MASS NOTIFICATION SYSTEMS

SCENARIOS: A truck parks outside of an apartment for military personnel; when approached by security officers, the occupants get into another waiting vehicle and speed away. A vehicle is car-jacked with a toddler still strapped into a car seat in the back. A railroad tanker car carrying chlorine gas overturns upwind from a residential neighborhood. A fire is detected in a laundry room on the third floor of a high-rise apartment building. An overnight boiler failure necessitates the canceling of high school classes. A disgruntled employee barges past security into an office building – possibly carrying a weapon. A motorist spots a distant tornado.

What do these scenarios have in common? Some are natural and others are man-made disasters. Some signify increased risk, while others are immediate hazards and emergencies. One of the scenarios is merely an inconvenience. However, the common thread is that they all necessitate a need to communicate to people.

Those who grew up in the 1950s and '60s are familiar with the old Civil Defense Warning System used to provide alerting to entire neighborhoods, towns, and cities. In many parts of the world, tornado, hurricane, and tsunami warning systems provide alerting and, sometimes, information. An effective detection and alerting system could have saved many lives during the recent Southeast Asia tsunami disaster. High-rise buildings often use Emergency Voice/Alarm Communication (EVAC) systems to alert and inform the occupants of fire and other emergencies. These are all forms or types of Mass Notification Systems.

NFPA Setting Standards for Excellence

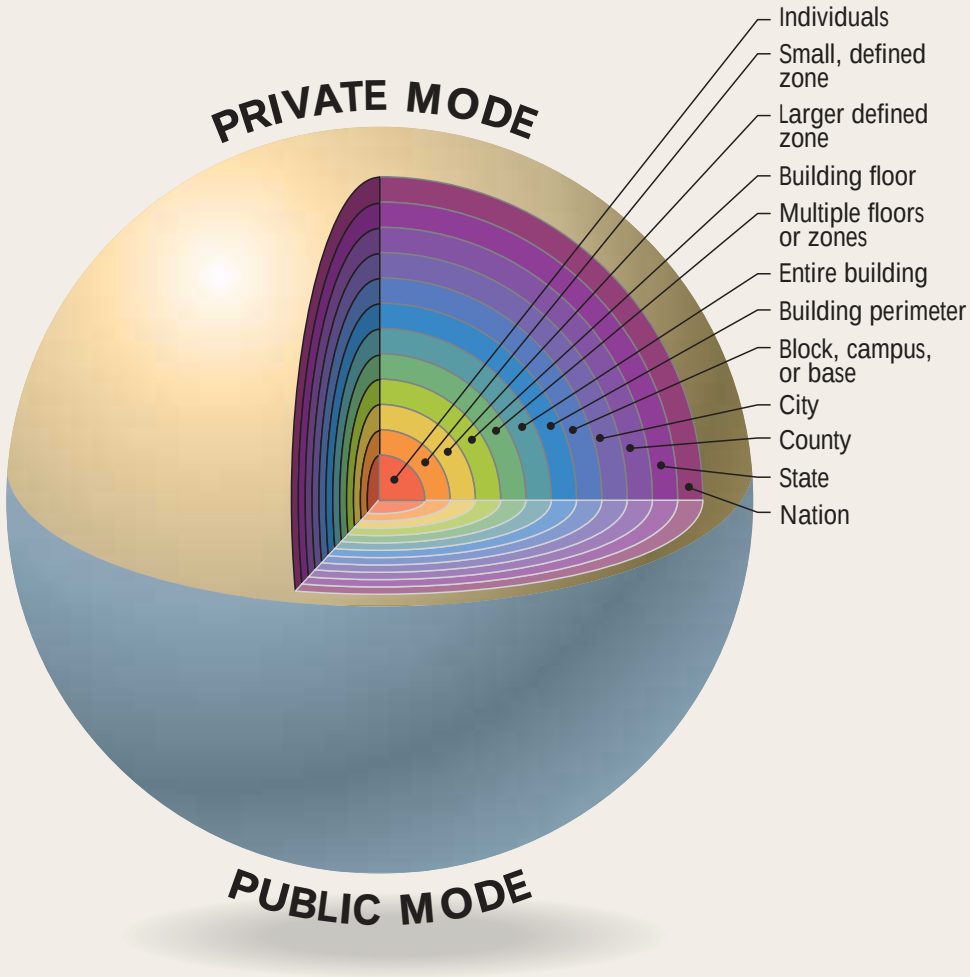
The world has changed since September 11, 2001. However, even before 9/11, events such as the bombing of the Kohbar Towers in June of 1996 emphasized the need for rapid, informative communications, both for prevention and for emergency management. One goal cited in the National Strategy for Homeland Security[1] is for a system "to ensure that leaders at all levels of government have complete incident awareness and can communicate with and command all appropriate response personnel." Similarly, the Department of Defense (DoD) Unified Facilities Criteria (UFC) Minimum Antiterrorism Standards for Buildings[2] mandates that almost all DoD facilities have some form of a Mass Notification System. A direct result of that mandate is the UFC 4-021-01 document for the design, operation, and maintenance of Mass Notification Systems.[3] The developers of that standard requested the National Fire Protection Association (NFPA) to consider a project to draft a complete standard for Mass Notification Systems. That task was directed to the committee on Signaling Systems for the Protection of Life and Property, which also has responsibility for *NFPA 72, The National Fire Alarm Code*.

