiative Final System Design Document*, V2.0, February 2009.[10]

[Ref 9] NENA 57-501, *NENA Information Document for Synchronizing Geographic Information System Databases with MSAG & ALI*, Version 1.1, September 8, 2009.[11]

[Ref 10] XMPP XEP-0301, *XMPP/Jabber Extension Protocol: In-Band Real Time Text*, Version 0.1, June 29, 2011.[12]

[6] This document is available from the 4G Americas. < http://www.4gamericas.org/ >

[7] This document is available from the 3rd Generation Partnership Project (3GPP) < http://www.3gpp.org/ >

[8] This document is available from the Internet Engineering Task Force (IETF). < http://www.ietf.org >

[9] This document is available from the International Telecommunication Union (ITU). < http://www.itu.int/ >

[10] This document is available from the US Department of Transportation
< http://www.its.dot.gov/NG911/pubs/USDOT_NG911_FINAL_System_Design.htm >

[11] This document is available from the National Emergency Number Association (NENA). <http://www.nena.org>

[12] This document is available from the XMPP Standards Foundation. <http://xmpp.org>

Appendix C: Landscape of Near-Term Candidate Solutions

This appendix describes the landscape of candidate interim solutions that was considered by the ATIS INES Incubator. This appendix provides descriptions on the following candidate interim solutions:

- Video American Sign Language
- Video Relay Service (VRS)
- IP Relay Service
- Instant Messaging (IM)
- Short Message Service (SMS) Direct to PSAP
- Voice Emergency Call then SMS
- National Short Message Service (SMS) Relay Center
- Real Time Text (RTT) Direct to PSAP
- Real Time Text (RTT) with TTY to PSAP
- Real Time Text (RTT) to Relay Service
- TTY Emulation
- Home PSAP
- Voice 9-1-1 Call then Web-Based Non-Voice Communications
- Central All Text (CAT)

There is no implied preference or priority of the candidate interim solution based upon the order that these candidate solutions are presented in this Appendix.

The diagrams in this Appendix show only one type of connection that may exist and do not illustrate all possible permutations.

C.1 Video American Sign Language (VideoASL)

C.1.1 Description

Video American Sign Language (VideoASL) is a technique which utilizes the video capabilities of mobile devices to perform American Sign Language communications.

Mobile American Sign Language (MobileASL) is a video compression project at the University of Washington and Cornell University.[13] MobileASL is American Sign Language (ASL) communication using video cell phones over current U.S. cell phone networks.

With the advent of cell phone PDAs and smart phones with larger screens and photo/video capture, people who communicate with ASL could utilize these new technologies. However, even today's best video encoders likely cannot produce the quality video needed for intelligible ASL.

People already use cell phones for sign language communication in countries like Japan and Sweden where 3G (higher bandwidth) networks are ubiquitous.

The following figure shows how MobileASL could work for calls to 9-1-1:

[13] See http://mobileasl.cs.washington.edu/

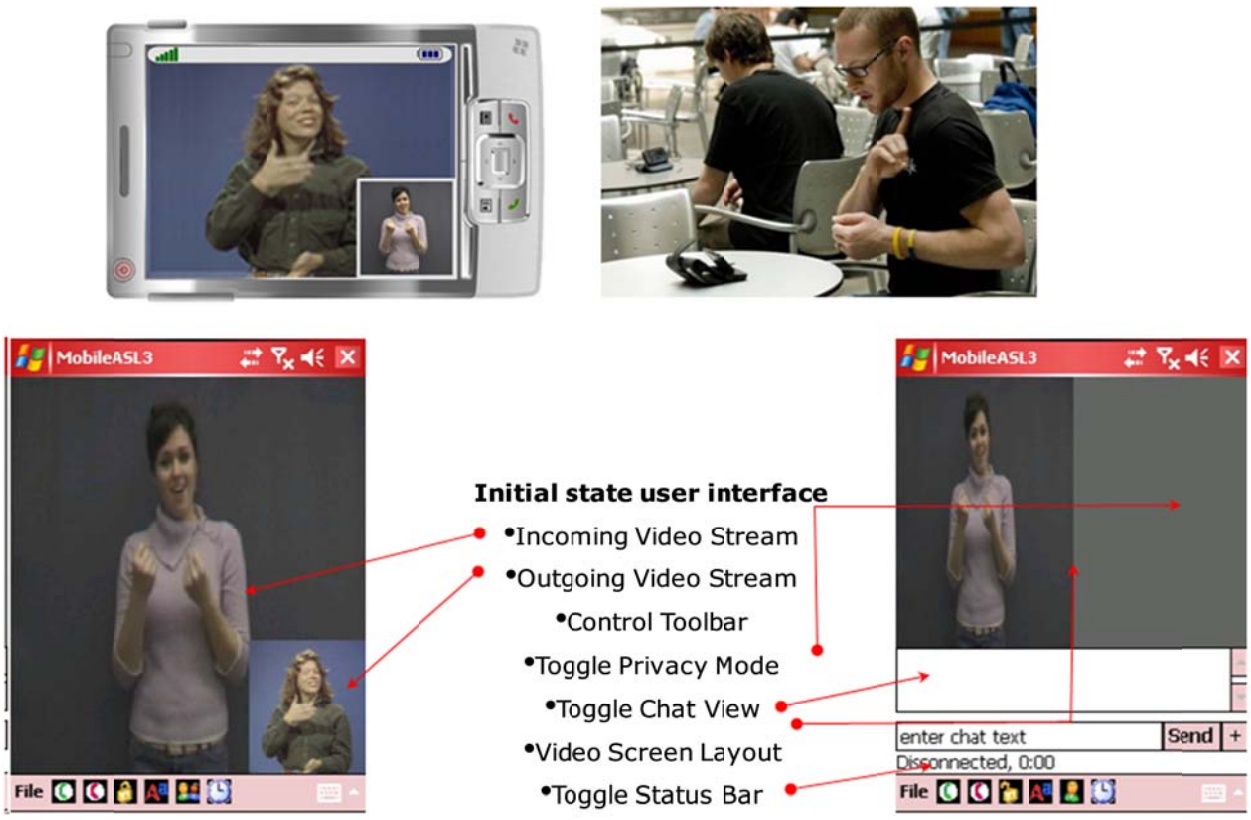

Figure 1: Mobile ASL

C.1.2 Pros

1. MobileASL enables hearing and speech impaired users to use an existing technology to interact.
2. MobileASL requires minimal changes to standards and can be readily deployed and used.

C.1.3 Challenges

1. A new real time video compression scheme is needed to transmit within the existing wireless network while maintaining video quality that allows users to understand semantics of ASL with ease.
2. PSAPs are not currently equipped to handle this video-based service.
3. PSAPs do not have call takers trained in ASL.
4. MobileASL requires a phone capable of video telephony (e.g., front facing camera, appropriate video applications, handset positioning stand). Although several of the recent smartphones have this capability, it is not universally available in all mobile devices.
5. MobileASL requires a data packet service with a minimum bit rate to work properly. As such, MobileASL is probably not suitable for legacy (2G) access technologies.

C.2 Video Relay Service (VRS)

C.2.1 Description

Video Relay Service (VRS) is a form of TRS that enables persons with hearing disabilities who use American Sign Language (ASL) to communicate with voice telephone users through video equipment, rather than through typed text.

Video equipment links the VRS user with a TRS operator – called a “communications assistant” (CA) – so that the VRS user and the CA can see and communicate with each other in signed conversation.

Because the conversation between the VRS user and the CA flows much more quickly than with a text-based TRS call, VRS has become an enormously popular form of TRS.

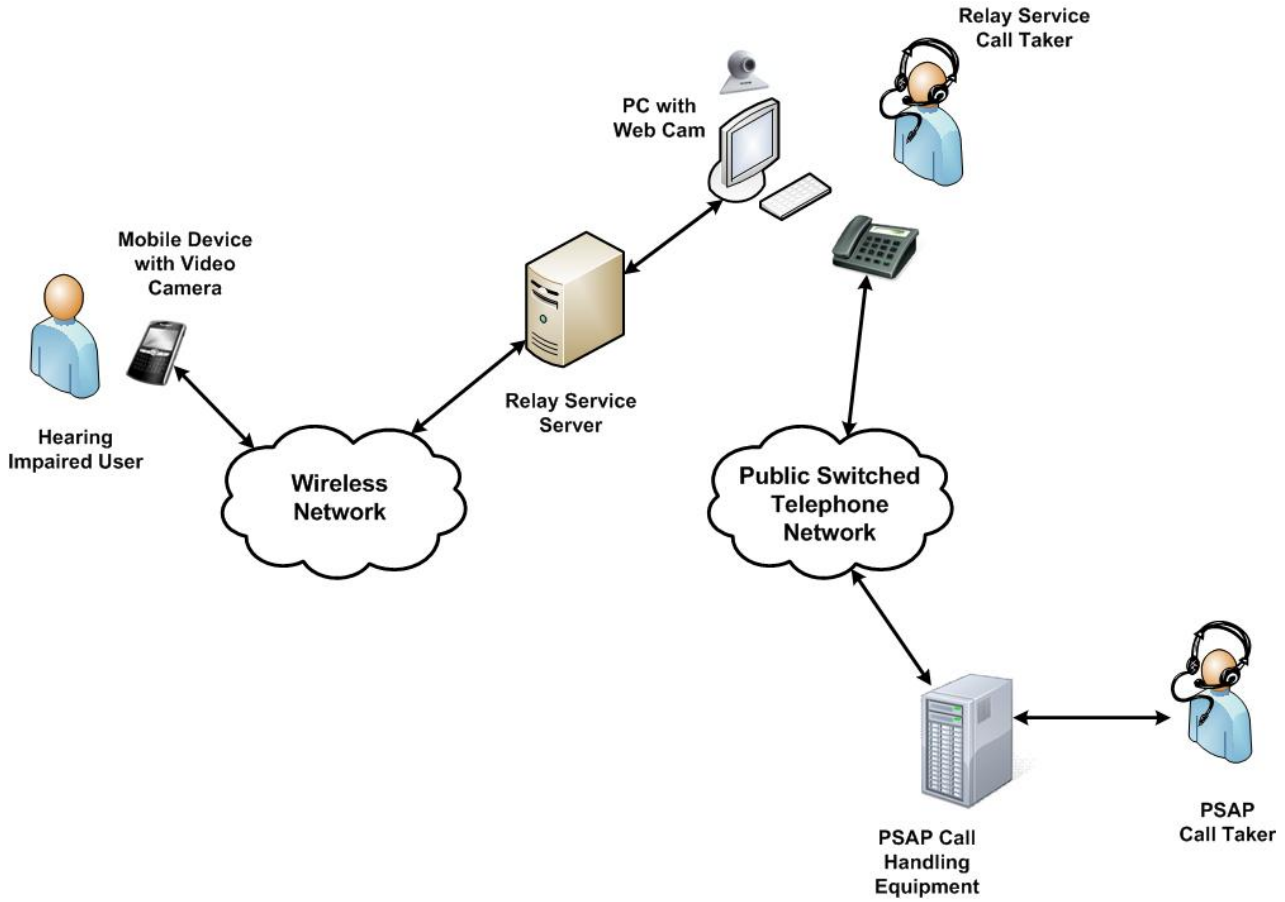

Figure 2: Video Relay Service (VRS)

C.2.2 Pros

1. VRS allows those persons whose primary language is ASL to communicate in ASL, instead of having to type what they want to say.
2. Because consumers using VRS communicate in sign language, they are able to more fully express themselves through facial expressions and body language, which cannot be expressed in text.
3. A VRS call flows back and forth just like a telephone conversation between two hearing persons. For example, the parties can interrupt each other, which they cannot do with a TRS call using a TTY (where the parties have to take turns communicating with the CA).
4. Because the conversation flows more naturally back and forth between the parties, the conversation can take place much more quickly than with text-based TRS. As a result, the same conversation is much shorter through VRS than it would be through other forms of text-based TRS.
5. VRS calls may be made between ASL users and hearing persons speaking either English or Spanish.

