Whole of Government Plan for Public Protection and Disaster Relief Radio Communications

Emergency Telecommunications Services Steering Group (ETSSG)

April 2010
## Version History

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<th>Release</th>
<th>Status</th>
<th>Date</th>
<th>Author(s)</th>
<th>Description of Release</th>
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<td>v 0.1</td>
<td>Draft</td>
<td>15.05.09</td>
<td>Bill Deverall</td>
<td>Initial circulated draft based on simplified text and incorporation of Consultation feedback comments.</td>
</tr>
<tr>
<td>v 0.11</td>
<td>Draft</td>
<td>25.05.09</td>
<td>Bill Deverall</td>
<td>Revised clean draft with Ian Rae’s corrections.</td>
</tr>
<tr>
<td>v 0.15</td>
<td>Draft</td>
<td>23.06.09</td>
<td>Bill Deverall</td>
<td>Revised clean draft with Ross Barr’s corrections.</td>
</tr>
<tr>
<td>v 0.2</td>
<td>Draft</td>
<td>18.08.09</td>
<td>Alan Jamieson</td>
<td>Revised draft with mark-ups</td>
</tr>
<tr>
<td>v 0.25</td>
<td>Draft</td>
<td>19.08.09</td>
<td>Alan Jamieson</td>
<td>Addition of amendments from Ian Rae and Ross Barr to v 0.2.</td>
</tr>
<tr>
<td>v 0.3</td>
<td>Draft</td>
<td>17.09.09</td>
<td>Alan Jamieson</td>
<td>Revisions agreed at 14th WG 3 meeting and further up-dates</td>
</tr>
<tr>
<td>v 0.4</td>
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<td>19.11.09</td>
<td>Alan Jamieson</td>
<td>Revisions agreed at 15th WG 3 meeting</td>
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<tr>
<td>V0.5</td>
<td>Draft</td>
<td>23.03.10</td>
<td>Steve Dixon</td>
<td>Revisions as per structure agreed by ETSSG subgroup</td>
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<tr>
<td>V0.6</td>
<td>Draft</td>
<td>30.03.10</td>
<td>Steve Dixon</td>
<td>Amendments after working group comments</td>
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<tr>
<td>V0.7</td>
<td>Draft</td>
<td>21.04.10</td>
<td>Steve Dixon</td>
<td>Amendments following ETSSG comments</td>
</tr>
<tr>
<td>V1.0</td>
<td>Final</td>
<td>28.04.10</td>
<td>Ross Barr, Shona Elgar, Richard Harkett</td>
<td>Amendments following ETSSG comments</td>
</tr>
<tr>
<td>V2.0</td>
<td>Final</td>
<td>3.05.10</td>
<td>Ross Barr, Shona Elgar, Richard Harkett</td>
<td>Amendments following ETSSG comments</td>
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<tr>
<td>V2.1</td>
<td>Final</td>
<td>10.05.10</td>
<td>Ross Barr, Shona Elgar, Richard Harkett</td>
<td>Amendments following feedback from central agencies</td>
</tr>
<tr>
<td>V2.20</td>
<td>Final</td>
<td>13.05.10</td>
<td>Ross Barr</td>
<td>Document finalised.</td>
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Executive Summary

Introduction
This document describes the recommended approach for future development and deployment of radiocommunications used by Public Protection and Disaster Relief (PPDR) agencies.

The New Zealand Government has directed that a whole-of-government approach be adopted for PPDR communications. The intent of this approach is to enhance the interoperability of communications across PPDR agencies and to enable efficiencies in the use of financial and other resources such as network assets and the radio spectrum. To strengthen and increase the effectiveness of PPDR agencies the plan includes the development of technical standards and standard operating procedures for all agencies that are either primarily responsible for providing emergency services or are very closely aligned with those that do. The agencies that are currently recognised as PPDR agencies include Enforcement agencies, First Responder agencies and Support agencies. The full list of agencies can be found in Section 2.4. The plan allows for the incremental migration of all qualifying agencies to a land mobile radio network, over a measured 15 year time period.

Background
The current approach used in New Zealand to manage emergencies and the recovery from disaster events is presented in the National Civil Defence Emergency Management (CDEM) Plan. The CDEM Plan lays out the methodology, command structures and responsibilities of agencies for the anticipation and management of civil defence emergencies and recovery from disasters. It includes a systems approach for managing incidents known as Co-ordinated Incident Management System (CIMS).

Wide consultation across government and the private sector found that a unified interoperability plan and command structure covering all PPDR agencies and the different types of operation currently does not exist. A variety of disparate procedures and processes have been put in place over time to improve cooperation and coordination of activities between PPDR agencies. These plans and structures operate as and when required to cover PPDR activities, both routine and extraordinary. Plans continue to be developed, often based on experience gained from exercises but also from lessons learnt in actual emergency events in New Zealand and internationally. Nevertheless, this approach can be described as being essentially an ad hoc response to needs as they become apparent.

Currently, New Zealand’s PPDR radiocommunications are based mostly on analogue systems, some of which are nearing obsolescence. Over time it is anticipated that as analogue equipment becomes obsolete it will be replaced by digital equipment. The OECD is leading the transition towards more secure encrypted, feature rich digital services. As digital capabilities evolve, the equipment used today will be unable to deliver sufficient capacity and features to support the applications required in the future. (e.g. multi-media applications and video services, as required for ambulance or fire services to remotely view emergency situations).

Outline of Approach
The current analogue based networks used by PPDR agencies in New Zealand are proving unable to ensure adequate agency interoperability. A number of benefits have been identified for moving to a more reliable and interoperable digital PPDR network including:

- **Risk avoidance** – avoiding the potential risks of failing legacy analogue systems.
- **Operational** – improving the delivery and effectiveness of frontline activities.
Social - reduced economic impact of incidents (including crime, accidents and fire) and increased public trust and confidence in emergency services.

