



**3G AMERICAS VIEWPOINT
ON THE POTENTIAL OF
SMS/MMSTO 9-1-1 PUBLIC
SAFETY SYSTEMS**

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3G Americas Viewpoint on SMS/MMS to 9-1-1 Systems

3G Americas understands the need for “EMERGENCY HELP. Anytime, anywhere, any device”™. However, technology considerations must be accounted for when developing solutions for critical emergency needs.

3G Americas supports the efforts of industry standards bodies, industry associations, and the National Emergency Number Association (NENA) to find effective ways to support messaging solutions to 9-1-1 systems as provided by Public Safety Answering Points (PSAPs).

3G Americas recognizes that there is a special needs community who require emergency communications with PSAPs which are not voice calls.

Technology Considerations for Mobile Wireless Networks

Policymakers and mobile network operators must work together closely to develop messaging to 9-1-1 requirements that can reasonably be met by both mobile wireless networks and by the PSAPs and satisfy the expectations of the general public.

For emergency communications for the general public, existing voice 9-1-1 service provides users with a highly reliable means for contacting their local public safety agency in order to get the assistance they need, including:

- immediate feedback from a live PSAP operator who can comfort and provide instructions to the user in real time;
- delivery of location estimate information to the PSAP in accordance with current FCC requirements based on the customer’s voice call;
- callback ability from the PSAP operator to reconnect with the user in the event the call is lost;
- the ability for PSAP operators to determine the “emotional” state and age of the caller;
- additional information provided by background sounds transmitted as part of the voice call can help the PSAP operator determine important information about the caller’s situation and possible risks to first responders; and
- deterrence of prank calls via PSAP recordings of all voice 9-1-1 calls, which may allow callers to be identified in many cases.

Neither the existing Short-Messaging Service (SMS) nor the existing Multimedia Messaging Service (MMS) are suitable replacements for real-time voice emergency communications.

SMS and MMS messaging that exists on cell phones today were not designed for real-time, 2-way communications and do not provide the level of reliability and the capabilities that are

available in a voice 9-1-1 call (such as location, routing to the appropriate PSAP, and callback capabilities).

Considerations about legacy mobile device, mobile network, and PSAP system compatibility versus service expectations must be evaluated.

The 3G Americas white paper, *Characterizing the Limitations of Third-Party EAS Over Cellular Text Messaging Services*¹, September 2008, by Patrick Traynor, Ph.D. has characterized the limitations of third party Emergency Alert System (EAS) over cellular text messaging services such as SMS and has concluded that text messaging has significant limitations.

TTY and TTY-emulation solutions may provide non-voice communication capabilities to PSAPs for special needs users.

Policy Considerations for Mobile Wireless Networks

The general public has expectations on the reliability and availability of voice 9-1-1 calls. Any messaging to 9-1-1 solution must be developed such that the general public expectations on the reliability and availability emergency messaging services can be achieved.

Specific messaging to 9-1-1 requirements and use cases need to be developed jointly with the industry, the industry associations, and the PSAP community before any technical solutions can be implemented.

Configuring existing wireless mobile networks and PSAPs to provide SMS or MMS based messaging to 9-1-1 systems, regardless of the specific requirements, will be a costly and complex undertaking on both the mobile networks as well as the PSAP community. Many of the desired capabilities including service reliability may not be achievable.

Any decision to incorporate messaging to 9-1-1 into mobile wireless networks must take into account the time needed to develop and implement technology choices.

Using wireless networks to provide messaging to 9-1-1 will also create liability issues that policymakers must address to best facilitate wireless messaging as a possible solution.

Conclusion

To overcome the technical and policy hurdles, it is important that the industry, the industry associations, and the PSAP community work together, as happened in the creation of the Wireless Priority Service (WPS) and the Commercial Mobile Alert System (CMAS) – both voluntary programs crafted by industry and government working together.

¹ The 3G Americas white paper can be retrieved from <http://www.3gamericas.org/index.cfm?fuseaction=page§ionid=334>

It is important to educate the public that SMS/MMS will not work for emergency services, and if they try to SMS/MMS to 9-1-1, they are not guaranteed anyone will get the message in a reliable and timely manner, if at all.

