From a message in a bottle to best practice in communications

As Australian states and federal bodies work to improve emergency communications, journalist Kate Lahey speaks with Louisiana's Brant Mitchell about the radio network he helped build after *Hurricane Katrina*.

Brant Mitchell, Director of Research and Operations of the Stephenson Disaster Management Institute at Louisiana State University.

Of all the communication technologies New Orleans could boast in 2005, few held up under the force of *Hurricane Katrina*. Mobile phones failed, landlines were knocked out and the few emergency radio systems that did work were jammed. Fire and emergency medical services lost all 911 communications.

To communicate with each other, first responders were forced to thumb out text messages on their phones or find a runner—someone who could physically travel to the person they were trying to reach, on foot or by car.

To warn a team of emergency workers about a dangerous gas leak, a military helicopter dropped a message in a bottle. This was among the evidence given in a report on the communications failures during

Katrina, for the United States Federal Communications Commission.[1]

The report also described how thousands of first responders were forced to communicate in single channel mode—one single radio to another single radio at a time—using just three frequencies. Radio users had to wait their turn before speaking, sometimes up to 20 minutes.

Katrina, of course, was not unique in destroying communications or highlighting the shortcomings of a system ill-prepared. Problems during Victoria's Black Saturday bushfires included poor coverage, serious delays, channel congestion and difficulties among metropolitan and regional police who were using incompatible systems, according to the 2009 Victorian Bushfires Royal Commission.[2]

Responders to the Queensland floods in 2011 battled black spots, congestion and a lack of interoperability between emergency service agencies, the Queensland Floods Commission of Inquiry found.[3]

Australian states and federal bodies are in the process of improving radio communications for emergency services and developing systems to eventually allow first responders in all states to communicate with inter-agency and interstate colleagues when they need to.

The *National Framework to Improve Government Radiocommunications Interoperability*, endorsed by COAG in 2009, aims to enhance government voice and data radio communications and have all domestic radio communications equipment working on interoperable systems by 2020.[4]

1   Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks Report and Recommendations to the Federal Communications Commission. *At: http://transition.fcc.gov/pshs/docs/advisory/hkip/karrp.pdf, p 26*.

2   Victorian Bushfires Royal Commission Final Report. *At: www.royalcommission.vic.gov.au/commission-reports/final-report*.

3   Queensland Floods Commission of Inquiry. *At: www.floodcommission.qld.gov.au/publications/final%2Dreport*.

4   National Framework to Improve Government Radiocommunications Interoperability. *At: www.em.gov.au/Documents/Nationa%20Framework%20to%20Improve%20Government%20Radiocommunications.pdf*.

In New Orleans, those who endured the chaos of *Katrina* are already using such a system. Eight years after *Katrina,* Louisiana now lays claim to the largest statewide radio system in the USA by number of users – more than 70 000 - and one that is considered best practice in the country.

Brant Mitchell is among those responsible for leading this transformation. He visited Australia recently to explain how Louisiana built the USA first statewide digital 700MHz radio system.

Using recovery grants from the USA Federal Emergency Management Agency (FEMA), as well as state and local funds, authorities began building the new network in south-east Louisiana immediately after *Hurricane Katrina,* then extended it to the rest of the state.

It took about four years and cost more than $250 million, Mr Mitchell said. Some of that was for infrastructure, and some for radios, which Mr Mitchell said cost between $1 500 to $5 000 each. 'If you look at the number of users, you're talking about a lot of financial support to be able to acquire just the radios alone,' he said.

By January 2012, authorities had completed the system of 118 towers. Most of the towers have nine to 12 repeaters, giving the digital network far greater capacity than the previous statewide analogue system.

Today, the network is used by all levels of government, including border control, US marshals, sheriffs' offices, firefighters, city police, state police, emergency managers and FEMA, as well as organisations like the Red Cross.

Radios are programmed to allow for specific talk groups. This means when firefighters in one town know that medical help is coming from another town, they can communicate with the medical team directly, *en route*.

'While each agency has their own talk groups, there's a minimum number of talk groups that are required to be programmed in every radio, and that's by design, to ensure you have the interoperability when you need it,' Mr Mitchell said.

The repeaters can work on both 700MHz and 800MHz spectrums. Mr Mitchell said the advantage of using two spectrums was that it provided more capacity.

'If you operate strictly in 700MHz there's just a limited number of frequencies that you can use. There are not enough 700MHz frequencies to build that state-wide, with the capacity that we have,' he said.

Most Australian emergency radios operate in the Region 3 (Asia Pacific) frequency in the 400MHz band. This is the equivalent of the USA 700MHz band, for narrowband communications, which is mostly voice communication over radio.

Louisiana authorities had been planning for a 700MHz system before *Katrina* hit, Mr Mitchell said. As soon as

the life-saving recovery efforts were completed in New Orleans, the work to introduce this system began.