C.2.3 Challenges

1. Relay Center to PSAP call is not a 9-1-1 call and may take several minutes to establish.

   Note: VRS providers must answer 80 percent of all VRS calls within 120 seconds.
2. Requires a mobile device, television or a computer with a video camera and a broadband (high speed)

Internet connection.

3. VRS requires a CA who is a qualified sign language interpreter.
4. Relay Center has to identify and make a call the proper PSAP based on caller's location.
5. The VRS CA relays the conversation back and forth between the parties thus introducing delays.
6. Unlike with some of the other forms of TRS, the VRS CA may not be able to offer or handle some call services, such as operator-assisted calls and 900 (pay-per-call) calls.

C.3 IP Relay Service

C.3.1 Description

IP Relay Service is accessed using a computer and the Internet or a mobile phone with IP capability, rather than a TTY and a telephone. The user can connect to IP Relay using any IP-enabled device.

In an IP Relay call, the relay operator communicates with the person with a hearing or speech disability via text and the person without a hearing or speech disability via voice.

A person with disabilities must pre-register with the IP Relay service and be assigned a ten digit telephone number that the outside world dials to contact the user through the IP Relay. Without prior registration, protection against attacks is more difficult.

A call from the user goes from the caller's computer, or other Web-enabled device (mobile device), to the IP Relay Center via the Internet. The IP Relay Center is usually accessed via a Web page using an application (one click).

The IP Relay Call Attendant (CA), as with traditional TRS, is from the CA to the receiving party via voice telephone through the public switched telephone network.

Voice calls to the user are initiated via the ten digit number to the IP Relay CA. The CA then contacts the user's web enabled device.

IP Relay operators recommend users call emergency services utilizing a TTY or a silent voice call. Either of these methods will generate the proper location information and speed dispatch.

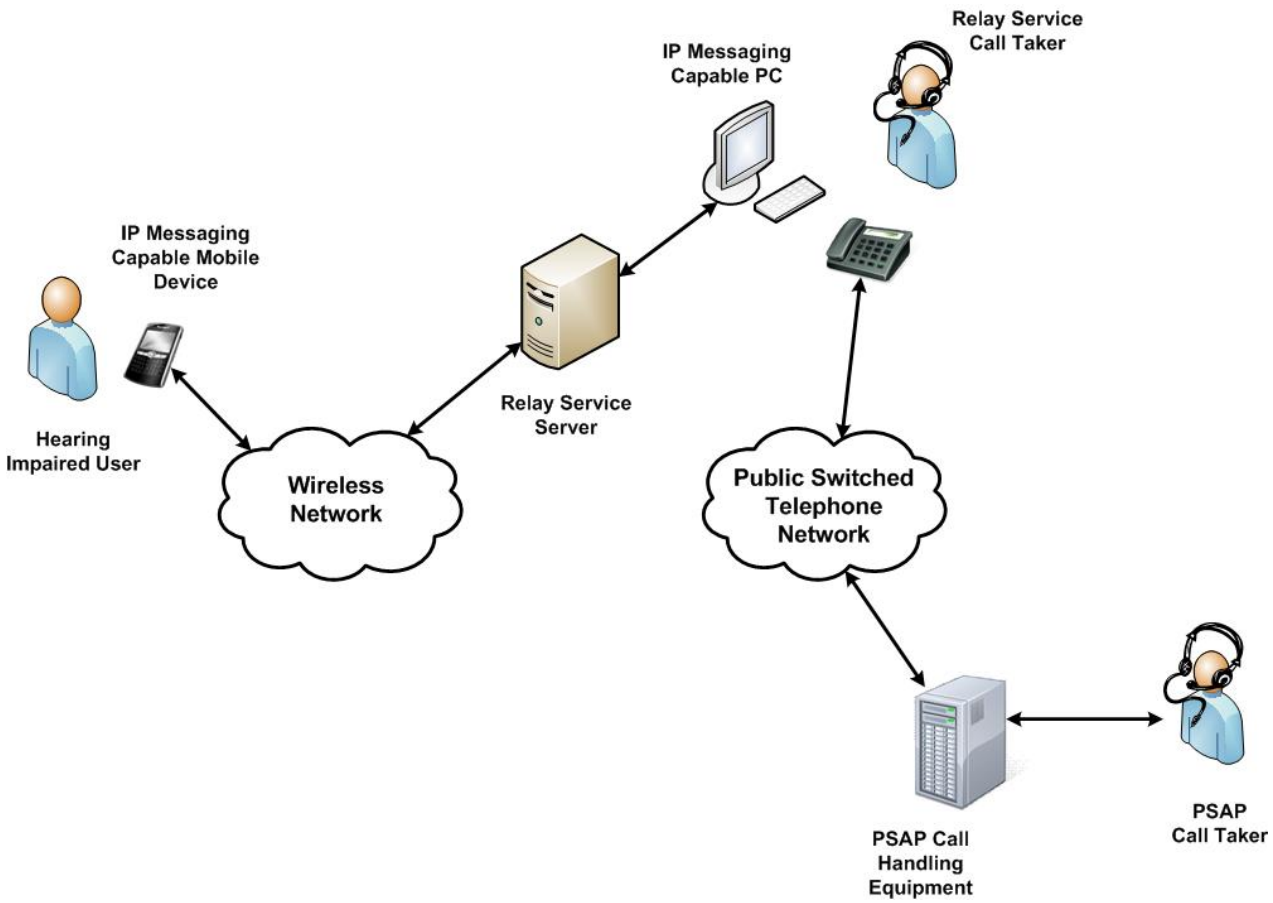

Figure 3: IP Relay Service

C.3.2 Pros

1. IP Relay is available to persons with disabilities who have access to the Internet via a computer, personal digital assistant (PDA), Web-capable telephone, or other device. IP Relay apps are available for popular mobile device operating systems, as well as IM applications.
2. Consumers do not need to go to a separate TTY or log off the Internet to use a TTY telephone line. IP Relay lets consumers make relay calls even when there is no TTY handy.
3. Consumers often say that using a computer screen and keyboard, or a smartphone is easier than using a TTY. IP Relay permits much faster typing and allows users to see much more of the conversation on their computer and handset screens than they can see with a TTY LCD window.
4. Transmission speeds are faster via IP Relay than via a TTY.
5. The FCC has imposed 9-1-1 requirements on IP Relay providers, expressly determining that IP Relay falls under the statutory definition of TRS.
6. IP Relay pre-registers users with location information. If the user verifies they are at the pre-registered location, this location information is used when contacting Public Safety and can help speed PSAP selection.

C.3.3 Challenges

1. No relay service can guarantee a prompt answer to user's emergency calls.
2. The IP Relay Center to PSAP call is not a 9-1-1 call and may take several minutes to establish, especially if user is in a different location than the pre-registered location.
3. Does not support one national number.

4. The handset must support at least one protocol in common with the IP Relay Service.
5. The caller must know the domain name of the IP Relay Service, or have a client pre-configured with this information on the device.
6. The IP Relay Center has to identify and make a call the proper PSAP based on caller's location.
7. As with any Relay call, the process where the IP Relay CA relays the conversation back and forth between the parties thus introducing delays.
8. When prior registration and call-time authentication are used, the broad usefulness of the relay service is limited by requiring advance action by all users who need the service.
9. The text communication session is not recognized as an emergency session by the handset or the network, and thus does receive priority treatment as an emergency call.
10. The user has to hit "send" after typing the entire message for it to get transmitted. If sender has medical issue or some other problem, partial messages won't be transmitted

C.4 Instant Messaging (IM)

C.4.1 Description

Instant Messaging (IM) is an IP-based service allowing two or more users to send messages to each other via an established data connection, such as peer-to-peer over the Internet.

Depending upon the IM application, messages can be simple textual messages or richer multi-media messages that include files, voice, images, video, web-links and other streaming content.

