

### Towards an “Intelligent Response” to Emergencies

**Society has long learned to accept fire as one of the many risks to life and property that simply must be effectively managed. Improved fire detection and protection systems, tougher construction codes, more extensive safety standards and more sensitive planning have all helped reduce the threat over recent years. But better ways still need to be found, not only in terms of limiting damages and costs, but also to ensure people safety, particularly as threats and our living and working environments become ‘denser’. This calls for a wider scope of emergency preparedness to intelligently respond to both traditional and new threats, a preparedness in which technology has an increasing role to play.**

Despite all of the advances that have been made, the estimated economic cost of fire still stands at around one percent of gross domestic product (GDP) in developed countries<sup>1</sup>, while 70% of business victims of a major fire close down after three years – a stark reminder that it is not just a life safety issue. With terrorist attacks also a factor and industrial incidents, natural disasters and extreme weather claiming thousands of lives, people generally believe that their safety is more at risk than ever before. It seems ironic therefore, that on first hearing a conventional fire alarm, many people will hardly react. Many will often assume that a ringing alarm is a test procedure or an unwanted ‘false’ alarm and hesitate for several vital moments before taking action. In some cases, people are unaware of the correct emergency or evacuation procedure relevant to their location. Quite simply, they do not know what to do – and when faced with the very real dangers of a genuine emergency, some people will become flustered, disoriented or even panic-stricken. Most people using a hotel or an airport, for example, will not be familiar with its layout and, in a potentially life-threatening fire, may struggle to find the nearest emergency exit. Studies have also shown that on-site response personnel are not immune to the effects of stress in a real-life emergency. They, too, sometimes panic and are overwhelmed by the responsibilities involved.

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<sup>1</sup> World Fire Statistics, Information Bulletin of the World Fire Statistics Centre, October 2010 issue, The Geneva Association.

## **Addressing the ever wider “duty of care”**

To cope with fire and other life-threatening emergencies, there is a noticeable change of priorities taking place today. Simple detection is no longer accepted as sufficient and, driven by insurance companies and end-users – and the increase in the personal liability burden and prosecutions – the focus has shifted towards incident prevention and response management through emergency preparedness. For real contingency planning necessitates the implementation of solutions that are as widely comprehensive as possible and fire and security systems are currently needed to support real response capability in all kind of events. Regardless of the organization – hotel, university, airport, shopping center – the owner/operator has a duty of care towards its employees, customers and visitors, so procedures need to be put in place to reduce the potential for incident. Protection systems should also be implemented to detect the very earliest signs of combustion, intrusion, attack or other hazardous event. Building owners and occupants should be prepared to react and have plans in place to safeguard people and property – reliably and efficiently directing people to safety in any emergency situation in order to keep the consequences to a minimum, not only in terms of fatality or damage but also commercial disruption. Post-event analysis and reporting mechanisms should also be put in place both to speed up recovery and also to enable “lessons learned” to be converted into continuous improvements with regards to emergency measures and policies, as well as protection system upgrades for the prevention, detection and response to incidents.

## **Train, retrain, and train again – yes, but is it enough?**

The current focus on preparedness lies predominantly in the structural (e.g. emergency stairs) and organizational (e.g. emergency plans) spheres, drawing from scenarios and known risks to derive appropriate response actions by first responders and building occupants. However, while training and drills are an essential part of emergency preparedness, they bring their own set of problems . For one, effective preparedness based mainly on organizational and structural measures necessitates the meticulous and regular training of all fire/security staff, relying on their efficiency and competence (this ranges from ensuring emergency exits are left clear at all times to ensuring regular system checks), regardless of illness, holidays or changing personnel and shift rotas. In addition, they can sometimes fail to cover the need to instruct visitors and other people unfamiliar with the building and site emergency procedures. In industries with a very international mix of staff and visitors, such as hospitality, the lack of international standards in some areas can also easily cause confusion in an evacuation situation, therefore increasing the need for clear and appropriate “training” being given to all building occupants. One example is the emergency exit sign: while the green ISO-1987 “running man” pictogram is widely used in many parts of the world, it is only starting to make its way into the US. In high-risk facilities and installations such as power stations, petrol, oil and gas refineries where there is a strictly limited number of untrained visitors,

