SHORT MESSAGE SERVICE (SMS)

IS IT THE ANSWER FOR MESSAGING?

“All circuits are busy. Please hang up and try again later."
- Wireless Carrier

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1. Introduction

Cellular networks are a critical component of the economic and social infrastructures in which we live. In addition to voice services, these networks deliver alphanumeric text messages to the vast majority of wireless subscribers.

To encourage the expansion of this new service, telecommunications companies offer connections between their networks and the Internet. The ramifications of such connections, however, have not been fully evaluated and vary by usage and geography.

Short Message Service (SMS) is a telecommunications protocol that generally allows the sending of "short" (160 characters or less) text messages. It is available on most digital mobile phones and some personal digital assistants with onboard wireless telecommunications.

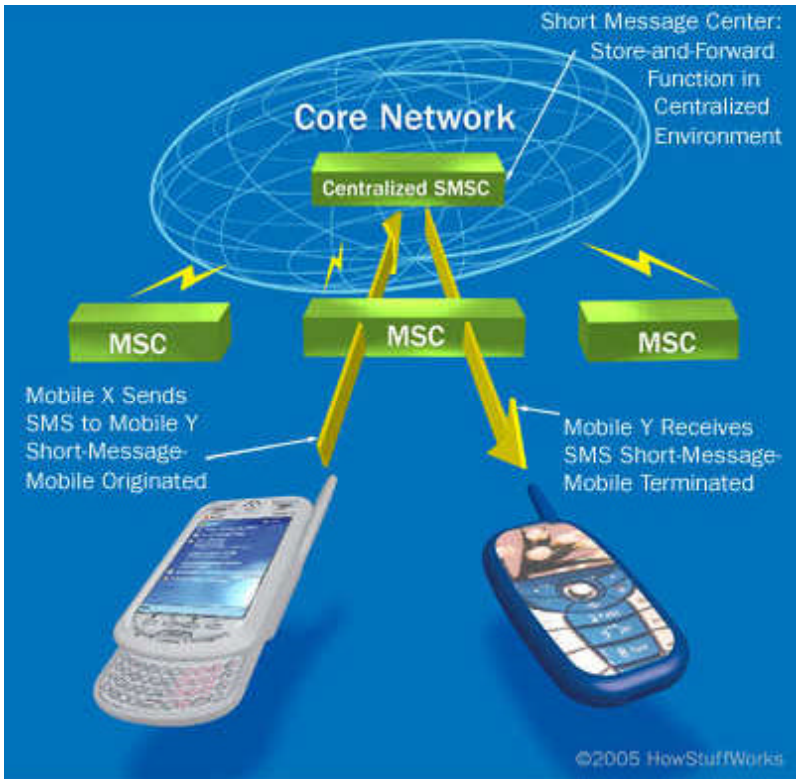
The individual messages which are sent are called text messages, and more colloquially SMSes, texts, or even txts (in "text speak").

The purpose of this paper is to discuss the ability of cellular networks to provide the bandwidth for usage of SMS for emergency communications between public safety agency administration and staff during critical situations.

2. Background

A SMS message is created and sent from either a cellular device or a web based application. Once the message is sent, it is received by a Short Message Service Center (SMSC), which must then get it to the appropriate mobile device.

Figure 1: How SMS works



To do this, the SMSC sends a SMS Request to the home location register (HLR) to find the roaming customer. Once the HLR receives the request, it will respond to the SMSC with the subscriber's status: 1) inactive or active 2) where subscriber is roaming.

If the response is "inactive", then the SMSC will hold onto the message for a period of time.

When the subscriber turns on his device, the HLR sends a SMS Notification to the SMSC, and the SMSC will attempt delivery. The SMSC transfers the message in a Short Message Delivery Point to Point format to the serving system. The system pages the device, and if it responds, the message gets delivered.

The SMSC receives verification that the message was received by the end user device, then categorizes the message as "sent" and will not attempt to send again.

3. SMS Advantage

SMS is an inexpensive method of communication with each message under $.20 and, with the appropriate plan with carrier, free.

