



# Text Messages in a PSAP Environment

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APCO Emerging Technologies

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Overview of the technology currently in use to facilitate text messages into a PSAP environment. Discuss the status of interim options and provide example deployments and the potential human and operational aspects of the options and deployments.

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## 2 **Acronyms and Abbreviations\***

3 For the purpose of this white paper, the following definitions of acronyms and abbreviations  
4 apply:

5

6	<b>APCO</b>	Association of Public-Safety Communications Officials
7	<b>API</b>	Application Programming Interface
8	<b>CSC</b>	Common Short Code
9	<b>CSCA</b>	Common Short Code Administrator
10	<b>CTI</b>	Computer Telephony Integration
11	<b>CTIA</b>	Cellular Telecommunications & Inter Association
12	<b>E9-1-1</b>	Enhanced 9-1-1
13	<b>EENA</b>	European Emergency Number Association
14	<b>IETF</b>	Internet Engineering Task Force
15	<b>IM</b>	Instant Messaging
16	<b>MO</b>	Mobile Originating
17	<b>MT</b>	Mobile Terminated
18	<b>NENA</b>	National Emergency Number Association
19	<b>OSI</b>	Open System Interconnection
20	<b>PSAP</b>	Public Safety Answering Point
21	<b>RTT</b>	Real-Time Text
22	<b>SIP</b>	Session Initiation Protocol
23	<b>SMPP</b>	Short Message Peer-to-Peer
24	<b>SMS</b>	Short Message Service
25	<b>SMSC</b>	Short Message Service Center
26	<b>SMTP</b>	Simple Mail Transfer Protocol
27	<b>TCP</b>	Transmission Control Protocol
28	<b>TDD</b>	Telecommunication Device for the Deaf

29	<b>ToIP</b>	Text over Internet Protocol
30	<b>TRS</b>	Text Relay Service
31	<b>TTY</b>	Teletypewriter
32	<b>UDP</b>	User Datagram Protocol
33	<b>VoIP</b>	Voice over Internet Protocol
34	<b>WPH1</b>	Wireless, Phase 1
35	<b>WPH2</b>	Wireless, Phase 2
36	<b>WRLS</b>	Wireless, Phase 0
37		
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84 **Introduction**

85 **Scope**

86 This paper evaluates various interim 9-1-1 text solutions, including the technology, operational  
87 implications and lessons learned from early deployments. The intent of this paper is to provide the  
88 reader with an overview of current text technologies that should be considered for eventual Next  
89 Generation 9-1-1 (NG9-1-1) solutions. However, the questions involving other multimedia (e.g. picture,  
90 video messaging, or over the top applications) and other associated technology are not addressed at this  
91 time. While TTY/TDD is delivered in both ASCII and Baudot formats the interim solution to deliver text  
92 to 9-1-1 via TTY/TDD focus on Baudot.

93 **Background Information**

94 Text messaging is a form of non-verbal communication between two entities via an electronic interface,  
95 most commonly a mobile electronic device. In the public safety context, the communication may be  
96 conducted in any number of formats, including Teletypewriter (TTY), Telephone Device for the Deaf  
97 (TDD), Short Message Service (SMS), Instant Messaging (IM), or Real-time Text (RTT). Each of these  
98 formats has unique attributes; however, all provide the ability for a caller to communicate non-verbally  
99 with a 9-1-1 call taker. In today's E9-1-1 infrastructure sending a text message from a mobile device  
100 direct to a PSAP is not supported.<sup>1</sup>

101  
102 On June 9, 2009, the Black Hawk County Iowa 9-1-1 Service Board announced that the Black Hawk  
103 Consolidated Public Safety Communications Center became the first PSAP to "successfully receive text  
104 messages sent directly to 9-1-1".<sup>2</sup> Through cooperation between several vendors, the PSAP was able to  
105 incorporate text messaging into their facility. However, their efforts were focused mainly on those with  
106 speech and hearing impairments and cautioned that "a voice call remains the best way to contact 9-1-  
107 1."<sup>3</sup> It is important to note that the ability to text to 9-1-1 is limited to a single wireless carrier and  
108 currently does not facilitate automatic location information in the form of an address as a landline call  
109 or WPH2 latitude/longitude data of wireless devices.

110  
111 On August 3, 2011, the Durham Emergency Communications Center (DECC) became the second PSAP in  
112 the country to implement a text-to-9-1-1 solution for a six-month trial. The implementation involved  
113 only a single wireless carrier. In order to send a text to DECC, the "customer must be in range of cell  
114 towers in the Durham County area".<sup>4</sup>

115  
116 While both instances of an implementation of a text-to-9-1-1 solution are outstanding achievements,  
117 public safety stakeholders, both public and private, are still faced with the conundrum of trying to  
118 identify and implement solutions that are workable on a national scale.

119  
120 On May 4, 2012, Verizon announced that, in cooperation with Telecommunication Systems, beginning as  
121 early as 2013, it is planning to launch SMS-to-9-1-1 service nationwide.<sup>5</sup> This is the first major step by  
122 private companies working to provide this technology. At first, this will only be offered to select PSAPs,

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<sup>1</sup> <http://www.ravemobilesafety.com/public/smart911.html>

<sup>2</sup> [http://www.racom.net/newsletter\\_files/Press\\_release\\_6\\_8\\_09.pdf](http://www.racom.net/newsletter_files/Press_release_6_8_09.pdf)

<sup>3</sup> Ibid

<sup>4</sup> <http://www.newsobserver.com/2011/08/03/1388411/durham-verizon-customers-can-now.html>

<sup>5</sup> See *Text-to-911 moves ahead in the US as Verizon chooses partner vendor*, published by arstechnica (dated May 4, 2012), available at <http://arstechnica.com/business/2012/05/next-generation-911-moves-ahead-as-verizon-choose-partner-vendor/>

123 using its existing CDMA SMS network for 9-1-1 text notifications and only to Verizon wireless customers  
124 with a text-capable phone and service plan.<sup>6</sup>

125 To increase flexibility for the PSAPs, the program will be offered in three different methods:

- 126 • Client Backend delivering content to a PSAP via a secure web browser.
- 127 • Client API to support existing CPE equipment required by PSAPs.
- 128 • ToIP/TTY Gateway connectivity.

## 129 **Definitions**

130 **Application Programming Interface (API)** - is a source code-based specification intended to be used as  
131 an interface by software components to communicate with each other. An API may include  
132 specifications for routines, data structures, object classes, and variables. API is an essential feature too.  
133 An API specification can take many forms.

134 **Common Short Codes (CSC)** - are short numeric codes to which text messages can be addressed from a  
135 wireless device. Common short codes are easy to remember and they are compatible across all  
136 participating carriers. CSCs are either five-digit or six-digit numbers and can be leased by anyone  
137 interested in interacting with over 200 million wireless consumers.

138 Wireless subscribers send text messages to short codes to access a wide variety of mobile content for  
139 delivery to their wireless devices. Applications of CSCs include sweepstakes, tele-voting campaigns,  
140 mobile coupons, in venue, and other promotions as well as a wide range of additional interactive  
141 wireless services.<sup>7</sup>

142 **Common Short Codes Administrator (CSCA)** – CTIA administers common short codes

143 **Computer Telephony Integration (CTI)** - involves integrating computer systems with telephony  
144 resources to augment an organization's communications capabilities. In the last several years, the  
145 definition of CTI has grown to include call routing, the integration of multiple media channels—such as  
146 Web, voice, and e-mail—and integration with interactive voice response (IVR) units.<sup>8</sup>

147  
148 **Cellular Telecommunications & Inter Association (CTIA)** - CTIA-The Wireless Association® is an  
149 international nonprofit membership organization that has represented the wireless communications  
150 industry since 1984. Membership in the association includes wireless carriers and their suppliers, as well  
151 as providers and manufacturers of wireless data services and products. The association advocates on  
152 behalf of its members at all levels of government. CTIA also coordinates the industry's voluntary efforts  
153 to provide consumers with a variety of choices and information regarding their wireless products and  
154 services. This includes the voluntary industry guidelines; programs that promote mobile device recycling  
155 and reusing; and wireless accessibility for individuals with disabilities.