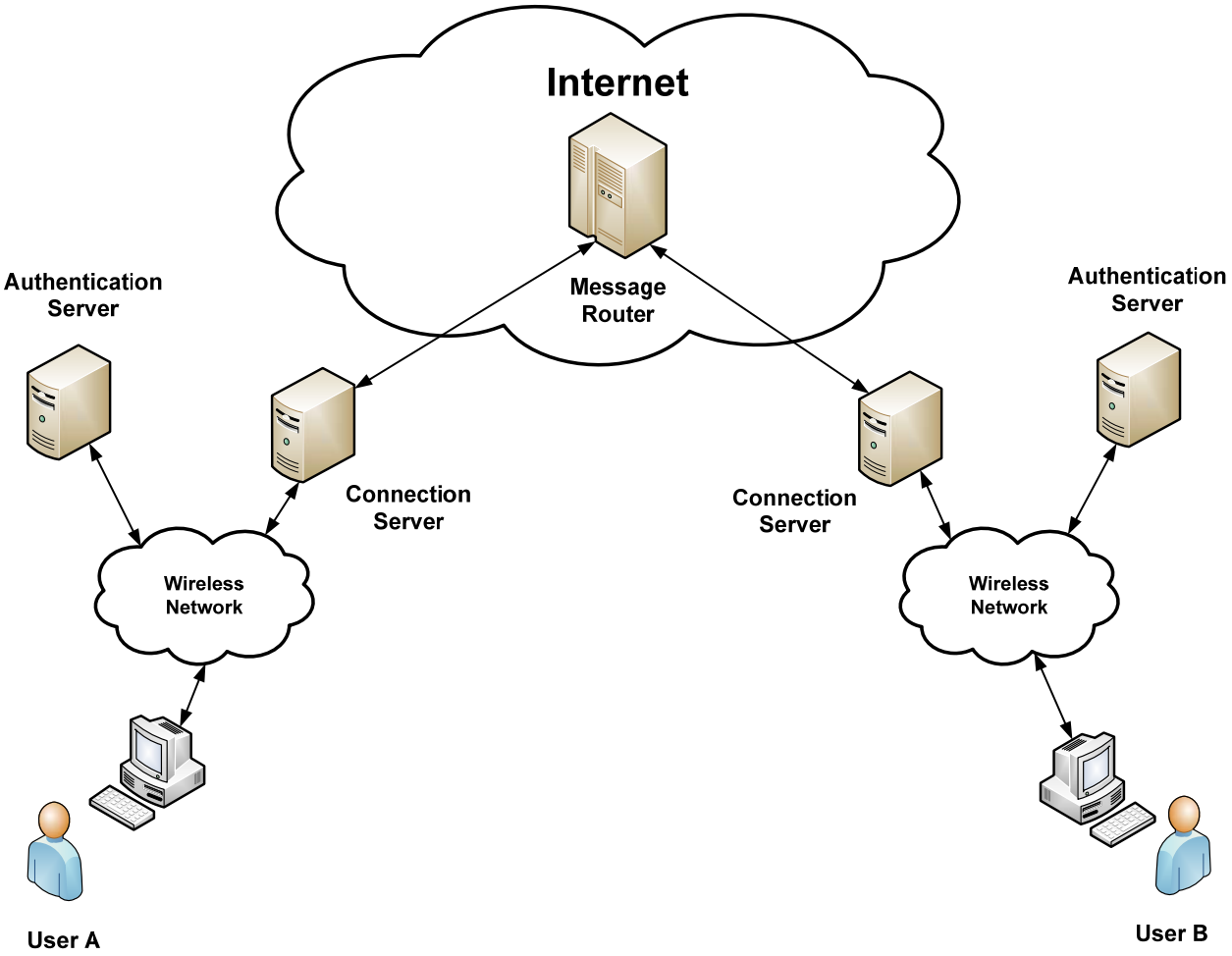

Figure 4: Instant Messaging (IM)

For IM to be used for communications with 9-1-1, the following steps would be required:

1. IM client application has a “9-1-1” contact.
2. User opens chat session with “9-1-1” in IM client application.
3. Chat session opened with PSAP call taker. Note: it is not currently known how this step would be accomplished.
4. User and call taker engaged in IM conversation.

The following is an example IM-based communications:

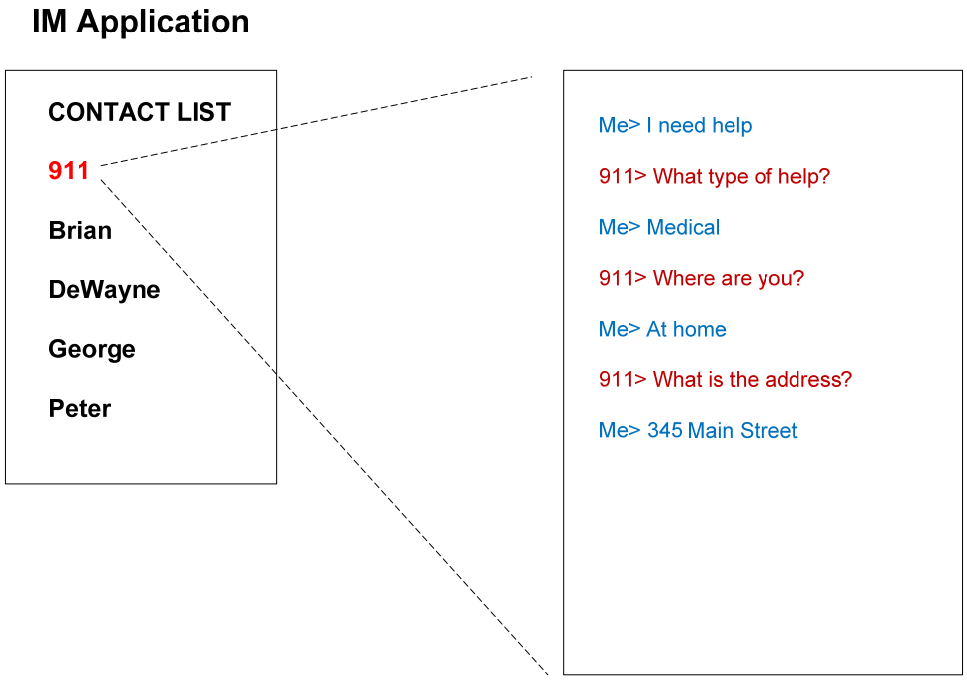

Figure 5: Example IM-based 9-1-1 Communications

C.4.2 Pros

1. IM is an instant "conversational", widely-used and freely available. Since a complete message is sent, IM is effective for text to speech applications.
2. IM can carry text, voice, video and other streaming content within the same architectural framework.
3. IM can work either from a user's personal computer or mobile device.

C.4.3 Challenges

1. IM services are not designed for high reliability emergency services (e.g. robustness and reliability).
2. There is a plethora of IM applications available that vary widely in their features and capabilities. PSAPs would have to support this plethora of IM applications.
3. IM relies on third party servers for services such as authentication, buddy list, message routing.
4. Does not support one national number.
5. User has to have an active subscription to the IM service.
6. "Logging in" to the IM service may result in delays to access Public Safety
7. IM is subject to malicious threats and vulnerabilities.
8. IM application capabilities are not standardized across all applications.

C.5 Short Message Service (SMS) Direct to PSAP

C.5.1 Description

Short Message Service (SMS) is a text communication service component of phone, web, or mobile communication systems, using standardized communications protocols that allow the exchange of short text messages between some VoIP or mobile phone devices.

SMS is a point-to-point store and forward best effort service.

- SMS messages are sent to a Short Message Service Center (SMSC) that provides a store-and-forward mechanism to queue the SMS message and forward it to the recipient.
- If a recipient is not reachable, the SMSC re-queues the SMS message to be re-tried later.
- Some SMSCs will retry only once (or twice) and then discard the SMS message.
- SMS message delivery is a “best effort” service; there are no guarantees that a SMS message will actually be delivered to its recipient, and delay or complete loss of a SMS message is fairly common, particularly when sending SMS messages between networks.

SMS allows the sending of text messages up to 160 characters in length (including spaces), to and from other mobile devices. Segmentation and concatenation allows longer SMS messages but there is a risk of out of order receipt of the various SMS message segments.

There are millions of SMS messages sent each day and there is a perception that SMS is reliable. However the reliability of SMS comes at the price of latency. The SMS message may be reliably delivered but several hours later.

SMS was never designed as a reliable means for life-saving critical communications.

SMS has significant limitations and shortcomings that do not make SMS suitable for emergency communications, especially under life threatening conditions. SMS will never be as robust and reliable as voice-to-PSAP and these limitations will likely pose a significant risk to individuals’ safety and well-being.

SMS Direct to PSAP requires significant development which potentially could be provided by the wireless operator network or by a third party service provider outside of the wireless operator network. This development does not overcome the inherent limitations of SMS.

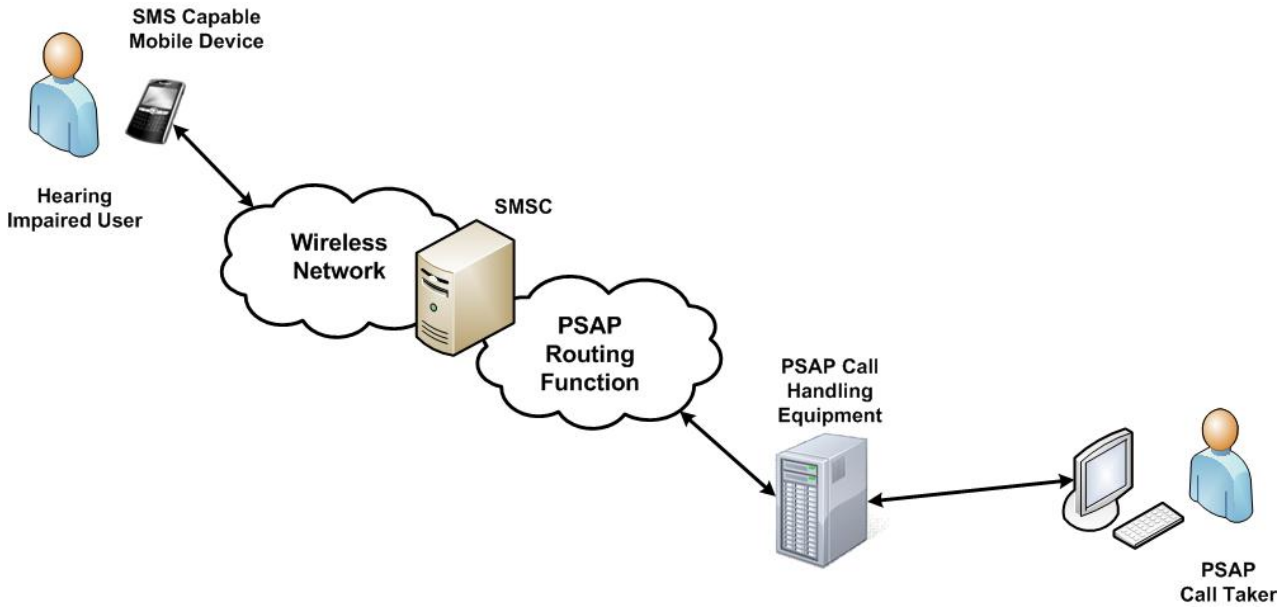

Figure 6: SMS Direct to PSAP

C.5.2 Pros

1. SMS is an application that many are familiar with and use regularly.
2. SMS is supported by most mobile phones and networks.

C.5.3 Challenges

1. The limitations and challenges associated in the use of SMS for emergency communications with 9-1-1 are extensively described in the 4G Americas white paper titled “Texting to 9-1-1: Examining the Design and Limitations of SMS” [Ref 1].
2. U.S. DOT Analysis concluded “the demonstration showed that SMS texting was an inferior technology…” [Ref 8]
3. SMS capabilities would need to be deployed in PSAPs or a National SMS Relay Center (see Section *C.7 National Short Message Service (SMS) Relay Center*) would need to be created and funded.
4. The text communication session is not recognized as an emergency session by the handset or network and the device does not enter emergency mode.
5. The user has to hit “send” after typing entire message for it to get transmitted. If sender has medical issue or some other problem, partial messages won’t be transmitted.
6. Not all mobile devices are capable of supporting a three digit 9-1-1 emergency short code.