Strategic and Communications – improved interoperability, increased ability to publish information to the media and increased effectiveness of communication between agencies.

Financial - cost avoidance in the future as the current network becomes increasingly difficult to maintain. Potential cost reductions from shared infrastructure due to consolidation of networks and other IT communication costs.

An effective PPDR radiocommunications network requires the development of base infrastructure, technical and operational interoperability standards, practices and procedures for all qualifying PPDR agencies.

This plan envisages that the PPDR radiocommunications network will display key characteristics in order to enable it to enhance interoperability and the effectiveness of communications of PPDR agencies as well as to enable efficiencies. These key characteristics are; the network is:

- Developed for the Whole-of-Government, operating within the governance of a multi agency steering group.

- Based on the NZ Police Replacement Radio Network with the Police taking the lead role in the day to day operation of the initial network. Police are the largest user of the network, are operating it in some regions today; and have the appropriate skills.

- Encompassing the concept of a “network of networks”. This enables agencies and their staff to interconnect across each others networks and from handset to handset in the field.

- Containing gateways to other networks where required as well as to other networks used for particular PPDR applications e.g. the networks serving the Department of Conservation’s conservation estate and the Ministry of Civil Defence and Emergency Management and Territorial Authorities.

- Providing opportunities to interface with commercial service provider networks.

The Plan is based on a fourfold approach:
The key principles driving the plan are the US Department of Homeland Security Interoperability Principles which outline the critical success factors of the Interoperability Continuum:

1. Governance.
2. Standard operating procedures.
3. Technology.
4. Training and exercises.
5. Usage.

The NZ Police Replacement Radio Network (RRN) will be used as the foundation backbone for the Whole of Government Radio Network (WGRN), to support the whole-of-government plan for PPDR communications. It is currently being constructed to the APCO P25 standards to meet the narrowband voice and low speed data requirements of Police and NZ Fire Service, in alignment with the e-GIF framework requirements.

|----------------|-------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------|
| Governance     | - ETSSG\(^1\) provide oversight  
- Police lead RRN development  
- Police lead WGRN          | - ETSSG provide oversight  
- Police lead RRN development  
- Dedicated WGRN steering group | - Dedicated WGRN steering group established  
- Agencies join steering group as they access |

\(^1\) Emergency Telecommunications Services Steering Group (ETSSG)
|-----------|---------------|----------------------------------------|------------|
| **Standard Operating Procedures (SOPs)** | - Lack of consistent SOPs across agencies  
- Agency SOPs do not align with CIMS | - Core SOPs applicable to all agencies  
- Some SOPs unique to specific agencies  
- Compliance with CIMs by all agencies | - SOPs flexible to allow for mix of technologies. |
| **Technology** | - Majority analogue network  
- Some digital use on Police RRN  
- Variety of terminals/handsets used  
- Wide and broadband access via commercial networks  
- Some spectrum allocated | - Police RRN expands nationally  
- PPDR agencies join WGRN  
- Increased standardisation of terminals/handsets  
- Alignment of agencies spectrum allocation requirements and efficiency of spectrum use  
- Desired usage for wide and broadband purposes will be assessed at a later date as the WGRN network progresses | - Early adopters and enforcement agencies join WGRN first  
- Ad hoc transition for other agencies as they are able  
- Wide and broadband access continues via commercial networks |
| **Training and Exercises** | - Agencies undertake training for own staff  
- Interagency exercises led by appropriate agency | - Agencies continue training for own staff  
- Scope of interagency exercises broadened | - Greater emphasis on the role of communications during exercises  
- WGRN exercises expand as agencies join network |
| **Usage** | - ‘Business as usual’ activities by agencies provide the basis for handling interagency major events and emergency situations  
- Routine activities used to test equipment and to refine standard procedures | - Narrowband network to provide coverage of approximately 90% of the North Island and 70% of the South Island geographical area | - Early adopters and enforcement agencies join WGRN first  
- Ad hoc transition for other agencies as they are able |
1.1 Resources Required to Complete Whole of Government PPDR Capability

The next phase of this PPDR interoperability process includes clarification of specific resource requirements. The development of a reliable estimate will require a more detailed understanding of requirements for each agency. Furthermore, the experience gained from the first stages of the roll-out of the Police RRN network will facilitate more accurate estimations of the likely cost structure to implement the WGRN. The next phase will include preparation and implementation of the work programme, including the preparation of integrated plans for PPDR agencies to join the WGRN.

Indicative Timeframe to Achieve Whole of Government PPDR Capability

Timeframes for transition to a whole-of-government narrowband PPDR network are linked to the timeframes for the approval and implementation of RRN and the position of individual PPDR agencies in their respective investment cycles. The following diagram outlines the approximate agency migration timing and illustrates how network capacity increases as agencies join the network. Coverage and functionality may also increase over time.

Next Steps

The next step involves the implementation of the full programme including developing a detailed work programme that meets the requirements identified in this plan.
Introduction

Background
Under the National Civil Defence and Emergency Management Plan (CDEM), all government agencies have responsibility for ensuring that under emergency conditions, or in the event of natural disasters, the functions of government continue and that a level of service remains available.

The New Zealand Government has directed that a whole-of-government approach is to be adopted for the development of PPDR communications. The purpose of this approach is to provide a roadmap for the development, use and governance of PPDR communications in New Zealand.

Purpose
This document presents the recommended plan for future development and deployment of interoperable radiocommunications used by PPDR agencies in New Zealand.

