

Addressable Radios for Emergency Alert (AREA):
A WorldSpace solution for effective delivery of alerts⁺

by

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1. Overview

The recent series of disasters have reiterated the importance of timely and effective delivery of emergency alerts. Delivering hazards information to the remotest regions of the developing world has been a major challenge. Digital broadcast satellites can deliver signals into compact and inexpensive receivers that hardly require any local infrastructure and, hence, are ideal candidates for deployment in public outreach applications, for awareness and preparedness.

WorldSpace has recently developed a new radio called Addressable Radio for Emergency Alert (AREA). WorldSpace solution guarantees the delivery of the alert within 10 seconds of its transmission over the web by the authorized agency. There is provision for connecting a siren through a relay, which gets activated when an alert is received. Since AREA can be powered by small solar panels, and the antennas of AREA are compact in size and not prone for destruction under hazardous conditions, the availability and reliability of the system is very high. In addition, because AREA can be used for infotainment of the community during non-hazard times the system gets integrated to the daily lives of the community. There is also the feature of connecting a GPS receiver optionally to this unit, thereby allowing delivery of the alert based on the current position of the receiver.

2. AREA: Features and Advantages

The WorldSpace system offers several advantages such as:

- Lowest cost among all the possible satellite terminals.
- Existing coverage of more than 130 countries.
- Reach well beyond traditional communication and broadcast networks.
- Least dependence on terrestrial infrastructure.
- Rapid roll-out of the system over wide areas.
- Geo-referencing and selective addressability.
- Easy to use web-interface for alert generation, updates and cancellation.
- Built-in authentication and security features.
- The Receiver automatically turns ON even when the Receiver has not been in use at the time of the alert.
- Low power consumption and possibility of solar powering.

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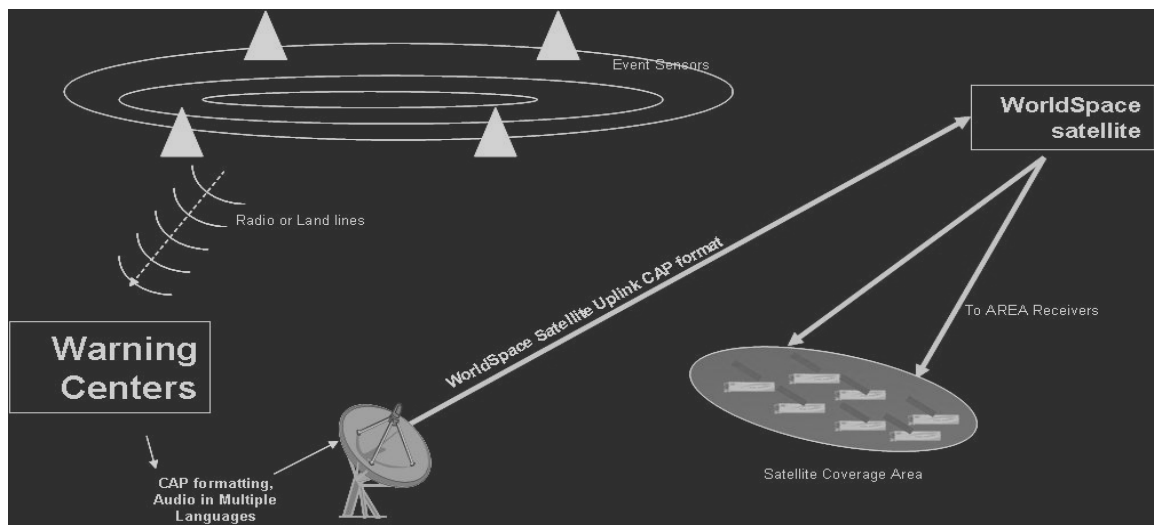
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- Provision to display emergency attributes based on CAP standards.
- Ease of deployment, operation and maintenance.
- Expandability and Scalability.

3. Development of Dual-Channel Special Radios for AREA

The initial launch of the AREA service incorporates minimal modifications to the existing receivers. The first receiver, called DAMB-R2, is a low-memory radio with a small display and limited processing power. DAMB-R2 features dual channel reception, one of the channels always being a data channel called OAAC (Over Air Activation Channel). Through the OAAC channel the alert provider can send an alert message. DAMB-R2 has the capability to monitor the alert, validate the message and perform the specified action. The action could range from activating a relay for a siren, turning on/switch to a WorldSpace channel for audio messages, displaying text regarding the alert, or delivering a file to a computer connected to the unit. A variant of DAMB-R2 is DAMB-A2 that incorporates all the functionalities of DAMB-R2 and is connected to an USB port of a computer.