C.6 Voice Emergency Call then SMS

C.6.1 Description

The voice emergency call then SMS would proceed as follows:

1. A pre-registered user places a “silent” 9-1-1 voice call.
2. The call is routed to the designated PSAP and location information is provided, along with a “flag” that indicates that the caller requires a SMS response. The “flag” is defined when the user pre-registers their wireless handset telephone number which is entered onto a national database.
3. The “silent’ 9-1-1 voice call is maintained and the PSAP initiates and exchanges SMS text messages with the caller to service the emergency response.

This candidate interim solution is currently under trial and evaluation in Canada.

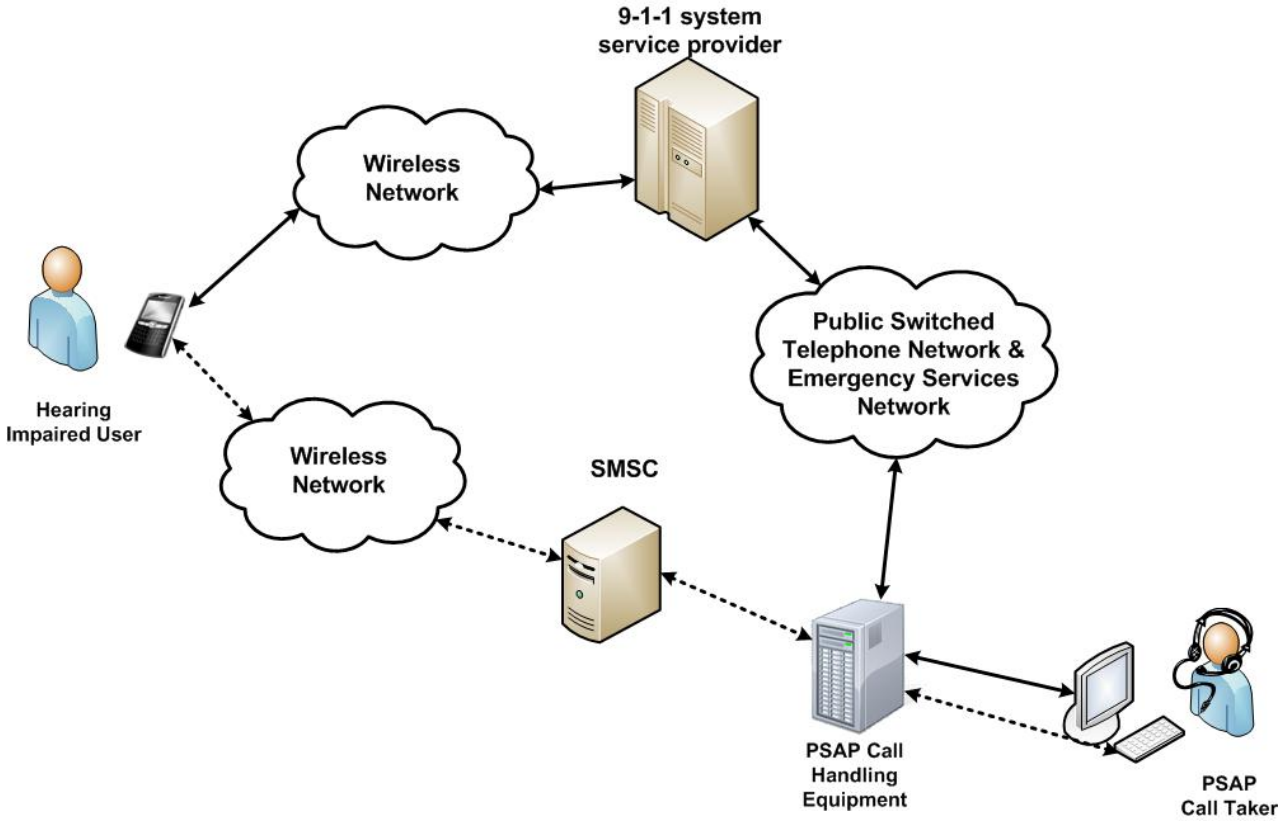

Figure 7: Voice Emergency Call then SMS

C.6.2 Pros

1. SMS is widely used to communicate today.
2. Calls can be routed directly to the designated PSAP based on existing voice routing paths in the 9-1-1 network.
3. Location is obtained by the voice call.
4. The SMS messages are initiated by the PSAP.
5. This technique enables the automatic provision of the 9-1-1 caller's call-back number and location information to the PSAP.
6. The voice communication session is recognized as an emergency session by the handset and network.

C.6.3 Challenges

1. The same SMS limitations as described in the 4G Americas whitepaper [Ref 1] still exists although SMS over traffic channel mitigates some of these limitations.
2. Not all mobile device operating systems allow SMS during 9-1-1 emergency call.
3. Unlike a voice call, SMS services do not have a consistent methodology to confirm whether a communication was delivered to either the caller or 9-1-1 PSAP.
4. When allowed by the mobile device operating system:
    a. SMS menus may be difficult to navigate while on an active 9-1-1 call.
    b. SMS does not operate identically on all mobile devices or platforms.
    c. The indication of the receipt of a SMS may not be obvious while on 9-1-1 call.

5. User pre-registration to service is required and a national emergency services database would need to be created to contain wireless customer-level registrations.
6. The appropriate emergency service database would need to be modified to contain the SMS response flag that alerts the call taker that a SMS response is required.
7. PSAP conversations have to be recorded. Therefore, the SMS from the PSAP call taker has to be via the PSAP ACD and not via a cell phone. This implies changes to the PSAP ACD or logging system.
8. Does not use existing communication methods with the PSAP and PSAPs would require a method to send SMS messages to the SMS 9-1-1 caller. Call taker screens would need to be modified to display the individual SMS messages and replies that would constitute a single "conversation".
9. This technique does not enable the 9-1-1 caller to initiate a SMS text emergency call directly to a PSAP. This technique requires PSAPs to reply back to the caller with a PSAP call taker initiated SMS message.
10. The PSAP has to have a "SMS address" for the reply message from the user. This reply message from the user has to be routed by the PSAP ACD equipment to the same PSAP call taker that initiated the SMS text message.
11. Additional PSAP training required.

C.7 National Short Message Service (SMS) Relay Center

C.7.1 Description

Under the national SMS relay center technique, emergency SMS messages are sent to a centralized national SMS relay center that serves as a means of providing a voice connection to an appropriate PSAP.

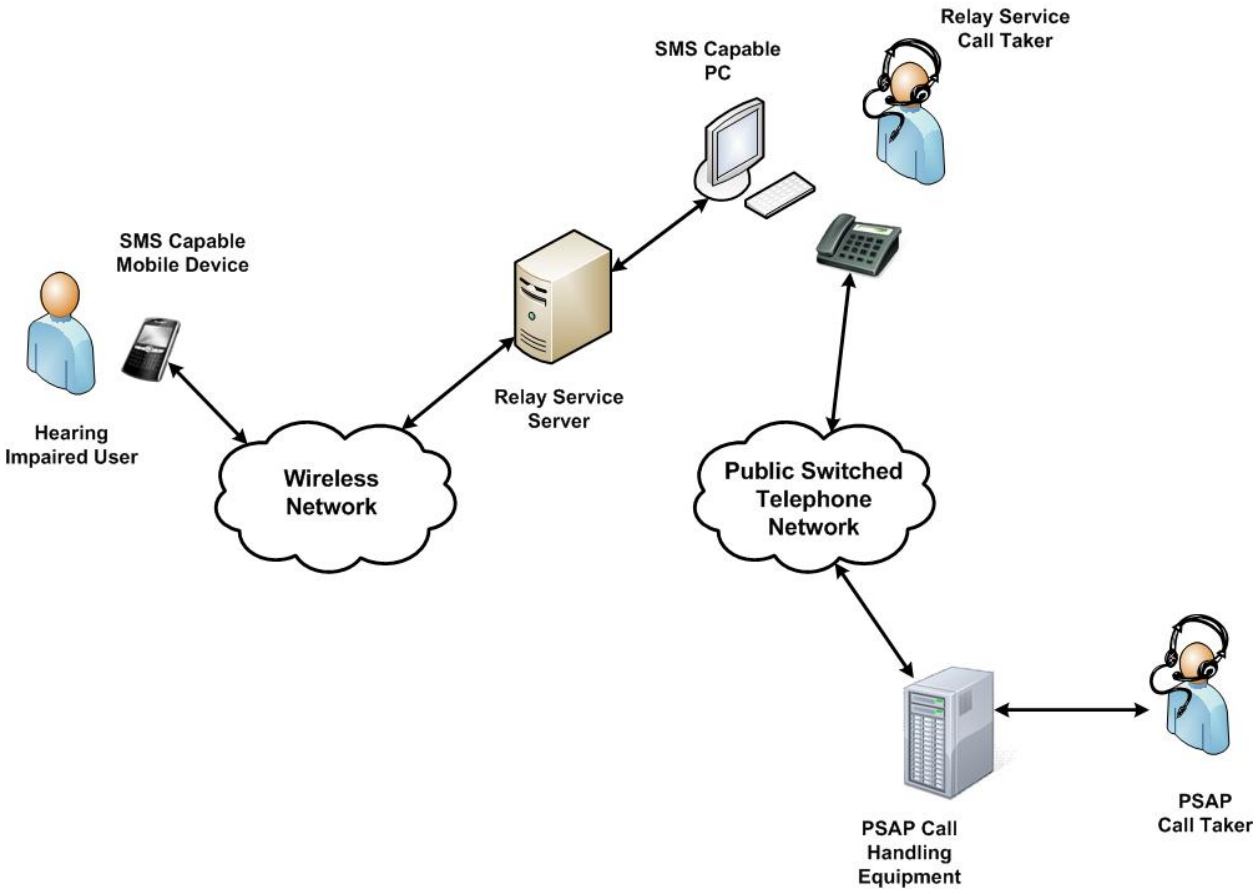

Figure 8: National SMS Relay Center

The National SMS Relay Center technique for emergency communication would operate as follows:

1. User sends SMS message to standard address/short code for National SMS Relay Center (e.g., 91163).
2. Regional/local relay centers would require user to know address/short code for their area.
3. SMS Relay Center receives message, determines the caller's location (via SMS exchange), and places a voice call to the PSAP in the caller's area (not a 9-1-1 call).
4. Relay center translates voice PSAP conversation to SMS text. This translation could be performed either by the SMS Relay Center call taker or by an automated speech-to-text and text-to-speech system.