This plan outlines the need to move from a complex interoperability environment to a seamless system, describes the intent to move PPDR radiocommunications from an analogue to a digital environment, and examines how this will occur.

This plan builds on existing capability and takes guidance from international trends in public safety and emergency management, while ensuring that a New Zealand appropriate focus is retained. This includes the preparation of technical standards and standard operating procedures to enhance interoperability between PPDR agencies.

The intent of the plan is to enhance the effectiveness of communications across PPDR agencies, and to enable more efficient use of financial and other resources such as network assets and the radio spectrum. This will support resilient and collaborative communications in the event of emergency and disaster recovery incidents, while also greatly benefiting the routine activities and interactions of PPDR agencies.

Scope of this Plan
This document is the key deliverable of Phase II of the ETSSG work programme to develop and deploy a whole of government approach for PPDR communications. The phases of this programme are:
This document outlines the current and desired states for PPDR radiocommunications and provides direction as to the future development of the infrastructure. This plan defines the high level approach and identifies key issues and their likely solutions. It is not intended to show implementation activities as part of a detailed work programme. The work programme will form part of the next phase.

In this Plan interoperability refers to the ability of public safety agencies to talk across disciplines and jurisdictions via radiocommunications systems, exchanging voice and/or data with one another on demand, in real time, when needed, and as authorised. Interoperability needs to encompass successful interagency communication during on ground, major incident and major disaster situations.

Out of Scope

There are also a number of organisations that provide commercial services resembling some classes of PPDR functions (e.g. alarm monitoring and security companies). It is not envisaged that these organisations will become qualifying PPDR agencies and therefore they are not included in the scope of the whole-of-government PPDR radiocommunications interoperability plan.

Also excluded from the scope are:

- Radiocommunications networks and facilities which have standards set internationally (e.g. maritime and aeronautical mobile activities).
- Radio spectrum allocation which remains the domain of the Ministry of Economic Development (MED).
- Non radio communications interoperability issues.
## The PPDR Agencies

PPDR agencies that are potentially qualified to join a PPDR radiocommunications network can be categorised as enforcement agencies, first responder agencies, and support agencies. Examples of these agencies, with an outline description of their roles in dealing with public safety services are outlined below.

<table>
<thead>
<tr>
<th>PPDR Enforcement Agencies</th>
<th>NZ Police</th>
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<tbody>
<tr>
<td>Those agencies that act to ensure law and order or provide specialist services in enforcing the law.</td>
<td>NZ Customs Service</td>
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<td></td>
<td>NZ Fisheries</td>
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<td></td>
<td>Ministry of Agriculture and Forestry (MAF) – Biosecurity</td>
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<td></td>
<td>Aviation Security (Avsec)</td>
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<th>PPDR First Responders</th>
<th>NZ Police</th>
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<td>Agencies that provide services in the field as a first response to emergencies</td>
<td>Ambulance Services</td>
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<td></td>
<td>NZ Fire Service</td>
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<td></td>
<td>National Rural Fire Authorities</td>
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<td></td>
<td>Volunteer organisations (e.g. civilian search &amp; rescue organisations, Coastguards)</td>
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<td></td>
<td>Airport Fire Services</td>
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<td></td>
<td>Maritime NZ (in conjunction with CDEM Groups for certain classes of oil spills)</td>
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<td></td>
<td>NZ Defence Force (within their specific areas of interest)</td>
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<td></td>
<td>Department of Conservation (DOC) (within 1km of the conservation estate)</td>
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<tr>
<th>Support Organisations</th>
<th>CDEM Groups and Territorial Local Authorities</th>
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<tr>
<td>Agencies that provide specialised resources and services in the management of and responses to emergencies</td>
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<td></td>
<td>Ministry of Health</td>
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<td></td>
<td>District Health Boards</td>
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<td></td>
<td>Maritime NZ</td>
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1.2 Consultation

ETSSG has undertaken broad consultation on this plan including with the commercial sector.

The membership of the ETSSG includes all of the key government agencies with an interest in PPDR communications, including the Ministry of Economic Development and the Department of the Prime Minister and Cabinet.

To assess the current status of PPDR communications and interoperability in New Zealand, a series of workshops were held across key agencies, including NZ Police, New Zealand Fire Service (NZFS), Ambulance Services, New Zealand Customs Service, Ministry of Fisheries and Ministry of Civil Defence and Emergency Management (MCDEM). The workshops held by NZFS, Ambulance and MCDEM, in particular, were geographically widespread and gathered input from across the country.

Input has also been sought from commercial operators in the telecommunications and data network industries.

Feedback from the consultation was supportive. Key stakeholders supported the choice of APCO P25 technical radio standard and agreed that interoperability was an important issue requiring resolution. Some issues raised included:

- A strong theme from government and first responder agencies was the necessity to ensure all key agencies were engaged in the plan and form part of ETSSG decision making.
- A number of technical issues were raised by Territorial Local Authorities, commercial organisations and enforcement agencies which are best responded to in the next stage of work.
- Telecommunications companies raised issue with the assumption in the plan that commercial networks were not appropriate for core PPDR communications needs. This plan does not rule out the use of commercial services for the provision of PPDR broadband applications – although it recognises that providing core PPDR services via commercial networks has created issues when applied internationally.

This feedback has been incorporated into this plan and responded to where appropriate. As a result of public consultation, this document has been amended to better describe the desired state of PPDR radio communications and transition from the current state has been further detailed.
Current Status of PPDR Interoperability

Introduction

The current approach used in New Zealand to manage emergencies and the recovery from disaster events is presented in the National CDEM Plan. The CDEM Plan lays out the methodology, command structures and responsibilities of agencies for the anticipation and management of civil defence emergencies and recovery from disasters. It includes a systems approach for managing incidents known as Co-ordinated Incident Management System (CIMS).