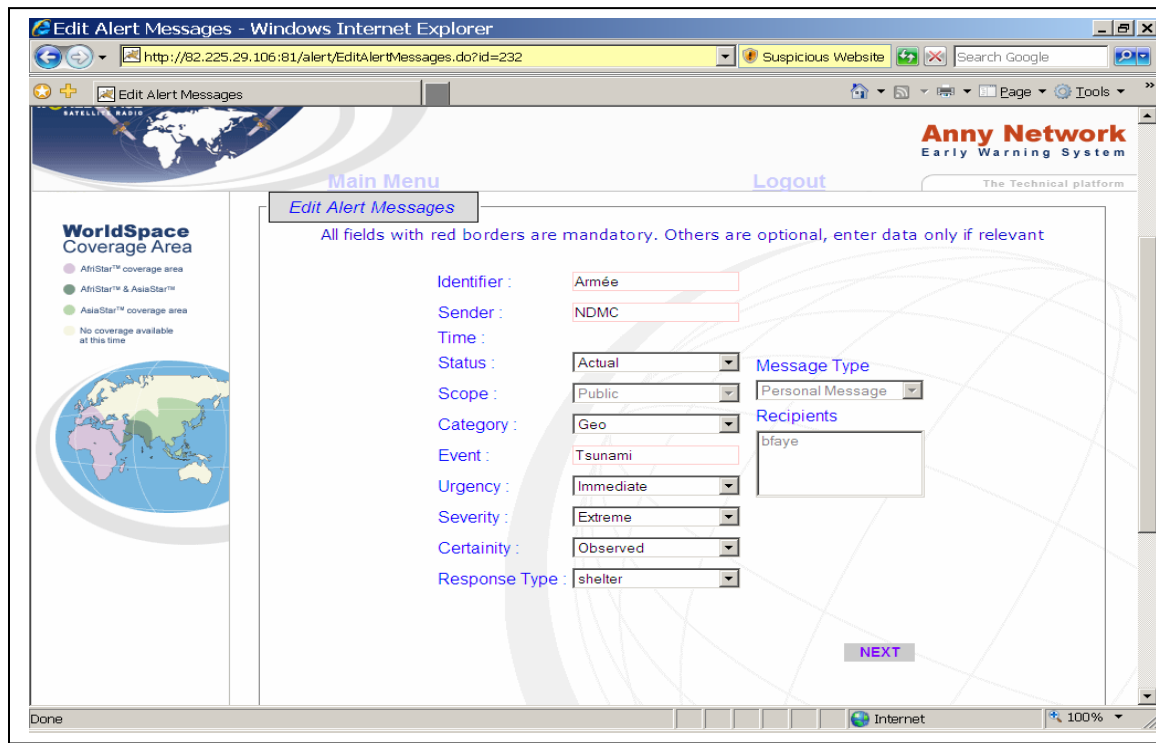
The overall schematic is as shown.



4. System Configuration at the Hub

The uplink segment includes a special, secure, web interface as shown above, at one or more of the designated centers wherefrom the Emergency Warning (EW) message is generated. Additionally, it would also incorporate procedures for authentication and logging of the alerts, generation of contents for the supplementary audio channel that WorldSpace supports once an alert is announced, updating an announced alert, canceling the alert, periodic end-to-end testing of the entire system.

WorldSpace is one of the first systems to adapt Common Alert Protocol (CAP) version 1.1 and has the user interface for inputting the 8 basic parameters as well as the 35 optional parameters.



5. Equipment and Connectivity at Each Location

Regardless of the configuration, an unobstructed path from the satellite to the receiver antenna is required in order to receive a clear signal from the satellite. The receiver antenna, therefore, needs to be positioned so that it “sees” the satellite. Radio Line of Sight (RLOS) is then presumed to exist between the satellite and the receiver antenna.

The receive configuration in AREA is adaptable to the needs and conditions of the location where the service is intended. Three different types of configurations are defined in Appendix-I. The explanation of the same is given as under:

5.1. AREA-A

In AREA-A configuration a special satellite modem called DAMB-A2 is attached to an USB port of the computer. During non-alert times, AREA-A would deliver multiple channels of audio to play out on the computer, and can provide the pipe for downloading multi-media digital contents of relevance, such as agricultural information, health information, and education, to respective communities. The computer system is a minimum of Pentium- II with Windows operating system, having speakers that are enabled and run on a UPS.

The onset of alert is decoded by AREA-A which, in turn, triggers a series of alarms and announcements on the computer. AREA-A can be configured at selectable centers to deliver updates on the alert using the datacasting capability of WS. As the alert generating software has the provision to automatically tune to any desired channel, this feature is made use of by switching to the datacast channel of WorldSpace to enable these downloads.