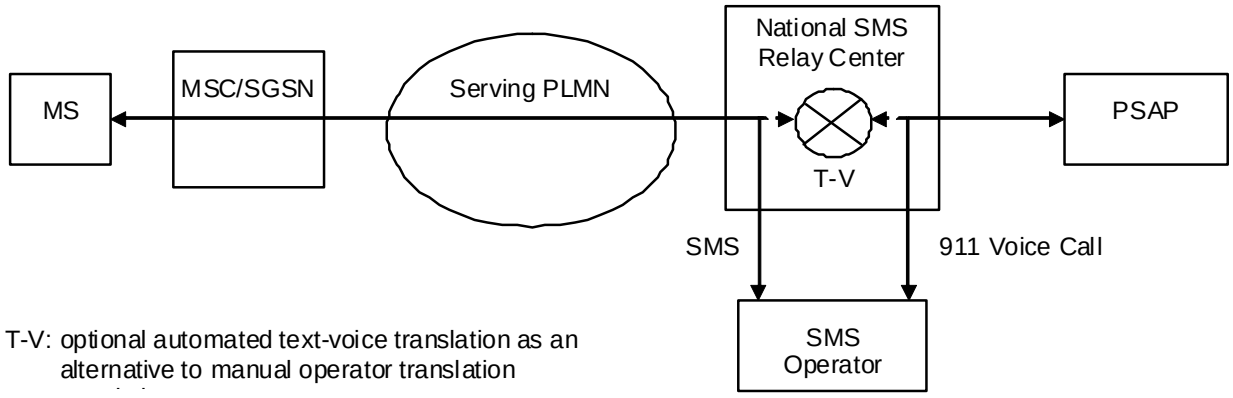

Figure 9: National SMS Relay Center Architecture

C.7.2 Pros

1. The National SMS Relay Center enables hearing and speech impaired users to use normal SMS for emergency access.

C.7.3 Challenges

1. All of the limitations of SMS as described in the 4G Americas whitepaper [Ref 1] still apply.
2. The National SMS Relay Center would need to be created, funded, staffed and maintained.
3. The National SMS Relay Center to PSAP call is not a 9-1-1 call and may take several minutes to establish.
4. The National SMS Relay center has to identify and make a call the proper PSAP based on caller's location.
5. There may be delays in communicating with the final PSAP call taker. For example, there may be delays if there are insufficient human operators at the National SMS Relay Center.
6. There are security issues with the use of SMS. SMS can be subject to misuse; both accidental and deliberate. For example, the National SMS Relay Center could be subject to frivolous messages (spam) as well as a denial of service attack.
7. The text communication session is not recognized as an emergency session by the handset or network thus does not have priority treatment and the device does not enter emergency mode.
8. The SMS Relay Center has to have a "SMS address" for the reply message from the user and that reply message has to be routed to the same National SMS Relay Center call taker that is handling the SMS text messages from that specific user.
9. The user has to hit "send" after typing entire message for it to get transmitted. If sender has medical issue or some other problem, partial messages won't be transmitted

C.8 Real Time Text (RTT) Direct to PSAP

C.8.1 Description

Real Time Text (RTT) supports multiple modes of operation. In character mode, conversational text is sent and received on a character by character basis. The characters are sent immediately once typed and displayed to the receiving person(s). This allows text to be used in the same conversational mode as voice. RTT can also operate in page mode, where there may be an indication of typing by the far end, but the messages appear only after sent by the originator.

True RTT differs from IM and SMS protocols in that the characters appear in near real-time as they are typed, not as a datagram after the message is written.

RTT is a natural extension for other real-time, conversational services such as voice telephony (e.g. for use in noisy environments or when you want to communicate during a meeting when voice is not appropriate).

Some RTT related standards are as follows:

- 3GPP TS 26.114 "Multimedia Telephony, media handling and interaction" [Ref 2] describes how to implement real-time voice, video and text services.
- ToIP (RFC 4103 [Ref 4]) Real-Time Text standard for IP networks (SIP control and Real-Time Text transport using RTP).
- IETF Framework for Real-Time Text in RFC 5194 [Ref 5].
- XMPP/ Jabber (XEP-0301) In-band Real Time Text [Ref 10].

Additionally, there are multiple methods of implementing RTT in communications networks. Support for RTT could exist within the operating system of the mobile device, and could also be integrated with the mobile carrier emergency service network.

Alternately, RTT could exist as a separate process (for example as a downloaded device application) that operates as an ‘over the top’ (OTT) service, utilizing the device’s IP connectivity to transport messages. In this model, there is no reliance on the mobile device operating system or the mobile device carrier’s emergency service network.

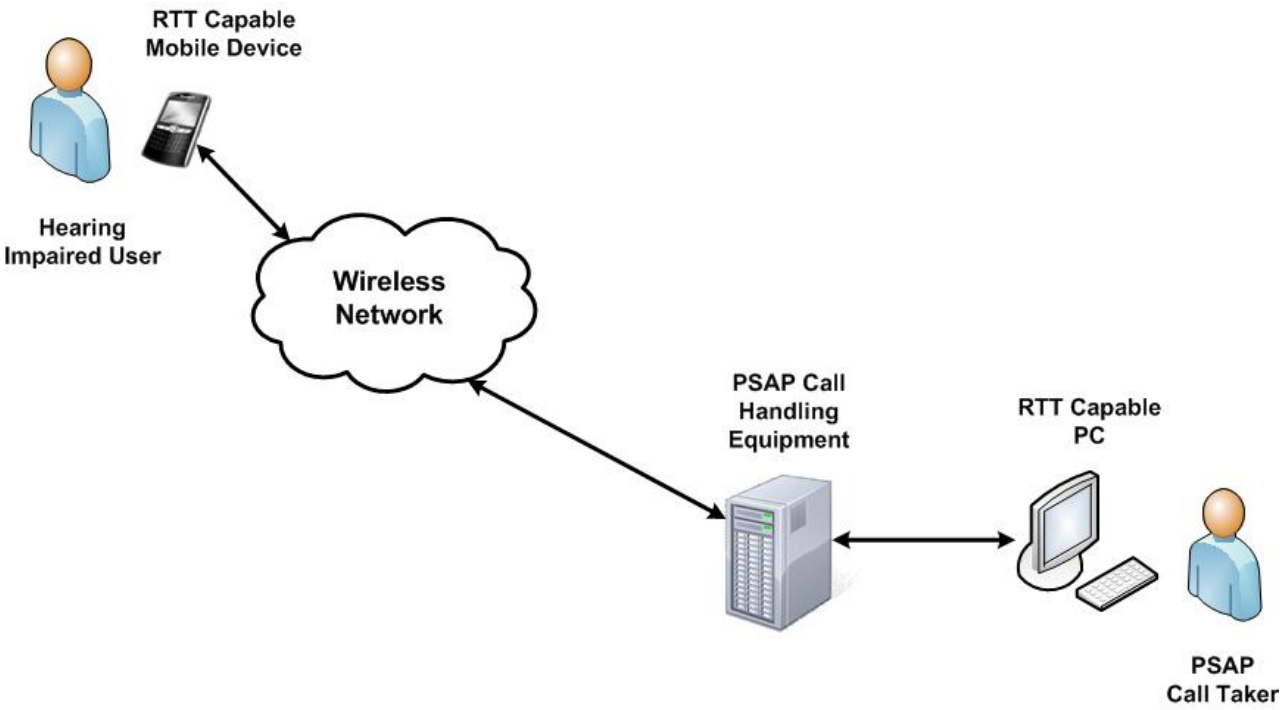

Figure 10: Real Time Text (RTT) to PSAP

C.8.2 Pros

1. RTT allows character by character transmission which is similar to TTY.
2. RTT is more reliable than TTY over wireless. The RTT transmission as a data communications protocol can ensure all data frames are successfully sent compared to TTY which is sent as tones within the voice channel. With TTY, some voice frames can be dropped and not recovered, producing a higher total character error rate (TCER).
3. Since RTT is IP-based, RTT can be used simultaneously with other media types (e.g., voice, video) unlike TTY that is transmitted on the voice channel.

C.8.3 Challenges

1. The RTT direct to PSAP candidate solution requires that RTT is used with LTE.
2. If the solution involves an IP-based, carrier-independent over-the-top RTT service, there are fundamental challenges such as routing and location that are outside the mobile device carrier network. Specifically:
   a. Where is it done?
   b. How is the information obtained from the mobile device, and what is the accuracy of the information?
3. The 3GPP standards for RTT require an IMS capable mobile device and support of IMS Emergency Calls for bearer establishment, routing, and location. The generic OTT IP-based RTT application does not provide these capabilities.
4. RTT applications (3rd party or native) would need to be built for mobile device platforms.
5. PSAP call taking equipment will need IP access and RTT support.
6. Without relying on the IMS platform of the mobile device carrier emergency service network, OTT text communication sessions are not recognized as an emergency session by the mobile device or underlying network, thus does not have priority treatment and the device does not enter emergency mode.

C.9 Real Time Text (RTT) with TTY to PSAP

C.9.1 Description

This candidate solution is a variation of *C.8 Real Time Text (RTT) Direct to PSAP.* In this candidate, RTT is originated by the caller and then converted to TTY for deliver to the PSAP.

As with *C.8 Real Time Text (RTT) Direct to PSAP*, there are multiple methods of implementing RTT in communications networks. Support for RTT could exist within the operating system of the mobile device, and could also be integrated with the mobile carrier emergency service network.

Alternately, RTT could exist as a separate process (for example as a downloaded device application) that operates as an 'over the top' (OTT) service, utilizing the device's IP connectivity to transport messages. In this model, there is no reliance on the mobile device operating system or the mobile device carrier's emergency service network.

This candidate solution requires the IMS or OTT platform to provide interworking between Real-Time Text (RTT) and PSTN text telephony (TTY). Calling party identity and location information are supported via the internetworking platform in a manner similar to existing E9-1-1 voice emergency calls.

This technique requires conversion between IP-based RTT and TTY compliant audio tone-based transmission of the real-time text messaging using ITU-T Recommendation V.18 [Ref 7] or any of its specific sub-modes as specified in 3GPP TS 26.114 [Ref 2].