The Technical Correlating Committee formed a Task Group composed of members of the existing technical committees as well as many persons already involved as users, designers, manufacturers, and installers of non-fire Mass Notification Systems. The Task Group has drafted a proposed Annex to *NFPA 72* for Mass Notification Systems. In addition, the Task Group and the regular Technical Committees of *NFPA 72* have worked to change, add, or delete existing language in *NFPA 72* to make the document more suitable and applicable for application to Mass Notification Systems.

A Mass Notification System (MNS) is used to provide information and instructions to people in a building, area, site, or other space using intelligible voice communications and possibly including visible signals, text, graphics, tactile, or other communications methods.[4]

In a broad context, an MNS is a communication and emergency management tool. In the simplest form, it may be used to manually alert or notify some or all occupants of a space that an emergency exists. Many fire

Figure 1



alarm systems fit this description – they provide alerting, but no additional information, and are intended to be used only for fire warning, leaving the recipient to take actions they deem appropriate or for which they have been trained or "programmed." However, the title and definition of Mass Notification Systems is meant to encompass greater possibilities for communication, information dissemination, and personnel management.

Depending on the situational needs, an MNS may be a simple alarm system, or it may be a highly secure command and control system suitable for use in a variety of situations including biological, poison gas, and nuclear terror threats; bombings; antipersonnel attacks; etc. Also, the system may be one-way or two-way. That is, it may be used only to give information to the target audience, or area, or it may be designed to also receive and transmit information to a command center in the form of real-time sensor data or text, voice, or video communications from the scene.

NFPA 72[5] defines the Public and Private Operating modes as:

Private Operating Mode

Audible or visible signaling only to those persons directly concerned with the implementation and direction of emergency action initiation and procedure in the area protected by the fire alarm system.

Public Operating Mode

Audible or visible signaling to occupants or inhabitants of the area protected by the fire alarm system.

Based on proposals received and processed by the *NFPA 72* Technical Committees, it is expected that these definitions will be modified slightly to reflect signaling for purposes other than just fire. An MNS may operate in either or both operating modes. In many situations, an MNS will operate in both modes simultaneously.

It must also be recognized that an MNS may be intended for signaling within a building or structure, or to a wide area such as a campus, industrial park, military base, or even a city. In a very broad context, an MNS could trigger nationwide alerting via radio, television, SMS (Short Message Services, such as mobile phone text messaging and Instant Messaging), Amber Alert systems, "giant voice" systems, Internet news alerts, automated telephone messaging, etc. The planning and design of an MNS begins with a Threat and Needs Assessment. As with a fire protection risk assessment, a Threat and Needs Assessment will identify specific and potential hazards and their estimated probabilities. Laws, codes, regulations, or corporate policies will establish specific goals for the protection of life, property, and mission. Combined, these goals lead the development of the system "needs," or the overall system scope and definition of the system. The threat and the needs must both be considered in the context of public versus private operating

mode as well as the "extent", or area served by system. Figure 1 shows a segmented, multilayered approach for threat assessment, needs assessment, and communication.