The Louisiana Wireless Information Network, known as LWIN, has already proven its worth.

'We have statistics that show that during *Hurricane Gustav* (in 2008), which was our first major test, you had a 99.9 per cent chance of getting through on the first time,' Mr Mitchell said.

It has also proved to be invaluable on a bigger scale. When the BP Deepwater Horizon oil spill gushed oil for 87 days into the Gulf of Mexico in 2010, LWIN was used to help establish voice communications for the United States Coast Guard – linking different systems across the Gulf Coast. Responders in Texas, Louisiana, Mississippi, Alabama and Florida were able to quickly establish a network of seamless communications as the world's biggest oil spill lapped their shores.

By coincidence, the Gulf states had purchased the same hardware, Motorola P25. Although this was not essential in linking communications systems, Mr Mitchell said it did make it easier.

'Because the technology was the same we were able to literally just plug in right away. We were able to have a much greater reach because the radios were all on the same vendor. Our radios that we have programmed here (in Louisiana) were programmed on the same master control site in Mississippi, so when we went to talk on Mississippi's network it recognised our radios. We only limited it to certain radios. In order to be able to utilise that we built our own talk groups specifically for that system,' he said.

Mr Mitchell led the work to establish GulfWIN and said it made a significant difference to the response to the spill. 'For command and control it was very important,' he said.

Responders in the field were able to stay in contact regardless of where they were on the bay. It also extended the reach of those working on the water, beyond the usual 'line-of-sight' scope of marine radios, Mr Mitchell said.

Another tool Louisiana contributed to the oil spill response was Virtual Louisiana – a geospatial information system, built on the same platform as Google Earth. Mr Mitchell was responsible for introducing this and the program provided an additional way for first responders to share information. About 4 500 people now use Virtual Louisiana and have to be approved to do so due to the sensitive nature of some of the information that is shared.

'We used it extensively during the BP oil spill where we were providing hourly updates on oil sightings, bird sightings, animal sightings or issues with different booms (containment barriers) that were laid out.

'We've used it quite a bit for other events. The great thing with it is, once we get information that's

geospatially related, we can take it and put it in Virtual Louisiana and we can share it with our community.

'It's a secure network, so we are able to put some sensitive information on there that we wouldn't necessarily put into the public [arena] but we need our first responders to see,' he said.

Mr Mitchell, a Lieutenant Colonel with the United States Army Reserves, was not in the USA when *Katrina* made landfall. He was commanding an infantry company in Bagdad. He spent one year in Iraq. From 2008-2012 he was Chairman of the Louisiana Statewide Interoperability Executive Council which is responsible for providing governance of the LWIN. Today he is Director of Research and Operations of the Stephenson Disaster Management Institute at Louisiana State University.

He also recently served as a member of the Federal Communications Commission's Public Safety Advisory Committee for the Emergency Response Interoperability Committee, to help develop technical specifications for a nationwide broadband network for the USA, dedicated to first responders.

Dubbed FirstNet, the data network is yet to be built and is not designed to replace land mobile radios. The US Congress has committed more than $7 billion to the project.

Like Australia, the USA is working to improve emergency communications systems in two major ways. The first is by upgrading narrowband communication—mainly voice calls over radio. This is what Louisiana has done and what Australian states are working towards.

In both countries, radio voice communication continues to play a critical role in keeping public safety officers in touch, particularly in times when demand for availability is high and urgent. To add to that, both countries are aiming to give first responders access to mobile broadband data while they are working.

This technology would allow emergency services to, for example:

- Check live maps, building plans, fingerprint scans, biometric data and facial recognition.

- Access databases and records, including medical records.

- Access surveillance video and tactical video.

- Monitor vehicles.

- Monitor a patient's vital signs.

In 2011, the Australian Government established a Public Sector Mobile Broadband Steering Committee to guide decisions about the broadband needs of emergency services.

In 2013, Federal Parliament's Joint Committee on Law Enforcement released a report on its inquiry into Spectrum for public safety mobile broadband.[5] It recommended the Minister for Broadband, Communications and the Digital Economy issue a Ministerial Direction to the Australian Media and Communication Authority (ACMA) to allocate 20MHz of contiguous spectrum in the 700MHz band for a public safety mobile broadband network, and that the Government should secure priority access to an additional 10MHz of spectrum in the 700MHz band for public safety purposes.

This differed to the ACMA's decision to allocate 10MHz of the 800MHz band, as well as 50MHz of spectrum in the 4.9GHz band. At the time of writing, the committee's recommendations were still being considered.

The Attorney-General's Department, in its submission to the inquiry, supported the call for public safety agencies to have mobile broadband capabilities.

Part of the debate around allocating spectrum to Australian emergency services has centred on how much of it first responders need to operate day-to-day and during a disaster, and whether enough spectrum should be allocated to cover a 'rare contingency', such as a terrorist attack on a major city.