156

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<sup>6</sup> See *Verizon Selects Telecommunications Systems to Provide Text to 911 National Gateway Solution*, published by PR Newswire (dated May 3, 2012), available at <https://www.prnewswire.com/news-releases/verizon-selects-telecommunication-ssystems-to-provide-text-to-911-national-gateway-solution-150048385.html>

<sup>7</sup> [http://www.ctia.org/business\\_resources/short\\_code/](http://www.ctia.org/business_resources/short_code/)

<sup>8</sup> [http://www.cisco.com/en/US/products/sw/custcosw/ps427/products\\_white\\_paper09186a00801da678.shtml](http://www.cisco.com/en/US/products/sw/custcosw/ps427/products_white_paper09186a00801da678.shtml)

157 **E9-1-1** – The E9-1-1 feature provides Enhanced 9-1-1 service capabilities and optional PSAP customer  
158 services for completing and handling 9-1-1 calls. It provides the capability for the E9-1-1 tandem office  
159 to serve several PSAPs within the E9-1-1 service area. The main characteristic of E9-1-1 service is the  
160 capability of the E9-1-1 tandem office to selectively route a 9-1-1 call originated from any station in the  
161 E9-1-1 service area to the correct primary (or controlling) PSAP designated to serve the originating  
162 station’s location.<sup>9</sup>

163  
164 **Emergency Services IP Network (ESInet)** – An ESInet is a managed IP network that is used for  
165 emergency services communications, and which can be shared by all public safety agencies. It provides  
166 the IP transport infrastructure up which independent application platforms and core functional  
167 processes can be deployed, including, but not restricted to, those necessary for providing NG9-1-1  
168 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be  
169 interconnected at local, regional, state, federal, national and international levels to form an IP-based  
170 inter-network (network of networks).<sup>10</sup>

171  
172 **Internet Engineering Task Force (IETF)** - The mission of the IETF is to make the Internet work better by  
173 producing high quality, relevant technical documents that influence the way people design, use, and  
174 manage the Internet.<sup>11</sup>

175  
176 **Instant Messaging (IM)** – refers to the transfer of messages between users in near real-time. These  
177 messages are usually, but not required to be, short. IMs are often used in a conversational mode, that  
178 is, the transfer of messages back and forth is fast enough for participants to maintain an interactive  
179 conversation.<sup>12</sup>

180  
181 **In Network** – with the network coverage area

182 **Internet Protocol (IP)** - is the method or protocol by which data is sent from one computer to another  
183 on the Internet. Each computer (known as a host) on the Internet has at least one IP address that  
184 uniquely identifies it from all other computers on the Internet. When you send or receive data (for  
185 example, an e-mail note or a Web page), the message gets divided into little chunks called packets. Each  
186 of these packets contains both the sender's Internet address and the receiver's address. Any packet is  
187 sent first to a gateway computer that understands a small part of the Internet. The gateway computer  
188 reads the destination address and forwards the packet to an adjacent gateway that in turn reads the  
189 destination address and so forth across the Internet until one gateway recognizes the packet as  
190 belonging to a computer within its immediate neighborhood or domain. That gateway then forwards the  
191 packet directly to the computer whose address is specified.<sup>13</sup>

192 **Mobile Originating (MO)** – messages sent **by** a mobile handset

193  
194 **Mobile Terminated (MT)** – messages sent **to** a mobile handset

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<sup>9</sup> [http://www.nena.org/resource/collection/6366E817-C855-4776-AF3A-F9F715D1AF12/NENA\\_04-001-v1\\_E9-1-1\\_PSAP\\_Equipment.pdf](http://www.nena.org/resource/collection/6366E817-C855-4776-AF3A-F9F715D1AF12/NENA_04-001-v1_E9-1-1_PSAP_Equipment.pdf)

<sup>10</sup> See NENA Master Glossary of 9-1-1 Terminology, NENA 00-001, Version 16, August 22, 2011 at page 45. Available at [http://www.nena.org/resource/resmgr/Standards/NENA\\_00-001\\_V16.pdf?hhSearchTerms=definition+and+of+and+ESInet](http://www.nena.org/resource/resmgr/Standards/NENA_00-001_V16.pdf?hhSearchTerms=definition+and+of+and+ESInet)

<sup>11</sup> <http://www.ietf.org/>

<sup>12</sup> <http://www.ietf.org/rfc/rfc3428.txt>

<sup>13</sup> <http://searchunifiedcommunications.techtarget.com/definition/Internet-Protocol>

195  
196 **Next Generation 9-1-1 (NG9-1-1)** - A system comprised of hardware, software, data and operational  
197 policies and procedures to:

- 198 • Provide standardized interfaces from call and messaging services
- 199 • Process all types of emergency calls including non-voice (multimedia) messages
- 200 • Acquire and integrate additional data useful to call routing and handling
- 201 • Deliver the calls/messages and data to the appropriate PSAPs and other appropriate emergency  
202 entities
- 203 • Support data and communications needs for coordinated incident response and management<sup>14</sup>

204

205 **OSI Transport Layer (Open System Interconnection)** - The transport layer ensures that messages are  
206 delivered error-free, in sequence, and with no losses or duplications. It relieves the higher layer  
207 protocols from any concern with the transfer of data between them and their peers. Typically, the  
208 transport layer can accept relatively large messages, but there are strict message size limits imposed by  
209 the network (or lower) layer. Consequently, the transport layer must break up the messages into smaller  
210 units, or frames, prepending a header to each frame.<sup>15</sup>

211

212 **Public Safety Answering Point (PSAP)** - A facility equipped and staffed to receive emergency and non-  
213 emergency calls requesting public safety services via telephone and other communication devices.  
214 Emergency calls are first answered, assessed, classified, and prioritized. The FCC further defines a  
215 primary PSAP as a facility to which 9-1-1 calls are routed directly from the 9-1-1 Control Office. A  
216 secondary PSAP is defined as a facility to which 9-1-1 calls are transferred from a primary PSAP.

217

218 **REACH112 (Responding to All Citizens needing Help)** - a project partially funded by the European  
219 Commission under the Information and Communication Technologies Policy Support Programme (ICT  
220 PSP). It represents partners from all over Europe, including user organizations and major global  
221 telecommunications companies. In five countries, it will deploy a new communication solution to allow  
222 people to communicate in video, voice and text simultaneously, with special focus on people with  
223 disabilities. The project will offer access to relay services to help connecting users with different abilities  
224 to others and will also provide access to the emergency services. Ultimately the service will benefit all  
225 citizens.<sup>16</sup>

226

227 **RFC4103** - defines a payload type for carrying text conversation session contents in RTP [2] packets.  
228 Text conversation is used alone or in connection with other conversational facilities, such as video and  
229 voice, to form multimedia conversation services. Text in multimedia conversation sessions is sent  
230 character-by-character as soon as it is available, or with a small delay for buffering. The text is intended  
231 to be entered by human users from a keyboard, handwriting recognition, voice recognition or any other  
232 input method.<sup>17</sup>

233

234 **Real-Time Text (RTT)** – Conversational text that is sent and received on a character by character basis.  
235 The characters are sent immediately (in a fraction of a second) once typed and are also displayed

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<sup>14</sup> <http://www.topcompinc.com/NG%209-1-1/NENA%20NG911%20Standards.pdf>

<sup>15</sup> <http://support.microsoft.com/kb/103884>

<sup>16</sup> [http://ec.europa.eu/information\\_society/activities/ict\\_psp/projects/portfolio/h3\\_documents/reach\\_112.pdf](http://ec.europa.eu/information_society/activities/ict_psp/projects/portfolio/h3_documents/reach_112.pdf)

<sup>17</sup> [http://datatracker.ietf.org/doc/rfc4103/?include\\_text=1](http://datatracker.ietf.org/doc/rfc4103/?include_text=1)

236 immediately to the receiving person(s). This allows text to be used in the same conversational mode as  
237 voice.<sup>18</sup>

238  
239 **Real-Time Transport Protocol (RTP)** - provides end-to-end network transport functions suitable for  
240 applications transmitting real-time data, such as audio, video or simulation data, over multicast or  
241 unicast network services. RTP does not address resource reservation and does not guarantee quality-of-  
242 service for real-time services.<sup>19</sup>

243  
244 **Session Initiation Protocol (SIP)** is an IETF-defined signaling protocol widely used for  
245 controlling communication sessions such as voice and video calls over Internet Protocol (IP). The  
246 protocol can be used for creating, modifying and terminating two-party (unicast) or multiparty  
247 (multicast) sessions. Sessions may consist of one or several media streams.

