Public Warning System

Executive Summary
Public Warning System (PWS)

Public Warning System (PWS) service is driven by the simple observations that the lives and property of citizens are at risk during natural and man-made disasters, and that enabling government agencies to broadcast timely and accurate alerts, warnings and critical information to citizens during emergencies would help citizens take appropriate action to protect themselves from serious injury, loss of life or property.

In 2006, the 3GPP standards body started to define the Public Warning System (PWS) technical specifications and requirements in the document 3GPP TS 22.268. This document sets global criteria for the delivery of alerts, the content of messages and the nature of features for PWS-capable handsets. Based on this standard, various governments around the globe (in the US, the Netherlands, Chile, Japan, Korea, Canada and Israel) have deployed emergency alerting services. In the EU, a recent directive 2018/1972 of the European Parliament and of the Council dated 11 December 2018, states at article 110 that “By 21 June 2022, Member States shall ensure that, when public warning systems regarding imminent or developing major emergencies and disasters are in place, public warnings are transmitted by providers of mobile number-based interpersonal communications services to the end-users concerned.”

As shown in Figure 1, the emergency alert messages are issued by government agencies via the government’s alert management system and sent to mobile operators’ networks for broadcast to one or more target geographic areas.

There are two main technical ways to implement Public Warning Systems.
Option 1: Cell Broadcast Service (CBS) solution

From the 3GPP and ETSI specification documents and experience gained from early PWS implementations, the Cell Broadcast Service (CBS) emerges as the most effective technology to reach large areas and populations.

CBS has key practical advantages over regular point-to-point (P2P) SMS and OTT smartphone P2P applications, which are by nature not designed for mass distribution of critical authority-to-individual emergency alerting:

- It enables mobile service providers to broadcast emergency alert messages in real time to citizens at risk. These alert messages can be delivered quickly to millions in seconds or just a few minutes, with no significant delivery delays and without being affected by potential network congestion.
- Alerts can be geographically targeted to specific areas.
- It supports emergency broadcasts over 2G/3G/4G and 5G networks and can be received by visitors traveling in a foreign country to maximize reach.
- It is compliant with global standards for emergency alert service, as defined by 3GPP and existing regulations worldwide (such as in the EU). It also provides standards evolution to multimedia-based alerts.
- It can also be leveraged by service providers to enable advertisers to broadcast messages to user equipment based on its location (commercial purposes).

Below are examples of such alerts delivered to end users’ smartphones (system powered by Nokia technology):

US Nationwide Presidential Alert broadcast at 2:18PM EST
- Alert received at 2:18 PM EST (<1 sec delay) over 3 different networks.
- Most alerts received within minutes nationwide.
Option 2: Location-based SMS (LB-SMS) solution

LB-SMS is based on a technology that identifies the position of mobile subscribers. Once all mobile subscribers residing in the alert area defined by the government are listed, each of them will receive geo-located alert messages. This technology provides the ability to:

- Count the number of recipients in an area (situational awareness)
- Identify the current location of the affected people to assist in rescue operations (situational awareness)
- Eventually provide individual delivery reports (real-time status on successful delivery)
- Deliver language-specific content (based on recipients’ country code).

It is also possible to

- Send alerts to people who enter the affected area after the alert was initiated
- Update people who have left the area
- Alert the citizens of a country who are traveling abroad.

Nokia solution for Cell Broadcast Services

The Broadcast Message Center (BMC) is a Nokia product designed primarily to broadcast warning alert messages to mobile devices in a specific geographic area. The BMC is compliant with PWS standards and enables wireless service providers to meet government mandates for emergency broadcast services as defined in various countries. The BMC is a mission-critical product for national and regional emergencies to save life and property. It supports message delivery over any generation of mobile network (GSM, UMTS, LTE, 5G and CDMA). Nokia is market leader in CBC deployments for emergency alerting services.

The Nokia BMC also enables potential revenue-generating commercial services such as information alerts, community and campus alerts, and mobile advertising. For mobile network operators (MNOs), this creates further incentive to implement a PWS system beyond simply obeying a law.
Nokia solution for LB-SMS

The Nokia LB-SMS solution allows the addition of SMS communication with situational awareness capabilities leveraging Location-Based Server (LBS) information. This solution relies on the Nokia Location Server (NLS), which locates the geographical position of mobile devices and sends this information to the Location-Based SMS Server, which stores location data in its database and sends the alert message to devices located in the warning area defined by government authorities.

![Nokia Location-based SMS solution architecture](image)

Figure 3. Nokia Location-based SMS solution architecture

Nokia solution for PWS

If CBS is the most effective technology for PWS, LB-SMS brings the following additional benefits:

- Compatible with any handset (SMS)
- Enhanced situational awareness for emergency authorities
- Allows two-way communication
- Allows identification of the current location of the affected people to assist in rescue operations.

Given the complementarity of both solutions, Nokia supports both Cell Broadcast and Location-Based SMS, thus providing a one stop shopping approach to governments and MNOs by providing both platforms as well as associated integration services. This maximizes the efficiency of the PWS, speeds up the deployment of such a system across the country, and guarantees end-to-end interworking of the solution.
Key takeaways of Nokia PWS solution:

- One-stop shop: Comprehensive end-to-end solution as one-stop shop for PWS covering both government domain and MNO requirements
- Standards-compliant: Nokia’s PWS offers feature-rich solution complying with all possible Wireless Emergency Alert standards (3GPP, ATSI, ETSI).
- Telco expertise: Nokia is the only vendor with wireless network expertise end-to-end including core and RAN
  - Leveraging Nokia 5G/LTE solution and IoT testing.
  - Major factor in helping Tier 1 operators identify network issues (5G PWS available and being deployed in US Tier 1 operator)
  - Most experienced vendor with LTE deployments in large Tier 1 operators)
- Proven solution: In service with the top Tier 1 operators for PWS in US, Canada, Europe and CALA. Deployed and tested with multiple major network vendors.
- Scalable and industrialized: Scalable solution meets large network capacity supporting rapid cell growth. Fast use case development leveraging BMC capability and unique features.
- E2E Professional Services: Nokia PWS comes with a package of leading integration services to define, design, deploy and test the solution across government and operator networks, with all stakeholders involved.