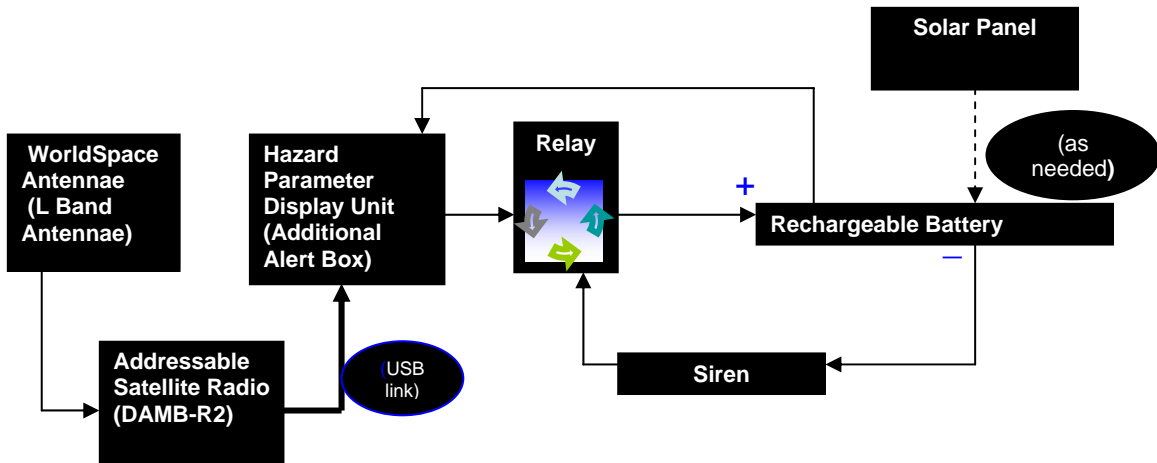
5.2. AREA-M

Another possible configuration is AREA-M that has a GPS receiver connected to DAMB-R2 via an external box. The user could fit AREA-M receivers on any vehicle, including fishing boats. These units draw power from the vehicle and play the audio in its speaker system. At normal times these radios provide entertainment, news, information update on weather, potential fishing zones etc. When an alert signal is originated by the authorized agency the same receiver will sound an alarm, display the alert parameters and switch the audio to a different channel where more specific information can be provided. By using the GPS signal fed to AREA-M, the alert delivery can be restricted to those receivers that are located within the risk zone identified by the agency responsible for generating the alert.



5.3. AREA-C

AREA-C configuration is suitable for a fixed location, with public address for the community. This system is depicted in the figure below. In this configuration, the rechargeable battery provides immunity to the loss of AC power at the alert-instant. The automatic remote activation of the siren provides the capability to alert the community over long distances, typically one km. Besides the textual display of the alert parameters and their updates, the radio plays the special alert audio channel to provide authentic information to the community.



Equipment layout for AREA-C

6. Rendering in Local Languages and Other Media

In order to cater to the need for reaching out directly to as many people as possible WorldSpace is working with software companies to integrate their modules for Location Based Language Messaging and Dynamic Voice Translation System. Also, it is possible to deliver the output of the WorldSpace Alert Generation software in XML format to other distribution media like cell broadcast and group email.

7. Operation

When an emergency message is to be communicated, CR will, after due process of validation, start broadcasting messages and feed contents to the EW audio channel. At the receive end, the radio will automatically switch its channel to a special EW channel, and start relaying the broadcast message and also display the alert parameters.

Once the alert is recognized by the receiver, an audio alarm is generated. In AREA-C configuration, it closes a relay which activates the siren which can be heard over a radius of typically 1 km. In contrast, AREA-A provides a computer-generated warning signal, while AREA-M uses a buzz for drawing the attention to the alert. Once the emergency message is cancelled from the CR, AREA in all configurations will switch back to its original mode.

The receiver has a provision to automatically switch on the special broadcast, even if it is in an off mode (i.e. music not playing for any reason), and sound the alarm. However, the receiver has to be **powered on** all the time to achieve this status. (i.e., power up to the receiver is provided but the radio can be switched off). In case of AREA-A, the computer is to be kept on and the application software running, so that the alert is received and acted upon.

8. Conclusion

Based on the post-Tsunami feedback from the affected countries, WorldSpace has designed an emergency alert system that incorporates CAP 1.1 formatted message generation, provision for auxiliary audio delivery, automatic switchover at the remote sites, selective addressability, geo-referencing and a host of other features that derive from a digital satellite broadcast system. The scheme has been successfully field-tested and ready to be scaled up quickly.

Acknowledgement

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