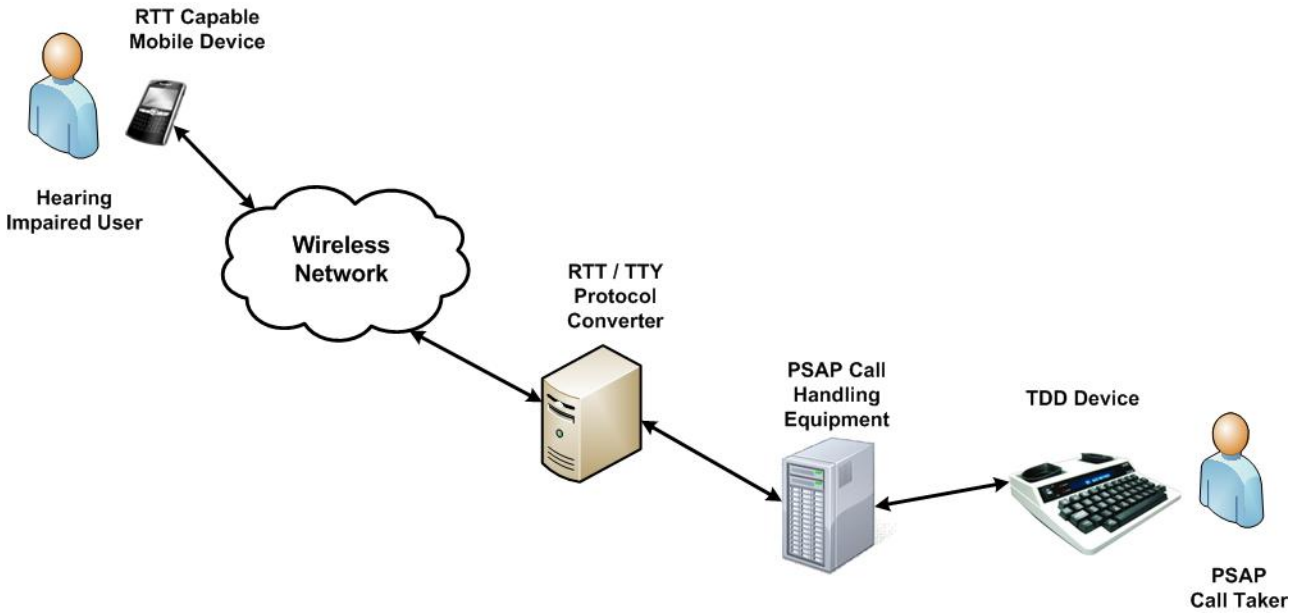

Figure 11: Real Time Text (RTT) with TTY to PSAP

C.9.2 Pros

1. In a mobile device carrier-based environment (shown in the diagram above) RTT/TTY interworking allows RTT to be used for IMS emergency calls to a PSTN-based PSAP.
2. This architecture can be supported by PSAPs with TTY capability.

C.9.3 Challenges

1. The RTT to TTY Protocol Converter has to be developed and deployed in such a manner that it operates in concert with the functions of selective routing and in a manner that provides for call termination to the PSAP.
2. RTT applications (3rd party or native) would need to be built for mobile device platforms.

3. This candidate solution has many of the same challenges as those for the RTT to PSAP candidate solution as described in clause *C.8.3 Challenges*.
4. The location for the RTT to TTY Protocol Converter can vary, depending on the network configuration.
5. In an environment where certain of the required network elements are provisioned using an over-the-top service, a significant amount of integration of the multiple 9-1-1 network elements must be successfully managed by the RTT to TTY 9-1-1 system service provider.

C.10 Real Time Text (RTT) to Relay Center

C.10.1 Description

This candidate solution is a variation of *C.8 Real Time Text (RTT) Direct to PSAP* as discussed in the preceding section. There are multiple methods of implementing RTT in communications networks. Support for RTT could exist within the operating system of the mobile device, and could also be integrated with the mobile carrier emergency service network.

Alternately, RTT could exist as a separate process (for example as a downloaded device application) that operates as an 'over the top' (OTT) service, utilizing the device's IP connectivity to transport messages. In this model, there is no reliance on the mobile device operating system or the mobile device carrier's emergency service network.

Either originating service type is depicted in the RTT to Relay Center candidate solution illustrated below and would perform as follows:

1. Caller establishes RTT session with the Relay Center.
2. The Relay Center receives message, determines the caller's location (via a variety of technical methods, or by using RTT location exchange with the caller), and places a voice call to the PSAP in the caller's area (not a 9-1-1 call).
3. The Relay Center translates between voice PSAP conversation and RTT.

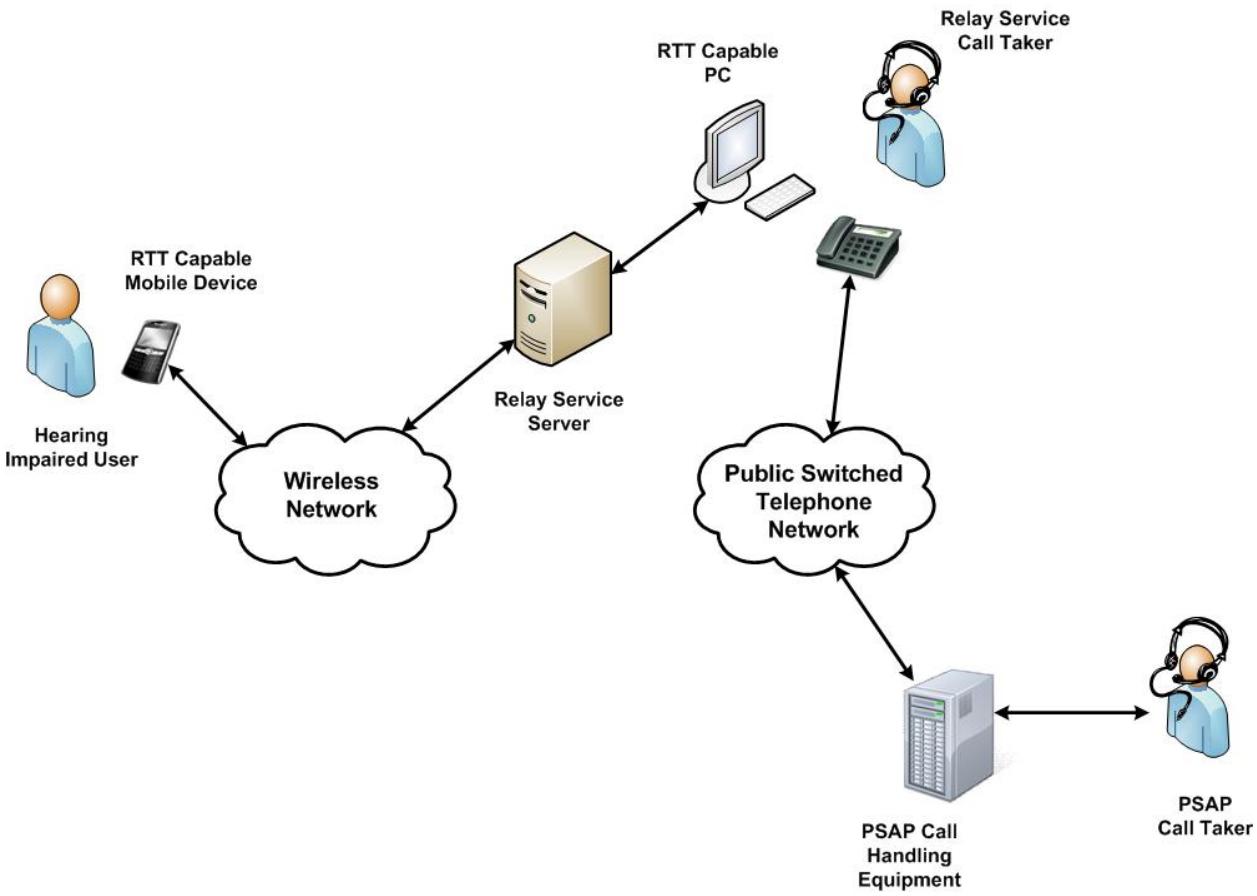

Figure 12: Real Time Text (RTT) to Relay Center

C.10.2 Pros

1. The RTT to Relay Center candidate solution can exist without upgrades to PSAPs or originating networks.
2. The routing of the IP media stream to the Relay Center does not require originating network intervention if deployed as an OTT service.

C.10.3 Challenges

1. Development and deployment of RTT Relay Center is required.
2. The Relay Center to PSAP call is not a 9-1-1 call and may take several minutes to establish.
3. RTT applications (3rd party or native) would need to be built for mobile device platforms
4. The Relay Center has to identify and make a voice call to the proper PSAP based on caller's location.
5. There may be delays in communicating with the final PSAP call taker. For example, there may be delays if there are insufficient human operators at the National RTT Relay Center.

C.11 TTY Emulation

C.11.1 Description

Carrying a mobile TTY terminal to connect to a cellular phone for emergency calls is onerous and is rarely done by the individuals who require the use of a TTY device.

The Rehabilitation Engineering Research Center (RERC) for Wireless Technologies proposed a TTY emulation application called TTYPhone which allows deaf users to communicate directly from their cellular phone with PSAP call takers. TTYPhone is a software-only application that would be loaded on a commercially-available cellular phone and would be compatible with existing PSAP and cellular phone infrastructure. TTYPhone has been demonstrated in a number of forums and the RERC research team has gained significant experience in implementing a system that may work for a wide range of users. A video demonstration of TTYPhone emulation software is available at

http://www.youtube.com/watch?v=UOBue2Aa3mo.

The following figure provides a general architecture for TTY Emulation:

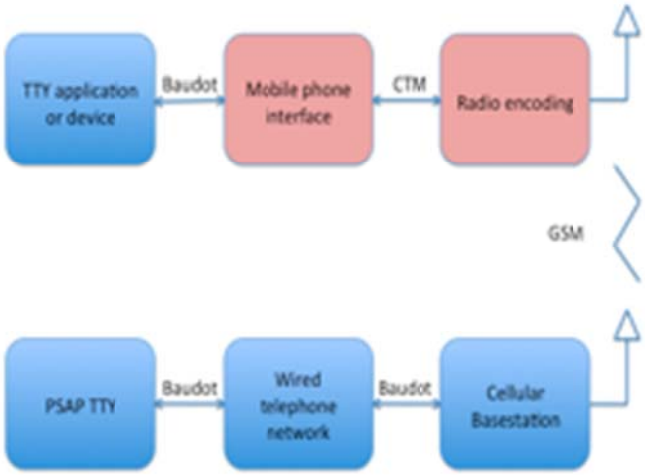

Figure 13: TTY Emulation Architecture

The Baudot coding used by TTY may be transcoded into the Cellular Telephone Text Modem (CTM) standard before transmission over a wireless link.