248  
249 **Short Codes** – See Common Short Codes.

250  
251 **Short Message Peer-to-Peer (SMPP)** – An open, industry-standard protocol for sending text message  
252 (SMS) data over the internet. It is used primarily for connecting third-party services with SMS centers,  
253 enabling various types of automated SMS services. It is also used to link SMS center gateways, enabling  
254 inter-carrier messaging.<sup>20</sup>

255  
256 **Short Message Service (SMS)** – Enables users to send and receive short text messages (usually about  
257 140-160 characters) on wireless handsets. Usually referred to as “text messaging” or “texting”.<sup>21</sup>  
258 Although SMS is commonly used for Mobile to Mobile messages, it is also used today to send messages  
259 across multiple paths such as from a mobile device to a personal computer or other endpoints. For  
260 instance, in an SMS to E9-1-1 scenario, the path would typically be to / from a mobile device to a  
261 telecommunicator at the PSAP.

262  
263 **Short Message Service Center (SMSC)** – acts as a centralized store-and-forward device that accepts  
264 messages and buffers or retains those messages until a suitable deliver time (i.e., the cell phone is  
265 powered on and the location known).<sup>22</sup>

266  
267 **Simple Mail Transfer Protocol (SMTP)** – A set of commands that authenticate and direct the transfer of  
268 electronic mail from one mail server to a receiving server.<sup>23</sup>

269  
270 **Spoofing** – (A) The process of deception by which an individual or system alters its identity or creates  
271 additional identities, thereby causing another person or system to act incorrectly. (B) The process of  
272 deception by which an unauthorized person causes a transmission or message to appear to come from  
273 an authorized user in order to gain privileged access to computer or network resources. IP spoofing, an  
274 integral element of many types of network attacks, involves creating TCP/IP packets that use false  
275 addresses, perhaps stolen from others. (C) The process of deception by which a system alters its  
276 identify or creates additional identities, to impersonate another device in a communications session or

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<sup>18</sup> <http://www.realtimetext.org/index.php?pagina=27>

<sup>19</sup> <http://www.ietf.org/rfc/rfc1889.txt>

<sup>20</sup> <http://www.phonescoop.com/glossary/term.php?gid=257>

<sup>21</sup> <http://www.ctia.org/advocacy/research/index.cfm/AID/10406>

<sup>22</sup> [http://www.ncs.gov/library/tech\\_bulletins/2003/tib\\_03-2.pdf](http://www.ncs.gov/library/tech_bulletins/2003/tib_03-2.pdf)

<sup>23</sup> <http://www.sharpened.net/glossary/definition/smt>

277 transaction.<sup>24</sup> [See also “The Trouble with Spoofing: How manipulating caller ID Harms 9-1-1,”  
278 originally published in *Public Safety Communications, Vol. 75 (5): 42-43, May 2009.*]<sup>25</sup>

279  
280 **Telecommunicator** - The individual employed by a public safety agency as the first of the first  
281 responders whose primary responsibility is to receive, process, transmit, and/or dispatch emergency  
282 and non-emergency calls for law enforcement, fire, emergency medical, and other public safety services  
283 via telephone, radio, and other communication devices.

284  
285 **Teletypewriter (TTY)** – also known as **Telecommunication Device for the Deaf (TDD)**, is a device capable  
286 of information interchange between compatible units using a dial up or private-line telephone network  
287 connection as the transmission medium. ASCII or Baudot codes are used by these units.<sup>26</sup>

288  
289 **Ten Digit Long Code** – are voice, SMS and fax enabled. They can be accessed from a mobile device,  
290 landline, chat window, email or web-based application.<sup>27</sup> These are in the format of NPA-NXX-XXXX  
291 (ITU-T E.164 [International Dialing Plan] or ATIS-0300076 [The North American Numbering and Dialing  
292 Plan]). Although it has seen limited use, this format is being discontinued in favor of SMS Short Codes.

293  
294 **Text Relay Service (TRS)** – A telephone transmission service that provides the ability for an individual  
295 who has a hearing or speech disability to engage in communication by wire or radio with a hearing  
296 individual in a manner that is functionally equivalent to the ability of an individual who does not have a  
297 hearing or speech disability to communicate using voice communications services by wire or radio. Such  
298 term includes services that enable two-way communication between an individual who uses a text  
299 telephone or other non-voice terminal device and an individual who does not use such a device, speech-  
300 to-speech services, video relay services and non-English relay services.<sup>28</sup>

301  
302 **Transaction Mode** – a SMSC may provide this option, where a transmission/text is tried only once,  
303 returning proof of delivery as part of the process.

304  
305 **Transmission Control Protocol (TCP)** - is a transport layer protocol used by applications that require  
306 guaranteed delivery. It is a sliding window protocol that provides handling for both timeouts and  
307 retransmissions. TCP establishes a full duplex virtual connection between two endpoints. Each endpoint  
308 is defined by an IP address and a TCP port number. The operation of TCP is implemented as a finite state  
309 machine. The byte stream is transferred in segments. The window size determines the number of bytes  
310 of data that can be sent before an acknowledgement from the receiver is necessary.<sup>29</sup>

311  
312 **User Datagram Protocol (UDP)** - is defined to make available a datagram mode of packet-switched  
313 computer communication in the environment of an interconnected set of computer networks.  
314 This protocol assumes that the Internet Protocol (IP) is used as the underlying protocol. This protocol  
315 provides a procedure for application programs to send messages to other programs with a minimum of  
316 protocol mechanism. The protocol is transaction oriented, and delivery and duplicate protection are not

---

<sup>24</sup> <http://computer.yourdictionary.com/spoofing>

<sup>25</sup> <http://psc.apcointl.org/2011/03/17/the-trouble-with-spoofing/>

<sup>26</sup> <http://www.apcointl.com/new/commcenter911/downloads/ADA-TDDTrainingStandard.pdf>

<sup>27</sup> <http://www.mobilemarketingunlimited.net/mobile-marketing-411/long-codes-versus-short-codes/>

<sup>28</sup> <http://transition.fcc.gov/cgb/dro/4regs.html>

<sup>29</sup> <http://www.networksorcery.com/enp/protocol/tcp.htm>

317 guaranteed. Applications requiring ordered reliable delivery of streams of data should use the  
318 Transmission Control Protocol (TCP).<sup>30</sup>

319  
320 **Voice over Internet Protocol (VoIP)** - a technology that allows you to make voice calls using a  
321 broadband Internet connection instead of a regular (or analog) phone line. Some VoIP services may only  
322 allow you to call other people using the same service, but others may allow you to call anyone who has a  
323 telephone number - including local, long distance, mobile, and international numbers. Also, while some  
324 VoIP services only work over your computer or a special VoIP phone, other services allow you to use a  
325 traditional phone connected to a VoIP adapter.<sup>31</sup>

326  
327 **Driving the Need for Text-to-9-1-1**

328  
329 Text messaging is the most common non-voice application via mobile devices used today. The average  
330 person sends 41.5 messages per day, up from the 29.7 messages per day in 2009. If you then consider  
331 those 18-24 years old, the average messages per day rises to 109.5, or 3,200 per month. At the same  
332 time, the number of voice calls, made or received, via cell phone has remained steady at approximately  
333 12.3 calls per day.<sup>32</sup> Data presented by Neustar suggests that over 72% of wireless users have paid for  
334 SMS packages and 57% of those over the age of 13 are considered regular text message users.