Wide consultation found that a unified interoperability plan and command structure covering all PPDR agencies and the different types of operation currently does not exist. A variety of disparate procedures and processes have been put in place over time to improve cooperation and coordination of activities between PPDR agencies. These plans and structures operate as and when required to cover PPDR activities, both routine and extraordinary. These continue to be developed, often based on experience gained from exercises but also from lessons learnt in actual emergency events. Nevertheless, this approach can be described as being essentially an ad hoc response to needs as they become apparent.

The current state can be considered in terms of the United States Department of Homeland Security “Interoperability Continuum” methodology. This has been developed as a tool for improving public safety communications and facilitating interoperability between PPDR agencies in the US. The framework of the Interoperability Continuum has been adapted and used to assess the status of communications interoperability between PPDR agencies in New Zealand, with particular regard to the critical success factors identified within the Interoperability Continuum of:

1. Governance.
2. Technology.
4. Training and exercises.
5. Usage.

The approach is to ensure that each of the five principles above is covered off by a selection of standards such as e-GIF and APCO P25, standard operating procedures and the governance approach. This principle driven approach is illustrated in the following diagram.
Governance

The ETSSG was established in 2006, part of its brief was to develop an approach to enhance the integration, performance and reliability of PPDR radio communications and improve PPDR interoperability. ETSSG has separate working groups dealing with the: development of government-wide technical interoperability standards; allocation of emergency services spectrum; development of a PPDR radio communications strategy; and establishment of a long term Emergency Call Services strategy.

The Police RRN Programme and related Steering Committee were established in 2008 to focus on the development of a digital radio network for operational policing purposes and migration of Police onto that network, initially in the Wellington, Auckland and Canterbury districts, followed by the rest of New Zealand (subject to additional government funding). This committee includes representatives from Police, State Services Commission, Treasury and the relevant PPDR agencies.

ETSSG has to date provided oversight to ensure that a Government-wide perspective has been maintained during development of the Police RRN programme.

Technology

The existing separate PPDR radio network infrastructures, with differing functional capabilities and coverage, utilise a range of often incompatible analogue radio technologies and frequency assignments for each agency. This makes it difficult to achieve interoperability at the operational level.

PPDR radiocommunications applications are still largely 'narrowband' comprising voice communications with limited low speed data and status messaging. This focus on narrowband applications can be expected to change over time as converging digital technologies produce new opportunities for more versatile and sophisticated communications networks. New technologies for wideband and broadband PPDR applications, such as streaming video, are being developed in various international standards organisations.
Extending PPDR radiocommunications beyond voice into wideband and broadband data applications is likely to create demands that the existing analogue network is unable to meet. This will include demands for additional radio frequency spectrum allocations. Spectrum requirements for wideband and broadband applications will need to be assessed and solutions found that take into account international developments and the need for access to radio equipment of a standard consistent with the professional demands of PPDR applications.

Current analogue technology also has significant security and encryption inadequacies for those services which require secure communications.

**Standard Operating Procedures**

In addition to the technical considerations, consultation highlighted that current PPDR radiocommunications users have concerns regarding the need for consistency in adherence to standard operating procedures across agencies. It was found that the SOPs of agencies do not align with CIMS, and CIMS itself is sometimes misunderstood or not applied correctly. This leads to some weaknesses in managing different layers of incident management as incidents grow in scale.

Under present arrangements based on individual radio network structures and frequency assignments for each agency, inter-agency Incident Ground Communication which allows seamless communication between different agencies at incidents is difficult at best and frequently is virtually impossible. Generally, no more than any two participating agencies – and often not the principal ones - have the ability to communicate directly with each other. Incompatibility of radio equipment and frequency assignments and inability to switch to what would otherwise be suitable, interoperable radio channels means Incident Ground Communication is seldom effective. These difficulties become heightened for activities such as rural fire operations in remote locations.

It is also apparent that incident control communications is often overly reliant on face-to-face communication between the agency Scene Commanders, which can lead to coordination and response issues. A more consistent approach across agencies to the use of liaison channels with plain speech would assist in improving communications between Scene Commanders and their operational staff.

Moreover, the approach of ad hoc stand-alone network strategies and planning by agencies to date seriously impacts on the ability to communicate efficiently, reliably and safely in, for example, Incident Ground Communications.

**Training and Exercises**

Training and exercises presently occur at agency and joint exercise levels. The main focus for training and exercises is currently on regular desktop exercises for either single or multiple agencies. Agency level training occurs for staff for day to day purposes. Interoperability training is undertaken as part of Joint Operations Group (JOG) exercises which occur at regular intervals, led by the most appropriate agency depending on the scenario e.g. Police lead terrorism exercises, Fire lead hazardous chemical exercises.

**Usage**

CIMS provides the basis for current usage. As described earlier the multiple analogue systems used by agencies currently have limited interoperability. The only established interoperability is between Police and the NZ Fire Services which share a network and frequencies. For certain purposes NZ Police, NZ Fire Service and NZ Customs and Fisheries also share a network and specified frequencies.
Conclusion

Whilst the PPDR agencies continue to provide a safe service and operate effectively there is a clear opportunity to improve from the status quo. Interoperability with PPDR agencies in New Zealand is currently limited by a number of factors, including:

- Analogue equipment with limited functionality and with variations of performance across agencies.
- Inadequate encryption and security capability with existing equipment.
- Limited commonality in frequency bands.
- Standard operating procedures that are not used consistently and contain too many variations across agencies to enable true interoperability.
- Limited existing interoperability established between agencies.