C.11.2 Pros

1. User does not have to have a TTY terminal.
2. TTY Emulation requires no changes to the protocol and standards used to make text-based calls to the PSAP.
3. TTY Emulation can be used with the existing wireless infrastructure and with the existing PSAP provided that it is incorporated into mobile device capability.
4. If mobile device is capable of supporting, TTY Emulation should work with E9-1-1's location service the same as voice emergency calls.
5. It may be possible to reconnect the cellular phone microphone when the TTY Emulation is not transmitting a character so that the 9-1-1 call taker can monitor the caller's ambient environment and get a better awareness of the emergency situation
    a. TTY Emulation may allow VCO (Voice Carryover), where the caller could speak as well as type to the PSAP.
    b. Similarly, it should be possible to play the incoming audio to the external speaker allow HCO (Hearing Carryover), where a caller who is unable to speak could type messages to the PSAP and receive responses in speech.
    c. It is unclear if current PSAP hardware would support this feature, and such a loud device may be unsuitable for some emergencies (e.g., a call during a home break-in).
6. The text communication session is recognized as an emergency session by the handset or network provided that it is incorporated into mobile device capability.

C.11.3 Challenges

1. It is not technically possible to the meet the 1% total character error rate mandated by the FCC.
2. No commercially available mobile devices support TTY Emulation software capabilities.
3. Support of the TTY Emulation software on the mobile devices requires development on the mobile devices, including the ability of the device to enter emergency mode.
4. Application APIs need to be developed to allow the TTY Emulation software to provide CTM over the voice channel and must be tested to comply with the 3GPP TS 26.231 [Ref 3].

C.12 Home PSAP

C.12.1 Description

This technique is based on the Sacramento 9-1-1 center that has been using this approach to serve deaf residents for many years.

Each PSAP would secure a cell phone or computer with SMS service as well as a database with all the other PSAP's SMS number, email address, texting number, and or IM screen name.

A deaf user registers with their (home) PSAP to obtain the PSAP's SMS number and program their phone with it.

When an emergency arises, no matter where in the US the deaf person is located, the deaf person sends a message to their home PSAP asking for help.

The home PSAP looks up the PSAP for the person's location, contacts that PSAP via voice and relays the text messages by voice as if the home PSAP is a hearing friend or text relay service.

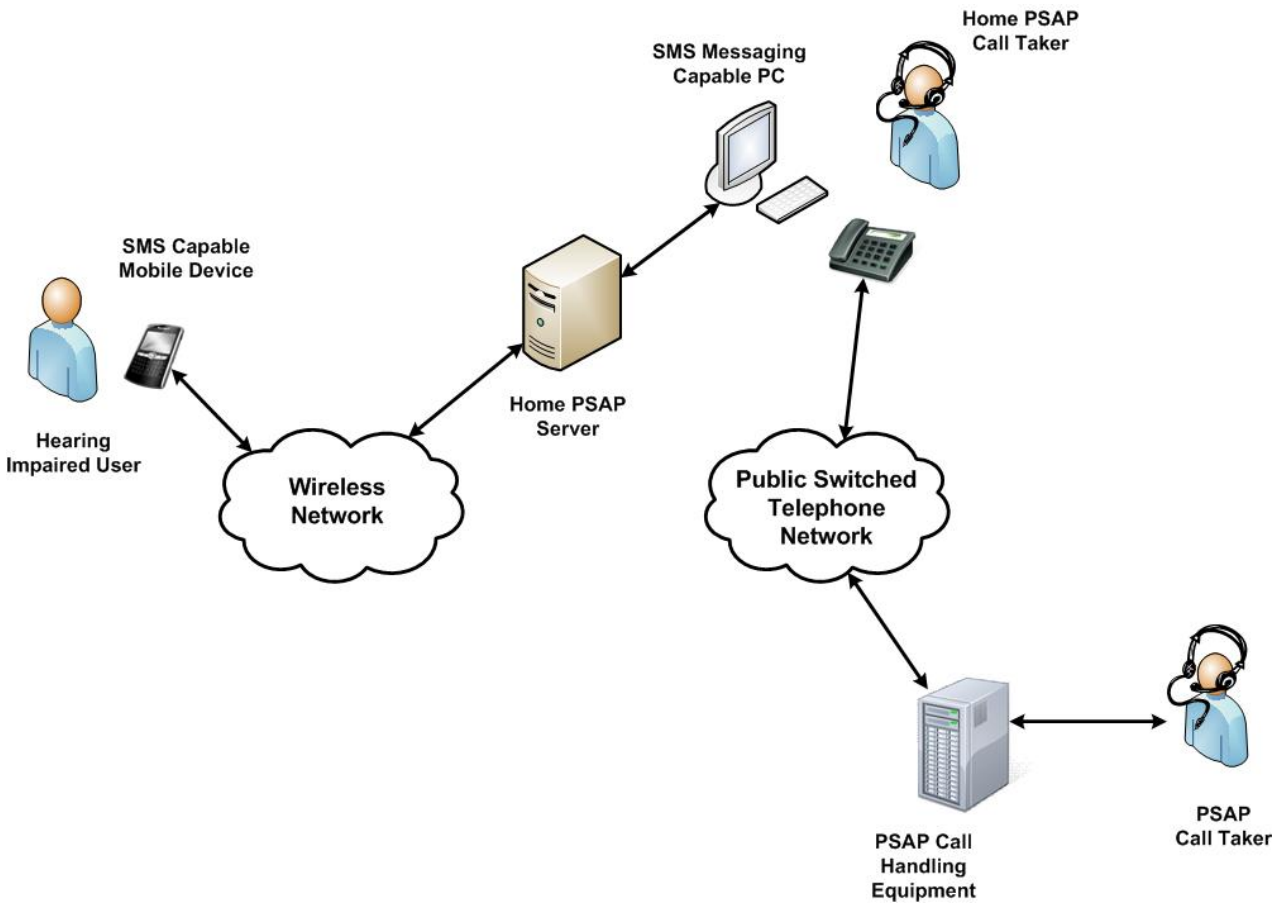

Figure 14: Home PSAP

C.12.2 Pros

1. Allows subscribers to directly SMS Text to Home PSAP after registration.
2. Using ten digit number or dedicated short code to route text to the Home PSAP.
3. Similar to what user does today for normal SMS.

C.12.3 Challenges

1. Each PSAP requires a unique access code i.e., ten digit number, or nationwide short code, etc.
2. Every PSAP would need access to the contact database for every PSAP in the country and keep the database updated. (This service is already available from NENA, but many PSAPs have not made use of it.)
3. Turns Home PSAP into a relay center.
4. The user has to program their phone with the PSAP's SMS address and access it when in an emergency.
5. Only supports one SMS message call at a time.
6. The SMS message may be reliably delivered but several hours later.
7. No automatic location information.
8. Requires user registration.
9. Not available for wireless roamers to the United States.

C.13 Voice 9-1-1 Call then Web-Based Non-Voice Communications

C.13.1 Description

Under this candidate solution, the user (either directly or using an application) places a dialed (or application assisted) voice emergency call to 9-1-1 and then a web chat session would be established with the PSAP call taker. There are several types and variations of this candidate solution.

Some implementations use a mobile device application may have different operating modes. Call origination techniques may be enhanced by being launched from an application on the mobile device and may further allow the caller to choose the calling option best suited for the situation. This is intended to help prevent inadvertent calls to 9-1-1.

In one candidate solution, upon receipt of the call at the PSAP, the mobile device application broadcasts a recorded message to the call taker – which repeats three times, advising them of the call type.

The call taker does not require direct audio communication with the caller. The recorded message tells the call taker (in coordination with proper training) that they are to access the Web Chat server.

In this implementation, the 9-1-1 command icon is available on the mobile device screen at all times for caller to access if a live call is needed (and supported by the device.)

In certain of these implementations, the application can provide a 9-1-1 Operator with a 10 second audio recording of the background audio of the caller, allow the transmission of photographs taken by the mobile device and initiate two-way texting between the caller and call taker. This is accomplished via a web browser interface at the PSAP. The function of how audio and photographic images are captured varies with the specific implementation of the application.

The 9-1-1 call taker begins the Web Chat by typing in the caller's phone number displayed on the PSAP ALI screen into the website, which retrieves the stored information associated with the 9-1-1 session. The caller's text is then sent to the secure browser text window from the centralized Web Chat server.

From this web interface, the 9-1-1 call taker, can hear the 10 second audio, can view the caller entered text, and can respond to the caller's text in a real time texting environment.

In one of the candidate solutions, at the conclusion of the 9-1-1 session, the mobile device application then deletes sent situation photos, audio and text from the cell phone upon termination of the call (thereby preserving privacy of the information, and to avoid further use of the information by others).

In other implementations within this category of candidate solutions, users can register their handset number with the PSAP, and can optionally provide personally identifiable information that is kept in a secure file and available to the PSAP during an emergency call.

In the operation of these types of implementations, a voice call is initiated in the regular manner by the user. Web Browser-based software at the PSAP is integrated with the call taking equipment. This software recognizes the registered handset number.

From the mobile device number or other identification, additional information is presented to the PSAP call taker, and the PSAP call taker can use this software to initiate and conduct a non-voice or multi-media communications session. This type of session can continue even if the underlying voice call ends, and some implementations use location-based services to provide an updatable location of the mobile device.