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'rehearsed scenarios' based on past event analysis and incident development can be usefully implemented. On other, less contained sites where there are large open areas, different buildings and/or large, inexact numbers of people in scattered locations – such as large education campuses or leisure parks – such response guidelines for the widest range of possible emergencies, are usually less viable. The difficulties include the need to ensure that everybody receives the appropriate information relevant to their own particular location and situation, as well as ensuring that everyone has been safely evacuated before extinguishing and fire-fighting activities begin. On certain remote sites, the longer mobilization times of the emergency services will increase the challenge. So too will the extended evacuation time of certain complex facilities such as airports – not to mention those institutions such as hospitals and residential homes where the ability to self-rescue is limited and where complete evacuation is only a last resort.

### **Preparedness and communication**

The current megatrends of growing populations and urbanization means that there is an increasing shift to multi-tenant and even multi-purpose buildings as local authorities struggle to cope with our burgeoning cities and towns. This increased urban density again adds to the complexity of sites and the task of providing protection throughout – for the one factor in every location that can thwart many strategies is human behaviour. For instance, fire escapes carefully integrated into a well-conceived evacuation plan may ultimately fail when complacency creeps in over a period of time and those routes become obstructed. The recently rendered verdict in the 2007 Penhallow hotel fire in Newquay, labelled the worst UK hotel fire in 40 years and in which three people died, illustrates only too well this risk, with witnesses at the inquest reporting suitcases left in the corridor overnight, which hampered their escape. The owners were fined £80 000 (GBP) for failing to comply with fire safety regulations.

Extensive analysis of recent events identified two areas as critical for a successful emergency response – preparedness and communication. As seen before, organizational and structural measures are an essential part of preparedness. But the demand for better systems to evacuate buildings and support intervention forces is increasing. Residents, workers and visitors populating the complex sites and structures that we are now building, need the right information and at the right time. They need to be told when to remain where they are, when to move, when to evacuate and where to go. Similarly, the amount of information first responders need to obtain and process to do their job efficiently – the police, fire brigade or the emergency medical staff – requires constant and timely communication. This includes the nature of the incident, its extent, the building layout, how many people are affected or injured, the risk of secondary incidents (e.g. explosions) etc. And, just as vitally, the instructions that people and first responders are given should reflect the changing stages of the incident; they need the information that will simply and quickly take them to

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safety or enable them to change their course of action and incident response – without confusion and without hesitation.

### **The case for a better use of existing technology**

What this all means is that, to ensure efficient incident management and evacuation, there is a need to go beyond the traditional prescriptive fire safety technology arena and look towards performance-based codes and systems that can help better address the challenges and changing requirements of emergency response.

The more diverse and complex the risks and the environment, the more important it is to have a scalable and flexible management solution for alarm handling and response that can manage all aspects of safety and security. By implementing technology already in existence, we can improve our view and understanding of the situation, as well as our communication with those caught up in the situation or those required to respond to it, whether it is a fire, environmental incident, workplace violence or terrorist threat. The industry already has several effective response solutions such as voice evacuation, automated extinguishing and danger management systems.

Voice evacuation systems are now commonplace legal requirements in many parts of Europe for rail and air transport terminals, high-rise buildings, schools, hospitals, and other large facilities. In any emergency situation, vocal evacuation warnings and public address broadcast can enable the safe and orderly evacuation of people from affected areas. Generally, voice evacuation systems sound an alarm tone followed by a spoken warning, giving instructions as to whether to evacuate the building and what to do next: instructions to proceed to the relevant assembly point or not to use elevators being prime examples. They can also be used to deliver live information: this gives such systems a distinct advantage over bells and sounders (often ignored or misunderstood) or even voice sounders broadcasting a pre-recorded message. An additional advantage is the capability, as with voice alarm systems from Siemens, to selectively direct announcements towards only those areas and people affected by the incident. This is particularly important in buildings such as hospitals, where a mass broadcast of an alarm or evacuation instructions would not be appropriate, potentially causing unnecessary panic among patients in non-affected areas.