160 characters take up as much room as a one-second-voice call. Messages are delivered immediately when the recipient's phone is turned on and get stored and delivered later if the recipient's phone is not on. Like e-mail, they can also be reviewed or stored in your phone for as long as you wish.

4. SMS Disadvantage

The delivery of SMS messages can be a problem, particularly when lots of people are sending them. As an example, on New Years Eve 2006, greetings were delayed up to two hours because of the volume of traffic.

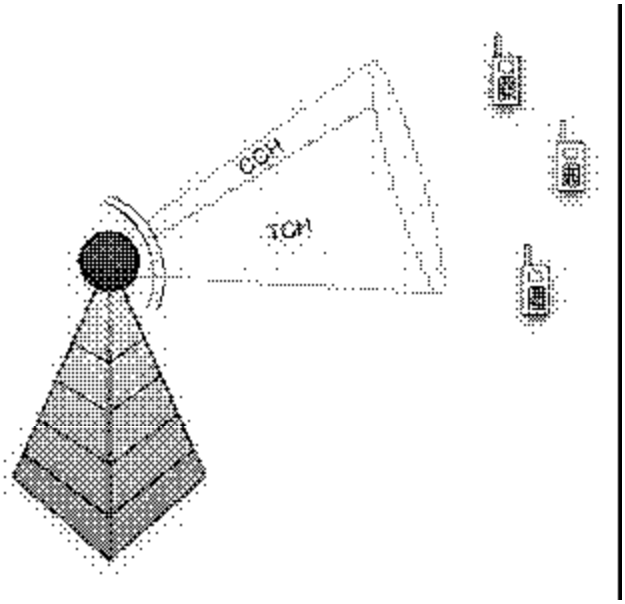
The problem is that Mobile Network Operators (MNOs) will give absolutely no guarantees about delivery of SMS messages. All MNOs offer to use their "best endeavors" to deliver messages and all have several "escape clauses" relating to infrastructure problems and matters beyond their control.

The net effect of this is that they give no guarantees at all that any message will be delivered let alone in a timely fashion. **Problems which may impact delivery include simple things like the person having their phone switched off, being out of range or the phone's memory being full.** On one occasion a major European MNO was unable to deliver for 12 hours when a tractor cut through all the fiber cables feeding their main switching center.

a) Will a message be delivered?

Cellular networks can be broken into two chief components - the radio, or "air interface" and the wired backbone. The area of interest in this paper is the air interface and how traffic can congest the air interface --- as it is the more constrained of the two.

Figure 2: How Air Interface Works



The air interface is divided into two general components - Control Channels (CCH) and Traffic Channels (TCH). It helps to think of control channels as a very small portion of radio frequency that allow cellular towers to send information pertaining to call setup, SMS delivery and network conditions (such as the availability of traffic channels) to mobile phones. Traffic channels are instead used to carry actual voice conversations after they have been established via the control channels. Figure 2 above, gives an intuitive representation of this setup. Notice that control channels have far much less bandwidth than traffic channels.

Because text messages and mobile phone call setups rely on the same limited resource, namely control channels, it is possible to overload this portion of the system. If enough text messages are sent so that no more control channels are available, calls will begin blocking (i.e. will not be connected) and no additional SMS can be sent until the channel is available.

5. Summary

If 90% of your staff have a SMS enabled cell phone, it would seem that this would be the ideal modality by which to connect, but for that very same reason, it is likely to not be the perfect medium.

Only a limited portion of the available radio frequency spectrum is assigned to CCH usage and supports SMS, so for example pushing 1,000 or 2,000 SMS messages in a short period of time over the channel will be too much for the system. It is likely that there will not be sufficient bandwidth to send messages, or for the sender of mass bundled emergency messaging to expect either highly expedited delivery in a short enough time span to facilitate true emergency notifications or to itself possibly cause overload or delay of the available bandwidth.

It is highly recommended that additional modalities such as land lines, email, pager, fax, satellite phone, TTY/TTD, cellular, PDA and any other resource available be used in parallel during an emergency to maximize the speed and likelihood of successful delivery of the intended notification(s).