335  
336 According to CTIA statistics<sup>33</sup> (referenced in Figure 1 below), the number of SMS text messages has  
337 increased to 2.30 trillion messages per year. Additionally, nearly 32% of households in the United States  
338 have completely “cut the cord”, relying solely on mobile devices for telephone service – an over 400%  
339 increase compared to six years ago.

340



	Dec-11	Dec-06	Dec-01	Dec-96
<b>Wireless Subscriber Connections</b>	331.6M	233.0M	128.4M	44.0M
<b>Wireless-Only Households</b> (% of U.S. Households)	31.6%	10.5%	N/A	N/A
<b>Annualized Minutes of Use</b>	2.29T	1.96T	456.96B	51.97B
<b>Annualized Yearly Text Messages</b>	2.30T	158.6B	N/A	N/A
<b>E-911 Calls Per Day</b>	>400K	260K	139K	55K

341

342

343 **Figure 1**

344 In a 2010 study conducted by the American Red Cross, 52% of respondents indicated they would send a  
345 text message to a response agency if it were available.<sup>34</sup> The number of respondents who would send a  
346 text message increases to 66% for those aged 18-34. To bring another perspective to the proliferation

<sup>30</sup> <http://tools.ietf.org/html/rfc768>

<sup>31</sup> <http://www.fcc.gov/encyclopedia/voice-over-internet-protocol-voip>

<sup>32</sup> <http://pewinternet.org/Reports/2011/Cell-Phone-Texting-2011/Main-Report/How-Americans-Use-Text-Messaging.aspx>

<sup>33</sup> <http://www.ctia.org/advocacy/research/index.cfm/AID/10323>

<sup>34</sup> <http://www.redcross.org/www-files/Documents/pdf/other/SocialMediaSlideDeck.pdf>

347 of mobile devices, the global mobile data traffic in 2011 was over eight times greater than the total  
348 global internet traffic in 2000.<sup>35</sup>

### 349 **Why do we need to look at enabling Text-to-9-1-1?**

350 NG9-1-1 defines an infrastructure for multi-media communication with 9-1-1, but broad deployment of  
351 NG9-1-1 networks is years away. Even after network deployment, changes will have to be made to  
352 wireless carrier networks to facilitate delivering text messages into those networks in the manner  
353 prescribed by NG9-1-1.

354  
355 The hearing and speech impaired communities are not able to effectively communicate via a mobile  
356 device with emergency services today. They represent a population of 54.4<sup>36</sup> million citizens who are  
357 not being provided parity of access to emergency services.

358 Situations also occur wherein a caller is not able to initiate a voice call to 9-1-1. Silent witness type  
359 scenarios represent valid use cases for text-to-9-1-1 outside the hearing and speech impaired  
360 communities. For example, Iceland's 112 system, while deployed for the speech and hearing impaired  
361 communities, has been used to alert the police when people have been in cars where drugs are being  
362 sold and by people being subjected to domestic violence.

363 As text messaging becomes a standard communication tool, citizens increasingly expect to be able to  
364 send messages via text to 9-1-1.

## 365 **Technology Overview**

### 366 **SMS**

367 Short Message Service (SMS) allows the exchange of short messages between a mobile station and the  
368 wireless system, and between the wireless system and an external device capable of transmitting and  
369 optionally receiving short messages. The external device may be a voice telephone, a data terminal or a  
370 short message entry system.<sup>37</sup> The term 'SMS' has become synonymous for all types of text messaging  
371 as 'texting' has become more and more commonplace and accepted in today's society.

372  
373 SMS Detailed Methodology: Typically, Mobile Originated messages are sent from a handset via a  
374 carrier's network. The carrier network includes a Short message service center (SMSC) which provides a  
375 "store and forward" mechanism. The SMSC "stores" the message received and then attempts to  
376 "forward" that message to the intended recipient, also via the carrier network. The majority of SMS  
377 messages not delivered on a first attempt are because the phone is unreachable (e.g. turned off or  
378 temporarily off the network), not because of network congestion or failure as is commonly believed.  
379 Messages that are not delivered on the first attempt enter into a robust SMSC retry mechanism, which  
380 delivers the message as soon as the recipient becomes available. This proven method ensures that the  
381 vast majority of messages will be retransmitted and received successfully.

382 There has been a great deal of discussion, and even controversy, surrounding the reliability and  
383 resilience of SMS as a means to communicate a 9-1-1 emergency request. SMS delivery, while

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<sup>35</sup> [http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white\\_paper\\_c11-520862.html](http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html)

<sup>36</sup> <http://www.census.gov/prod/2008pubs/p70-117.pdf>

<sup>37</sup> See *Short Message Service TIA/EIA-637-A, by 3<sup>rd</sup> Generation Partnership Project 2 "3GPP2" [3GPPS C.S0015-0]* available at [http://www.3gpp2.org/public\\_html/specs/CS0015-0.pdf](http://www.3gpp2.org/public_html/specs/CS0015-0.pdf)

384 considered a "best effort", has shown that the complete loss of a message is practically nonexistent and  
385 message delays are uncommon, typically affecting less than 1% of messages.<sup>38</sup> Of interest to the PSAP  
386 community though, is that in an SMS to PSAP scenario, both the sending and receiving devices would, by  
387 definition, be "on," "in network", and "not blocked" since the entire emergency scenario begins with a  
388 person successfully texting for emergency support. By successfully texting an initial message to the  
389 PSAP, the sender ensures that their phone is on and network coverage is available.

390 If the carrier chooses to do so, SMSCs also provide for a "Forward and Forget" or "Transaction Mode"  
391 option where transmission is tried only once, returning proof of delivery as part of the process. These  
392 existing protocol methods allow the status of message delivery to the recipient to be presented to the  
393 PSAP immediately (e.g., confirmation that the message has been delivered, determination that the  
394 handset is not responsive or not reachable, or representation that there is a network error and of what  
395 type). With this knowledge, the telecommunicator can decide to take further action; for example, to  
396 resend the same message or to attempt to reach the subscriber by voice calling, or to dispatch  
397 emergency services based on the information already gathered by the PSAP.

### 398 **SMS via 10-digit long code**

399 The experience of using SMS via a 10-digit long code is what most of the US population is used to today,  
400 where a mobile subscriber sends a message (or a series of messages) to a 10 digit number (e.g. 555-555-  
401 1212). This is commonly referred to as 'text messaging' or 'texting'. Billions of SMS messages via 10  
402 digit long codes are sent monthly in the United States.

403 It is generally believed that SMS to E9-1-1 utilizing a 10-digit long code would not be feasible for a  
404 nationwide deployment. Some examples of potential deficiencies of this method are:

- 405 • 10-digits used for a regional SMS to E9-1-1 deployment strategy would need to be memorized  
406 and/or programmed into handsets (e.g. Time consuming and difficult for the vast majority of the  
407 population to configure correctly).
- 408 • Subscribers traveling outside of their normal coverage area would be expected to know the local  
409 10-digit SMS to E9-1-1 sequence.
- 410 • The dynamic input of 10 digits into a device in order to contact the PSAP would be too costly in  
411 time and risk to the sender for large scale acceptance.

---

<sup>38</sup> <http://apps.fcc.gov/ecfs/document/view?id=7021750484>

- "The CU Team's study tracked several hundred messages and found that all of the text messages sent were received by the cellular network, resulting in a "data loss rate" of 0% and a reliability level of 100%."
  - Univ of CO research
- "Other researchers have tested the reliability of Short Message Service (SMS) texts and found that the "data loss rate" over several thousand messages was less than 1%, resulting in a reliability level of 99 %. The statistical implication is that large samples might experience a small percentage of data loss, but overall the reliability for text messages is similar to that of voice calls."
  - CO Cited: Chwan-Lu Tseng, Joe-Air Jiang, Ren-Guey Lee, Fu-Ming Lu, Cheng-Shiou Ouyang, Yih-Shaing Chen, Chih-Hsiang Chang, "Feasibility study on application of GSM-SMS technology to field data acquisition", Computers and Electronics in Agriculture, Volume 53, Issue 1, August 2006, Pages 45-59, ISSN 0168-1699, 10.1016/j.compag.2006.03.005.  
<http://www.sciencedirect.com/science/article/pii/S0168169906000494>

412 A possible method would be for a nationwide 10-digit (or shorter) number which is geo-targeted to the  
413 correct PSAP via carrier methods as discussed below.