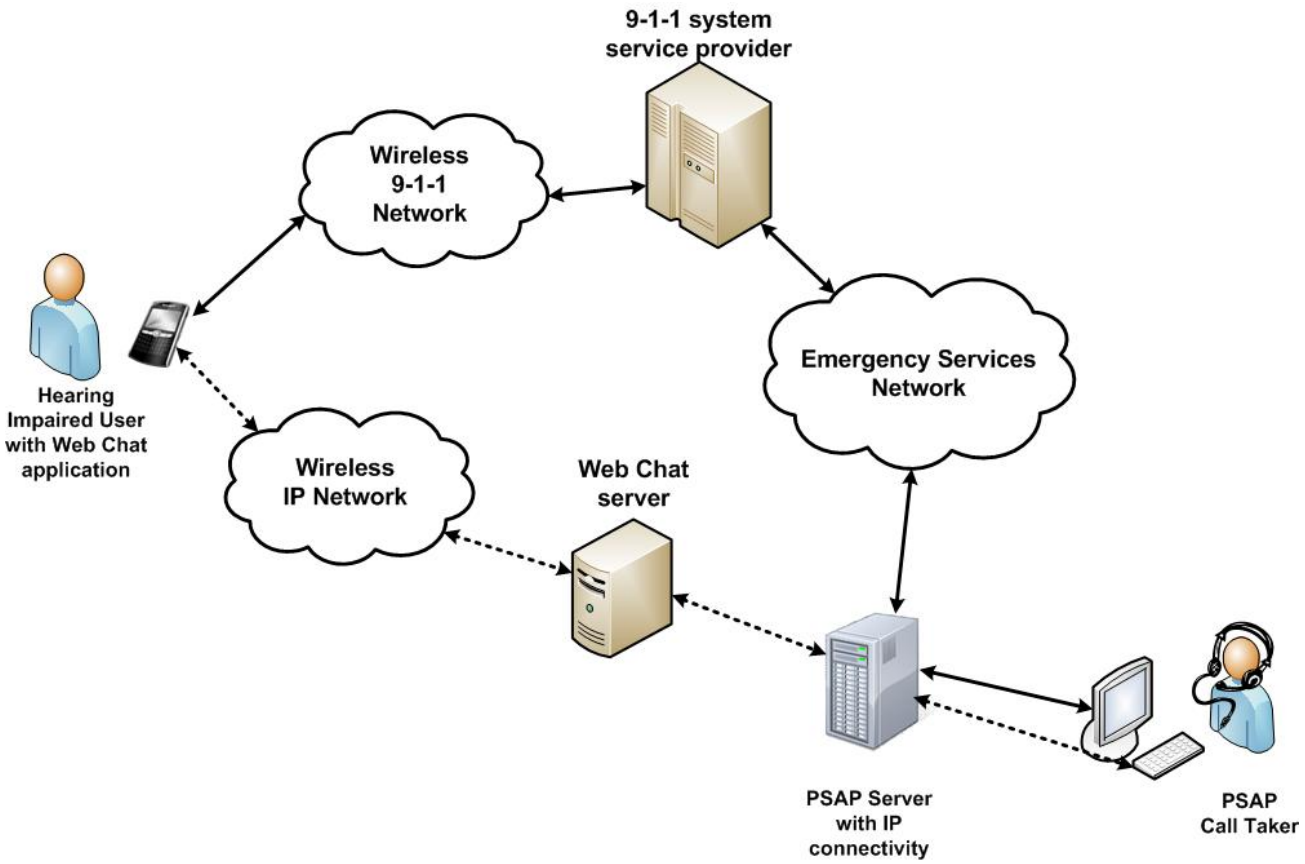

Figure 15: Voice 9-1-1 Call then Web-Based Non-Voice Communications

C.13.2 Pros

1. The call is initiated as a dialed 9-1-1 and sent directly through the 9-1-1 system to the appropriate PSAP.
2. Utilizes current cellular location determination processes and current E9-1-1 system for the initial delivery of the location of the caller.
3. Provides coordinated interactive text between caller and call taker, and added informational features.
4. Depending on the type of implementation, a low cost to user anticipated.

C.13.3 Challenges

1. The user may be required to have a mobile device that can support the application.
2. The user must buy or select, install and manage the application.
3. The user may be required to provide personal identifiable information.
4. The candidate solution requires PSAP have browser-based web access (a small number may not currently have web access).
5. PSAP training is required, likely as a combination of content provided by the application developer and a national outreach program.
6. The user could be tempted to test the application once loaded, possibly impacting PSAPs if not controlled and coordinated.
7. When an emergency voice call is placed, many devices enter an emergency mode and will not allow data applications to be active at the same time.

C.14 Central All Text (CAT)

C.14.1 Description

The Central All Text (CAT) candidate solution combines relay center functional elements and direct to PSAP call termination where supported by the local 9-1-1 authority.

In relay center operational mode, CAT supports callers using SMS (see also *C.7 National Short Message Service (SMS) Relay Center*) or RTT (see also *C.10 Real Time Text (RTT) to Relay Center*). In this mode, inbound emergency SMS messages are sent to the CAT relay center for processing. Depending on the inbound connection type, SMS calls are processed by an automated method or manually processed by a CA.

For 9-1-1 local authorities that cannot directly support non-voice communications, the CA then establishes a voice call and intermediates the call between text and voice.

For 9-1-1 local authorities that can directly support non-voice communication, the CAT establishes a connection to the local authority and the emergency call begins.

Similarly, CAT supports RTT (see also *C.8 Real Time Text (RTT) Direct to PSAP* and *C.9 Real Time Text (RTT) with TTY to PSAP*) methods of non-voice communication. Depending on the inbound connection type, RTT calls are processed by an automated method or manually processed by a CA.

Depending on the capability and preference of the 9-1-1 local authority, the CAT candidate solution can take the appropriate action for RTT using a CA or as a 'pass thru' of the RTT directly to the PSAP.

CAT has location determination limitations of the underlying technologies, and could require manual location determination from the caller.

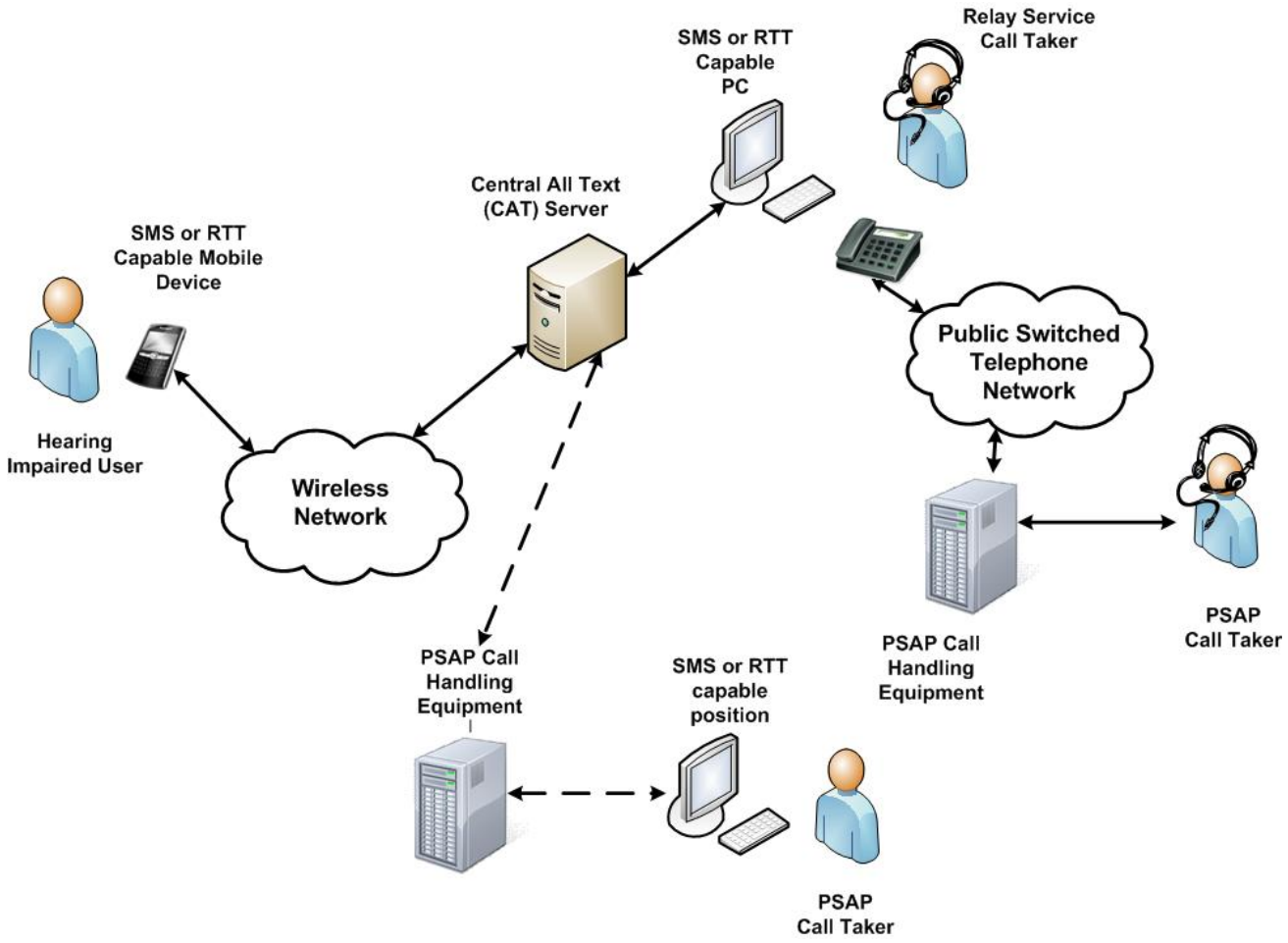

Figure 16: Central All Text (CAT)

C.14.2 Pros

1. Can support current mobile device non-voice communication protocols (SMS)
2. Can support emerging mobile device non-voice communication protocols (RTT)
3. Supports legacy 9-1-1 local authorities that do not support non-voice communication.
4. Can support NG9-1-1 local authorities that have non-voice communication capability.

C.14.3 Challenges

1. All of the limitations of SMS as described in the 4G Americas whitepaper [Ref 1] still apply.
2. The CAT server will need to be created, funded, staffed, and maintained.
3. The CAT Relay Center to PSAP call is not a 9-1-1 call and may take several minutes to establish.
4. The CAT server has to identify and make a call the proper PSAP based on caller's location.
5. There may be delays in communicating with the final PSAP call taker. For example, there may be delays if there are insufficient human operators at the CAT Relay Center.
6. The text communication session is not recognized as an emergency session by the mobile device or network thus does not have priority treatment and the device does not enter emergency mode.
7. The CAT server has to have a "SMS address" for the reply message from the user and that reply message has to be routed to the same CAT Relay Center call taker that is handling the SMS text messages from that specific user.
8. The user has to hit "send" after typing entire message for it to get transmitted. If sender has medical issue or some other problem, partial messages won't be transmitted.
9. PSAP call taking equipment will need IP access and RTT or SMS support.
10. If the solution involves an IP-based, carrier-independent over-the-top RTT service, there are fundamental challenges such as routing and location that are outside the mobile device carrier network. Specifically:
    a. Where is it done?
    b. How is the information obtained from the mobile device, and what is the accuracy of the information?
11. Without relying on the IMS platform of the mobile device carrier emergency service network, OTT text communication sessions are not recognized as an emergency session by the mobile device or underlying network, thus does not have priority treatment and the device does not enter emergency mode.
12. The CAT server has to be developed and deployed in such a manner that it operates in concert with the functions of selective routing and in a manner that provides for call termination to the PSAP.
13. In an environment where certain of the required network elements are provisioned using an over-the-top service, a significant amount of integration of the multiple 9-1-1 network elements must be successfully managed by the RTT to TTY 9-1-1 system service provider.

Appendix D: ATIS INES Incubator Members

The following companies are supporting members of the ATIS INES Incubator:

- Alcatel-Lucent
- APCO International
- AT&T
- CTIA-The Wireless Association®
- Intrado, Inc.
- National Emergency Number Association (NENA)
- Research In Motion Limited
- Samsung Telecommunications America
- Sprint
- T-Mobile
- TeleCommunication Systems, Inc.
- Telecommunications Industry Association (TIA)
- Verizon Wireless