TACTICAL COMMUNICATIONS

Rob Hall *explains why good communication is vital for the emergency services in the event of a terrorist attack*

Picture credit: Chenming

When faced with an emergency, there's limited time to assess the situation, determine the response and coordinate/deliver it. The scenario can change rapidly, requiring the response to be scaled up/down accordingly. With multiple emergency services, victims, bystanders and local/remote teams, a great deal of interaction and communication is needed. Something that is not without its challenges.

The emergency services have traditionally relied on Land Mobile Radio systems (LMR) for effective communication, which can be as simple as two handheld units using pre-set channels or hundreds of remote

units. Although it is an ageing technology, LMR is still relied upon for public safety. It usually provides better geographic coverage than commercial mobile cellular, offering more confidence in the ability to communicate.

In the UK and Europe, the Tetra-based Airwave system was designed for use by emergency services and public safety networks, as well as other users such as transport services, the military and government agencies. First responders in the United Kingdom are expected to complete the communications transition away from Airwave (Tetra) to the 4G-based Emergency Services Network (ESN) in 2020, but it is likely that LMR technology will still be used when off-network voice communications are needed.

While LMR offers reliable voice capabilities, it does not support the integration of multimedia into public safety communications. Homeland security events have exposed limitations of the LMR system, as it provides little or no interoperability between the disparate systems used by the emergency services.

To succeed, public safety and government operations need effective communications that deliver timely and relevant information over a secure network. As long as individual emergency services use their own proprietary equipment day to day, they cannot effectively cross-communicate. This reduces coordination effectiveness during large-scale events, such as political demonstrations, sporting events and major security incidents. LMR is also limited in how it can be extended, as units may be out of range for some of the communication chain. While LMR systems can be linked over the public telephone network to extend their reach, this can be expensive.

MULTIMEDIA CONTENT

It still only solves part of the need: emergency workers and organisations are pushing for the ability to reference online maps, access files and satellite photos, as well as stream live video from incidents to control rooms. Indeed, 4G mobile broadband is being adopted increasingly by police.

In the United Kingdom, the ESN forms part of the Home Office Emergency Services Mobile Communications Programme, which aims to provide voice and broadband data solutions for the emergency services (police, fire and ambulance) and other public safety users. According to the Home Office: "Great Britain will be the first in the world to deliver critical voice and data for emergency services over an enhanced and more resilient commercial 4G network". However, with a launch date of 2020, media reports would suggest that it still has some problems to iron out.

While the Home Office has stated that no emergency service will have to migrate to ESN before it is satisfied the service is equivalent to Airwave. Motorola, which runs the current system, has warned it will not be keeping the network running beyond March 2020.

Emergency services communications systems in the US are experiencing an overhaul similar to the UK, with FirstNet being developed to create the first nationwide, high-speed network dedicated solely to public safety.

For public safety, mission critical voice communications must deliver on coverage, reliability, redundancy, capacity and flexibility. This, coupled with the requirement to share multimedia information during an emergency incident, would suggest that commercial cellular networks provide the answer. However, they were never designed for every person with a phone or smart device to use the network at the same time.

While cellular communications bring obvious benefits to the emergency services, 4G networks are largely untested in major incidents. System overload problems are likely to arise in the aftermath of homeland incidents, when networks are overwhelmed by large numbers of people instantaneously communicating. Some fear that sharing the airwaves with the general public could put lives at risk, with the threat of call blackouts.

Likewise, in the event of natural disasters, communications systems must also work at optimal levels to successfully coordinate multiple agencies and

their areas of responsibility. Adapting to these difficult situations requires a resilient network that's not only secure and flexible, but fully interoperable. Effective mobile communication in such scenarios is, therefore, key to the delivery of a successful relief strategy.

"A phone-line can be a lifeline in times of crisis", according to the United Nations Foundation. It argues that communications advances present an opportunity for humanitarian organisations to harness modern technology, enabling more effective communication with communities affected by disasters, and allowing members of those communities to communicate with each other and the outside world.

Access to communications for disaster relief operations is a fundamental enabler for safety, coordination, situational awareness and welfare. It is a life saver for both the relief organisations and those they seek to assist. Damaged local infrastructure and the need for timely and accurate information, therefore, create significant challenges for disaster relief communications.