The ACMA has argued this 'rare contingency' capability is unnecessary and that there are other ways to access spectrum when it is needed. Others have argued it should form part of the new allocation.

The spectrum is valuable. As Australia's television networks switched from analogue to digital technology, some of the nation's 700MHz band opened up. When it did, three companies, Optus Mobile, Telstra and TPG Internet, paid close to $2 billion for a piece of it, and of the 2.5GHz spectrum (which became available for different reasons).

Meanwhile, Australian states are working towards better narrowband systems that will allow emergency personnel to communicate directly among agencies and jurisdictions. Alongside this work, the ACMA has been re-planning the 400MHz band to relieve congestion and to provide a dedicated, harmonised government radio segment. In heavily congested areas, the ACMA intends to finalise transition to the new arrangements by the end of 2015, and by the end of 2018 elsewhere.

In September 2013, the Queensland Government announced an enhanced digital radio voice and narrowband data communications network for the state, worth $457 million.[6] The Queensland Government plans to begin the project in Brisbane, the Gold Coast and Cairns and roll the network out across the rest of the state over time. It is to provide improved communications security and interoperability between

5   Spectrum for public safety mobile broadband. *At: www.aph.gov. au/Parliamentary_Business/Committees/Joint/Law_Enforcement/ Completed_inquiries/2010-13/spectrummobilebroadband/index.*

6   Queensland Government media release. *At: http://statements. qld.gov.au/Statement/2013/9/2/wireless-network-gets-everybody- talking/.*

public safety agencies and the G20 Leaders' Summit in 2014 will be among its first tests.

Around the same time, the Victorian Government announced it would begin a trial of its Emergency Services Integrated Communications project.[7] The project aims to allow Victorian emergency services organisations to communicate with each other on a common channel, from any device to any device.

The NSW Telco Authority recently reviewed the state's mobile radio network infrastructure with a view to rationalising it and improving services. At the time of the review, there were 77 agencies operating either fixed or mobile radio infrastructure, 16 of which also used the shared Government Radio Network, according to the Telco Authority website.

Mr Mitchell said although the Louisiana Wireless Information Network was 'finished' in January 2012, it would never be completed. 'We're always continuing to work on improving it. If we can add coverage somewhere - changing one tower to a higher tower – we always try to improve the coverage,' Mr Mitchell said.

The biggest challenge in establishing the network among its users was their agreement to become a part of it, he said. 'Essentially, every fire department, every police department, every sheriff's agency, they have their own radio system.

'So, when you ask them to come to a statewide radio system, you're basically asking them to give you trust that it's going to be operational, that you're going to meet their needs and you're going to design it for what their particular issues are,' he said.

Mr Mitchell said several factors helped in this regard. One was being able to guarantee in-building penetration for 95 per cent of users, another was the state's decision to foot the operational bill and scrap user fees that agencies had previously been asked to pay to join the old analogue network. The old network had just 10 000 users – only 10 per cent were from local agencies such as city police or fire departments.

Developing relationships was critical to forming the network, he said. 'We went from region to region to talk about what the benefits were. We have a very responsive staff. If anyone called – and even today when they have coverage issues – we always try to send technicians to those areas,' Mr Mitchell said.

'We're not at 100 per cent of all of our first responders. We don't have every agency on there. There are still some agencies that have their own capabilities and their own networks – although we do have ability to talk to those other networks. We just have to use different technology for that,' he said.

Euan Ferguson, CFA Chief Officer, Craig Lapsley, Fire Services Commissioner Victoria, James Esposito, New York City Fire Department, Brant Mitchell, Shane Wright Chief Officer, Metropolitan Fire & Emergency Services Board.

In March 2013, Mr Mitchell spoke at The Association of Public-Safety Communications Officials Conference in Adelaide. He also visited Melbourne, where he spent some time with Victorian firefighters and with the Australian Institute of Emergency Management.

'I can't say enough about how well organised and equipped and knowledgeable that whole group is,' he said.

'The way they do their training is very similar to ours. Their issues are very similar to ours as well, it's just different aspects of how we do things. Overall there are a lot of similarities.

'Their hazard library was really interesting and the website that they have, with all the different hazards where you can go see frequency and type that has struck Australia, was a very nice tool.'

He said the Memorandum of Understanding (MoU) between Australia and the USA on emergency management co-operation was very helpful. At the time of writing, Mr Mitchell was involved in competing for a maritime security grant. He said, if successful, this project was something he would like to involve Australia in. Having the MoU in place meant that the relationship to work together had already been established, he said.

Articles by Kate Lahey reflect the emergency management agreement of co-operation recently renewed between Australia (through Attorney-General's Department, Emergency Management Australia division) and the United States of America (through the Federal Emergency Management Agency).

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7   Victorian Government media release. *At: www.premier.vic. gov.au/media-centre/media-releases/7831-australian-first-for-victorian-emergency-services.html.*