

The use of mobile technologies in Public Alerting

This paper aims at describing the state of the art regarding the use of mobile technologies in Public Warning Systems (PWS) and introducing Intersec Alerting Solution.

I. Context: two dominant technologies coexist on the market

The huge adoption of mobile phones all over the world is providing a great opportunity for governments to better inform population during emergency situations, by sending a message to all handsets that are in the hazardous zone. In order to do so, several technologies can be used.

In 2006 the European Telecommunication Standards Institute (ETSI) produced a report on mobile-based technologies that became the basis for an emergency messaging service. The report suggested several mobile technologies (Paging, CBS, SMS, TV, MBMS, MMS, USSD, Email, IM Service) and concluded that Cell Broadcast Service (CBS) and Short Message Service (SMS) were among the most suitable technologies for delivering a mobile-driven PWS.

a) Cell Broadcast, the historical and most widespread choice

How CBS became the standard

Further 3GPP¹ & ETSI reports define more precisely the requirements for a PWS. Although they do not specify which technology has to be used, some CBS characteristics make it particularly interesting:

- It uses a dedicated channel, allowing the delivery to millions of people in seconds, without being affected by network congestion (and without causing it). On the contrary, SMS use shared signaling channels and network congestion may lead to delays in delivery.
- It can be displayed automatically with no user interaction and with a special ringtone, making the CBS message instantly recognizable as an alert (unlike the SMS).

¹ 3rd Generation Partnership Project

When Japan decided to implement its Earthquake and Tsunami Warning System (ETWS) in 2007 it chose CBS for its delivery speed. This aspect is indeed very important for earthquake warning, where the alert message has to be sent in the short time lapse (a few tens of seconds) between the first non-destructive waves and the real earthquake. The Japanese system was then formalized in 3GPP standards, setting the rule for future implementations.

Several countries have since followed Japan's example and chosen CBS for their PWS, including Israel, Chile, the USA, and the Netherlands.

CBS limitations

However, CBS has one main limitation: it is not supported by all handsets and even when it is supported it requires a manual configuration from the user.

This means that it does not reach everybody. During a test conducted in the Netherlands in November 2013 many people complained on Twitter that they did not receive the message².

This was supposed to be a temporary issue but cell broadcast penetration among handsets proved to be slower than expected. As of today it is still unclear how many years will be needed before all handsets can receive CBS messages. Based on Homeland Security study on WEA mobile penetration³, we can assume that from the time a country decides to implement CBS alerts, 5 to 10 years will be needed before a large percentage of the population (more than 90%) have a compatible device.

Moreover, the need for a manual configuration remains an issue, as a lot of people are still not familiar with the procedure, which can further postpone the date at which 90% of the population will actually receive the alerts.

b) SMS, historically second-best choice, has recently been chosen by several countries

For that reason and following recent technology improvements more and more countries are considering geo-targeted SMS as a viable option for mass-alerting. And that is how SMS, despite its limitations, is coming back on stage, maximizing the reach of the alerting campaign as all handsets natively support SMS, without requiring any configuration.

Australia was the first country to make this choice, in 2009, and today claims a rate of 93% of successful SMS delivery⁴. SMS systems have also been deployed in Norway and Belgium, and a trial in the UK in 2013 concluded that location-based SMS was the preferred solution over CBS⁵.

In addition to solving the reach issue, SMS offers several advantages, such as:

- It is less expensive and quicker to implement, as much of the infrastructure is already in place.
- It gives a proof of delivery, insuring governments and MNOs against all liability in case of accidents.

² <http://www.thehagueonline.com/news/nl-alert-test-hit-and-miss/2013-11-05>

³ Homeland Security, July 2013, Wireless Emergency Alerts, Mobile Penetration Strategy

⁴ According to Michael Hallowes's presentation at CATA Alerting Summit 2015 in Edmonton

⁵ UK Cabinet Office, April 2014, Mobile Alerting Trials: Project Report

- It unlocks the possibility to personalize the message (e.g. the language) on a per-user basis.

However, SMS keeps the aforementioned limitations:

- Network congestion may lead to delays in delivery
- A standard SMS may not be identified immediately as urgent.

c) CBS-SMS comparative analysis: what to keep in mind

The following table summarizes the main advantages and drawbacks of the two technologies.

	Geo-targeted SMS	CBS
Reach		
Handset compatibility	All handsets	Not all handsets
Handset configuration requirement	None	Channel manual selection in order to receive CB messages
Public awareness	Widespread technology, well understood by population	In a lot of countries most people are not familiar with CBS technology
Language selection	Possible on a per-user basis	Concatenate the different languages in the same message or broadcast different messages on different channels
Location accuracy	Cell level	Cell level
Performance in delivery		
Sensitivity to disaster network conditions	Network congestion may lead to delays in delivery	Not very sensitive to congestion (dedicated channel)
Delivery rate	From thousands to hundreds of thousands per minute (depending on network resources optimizations)	Millions per minute
Cost issues		
Implementation cost and time	Not very costly and quick to implement as much of the infrastructure is already in place	More costly and longer to implement as some changes are required in order to integrate CBS into the network
Advanced functionalities		
Delivery confirmation	Yes	No

Sources:

- GSMA, January 2013, *Disaster Response, Mobile Network Public Warning Systems and the Rise of Cell-Broadcast*
- UK Cabinet Office, April 2014, *Mobile Alerting Trials: Project Report*

CBS and SMS are often considered as rival technologies for PWS. However, a closer look at their advantages and drawbacks reveals some complementarities, meaning that using them together will solve most issues that each technology faces when used alone.