The wireless industry and the PSAP community should make the best use of their limited resources to develop a secure, trusted, and reliable messaging to 9-1-1 solutions for the next generation of wireless networks, via the appropriate standards groups, that will meet general public and public safety expectations.

Annex – SMS/MMS Limitations

Reliability:

- SMS and MMS are store-and-forward messaging technologies. As such, SMS and MMS were never designed nor deployed to provide any time-sensitive, mission-critical service. As the expert stakeholders advised the FCC as part of the Commercial Mobile Alerting Systems proceeding, there simply is no guarantee of delivery -- immediate or otherwise -- of an SMS/MMS message, whether for commercial or emergency purposes. Furthermore, there is also no guarantee of delivery of the proposed response or interaction from the PSAP to the initiating sender. It is virtually impossible to guarantee a real-time two-way text communication exchange using SMS/MMS technology.
- SMS/MMS does not provide “priority handling” at the air interface or on the network and was not designed with any QoS controls. SMS/MMS messages contend with other traffic on the control channels, both voice and messaging. Voice has the priority over SMS/MMS. Thus, there could be delays in the origination of the SMS/MMS message at the air interface. At the message center, the SMS/MMS would go into the queue with the tens of thousands of other messages being processed at any given time.
- If an attempted SMS/MMS to 9-1-1 transmission were to fail, there may be no immediate indication to the user of that failure on many mobile devices. For example, certain devices deposit a failed mobile originated message into an “outbox” with no clear indication to the user that the message was not successfully sent. Only when the user looks in the message outbox would the message failure become apparent. Obviously, in a major emergency event, it is likely that neither a voice call nor an SMS/MMS message will be answered by a PSAP due to the limited staff available relative to the number of E911 callers. However, voice callers who do not actually reach the PSAP will know that fact and can either call back or wait for the PSAP to contact them.
- If the SMS/MMS message were to reach the PSAP, there is no “delivery acknowledgement”. Accordingly, the user who transmitted the SMS/MMS to 9-1-1 message would have no knowledge that the message was actually received at the PSAP.
- Regarding the PSAPs be able to send SMS/MMS messages back to the subscriber initiating the SMS/MMS to 9-1-1, the apparent intent is to allow for a two-way text conversation (so-called “textback”) instead of voice “callback”. This functionality would allow the PSAP operator to ask the subscriber for additional information, or to provide any information that may be needed, or to “textback” if more info is needed. Each of these transmissions would have the same issues described above, resulting

in potentially significant delays for each transaction. In addition, the “textback” is subject to extreme delays in the “store and forward” system, which could be on the order of several hours and result in out-of-order message receipt by both senders.

Infeasibility of PSAP Routing & Location Estimates for SMS/MMS:

- Currently, an SMS/MMS message is sent from the mobile, through the radio network, and on to a Short Message Service Center or a Multimedia Messaging Service Center (MMSC) in the network. It is this message center that determines the routing of that message to the final end user – for traditional SMS/MMS, that would be a phone number of the target subscriber.
- For a text to 9-1-1 message, the address of the target for the SMS/MMS might be something like “911” (which itself is not a valid short code that can be translated in the network today). The proposed requirement would compel carriers to route the SMS/MMS to 9-1-1 message to the “appropriate” PSAP for that subscriber’s location, as discussed in the next point below. Carriers may have multiple national message center nodes that share traffic loads. This “9-1-1” routing would require that each message center have knowledge not only of the location of the user initiating the 9-1-1 text, but also have a mapping of every PSAP for every location in the U.S., including the jurisdictional boundaries of each PSAP, as the incoming SMS/MMS may come to any one of the message centers. This PSAP “mapping” task is done for 9-1-1 calls, and significant enhancements would have to be investigated to determine the feasibility of incorporating such capabilities in the Short Message Service Center (SMSC) or Multimedia Messaging Service Center (MMSC) on a nationwide scale.
- A current SMS/MMS communication does not have location information associated with the message. In traditional SMS/MMS messaging, there is no need for location data, and thus the air interface and network protocols do not support the ability to provide such location information. The message center may only be aware of which Mobile Switching Center (MSC) sent the SMS/MMS to it, and has no knowledge of the user location.
- In voice 9-1-1, location estimate determination is performed at the air interface. If the proposed SMS/MMS to 911 requirements were to be adopted, carriers would be obligated to investigate and likely redesign the air interface and SMS/MMS architecture to allow a location fix at the time the SMS/MMS is initiated and pass that information to the message center. There are several problems with location estimate generation for SMS/MMS:
 - SMS/MMS requires only a very short data burst on the control channel, which, even if all of the other required infrastructure were designed and deployed, would