The next section considers the desired state of PPDR interoperability.
Desired State of PPDR Interoperability

Introduction

Throughout the consultation the benefits for the PPDR agencies for radiocommunications and the desired level of interoperability were documented. These benefits have been used to establish objectives for realising enhanced interoperability between PPDR agencies in New Zealand.

Risk avoidance – avoiding the potential risks of failing legacy analogue systems.

Operational - directly impacting the delivery and effectiveness of frontline activities including maintaining the existing radio capability, more reliable communications, improved operational effectiveness and efficiency, and improved safety.

Social - providing wider social benefits to NZ including reduced economic impact of incidents (including fire, crime and accidents), greater responsiveness to victims, and increased public trust and confidence in emergency services.

Strategic and Communications - including establishing the foundation for Government-wide digital radio for wider public protection and disaster relief and increased effectiveness of communication between agencies (interoperability).

Financial - cost avoidance in the future as the analogue networks becomes increasingly difficult to maintain and potential cost reductions sharing infrastructure and hence costs.

Governance

It is important that the ETSSG continue in its whole of government oversight role as the PPDR programme continues. The Police digital radio network has become the base infrastructure to support the WGRN PPDR requirements. To enable leadership and governance for the continuing evolution of the WGRN a separate governance group has been proposed. Membership of the WGRN steering group will be made up from participating agencies executive teams and some representatives from central agencies.

Technology

Interoperability requires key technology issues to be resolved and for agencies to take a co-ordinated and standards based approach to equipment purchase and use.

The foundation WGRN has been designed to cater for narrowband PPDR applications with the ability to expand to cater for use by other PPDR agencies. The Police RRN network provides an ideal opportunity for other agencies as it can provide the technological ‘backbone’ from which a national WGRN network can be built.

The radio network has been designed using the North American open standard for narrowband digital Land Mobile Radio Networks - APCO P25. In contrast to proprietary systems, open standard based radio networks can be constructed using equipment sourced from multiple vendors provided the equipment complies with the relevant standard, therefore allowing procurement choice and technology future proofing. APCO P25 has been approved as an e-GIF standard and will require updating as technology and usage changes over time.

Detailed technical issues for narrowband applications need to be managed by the appropriate ETSSG working groups.
Standard Operating Procedures

Effective alignment requires appropriate technical standards. Technology alone will not lead to effective interoperability if agencies do not align their operational behaviours.

Consultation has made it clear that there is significant divergence in current SOPs across agencies. Whilst a standard and consistent set of SOPs would be ideal – due to operational differences and regional variations this is not currently practical. Therefore the desired state is that there is an increased level of formality around joint agency SOPs and that use is more rigorously encouraged.

The development of the SOPs will need to address these specific issues:

- The assignment of sufficient, dedicated frequencies to enable interoperability in a mixed digital and analogue environment, both inside and outside of the normal coverage areas of the network.
- The need to enable analogue units to work across the digital network, and digital radios with backward compatibility for analogue operation.
- The ability for users to create radio channels dynamically inside and outside the network on an “as required” basis rather than as a pre-planned activity requiring control centre initiation.
- Processes enabling communications with users who do not normally communicate with or through a regional communication centre, e.g. Customs and Fisheries, and those groups not engaged for the time being as a WGRN user, e.g. DOC and MCDEM.
- Processes around the set up and appropriate use of encryption where required.
- Incident Ground interoperability in remote locations, especially for rural fire operations. This focus will also address meeting interoperability needs during the initial phases of the WGRN installation roll-out.

Training and Exercises

Training and exercises are recognised as an important issue where interagency co-operation is essential and could be improved. Specific areas of desired improvement include:

- Improve the dissemination of information on the capabilities of communications systems.
- Further emphasise the role and importance of communications including regular testing of capabilities, the adequacy of SOPs and other interoperability conditions across agencies.
- Expanding the scope of exercises from civil defence training to include new disaster and threat scenarios. This will test current risk assessment by agencies and test interoperability across a wider set of operating conditions.

Usage

The network needs to provide consistent, reliable and extensive coverage and capacity across a wide geographical spread. The intent is that the narrowband network when fully deployed will use radio repeater equipment at approximately 330 existing sites to provide resilience and coverage of approximately 90% of the North Island and 70% of the South Island geographical area. By comparison, commercial radio networks operated by the telecommunications carriers cover 97% of the populated areas but only about 30% of the New Zealand geographical area.
Ongoing ‘business as usual’ activities by agencies provide the basis for handling major interagency events and emergency situations. Routine activities can be used to test equipment and to refine standard procedures.

Desired usage for wide and broadband purposes will be assessed at a later date as the WGRN network progresses.
Strategic Approach

Introduction
Sections 5 and 6 set out how PPDR radiocommunications can transition from its current state as described in section 3, to the desired state outlined in section 4.

To guide the strategic approach the ETSSG has adopted the United States Department of Homeland Security “Interoperability Continuum” tool in the preparation of the recommended PPDR Radio Communications plan. The adoption took into account operating conditions for PPDR agencies in New Zealand as well as differences in structure, size and scope of New Zealand PPDR agencies when compared with their counterparts in the US.

Governance
As mentioned in section 4.2 the desired state will be the use of the Police digital radio network as the base infrastructure for meeting the WGRN PPDR radio communication requirements. As the radiocommunications base infrastructure is built, Police as the lead agency will be responsible for the operational day to day activities.

It is proposed that the strategic leadership and direction during the implementation of the programme will be carried out through the WGRN Steering Group. Establishing the WGRN Steering Group in the implementation phase, allows for continuity beyond the delivery of the base infrastructure for Police by continuing to then manage the future WGRN PPDR activities.

The technical issues that arise, will need to be addressed by experts in that field, to ensure a “Whole of Government” approach, a technical representative from all the participating agencies will be identified and available to address collaboratively issues as they arise. These resources will be required on an ongoing basis.