The provision of food, water, medical supplies and care by a relief organisation cannot be achieved without

> **THE EMERGENCY SERVICES HAVE TRADITIONALLY RELIED ON LMR SYSTEMS FOR COMMUNICATION**

access to a communications network. No network means aid workers cannot be tasked and updated efficiently, and supplies cannot be ordered and directed where needed. A robust and resilient communications structure is, therefore, required by each organisation to manage its people and logistics.

OUT-DATED SOLUTIONS

Wireless communications have been used by relief organisations for many years, ranging from simple, private, push-to-talk radios to commercial cellular mobile, when available. The voice-only services of the simpler radio solutions are becoming insufficient for coordination efforts, as richer information formats are recognised as being essential for developing and maintaining situational awareness.

When the natural disaster requires a multi-organisation response, it is essential they work together as a single efficient team. However, communications systems interoperability between disparate organisations remains a problem. In civilian life, communications interoperability comes as standard. Years of standardisation have delivered technology that gives end-users the ability to call anyone and access the internet anywhere.

Relief organisations must be able to operate in the absence of such a standardised local infrastructure. There is a clear challenge to interoperability with other organisations in the region and with government systems, and to connectivity with remote support elsewhere in the world. Currently, some NGOs rely on commercial cellular networks, while others favour off-the-shelf radio systems, with the adoption of differing systems making effective coordination all the more challenging.

Officials need effective communications that deliver timely and relevant information over a secure network

Mobile network failure is not limited to major disasters. The general public's expectations for event network connectivity are increasing, such as high-definition streaming video highlights and real-time interactive, location-aware transactions. Consequently, this puts increased demand upon the cellular network. Indeed, outages are often experienced when large numbers of people gather at events, such as national celebrations and sporting events. It is during such events, that the emergency services must rely on this shared system, to effectively manage the situation and jointly deal with any emergency incidents.

A LONG WAY TO GO

According to Ofcom's 2017 Connected Nations report, 70 percent of the geographic area of the UK has telephone call coverage from all four networks, while 63 percent has mobile data coverage. While these figures are up from 63 percent and 52 percent respectively on 2016 last year, the Airwave network covers 99 percent of the national landmass. These coverage figures suggest that 4G-based services still have a long way to go in order to provide the emergency services with a foolproof multimedia communications solution.

A lack of accurate information can result in ambiguous situational assessments, potentially meaning poor decision making. Establishing a common situational awareness with the right information being shared with the right people at the right time, and in a readily understood format, is essential.

While voice communications are rapid and can be used to gain instant feedback, they can't exchange detailed information or support rich formats such as imagery, which are so important to the diagnosis of many situations.

In order to provide enhanced situational awareness, a number of key technological challenges must be overcome. Firstly, controlled integration of information from disparate sources, carried over a variety of links, is required. This will combine multiple information elements in a unified picture, which is necessary for efficient decision making at the tactical command level.

Secondly, the robust distribution of these information products down to the lower levels of command, via high bandwidth, low-latency communications, is required to support the range of full motion video, stills imagery and other complex information products that are available today. Thirdly, as always, the restrictions of weight, size, battery life and robustness of kit play a key role in technology development.

The simple answer could be a dedicated, rapidly deployable cellular network that uses commercial smartphones and tablets. This would not have the bandwidth issues of sharing a 4G network with the public, or the infrastructure costs of a system such as FirstNet. As well as providing local coordination and immediate data sharing between users, first responders would be able to track each other in difficult environments, improving collaboration and situational awareness.

Such a rapidly usable, cellular network-in-a-box solution, would continue to deliver real-time information to those operating in the cellular bubble when other communications systems have failed. This would give the emergency services access to all the features of a high-end cellular network, while maintaining their radio communications and ability to share location, video and image data in real-time, using only a small, well understood device that requires no training.

It is clear that lives are saved when first responders, security organisations and disaster relief agencies receive the right information at the right time. To meet that need, such a system has to be tough, rapidly and easily deployable and able to offer the features of a standard cellular network (voice, image, video and data sharing) in the most remote locations ●

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A joined-up approach to communication is vital for emergency services in the event of a terrorist attack