#### 414 **Text to TTY**

415 Conventional Tele-typewriters (TTY) have been used for many years by the hard of hearing or speech-  
416 impaired to communicate with one another and with PSAPs using a common protocol (code) referred to  
417 as Baudot. PSAPs are mandated by the federal government to provide 9-1-1 access via TTY for the  
418 hearing and speech impaired. However, legacy TTY technology has become antiquated with the  
419 inception and increase in popularity of wireless devices and VoIP. Many of the consumers who  
420 previously relied heavily on TTY communication now rely on other methods such as SMS. While there  
421 are many PSAPs that are willing to discuss how to implement more modern forms of text to 9-1-1  
422 solutions, there is very little funding available to upgrade their systems to do so. Since TTY technology is  
423 already present at the PSAP, consideration has been given to converting incoming text, such as SMS to  
424 Baudot as an interim text solution. There are known Quality of Service (QoS) issues with Baudot that  
425 make any type of conversion to this technology less than desirable. Absent significant funding however,  
426 during challenging economic times, text to TTY will remain a consideration for PSAPs that have no other  
427 means of receiving text calls to 9-1-1.

#### 428 **SMS via 4, 5, or 6-digit short codes**

429 Short codes are special telephone numbers, significantly shorter than full telephone numbers, which  
430 can be used to address SMS messages from mobile phones which are sent to an application at the  
431 carrier for interpretation of the intended purpose and/or recipient. Short codes are designed to be  
432 easier to remember than normal telephone numbers (e.g. HELP = 4357, INFO = 4646, MAIL = 6245).  
433 Carriers often have agreements in place for 'Common Short Codes' which would allow a single code to  
434 be used in an SMS to E9-1-1 application across all carrier networks.

435 It is understood that SMS via a short code for E9-1-1 access would have more general acceptance by the  
436 public than 10 digit short codes (See above). In addition, the technology, procedures and infrastructure  
437 to facilitate the use of short codes are already in place in the United States.

438 Short code SMS messages are delivered via the SMPP protocol. The 4, 5, or 6-digit short codes  
439 allow the sender of a message to appear as the same "from" number across multiple carriers. They  
440 also enable a sender to utilize a single short code (e.g. 12345) to deliver an MO message to the  
441 desired recipient regardless of their wireless carrier. Common short codes (CSC), these short strings  
442 of numbers, are administered by a single CSC Administrator (CSCA) - the Cellular  
443 Telecommunications & Internet Association (CTIA) - for a group of U.S. wireless carriers. In  
444 addition, the CSCA oversees the technical and operational aspects of CSC functions and maintains a  
445 single database of available, reserved and registered CSC.

446 Using a mobile device, users can send a Mobile Originated (MO) message to a short code via SMS.  
447 Typically, the carrier utilizes the CSC database to determine where to forward the message. Often,  
448 these messages are routed through an aggregator that manages interfaces to a number of application  
449 providers. These aggregators fill the role of shielding the carriers from a large number of application  
450 providers.

451 For emergency service use, there are a few different options for short codes. The primary challenge is  
452 delivering the message to the correct 9-1-1 answering point, since the messages are not routed from the  
453 originating device on the 9-1-1 network. Once the message is delivered from the carrier to the “owner”  
454 of the short code, the message must somehow be delivered to the correct PSAP based on the caller’s  
455 location. Several options have been implemented:

- 456 1) Designate a specific 5-digit short code for a region. Any text to that short code is routed directly  
457 to a specific PSAP, regardless of the caller’s actual location.
- 458 2) Utilize keywords at the beginning of the text message. For example, New York City residents  
459 might send a text message with the prefix NYC. The SMS message is delivered to the owner of  
460 the short code who then recognizes the keyword and pushes the message to the correct PSAP.
- 461 3) Utilize an intermediary step. In this model an automated request for the caller to specify their  
462 location is triggered (e.g. “please type in your exact address”), or a human intermediary who  
463 interrogates to determine the location and routes the message to the correct PSAP.

464 A possible method of delivery currently under development is to deliver the text to a PSAP by  
465 commercial location based services versus the current E9-1-1 location based routing.

466 Once the call has been delivered to a PSAP, there must be a mechanism for answering and responding  
467 to the call, since the call is not delivered directly into the 9-1-1 network. Most solutions utilize a  
468 dedicated “web page” and workstation for the telecommunicator to communicate with the caller. Some  
469 sort of audible and visual alarm indicates a text call has arrived at the dedicated station. The  
470 telecommunicator then interacts with the caller via a 2-way SMS session routed through the application  
471 vendor. Other options include delivering the SMS text via baudot tones to existing TTY machines.

472 It should be noted that the integration of public networks such as the internet into secure ESInet  
473 applications does bring a certain level of risk to an otherwise secure local area network (LAN). [See page  
474 20 – Text Messaging Vulnerability]

### 475 **SMS to 9-1-1**

476 SMS direct to 9-1-1 (i.e. 3-digit short code) is perceived to be very similar to the 4, 5 and 6-digit short  
477 codes as described above, and of course is generally believed to be the most effective method of SMS  
478 communication for the general public.

### 479 **SMS Location determination**

480 The SMSC platform currently supported by wireless carriers could be used to route SMS direct to PSAPs.  
481 SMS location determination may require additional integration at the carrier level in order to be  
482 consistent with existing methodologies used for 9-1-1 today (e.g. WPHI or WRLS, WPH2 ) to route calls  
483 to the correct PSAP. While 9-1-1 WPHII location determination would be complementary to a  
484 nationwide offering, this would require a separate discussion that is outside of the scope of this  
485 document.

### 486 **Text to 9-1-1 via Third Party Relay Service**

487 While the concept of a relay service is familiar to a PSAP through VRS, a TTY/TDD relay service, or  
488 language translation service, it may not be the most effective solution. A Text Relay Service requires the  
489 caller to contact a third party service to enable a conversation. The third party service must then  
490 determine the appropriate PSAP and, when connected, relay all information to and from the  
491 telecommunicator. The relay will most likely occur via a voice connection with the relay service and the

492 PSAP. Once a third party is introduced into the conversation, an inherent delay will exist and any delay  
493 in providing emergency services is unacceptable.

#### 494 **RTT**

495 Real-Time Text (RTT) is conversational text that is sent and received on a character by character basis.  
496 The characters are sent immediately (in a fraction of a second) once typed and also displayed  
497 immediately to the receiving person(s).<sup>39</sup> Unlike other forms of text messaging that are asynchronous,  
498 RTT can be used in a bi-directional mode similar to voice conversations.

499 At the core of this framework are SIP control and Real-Time Text transport using Real-time Transport  
500 Protocol (RTP) as described in RFC4103. SIP messages initiate sessions and manage the connection and  
501 registry between communication end points. RTT is usually transported via the same protocol as VoIP  
502 and Video-over-IP. As an IP-based means of communication, RTT requires the accessing device to have  
503 access to an IP network (or simply, a data connection). RTT applications can be natively built into the  
504 mobile device operating system, or operate as Over-the-Top applications loaded onto the device by the  
505 user.

### 506 **Status of Interim Options**

#### 507 **Text to TTY**

508 Currently, the ability to conduct a text conversation in the TTY environment exists once a wireless device  
509 is enabled for TTY functionality and if the receiving party has TTY capability or a TTY device. The TTY  
510 functionality for a wireless device may either be an option setting or may require hardware attached to  
511 the device via the standard 2.5mm headset jack. However, initiating a standard text conversation to or  
512 from a TTY device is not currently supported.

513 Interestingly, the FCC has received proposals from two separate vendors to provide text to TTY that may  
514 be used until further network and technological architecture allow more robust solutions.