The strategic direction will take into account the delivery of the voice and limited data capabilities for the existing and early adopter PPDR agencies in the short to medium term. The line of sight and development of requirements for extended data capabilities to allow more sophisticated technology delivery in the field or rural areas in the medium to long term will also be progressed. Any future strategic global changes to radiocommunications activities will also become line of sight for the WGRN steering group.

The plan therefore ensures that there is sufficient whole of government oversight over the PPDR programme and that governance incorporates the needs of central agencies and the individual operational agencies and services. The governance structure also ensures that technical and delivery issues are overseen by those with both sufficient technical knowledge and clear interests in its effective delivery.

Technology
Technology covers the network standards, bandwidth, spectrum and coverage requirements of PPDR radio communication services, together with their means of delivery for narrowband, wideband and broadband applications. The intention is to deliver enhanced voice and limited data applications (narrowband) in the early stages of the project with expansion to wide and broadband as demand, spectrum and technology allows.

Technology decisions are driven by two significant factors:

1. The use of the Police RRN network as the ‘backbone’ of the system; and
2. The adoption of the APCO P25 standard and its further integration into e-GIF standards.

Project 25 (P25), APCO-25 or APCO P25 refers to a suite of standards for digital radio communications for use by federal, state/province and local public safety agencies to enable them to communicate with other agencies and response teams in emergencies. The standard operates in North America, Australia, Singapore and Russia. The APCO P25 standard was preferred over other options as it:

- Had the best benefits to costs ratio (from NZ Police RRN Phase 1 business case).
- Is compatible with New Zealand's current PPDR VHF and UHF frequency plans and supports both analogue and digital modes. This allows it to interface with legacy VHF networks and analogue systems such as those used currently by Civil Defence organisations.
- Is in alignment with the Government’s e-GIF initiatives.

Technology issues are covered in detail in Appendix 1. Issues requiring attention include:

- Network standards.
- Bandwidth.
- Spectrum.
- Coverage.
- Mission critical applications.
- Use of commercial networks.
- Encryption and security.

**Standard Operating Procedures**

While the implementation of the foundation WGRN infrastructure by Police for use by the PPDR agencies will provide the technical capability essential for achieving interoperability between the agencies, it is paramount to establish a core set of SOPs for the network. Common SOPs are needed to ensure that not only are the radiocommunications needs of each agency met but also that the goal of interoperability between agencies can be realised especially in view of the following factors:

- Individual agencies will decide on the basis of their own needs and resource availability when to join the network and this may extend over a number of years. Therefore, the SOPs need to take into account that at any specific incident or disaster relief event there may be a mix of network technologies in use by the agencies involved.
- It will take time for the geographical coverage of the digital radio network to equal that provided by the existing analogue Police land mobile radio network. Hence, the SOPs must address the progressive roll-out of the WGRN to ensure the operational needs for interoperability can be realised in those geographical areas where coverage from the network is either yet to be provided or is inadequate.
- Incident Ground Communications place high importance on interoperability between agencies and the SOPs need to ensure the adequacy of communications planning prior to events, scenario planning, asset deployment plans and the preparation of communications plans.
Consequently, the development of a core set of SOPs must be treated as a priority, while taking into account the need to address procedures that will remain specific to single agencies. It is also necessary that all SOPs relating to the emerging WGRN conform to the emergency and disaster event management system set out in CIMS.

Training and Exercises

A formal structured approach to PPDR training and exercises is required. National co-ordination over a wider range of PPDR activities needs to be introduced, including a greater emphasis on assessing communications interoperability. Also, training and exercise activities for PPDR communications purposes needs to take into account Officials Committee for Domestic and External Security Coordination (ODESC) requirements especially in the area of emergency preparedness.

The value of conducting exercises involving a cross-section of PPDR agencies has been well demonstrated by two exercises held during the development of this plan; one involving both international and New Zealand-based participants (Exercise Maru) and the other a multi-agency training exercise in the build-up to deployment of the Project Protector fleet. In both exercises APCO P25 standards and compliant equipment operated very successfully across multiple agencies, including international, in a variety of operational scenarios. These exercises have provided the ETSSG with the confidence to recommend the WGRN rollout. Feedback from exercises will be captured and promulgated.

Usage

Adherence to SOPs, including the introduction of performance measures and compliance reviews, needs to become a matter of course within agencies (in a business-as-usual context) and across agencies, for the full benefits of interoperability to be realised.

Public Protection and Disaster Relief activities have very similar requirements in the New Zealand context (which is not always the case elsewhere). However, it is to be noted that one difference concerns the level of security that is required in the two types of activities.

Daily usage of systems, equipment and procedures on business-as-usual activities lays the groundwork for handling major events and emergency situations. Routine activities can be used to test equipment and to refine standard procedures. Where it is deemed prudent to maintain a store of additional equipment to be used in the event of a large scale emergency, then this equipment should also be used at least occasionally on day-to-day activities and in training exercises, to test the functionality of the equipment and to ensure users remain familiar with its operation.
Transition

Introduction

Transition from the current state to the whole-of-government PPDR network is linked to availability of the core network infrastructure (capacity and coverage), agency funding sources, investment cycle positions, expiry dates of existing commercial agreements, as well as operational and technical requirements. The transition path will be different for narrowband, wideband and broadband capabilities, with the complexity of each transition dependent on the specific applications involved.