When safety- and security-related incidents do occur, it is obviously better if they are brought to the full attention of security staff at the earliest stage possible. Taking the hotel industry as an example, where 62% of all alarms are still reported manually, efficient detection and alarm systems do undoubtedly bring significant improvements, but even more so when integrated with danger management systems (DMS), which can play a vital role by providing and displaying all essential information and functions clearly and concisely to ensure that effective countermeasures are taken.

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DMS from Siemens offer a one-source management application that enables centralized alarm management and supervision of a wide range of fire safety, electronic security, and control systems and, no matter how many subsystems are connected, it displays them all in a uniform, clearly structured manner. It unmistakably guides the operator during stressful situations, through predefined step by step procedures via action texts, intervention plans, graphics, and other means.

Other technologies are also already in existence, which, when put to use in an emergency response situation, will help more people escape the danger zone safely. The culture of mobile phone and instant messaging usage is just one example already in use in mass notification systems. Already common in the US and being installed with increasing regularity in universities, schools, hospitals, shopping malls and theme parks in Europe, mass notification systems not only warn people of danger, but also provide concise instructions via live or pre-defined messages over multiple communication channels and guide them to safety in potentially life-threatening situations. This increasing use of the new communication channels available is also driving a re-think of how 911 calls are received in the US, whereby technology that would enable emergency call centers to also receive text messages, pictures and messages are also under review.

### **Better still – Intelligent Response systems**

The present move towards Intelligent Response systems is driven by technological advance in IT and communications. With the adoption of open standards, already well established in the building automation arena and gaining momentum in some sectors of the safety and security industry, the capacity for innovation is immense. Smart Buildings are already becoming a reality today, providing tremendous efficiency gains in the fields of energy management. They do this by harnessing building data (temperature, air quality, etc) and triggering the relevant response, at the right time, from building automation systems accordingly. Similar efficiency gains can be obtained in the field of incident response: it is already increasingly common (though not common enough) for fire detection systems to be integrated with voice alarm and mass notification systems, automated extinguishing, emergency lighting – and building management and security systems for controlling smoke, lifts and doors in any life-threatening situation. But response systems of the future – these so-called Intelligent Response systems where the system in place involves a variety of these fully integrated, multi-modal technologies – will take this integration further still. In the same way as today you can implement demand-controlled ventilation or heating in a building to improve comfort and energy efficiency, future technologies should enable a “demand-controlled” response to incidents, where systems would be able to analyze all relevant data that has been collected from the thousands of sensors and field devices and the various management systems from buildings over the site. They will then trigger the relevant system response mechanisms in relation to the nature, size and criticality of the incident, and enable the automated provision of

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dynamically updated and targeted instructions to everybody concerned, regardless of their circumstances, to guide them quickly and efficiently to a place of safety.

Importantly, they will also enable the emergency services to work together more efficiently to help contain the incident so that damage and injury are kept to an absolute minimum.

### **Prevent, Detect, Respond and Recover – The virtuous circle of Intelligent Response**

Response coordination is indeed an important part of efficient preparedness. Again, technology exists today that improves situational awareness and response efforts coordination – such as Command & Control systems – that combine both emergency and non-emergency systems onto one platform, controlled from a single point. With the solutions from Siemens, safety and security policies and procedures can be customized and integrated, with support for the dispatch and management of forces such as security guards, fire brigades, medical aid or service engineers, and various means of communication between the control center and the forces. This brings a further benefit: with a clear and comprehensive overview of incident management, reporting and post-event analysis also becomes more seamless and efficient, enabling improvements to measures, policies, training and infrastructure to be implemented, that will help prevent, detect, respond to and recover from incidents even more effectively.

So the trend towards Intelligent Response systems will only accelerate as technology progresses, since they enable many of the error-prone manual procedures to be eliminated through automated functionality. It is, however, important to remember that in the best incident preparedness and response plans, organizational, structural and technical measures operate in conjunction and are given equal attention. So Intelligent Response systems will also help re-establish the necessary balance between these three core components of emergency planning.

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