515 The first solution is to convert the SMS into a TTY message and delivers to the PSAP via a gateway.  
516 Further, the proposal indicates WPH2 location information can also be provided to the PSAP.  
517 Essentially, the PSAP will receive the SMS in the same manner as a TTY call, including the Baudot tones  
518 associated. The system would also use the existing VoIP Positioning Center (VPC) and Emergency  
519 Services Gateway (ESGW) used by VoIP carriers.<sup>40</sup>

520 The second solution is similar in nature, using a secondary gateway to deliver the SMS to TTY call to the  
521 PSAP. However, this solution requires the PSAP have IP-enabled workstations, an API for integration  
522 with the CPE vendor, in addition to TTY/TDD equipment. This solution would also provide for WPH2  
523 location delivery.<sup>41</sup>

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<sup>39</sup> See the website for the Real Time Text Task Force (R3TF) at <http://www.realtimetext.org/index.php?pagina=27>

<sup>40</sup> See *In the Matter of Facilitating the Deployment of Text-to-9-1-1 and Other Next Generation 911 Applications*, PS Docket No. 11-153 and *Framework for Next Generation 911 Deployment*, PS Docket No. 10-255: COMMENTS OF NEUSTAR, INC., available at <http://apps.fcc.gov/ecfs/document/view.action?id=7021750472>

<sup>41</sup> <http://apps.fcc.gov/ecfs/document/view;jsessionid=TMbyPhpTdTb2C8CnMLjQFSJD338sd4BF3TJr1dGZ4yvTMvvyC5k4!-321460796!1471562840?id=7021899251>. See *Letter to Marlene Dortch, Secretary, Federal*

524 Both proposed interim solutions provide for direct delivery of a call via a 9-1-1 trunk. These solutions  
525 may be more cost effective for the PSAP, as each uses the ubiquitous TDD/TTY equipment already  
526 present in almost all (if not all) PSAPs. This methodology requires, however, that the telecommunicator  
527 remain on that call for the duration of the incident, as TDD/TTY calls should not be placed on hold. The  
528 extended length of an SMS emergency call could have a significant operational impact on centers with a  
529 small number of telecommunicators or 9-1-1 trunks.

### 530 **SMS via 4, 5, or 6-digit short codes**

#### 531 **Benefits**

- 532 • Allows anyone to send a message to anywhere on any phone.
- 533 • Utilizes an interface familiar to most populations.
- 534 • SMS as a communication vehicle has shown to be effective in network overload situations.

#### 535 **Disadvantages**

- 536 • Depending on the implementation, may require different numbers to be remembered in  
537 different regions, potentially confusing callers.
- 538 • Not real time. Delivery times can vary widely from seconds to minutes (although clearly minutes  
539 are normally an extreme case). European experience shows that the average call taking time for  
540 a SMS-based emergency call is 11 minutes.
- 541 • Messages are asynchronous and can be delivered out of order, potentially confusing the  
542 telecommunicator or caller.
- 543 • Often requires messages to go through numerous aggregators and third parties, raising  
544 questions on audit trails.
- 545 • No guaranteed message delivery or feedback mechanism for lost Mobile Originated (MO)  
546 messages.
- 547 • Varying abilities to locate the caller depending on the implementation.

#### 548 **Example Deployments**

549 In most instances currently deployed, short code is used for anonymous crime reporting through a third-  
550 party program that removes identifying information. There are numerous examples of this format in  
551 use today in both large and small metropolitan areas. The anonymity afforded the users promotes the  
552 use of such methodology for receiving information on incidents that may otherwise go unreported.

#### 553 **Operational Learnings**

554 The same potential drawbacks to using SMS are also present under these circumstances: no location  
555 information; timeliness of information; additional equipment or programs required; character  
556 limitations that may present issues with understanding for lengthy, out of order, messages, etc.

### 557 **SMS to 9-1-1**

#### 558 **Benefits**

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*Communications Commission, from H. Russell Frisby, Jr., Stinson Morris Hecker LLP, Counsel for TeleCommunication Systems, Inc., Re: Notice of Ex Parte Meeting – Facilitating the Deployment of Text-to-911 and Other Next Generation Applications, PS Docket No. 11-153 and Framework for Next Generation 911 Deployment, PS Docket No. 10-255 □ March 8, 2012*

- 559 • Direct receipt of messages without a relay service.
- 560 • An avenue of communication available to all with a cellular telephone.
- 561 • SMS as a communication protocol has shown to be effective in network overload scenarios.

#### 562 **Disadvantages**

- 563 • Only Phase I enabled at this time.
- 564 • Currently, no mechanism in place to provide for an indication that the response from the  
565 telecommunicator was received by the caller.
- 566 • Only an indication to the caller provided when the system is unavailable, not if the message was  
567 undeliverable – the call could remain in “limbo” without the caller being aware.
- 568 • Depending on the implementation, may require hardware changes at the PSAP to facilitate call  
569 handling.
- 570 • Requires changes to carrier infrastructure.
- 571 • Not real time. Delivery times can vary widely from seconds to minutes (although clearly minutes  
572 are normally an extreme case). European experience shows that the average call taking time for  
573 a SMS-based emergency call is 11 minutes.
- 574 • Messages are asynchronous and can be delivered out of order, potentially confusing the  
575 telecommunicator or caller.

#### 576 **Example Deployments**

577 The Durham Emergency Communications Center, out of Durham, North Carolina, is in the process of a  
578 trial via a cooperative effort with several vendors. At the time of this writing, they have only received a  
579 single SMS to 9-1-1 call since starting this project in August 2010. This is not due to lack of  
580 advertisement having used a wide range of media to deliver the message to the community: Twitter,  
581 Facebook, list serve accounts, and other media sources. Further, this is less than expected in an area  
582 which includes Duke University and North Carolina Central University.

583 In order to facilitate the delivery of SMS to 9-1-1, the wireless carrier is passing all text messages  
584 through third-party gateway, which, in turn, then filters the SMS to 9-1-1 calls for delivery to the PSAP.  
585 The text is not delivered via the ACD system in place but comes into a separate queue button on the  
586 telecommunicator’s screen. The “call” rings at all stations and the available telecommunicator answers  
587 to initiate the process. The messaging is then handled via the TTY module incorporated into the CTI  
588 system. This methodology allows for pre-scripted messages to speed the receipt of pertinent  
589 information. Additionally, a telecommunicator is able to handle multiple text messages as well as phone  
590 calls aiding productivity.

591 All text messages are printed for record keeping purposes. The reporting system accompanying the CTI  
592 shows the answer time of the telecommunicator and the time of messages sent or received, but does  
593 not capture the time of the originating message. However, according to James Soukup, Director of the  
594 DECC, they have not been experiencing any delays in delivery during the twice-daily testing done by  
595 personnel.

#### 596 **Operational Learnings**

597 Perhaps the greatest operational lesson in the Durham Emergency Communications Center is that we  
598 may not be overwhelmed with SMS to 9-1-1 calls.

599 **Text to 9-1-1 via Third Party Relay Service**

600 **RTT**

601 **Benefits**

602 RTT provides a number of key operational communication benefits:

- 603 • Provides real-time feedback – both the telecommunicator and caller can see that the other
- 604 side has received and is responding to their message.
- 605 • There are a number of encryption options, ensuring message traffic is secure.
- 606 • There is no limit to the length of a message (SMS is limited to 160 characters).
- 607 • No message delay.
- 608 • Broad support for Video and picture messaging.

609 **Disadvantages**

- 610 • RTT requires a data connection. Currently these connections do not receive priority on the
- 611 carrier communication networks. The coverage and effect of data connection loss is to be
- 612 determined.
- 613 • Is not currently available natively on carrier devices or used in other common forms of
- 614 communication. This means that users would have to install a separate application for
- 615 emergency communication that may not be as familiar as other means of communication they
- 616 use more frequently.
- 617 • Depending on the implementation, may require hardware changes at the PSAPs.
- 618 • Depending on the implementation, may require a phased roll out with different levels of service
- 619 available in different geographic regions at different times.

620

621 **Example deployments**

622 Early testing is being done in Spain, but the results of this deployed are not known. There are currently

623 no announced deployments in the United States.

