Professional Mobile Radio: Providing a Dependable Message Delivery Infrastructure for Early Warning Systems

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The main objective of any early warning system is to rapidly disseminate warning messages to specific users groups in response to an imminent hazard event. The dissemination has to be executed in a manner that ensures that the message delivery is timely, the message content is accurate, understandable, and usable [GLANTZ (2003), WMO (2007)]. Therefore, all available broadcast (television, radio) and telecommunication infrastructure must be used to increase the likelihood of the warning message reaching all persons under risk and organisations expected to respond to a hazard scenario.

Public Land Mobile Networks (PLMN) are considered one of the most important telecommunications infrastructures for delivery of messages from early warning systems. Wireless networks (both fixed and mobile) provide connectivity to end users without the need for fixed communication cables or wires, thus enabling many users to be rapidly connected without the high costs and disruptions associated with cable deployment. Furthermore, the added mobility feature enables users to be reachable wherever there is network coverage and stay connected even when moving at high speeds (e.g., in a car). These advantages have led to very high levels of adoption of the mobile services in most countries. Therefore, PLMNs meet the needs of early warning systems for a message delivery infrastructure with sufficiently wide coverage and large user base.

In recent times privatisation and deregulation measures widely adopted within the telecommunications sector, resulting in, increased competition; higher efficiency; cutting-edge innovations; affordable services for users (thus increasing service penetration to hitherto unconnected citizens), and significant revenues for telecommunication service providers. As a result privately-owned telecommunication service providers are being relied upon to provide services, not just for the general public and the private sector customers, but also for government agencies and authorities. These services include both traditional (commercial) services and emergency services, such as, the early warning services addressed in this paper.

However, time-critical and life-saving early warning systems cannot rely solely on widely shared PLMN infrastructure (typically planned with stringent cost optimization objectives), as they could be corrupted by security breaches or be totally unavailable (e.g., congested) during critical situations. Similar concerns are raised when using PLMNs for other emergency services or any other functions critical to national safety and security. Therefore, there is an increasing preference by government agencies, public authorities, emergency response organizations and critical infrastructure operators to build and/or operate dedicated Professional Mobile Radio (PMR) networks that are designed to guarantee robust security and high service availability at all times [KETTERLING (2004)].

The European Telecommunications Standardization Institute (ETSI) specified an open and harmonized digital PMR standard (EN300-392 series) known as TErrestial Trunked RAdio (TETRA), which is now arguably the most widely used PMR standard. The TETRA standard incorporates features of mobile telephony, mobile data and mobile radio systems, and is widely viewed as a replacement for the fragmented analog PMR systems that have been used previously by different authorities.

To that end, TETRA PMR networks are ideally positioned as a crucial telecommunications infrastructure for delivery of early warnings to first responders. In other words, the current quest for effective early warning systems further highlights the need for adoption of PMR networks (such as, TETRA) that are dedicated for use by first responders. This paper seeks to underline this point by providing an overview of TETRA systems, user terminals, services and applications, which make it useful for early warning purposes. These benefits are further highlighted by a comparative analysis conventional PLMN networks. The arguments are illustratively backed up by some relevant case studies from existing TETRA networks and general architectural diagrams for a TETRA-supported early warning system.

Literature

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