permit only a very broad (e.g., serving cell site) location estimate to be generated. It is our understanding that the public safety community views location estimates at this accuracy level as having minimal utility.

- Neither the radio access network nor the MSC currently do any “digit analysis” of SMS/MMS messages. The destination for the SMS/MMS is not known until the message is received at the “Message Center” in the network. Thus, at the time of transmission, neither the radio access network nor the MSC know if the transmitted SMS/MMS is destined for 9-1-1 or is just a routine SMS/MMS.
- It has been suggested that mobiles with Global Positioning System (GPS) capability can potentially provide the location information within the SMS/MMS to 9-1-1 text message. However, the majority of devices currently in the hands of users (numbering at least in the tens of millions) do not have GPS capabilities. Accordingly, any new SMS/MMS to 9-1-1 application would need to accommodate customers without GPS-capable handsets, as well as those users with GPS-enabled devices, thereby further complicating the design and deployment processes.

Other Operational Concerns:

- Roaming interoperability for SMS/MMS to 9-1-1 messaging also presents significant issues. If a subscriber is roaming into an operator’s network, the SMS/MMS message flow is more complicated and may include multiple transits through each network, adding delays. Other roaming-related questions abound, such as:
 - How are inbound roamers handled that may not use “9-1-1” as their emergency number?
 - Does a universal “short code” need to be established in the international community?
- SMS/MMS has no authentication. Although the mobile device is authenticated, an SMS/MMS message in itself is not authenticated. Thus, there is no method to validate the authenticity of the SMS/MMS to 9-1-1 message, leaving PSAPs vulnerable to the following scenarios, among others:
 - Cyberattacks using SMSs/MMSs that would clog every PSAP in a city, or worse case, every PSAP in the country. This attack could be made with nothing more than a cellular device that can initiate thousands of simultaneous SMS/MMS messages to 9-1-1.

- Criminal use of mass SMS/MMS transmissions to force public safety to respond to an “emergency” location on one side of town, while preying on targets in other parts of the community.
- To defeat these threats, every PSAP would have to build in firewalls and SMS/MMS “spam” filtering to combat these potential threats. A threats and vulnerability analysis is therefore essential as part of any SMS/MMS to 9-1-1 work by NENA.
- SMS messages are limited to 160 characters unless concatenation is to be supported (which takes more radio access time and network bandwidth). Concatenation of longer messages also does not work uniformly across all mobile devices.
- SMS/MMS to 9-1-1 has no capability to handle multiple languages for either sender or recipient, nor is it clear how a PSAP would handle a text message in a language it does not support. For example, the SMS/MMS message may be written in different character set such as Chinese, Japanese, or Cyrillic.
- There is no existing functionality on mobile devices that would allow users to distinguish SMS/MMS messages coming from a PSAP from other SMS/MMS messages.
- The PSAP impact of various customer actions needs to be analyzed in detail. For example, given a mobile environment, a user can move across a jurisdictional boundary, thus changing PSAPs in the midst of an exchange. If the new PSAP does not have the SMS/MMS capability, what happens to that communication session? Another situation requiring further study is how messages are routed within a PSAP so that a single operator is part of every message exchange – SMS/MMS is not ‘session oriented’. Finally, it is unclear at present how many of the nation’s thousands of PSAPs actually have the ability to receive and transmit SMS/MMS messages via their particular PSAP’s calltaking equipment.