624 **Operational Learnings**

625 N/A

626 **Europe's REACH112 project**

627

628 In addition to the current efforts in the United States, Europe has also been introducing the concept of

629 texting to 112, the European emergency services number. The on going efforts in Europe have seen

630 more instances of implementation than the U.S. and their processes and information are thereby useful

631 for our purposes.

632 **Example Deployments**

633 Iceland, which operates a single PSAP for the country, has been receiving SMS messages to 112 since  
634 April 2006. As with other efforts, the intention is to address the needs of the Hearing Impaired  
635 community but has seen usage from others during some emergent situations. As with a normal  
636 TTY/TDD conversation, Iceland has developed predetermined responses for SMS messages in an effort  
637 to facilitate the communication process. Further, they encourage the deaf and hearing impaired that  
638 have an underlying medical condition to have prepared emergency SMS messages available for use.

639 Just as with a standard voice initiated call, all SMS messages receive a response from a  
640 telecommunicator. Since location information is not available via SMS, they are often required to  
641 contact the caller and request the caller telephone 112 directly. For 2008, it is estimated they received  
642 an average of 124 SMS messages a month. By general observation, Iceland has determined that  
643 approximately 3% of the total messages are truly emergency SMS contacts. However, even one that  
644 may provide valuable assistance is worth the time.

645 In Sweden, the implementation included RTT in addition to a video component called Total Conversation  
646 and is routed through two specific PSAPs. If the call is for another PSAP, the call is handled by the two  
647 PSAPs and the information is passed to the destination PSAP. Again, this system is mostly focused on  
648 the hearing and speech impaired community rather than a wholesale deployment. Each time a message  
649 is initiated, the caller is automatically connected to a relay service and a telecommunicator at the same  
650 time. Not only are the three parties connected for the text communication, the connection also  
651 includes a video component allowing the telecommunicator to assess the situation visually. This  
652 methodology requires extra hardware and an IP connection to the 112 facility, requiring additional time  
653 and resources to deploy.

#### 654 **Operational Learnings**

655 One of the more common threads learned with SMS implementation is the additional length of time  
656 associated with processing a text. In an industry measuring seconds, 13 minutes is a lifetime.

#### 657 **Text Messaging Vulnerability**

658

659 Any discussion regarding sending a text message into a PSAP must also consider potential security or  
660 veracity concerns. “Spoofing” is already a concern for consumers in regards to email messages but it  
661 also affects text messages in that a well-versed person may spoof the caller ID from whom the message  
662 was sent. Fortunately, for a standard voice call into a PSAP via analog lines, the caller information takes  
663 a different path and instances of ANI spoofing are non-existent. However, as PSAPs migrate to an IP-  
664 based infrastructure to allow for the messaging, the vulnerability to spoofing and other potentially  
665 malicious messages increase.

666 To help combat, or at least increase enforcement capabilities, the Truth in Caller ID Act was signed into  
667 law in 2010 expressly to prohibit “spoofing” of caller ID for malicious intent or to defraud. In the FCC’s  
668 paper on Caller Identification Information in Successor or Replacement Technologies, June 22, 2011,

669 issues concerning the vulnerability to spoofing that may occur, even in a PSAP, were further identified.<sup>42</sup>  
670 Furthermore, the 2010 white paper produced by the 4G Americas called *Texting to 9-1-1: Examining the*  
671 *Design and Limitations of SMS*, also raises concerns about vulnerabilities.<sup>43</sup>

672 There are many third-party services that are available to the public that offer the ability to change the  
673 originating number of an SMS. Such services do make users aware of the potential legal ramifications of  
674 their offering but generally do not monitor that activity of the user. This can be done either via a mobile  
675 device or through a home computer. Potentially, a message can even be generated via a provider's  
676 website that allows messaging and does not verify the user's input before sending.

677 One possible scenario is that an individual could generate a message to a PSAP that requires a large-  
678 scale response, such as a Special Weapons And Tactics (SWAT) unit. Not only would this potentially tie  
679 up valuable resources, it could endanger otherwise innocent parties.

680 An additional consideration for messaging may be addressing. When RTT becomes a reality on a broad  
681 scale, a user may send a message to 9-1-1 and other persons at the same time. If one of those other  
682 parties is not within the same area as the sender and replies to "All", it may generate an additional  
683 message to another PSAP but not the original PSAP. Instead of a single PSAP responding to an incident,  
684 a second PSAP may inadvertently become involved.

685 The worst-case scenario for any implementation of messaging into a PSAP in an IP-based infrastructure  
686 would be the introduction of a virus into the network.

## 687 **Human and Operational Aspects of NG 9-1-1**

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689 While other sections of this white paper have addressed the pressing technological issues of Next  
690 Generation 9-1-1, no review of the subject would be complete without an assessment of the human and  
691 operational impact of the impending migration. The rapid progress of change during recent decades has  
692 presented PSAPs with a variety of challenges such as enhanced wireless 9-1-1 and Voice over Internet  
693 Protocol (VoIP.). However, none of these marks such a complete revision of the way we do business as  
694 the advent of true Next Generation 9-1-1 services.

695 A measurable portion of the current human challenge is to truly understand what NG is and what it  
696 takes to get there. Hopefully this document will shed some light on these issues; however, many  
697 telecommunicators – and even administrators – wrestle with grasping the concept as a whole. As such,  
698 there is misunderstanding, stress, and fear over what is the real cost (both in cash and impact upon

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<sup>42</sup> See *Federal Communications Commission, Caller Identification Information in Successor or Replacement Technologies, DA 11-108*, (filed June 22, 2011), available at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DA-11-1089A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-11-1089A1.pdf)

<sup>43</sup> See *Texting to 9-1-1: Examining the Design and Limitations of SMS* (dated October 2010), by 4G Americas, available at <http://www.4gamericas.org/documents/SMS%20to%20911%20White%20Paper%20Final%20October%202010.pdf>

699 operations) and the timeline for implementation.<sup>44</sup> At this writing, the committee is unaware of any  
700 100% Next Generation Compliant PSAPs in the United States, nor is there a firm and codified “drop dead  
701 date” by which agencies must comply with providing all of the services associated with NG 9-1-1. Those  
702 facilities currently providing text to 9-1-1, for example, do not all share a common methodology, nor is  
703 there sufficient data available from these trials on which to accurately make projections nationwide. For  
704 example, Durham, NC, reports an extremely low usage of their 9-1-1 text service. While this trial is  
705 limited to a single carrier, this carrier has a significant market share and the region is known for both  
706 high-tech industry as well as several major universities. Given the latter, one might expect a higher than  
707 average usage, yet the experience speaks otherwise.<sup>45</sup>

708 Despite the lack of data concerning prospective volume, there are some relatively reliable assumptions  
709 that can be made based upon other experience and knowledge. Included here are:

- 710 • A text conversation will take longer to process than a voice conversation regarding the same  
711 amount of information.
- 712 • The ability to actively interact with the caller is of benefit to the telecommunicator.
- 713 • Unlike TTY/TDD usage, there is currently no “official” guide to abbreviations used in texting.  
714 Misinterpretation of abbreviations could lead to longer processing times and/or errors.
- 715 • Background noises, tone of voice, and other audio clues are often used by telecommunicators  
716 to gain additional knowledge regarding emergency calls. These will be absent in text calls, just  
717 as they are now in TDD/TTY.<sup>46</sup>
- 718 • Processes to adequately deal with protocol driven interrogation will have to be adapted for use  
719 with Next Generation 9-1-1, as will policies for dealing with non-English speaking callers.
- 720 • Human friendly interfaces between the systems that receive Next Generation “calls” will need  
721 to be developed. While this may more properly fall under the realm of technology, these  
722 interfaces must be intuitive, and to the degree possible seamless, in order to be easily  
723 understood and used by telecommunicators. As the number and type of devices used to  
724 contact 9-1-1 increases, these interfaces must keep pace with the demand.<sup>47</sup>
- 725 • The impact of clusters of Next Generation calls upon PSAPs must also be understood. We have  
726 seen the results of this phenomenon with regards to wireless telephony. How will this play out  
727 in the NG world?
- 728 • Both telecommunicator training and internal policy must reflect the ever changing world of  
729 Next Generation.<sup>48</sup>
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<sup>44</sup> See *Report on Next Generation 9-1-1 in California Public Meetings by California Technology Agency Public Safety Communications Office* (dated July 2011, Version 1.0), available at [http://www.cio.ca.gov/Government/Publications/pdf/Report\\_on\\_NG9-1-1\\_in\\_CA\\_Public\\_Meetings\\_Rev\\_1\\_0.pdf](http://www.cio.ca.gov/Government/Publications/pdf/Report_on_NG9-1-1_in_CA_Public_Meetings_Rev_1_0.pdf)

<sup>45</sup> Soukup, James Director, Durham Emergency Communications Center, Durham, NC. Telephonic interview with committee members, 21 March 2012.