Implementation of the foundation narrowband digital radio network is proceeding in stages to mitigate operational and financial risk. The Wellington Police District has already been commissioned, with Auckland and Canterbury scheduled for deployment in time for the 2011 Rugby World Cup. These main metro areas will be followed by the remainder of the country (subject to additional government funding) with completion of the network and migration of Police frontline staff by approximately 2014. In addition to Police, other early adopter PPDR agencies such as the Fire Service, the Ambulance sector, MAF Biosecurity, and NZ Customs have either joined or are considering joining the network over the next 1-2 years as and when they determine and as resources permit. Other agencies will be kept informed and be consulted on key implementation decisions and on progress of the network installation.

Indicative WGRN Timeline

Narrowband Transition

The majority of existing PPDR radiocommunications can be categorised as narrowband. Services encompassed in this transition cover voice communications for command and control including incident ground control communications, and for sending information from operational sites back to a communications centre. Additionally, low level data communications for vehicle status and signalling are part of this transition.

Governance

During transition to full WGRN under APCO P25 standards the governance approach will be as described in section 5.2.
Whole of Government Plan for Public Protection and Disaster Relief Radio Communications.  
April 2010  
FINAL  
Technology  
There are two key mechanisms by which agencies can provide for continuing narrowband interoperability between their APCO P25 digital radios, their own analogue radios that have yet to be transitioned, analogue radios of other agencies with which interoperability is required, and other networks as required. Those key mechanisms are:

1. Compliance with the APCO P25 Common Air Interface (CAI) will enable any P25 portable, mobile or repeater equipment to communicate, provided they use and can switch to compatible frequencies.

2. Gateways to ensure interconnection between the PPDR network(s) and other networks, including legacy analogue networks.

Standard Operating Procedures  
As outlined in section 5.4, there is a clear need for an up-to-date and appropriate set of SOPs which can be used to guide the transition to the digital environment. These SOPs will have to take account of the fact that agencies will transition at different times and will have different operational requirements. SOPs will have to be both consistent enough to ensure interoperability is not lost, whilst flexible enough to meet multiple agency requirements.

Training and Exercises  
Appropriate training and exercises will be required which meet ODESC standards. Formats and approaches for this are yet to be established. Training is being undertaken on an agency by agency basis and future exercises will be co-ordinated by different agencies depending on the exercise scenario, as they are currently.

Usage  
As currently, agency usage of the narrowband WGRN will be a combination of day to day routine use, exercises and training and for genuine emergencies.

The WGRN allows for some more advanced capability than the current analogue systems including some data transfer, encryption and a more seamless interoperability.

Wideband Transition  
Wideband technology will enable agencies to have greater data transfer capabilities and limited photo/video capabilities. Some agencies are currently using services from commercial cellular network operators for PPDR wideband applications that generally are not mission critical. As these applications evolve and begin to assume mission critical status, further research is required in the short-term to identify appropriate strategies for delivering wideband PPDR applications, whether via the WGRN initiative; continued use of commercial networks or a combination of both. The need to develop and support wideband data applications, and the fact that these applications will be more demanding in terms of complexity than corresponding narrowband data services may restrict initial demand by PPDR agencies for wideband capability. It is highly likely however, that over time, agency requirements for wideband (and broadband for that matter) capabilities will increase. It will be a priority for the ETSSG to manage this transition.

Governance  
As agencies transition onto narrowband and the WGRN matures, agency requirements for wideband and broadband functionality will likely increase. The governance structure described in section 5.2 will at this time include all agencies that have transitioned to narrowband and these agencies will be in the best position to guide a further transition into wideband as required (either via WGRN or using commercial networks).
The provision of wideband capability in the WGRN will be more complicated and more expensive than that for the provision of narrowband capability due to technology complexities and spectrum requirements. The technical approach taken will also impact on the overall cost of provision, which if significant may lead to delays in securing funding.

**Training and Exercises**

As with narrowband, appropriate training and exercises will be required which meet ODESC standards. Formats and approaches for this are yet to be established. However it is expected that training will be undertaken on an agency by agency basis and future exercises will be co-ordinated as they are currently.

**Usage**

Wideband provides new categories of functionality currently only available via commercial networks. The use of this functionality will be on an agency by agency basis.

**Broadband Transition**

Development of broadband services will encounter similar complexities and transition issues to those anticipated for wideband services in terms of technology and spectrum availability. However, there should be less of a transition timeframe, given the relative lack of broadband PPDR applications in current use that would require support on an interoperable network.

It is also noted that in the short term broadband applications are likely to be of an ad hoc nature. That is, broadband capability will only be required for special purposes, probably for limited time and at limited locations rather than as a universal capability accessible on demand at all times across a NZ wide network. Although the locations will vary, provided the core of the network provides links between the network nodes, and the major base transmitter sites have sufficient capacity, it will be possible to support ad hoc broadband applications.

Governance, training and usage will remain as described for wideband services.

**Timeframe to Achieve Whole of Government PPDR capability**

Exact timing of transition from analogue to narrowband digital and then into wide and broadband PPDR is not yet known. However, the broad timeframes are well understood with Police having already begun transition, followed by other early adopter agencies and then over time by the remaining enforcement and first responder, and support agencies.

**Narrowband**

Timeframes for transition to the WGRN and its narrowband capability are linked to the timeframes for the funding approval and implementation of the Police digital radio network and the position of individual agencies in their investment cycles.

Police have commenced operational use of the digital radio network with a Specialist Group network capability already established and completion of the greater Wellington district deployment for Police General Duties staff. Additionally, MAF Biosecurity has been provided with a small number of terminals and limited access to the specialist group digital radio network at Auckland Airport as an ‘early adopter’ feasibility study. This has successfully demonstrated the potential of PPDR agencies being connected to the network and highlighted potential areas for service delivery improvement.