In a simple form, an MNS will provide voice instructions. How will a system provide visible communications? Presently, most systems incorporate strobes as do fire alarm systems. However, unlike voice (whether prerecorded or live), a strobe does not impart information, it only provides alerting. A better solution for visual communication is the use of text appliances such as scrolling displays used in train stations and stadiums, or smaller LCD displays such as are common on today's fire alarm systems. These would be distributed around a property or located at specific stations. Systems may also make use of existing computer and CCTV networks. The problem is that the textual information cannot penetrate all spaces in the same way as audible signaling methods. So, strobes may continue to be used for general area coverage to mean "leave the building or area" or "get additional information."

Mass Notification Systems may also interface or incorporate other forms of textual communication. For instance, a system may interface to a computer network and cause a pop-up to occur on all networked computers, or it may broadcast a text message to cell phones and pagers.

The configuration and complexity of Mass Notification Systems will vary greatly depending on the Threat and Needs Assessment. Therefore, the actual components and the codes and standards that address Mass Notification Systems must be flexible and modular. How will all these different systems share information and interface with each other? One possibility is through the use of a CAP – Common Alerting Protocol.[6]

In 2000, a Working Group of the National Science and Technology Council issued a report titled "Effective Disaster Warnings."[7] The committee stated: *"A standard method should be developed to collect and relay instantaneously and automatically all types of hazard warnings and reports locally, regionally, and nationally for input into a wide variety of dissemination systems."* A Working Group was formed and developed a draft specification for a CAP to address this need. The CAP specification is a standard message format for emergency information to be packaged and sent in an XML format.

The Partnership for Public Warning[8] endorsed the CAP standard, which was then submitted to the Organization for the Advancement of Structured Information Standards (OASIS).[9] The Notification Methods and Messages Subcommittee of the OASIS Emergency Management XML Technical Committee has accepted the draft CAP standard and is in the process of reviewing and refining the standard.

The CAP standardizes the format and the exchange of emergency alert and public warning information over data networks and computer-controlled warning systems. One example of the use of the CAP is a community weather warning system that receives a message packet from the National Oceanic and Atmospheric Administration. Elements in the message packet may automatically trigger deployment of the message. The specific message content may be displayed, or it may be translated to audio/voice alerts.

Although developed for wide area use, the protocol can also be used by smaller system components forming a system for a building. For example, an incident commander may use a laptop computer with secure radio network capability to send either custom or predefined messages to a building's voice fire alarm system.

As more government, military, and civilian facilities and communities begin incorporating Mass Notification Systems into their emergency planning, codes and standards will evolve to meet the needs of the users, planners, designers, and installers. The 2006 edition of *NFPA 72, The National Fire Alarm Code*, is currently being developed, and Mass Notification Systems will be incorporated in a new Annex to the code. That Annex is published in NFPA's 2006 *Report on Proposals*. The use of CAP has not yet been considered by the NFPA Task Group on Mass Notification Systems. Similarly, many other features of MNS, such as the use of strobes, network security, matching of needs and system features, etc., have either not been addressed or have been kept flexible for the current draft.

References

1 *National Strategy for Homeland Security*, Office of Homeland Security, July 2002. Available at: www.whitehouse.gov/homeland/book/

2 UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, Defense Unified Facilities Criteria (UFC), 31 July 2002.

3 UFC 4-021-01, Design and O & M: Mass Notification Systems, 18 December 2002.

4 Proposal to *NFPA 72* for a definition of Mass Notification System.

5 *NFPA 72, National Fire Alarm Code*, National Fire Protection Association, Quincy, MA, 2002 edition.

6 For more information about CAP, see: www.incident.com/cap/index.html

7 "Effective Disaster Warnings," Report by the Working Group on Natural Disaster Information Systems, Subcommittee on Natural Disaster Reduction Committee on Environment and Natural Resources, National Science and Technology Council, November 2000.

8 For more information about the Partnership for Public Warning, see: www.partnershipforpublicwarning.org/ppw/index.html

9 OASIS Web site: www.oasis-open.org/home/index.php

Editor's Note – About This Article

This is a continuing series of articles that is supported by the National Electrical Manufacturer's Association (NEMA), Signaling Protection and Communications Section, and is intended to provide fire alarm industry-related information to members of the fire protection engineering profession.