<sup>46</sup> See *911 texting idea has local support*, by Sam Shawver, *The Marietta Times*, (dated February 6, 2012), available at <http://www.mariettatimes.com/page/content.detail/id/542133.html>

<sup>47</sup> See *Next Generation 9-1-1 (NG9-1-1) System Initiative: Human Machine Interface Display Design Document by Intelligent Transportation Systems, U.S. Department of Transportation* (dated January 2008, Version 1.0), available at [http://www.its.dot.gov/ng911/pdf/NG911\\_HMI\\_Display\\_Design\\_FINAL\\_v1.0.pdf](http://www.its.dot.gov/ng911/pdf/NG911_HMI_Display_Design_FINAL_v1.0.pdf)

<sup>48</sup> See *Next Generation 9-1-1 (NG9-1-1) System Initiative: NG9-1-1 Transition Issues Report by Intelligent Transportation Systems, U.S. Department of Transportation* (dated February 2008, Version 1.0), available at [http://www.its.dot.gov/ng911/pdf/NG911\\_TransitionIssuesReport\\_FINAL\\_v1.0.pdf](http://www.its.dot.gov/ng911/pdf/NG911_TransitionIssuesReport_FINAL_v1.0.pdf)

731 From a management point of view, administrators must find a way to acquire Next Generation  
732 technology and integrate it into daily operations. This is easier said than done. A myriad of legal,  
733 financial, and technical hurdles may often have to be crossed in order for this implementation to take  
734 place.

735 As part and parcel of this acquisition, training, quality assurance, and policy development must also  
736 occur. Public education will also become increasingly important, as it is likely that the nationwide  
737 implementation of Next Generation will not occur overnight. During the transition period agencies not  
738 having NG functionality will need to assure that their citizens understand this fact. As announcements of  
739 the implementation of Next Generation in other areas increase, this understanding becomes even more  
740 critical as the presence of these features may often be assumed through inference.

741 Management policies will also be needed for the retention, release, and legal presentation of Next  
742 Generation records. While some of this policy will need to be developed on the state level, PSAPs will  
743 still need to deal with these issues on the local level.

744 Finally, stress and liability rate high among the human concerns that must be addressed. While there is  
745 often discussion surrounding equal protection from liability for providers of 9-1-1 services, thought must  
746 also be given to liability incurred by the public sector as well. Do protections that may exist now remain?  
747 What legal pitfalls exist, if any, in these uncharted waters? Is new legislation required to address these  
748 and other issues associated to NG 9-1-1?<sup>49</sup>

749 The impact of stress upon telecommunicators has long been documented. However, the impact of Next  
750 Generation on stress still remains to be seen. Will the assumed increase in processing times create call  
751 backups in the 9-1-1 center, leading to frustration, pressure and hurried calls? Will the lack of human  
752 contact associated with text messaging play a role? And while the scope of this white paper relates  
753 solely to text messaging, will future generations of technology that import real time videos of horrific  
754 crime, fire, and accident scenes directly into the PSAP place a different type of stress on those charged  
755 with handling these calls? Regardless of the answers, the public safety telecommunications community  
756 must be ready to address these challenges.<sup>50</sup>

## 757 **Summary of Operational Learnings**

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759 The road ahead still has issues that need to be addressed, issues that will not be resolved over night.  
760 However, the course is set and the functionality will be implemented in one form or another. With all of  
761 the available options, one may rise to the top as the most effective or the best result may be a  
762 combination of multiple solutions. Each of the solutions discussed has positives and negatives as no one  
763 solution can currently meet the needs and expectations of a PSAP. Whatever that solution becomes, we  
764 must ensure that we are prepared both technologically and personally.

765 Some of the deployment options have a limited scope and others have yet to be implemented. Efforts  
766 are continuing to refine the various solutions and make them effective for a PSAP. Will PSAPs be  
767 overwhelmed with messages? Based on the DECC project, possibly not. However, it is but one instance  
768 of many to come and, as public awareness grows, including the hearing and speech impaired  
769 communities, messages may become more prevalent. The time needed to process a message in the

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<sup>49</sup> Ibid.

<sup>50</sup> <http://911wellness.com/2012/02/21/frontline-dispatchers-voice-concern-re-ng911/>

770 currently available forms will remain an issue for PSAPs. Telecommunicators pride themselves on being  
771 efficient and timely when processing calls, the addition of messaging will cause frustration by not being  
772 able to quickly obtain information.

773 Effective training of telecommunicators will be the key to a successful implementation of a solution.  
774 Administrators and training personnel must become versed in a methodology with which they may not  
775 be comfortable.

776 Security of any messaging system, whether from spoofing or viruses, will remain a concern. The public  
777 needs to be secure in the knowledge that their ability to communicate during a crisis situation is  
778 available at all times. Perhaps authentication processes can be developed to limit the impact of  
779 spoofing. Perhaps an increased or multi-level virus protection can be implemented at the provider level  
780 in addition to the PSAP level.

781 Through cooperative efforts of telecomm providers, both for emergency communication and for  
782 consumer communication, a solution can be achieved else this discussion would be pointless. For  
783 emergency communication the solution must be able to work with and around other operations. Simply  
784 forcing a solution just to have one is not effective and will most likely cause issues for  
785 telecommunicators and impact effective response. A telecommunicator must be able to grasp the  
786 concepts and limitations of the solution and use it to advantage. Consumer telecomm providers must  
787 also be aware of the limitations of the solution in addition to the budgetary limitations that impact a  
788 PSAP.

789 On February 9, 2012, the CTIA responded to the FCCs NPRM on Text-to-9-1-1, and outlined these same  
790 arguments in addition to questioning the authority of the FCC to govern messaging. Essentially, since  
791 the FCC admitted in its own document that SMS was considered an informational resource and not an  
792 interconnected service which potentially limits its ability to regulate SMS.<sup>51</sup> Clearly the CTIA is poised to  
793 combat what may be perceived as the FCC overstepping their authority and ruling prematurely on a  
794 technology that may not be quite ready to provide a viable solution. If the FCC does rule regardless of  
795 protest, the impending litigation and opposition may further delay the ability of a PSAP to receive any  
796 text-to-9-1-1 solution. Further, APCO also responded to the FCCs NPRM reinforcing the idea that the  
797 FCC should focus on a long-term solution versus mandating any short-term and, potentially harmful  
798 solution.<sup>52</sup>

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<sup>51</sup> See *In the Matter of Facilitating the Deployment of Text-to-9-1-1 and Other Next Generation 911 Applications*, PS Docket No. 11-153 and Framework for Next Generation 911 Deployment, PS Docket No. 10-255: REPLY COMMENTS OF CTIA – THE WIRELESS ASSOCIATION (dated February 9, 2012), available at <http://apps.fcc.gov/ecfs/document/view?id=7021859396>

<sup>52</sup> See *In the Matter of Facilitating the Deployment of Text-to-9-1-1 and Other Next Generation 911 Applications*, PS Docket No. 11-153 and Framework for Next Generation 911 Deployment, PS Docket No. 10-255: COMMENTS OF APCO INTERNATIONAL (dated December 12, 2011), available at [http://www.apco911.org/about-apco/annual-reports/doc\\_download/158-apco-comments-to-fcc-nprm-on-text-to-9-1-1.html](http://www.apco911.org/about-apco/annual-reports/doc_download/158-apco-comments-to-fcc-nprm-on-text-to-9-1-1.html)