II. Intersec approach: combine CBS and SMS to maximize both reach and delivery speed of PWS

Intersec approach can be summarized in two key points:

- Combine CBS and SMS channels to maximize both reach and delivery speed with advanced network congestion prevention mechanisms.
- Take advantage of Igloo⁶ unique geo-fencing technology, which is both real-time and mass-scale, for advanced population movement monitoring and increased efficiency in crisis management.

Intersec has a proven track of records for Cell Broadcast and Igloo technologies in about 15 countries covering several hundred million people. Major deployments include various affiliates in Orange Group, Weve (joint venture of EE, O2 and Vodafone in the UK) and Telefonica Group in Europe and Latin America.

a) Maximizing reach & time to inform everybody effectively

Intersec multi-channel approach allows to maximize both reach and delivery speed by:

- Using CBS to inform CB activated handsets rapidly.
Intersec CBS is particularly relevant in a context of PWS: it is network agnostic (2G/3G/4G), PWS standards compliant (CAP/ATIS), and includes smart network congestion mechanisms.
- Sending SMS as a complement: first to people with a non CB compatible device and then to CB compatible devices in case CB was not configured or activated.

Moreover, Intersec solution uses real-time monitoring of subscribers density and statistics of successful delivery reports to optimize delivery timeline and which areas get alerted first. This way the delivery can benefit from the additional word of mouth effect, accelerating efficiently the spread of the alerting.

b) Maximizing successfulness of SMS delivery

Network congestion may cause delay in SMS delivery during emergency situations. Intersec solution implements several features designed to minimize this effect, such as:

- Using Igloo as a cache to offload network elements such as HLR,
- Leveraging on subscriber connection state to maximize First Delivery Attempt success,
- Prioritizing the SMS alerting traffic over the user P2P traffic,
- Using real-time monitoring of RAN / core network nodes load information to ensure SMS delivery across congested networks.

⁶ Igloo is Intersec technical enabler for mass-scale and real-time geolocation services

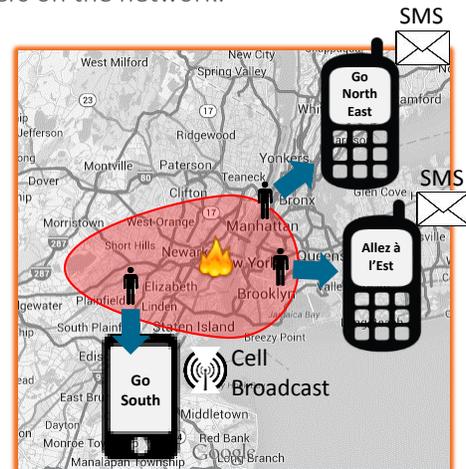
c) Increasing campaign effectiveness

Igloo offers two unique capabilities that allow increasing the effectiveness of an alerting campaign:

- The ability to manage lists of people, to know who has been alerted,
- A mass-scale real-time view over the location of all subscribers on the network.

These features increase crisis management efficiency by:

- Sending personalized messages in the language of the subscriber,
- Optimizing the evacuation plan by sending appropriate directions to different groups of population in the same area,
- Monitoring the effects of the campaign in real-time (using heat maps and statistics about population movements) and adapt quickly to changing circumstances.



It also allows to communicate with the alerted population after the crisis even if they have left the area, which was identified as a key issue by Francis Markus - East Asia spokesperson for the International Federation of Red Cross and Red Crescent Societies (IFRC) – who commented after the Fukushima event in Japan that “the conditions faced by those displaced were made worse by them not knowing when they can return.”⁷

Intersec provides a consolidated future proof solution, which:

- Is 100% telco grade, highly performant and supports virtualization,
- Maximizes the reach towards the population,
- Integrates unique and compelling functionalities for PWS for increased crisis management and population safety.

III. Bonus: beyond Public Warning Systems usages

Once Igloo has been installed for alerting purposes, it can also be used by the MNO to improve their internal efficiency (contextual marketing, revenue assurance...) and to monetize location information towards 3rd parties (Location Based Advertising, geo-marketing studies...). Igloo thus allows to alleviate the mandatory alerting investment, which is very difficult with a “CBS-only” solution.

⁷ <http://www.nbcnews.com/news/other/fukushima-evacuation-has-killed-more-earthquake-tsunami-survey-says-f8C11120007>



About Intersec

With its expertise in next-generation software and telecom technology, Intersec designs solutions that enable mobile operators to capture and monetize their network value through Big Data collection for innovative services creation.

Intersec integrates its leading core network solutions to generate location intelligence revenue and to maximize customer value management, contextual engagement, and messaging traffic profitability. Our award-winning products are designed to efficiently implement operator's loyalty & retention, value creation and cost optimization strategies.

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