Based on experience to date, it is proposed that while Police are establishing the remainder of the foundation radio network infrastructure a subset of the PPDR agencies should commence transition onto the WGRN. This approach balances the requirement for Police to replace its legacy network and initiate the value gained from common capability investment across wider
Government within an acceptable level of operational risk for Police and the transitioning agencies.

It is proposed the early adopter WGRN agencies consist of the core first responders, Police, Fire, Ambulance, with a small number of law enforcement users from agencies such as NZ Customs Service and MAF Biosecurity NZ. These ‘early adopters’ will establish the core WGRN and the majority of services required by other PPDR agencies. Based on recent data, Police, Fire and Ambulance have approximately 70% of all radio devices held by PPDR agencies. An indicative timeline for these early adopter agencies to migrate onto the WGRN has been prepared.

Some PPDR agencies have commenced transition and are already receiving operational services. It is expected that the remaining early adopters will commence migration in 2010 - 2011 and complete their transition in 2014 - 2016. Transition of other PPDR agencies is likely to require up to 15 years taking into account their current levels of operation and funding arrangements as well as their future needs. Therefore, completion of the migration to the WGRN narrowband network may not be fully achieved before 2025.

Wide and Broadband Transition

The addition of a comprehensive wideband PPDR capability through the use of new spectrum and a purpose-built wideband network is dependent on funding and could take some time. However, with agency needs identified and appropriate funding the transition to a limited wideband PPDR capability could be started as early as mid 2011. This is providing commercial service providers have sufficient capacity and coverage to support “mission critical” PPDR wideband services in the appropriate geographical areas.

Based on the use of satellite capacity, broadband capability could be provided quite readily by commercial providers. As with wideband, the provision of a dedicated broadband capability is dependent upon the availability of suitable spectrum, PPDR equipment and funding.

The setting of strategies for the provision of wideband and broadband capability in the network will determine the timeframes for the migration of these applications onto the PPDR network.

Timeframes for transition to a whole-of-government network from reliance on commercial networks for the support of wideband PPDR applications will be dependent upon:

- The technical approach that is adopted for the provision of wideband capability in the whole-of-government network on the one hand and continued use of commercial network capability on the other hand.
- The evolution of the APCO standards to encompass wideband applications.
- Spectrum availability.
- Funding to increase the capacity of the WGRN to cater for higher data volumes.
- The positions of the PPDR agencies in their investment cycles and their contractual arrangements with commercial network operators.

Of these factors, it is the technical approach which is likely to have the greater impact on extending the timeframes for transition.

Resources Required to Complete Whole of Government PPDR Capability

The next phase of this PPDR interoperability process is to clarify specific resource requirements. The development of a reliable estimate will require a more detailed
understanding of requirements for each agency. Furthermore, the experience gained from the first stages of the roll-out of the Police digital radio network will facilitate more accurate estimations of the likely resource requirements and cost structure to implement the WGRN.

The next phase will include preparation and implementation of the work programme, including the preparation of integrated plans for PPDR agencies to join the WGRN.
7 Conclusions and next steps

This document highlights the need for a structured and standards based approach to developing an interoperable PPDR radio communications network.

The plan is based on four foundations:

2. Using the development of the Police RRN as the backbone of a national PPDR service.
3. Taking a phased approach which allows agencies to join as and when able, and evolving from a narrowband to wide and broadband technologies in a structured way.
4. Undertaking pilots and testing the new technology in increasingly broader circumstances.

A number of technical and organisational challenges exist, especially in regards the development of workable and agreed standard operating procedures across multiple agencies. However, solutions to these issues are presented in this plan or will be worked through as part of the more detailed analyses in the next phase.

A major opportunity has presented itself to PPDR agencies in the current development of the Police RRN. This plan is designed to take full advantage of this opportunity whilst ensuring the RRN is sufficiently flexible and that other agencies have sufficient influence on its design to ensure it is fit-for-purpose for the wider PPDR agencies.

It is important that the transition to an integrated digital network is undertaken incrementally over a sufficiently extended time period. This allows PPDR agencies to make adequate preparations to join the network, access the required funding and exit existing provider commitments. An incremental approach also minimises the operational risks of migration by allowing time to test new equipment and standardised procedures with early adopter agencies first.

7.1 Next Steps

Phase III of the ETSSG work programme focuses on implementation. The first step of implementation is the development of a detailed work programme that meets the requirements identified in this plan. It will provide the basis for analysing current and future requirements for government agencies to progress towards PPDR radiocommunications interoperability and to develop long-term plans for their implementation that will include:

A summary of the short, medium and long terms plans of PPDR agencies for radiocommunications systems development and deployment.

An in-depth benchmarking of New Zealand’s PPDR infrastructure, measured against international best practice where possible; otherwise against the standards of leading overseas PPDR agencies.

A SWOT (strengths, weaknesses, opportunities, threats) analysis for current and future PPDR radiocommunications, making use of studies conducted to identify gaps and the need for remedial measures where appropriate.

Further consideration of key interoperability enablers e.g. SOPs, encryption, radio spectrum.
## Glossary

The following terms and acronyms are used in this document:

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>APCO P25</td>
<td>Association of Public Safety Communications (Project 25)</td>
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<tr>
<td>CAI</td>
<td>Common Air Interface</td>
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<tr>
<td>CDEM</td>
<td>Civil Defence Emergency Management</td>
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<tr>
<td>CIMS</td>
<td>Co-ordinated Incident Management System</td>
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<td>DOC</td>
<td>Department of Conservation</td>
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<tr>
<td>e-GIF</td>
<td>Electronic Government Interoperability Framework</td>
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<tr>
<td>ESB</td>
<td>Emergency Services B-Band (138-144 MHz)</td>
</tr>
<tr>
<td>ESC</td>
<td>Emergency Services C-Band (494-502 MHz)</td>
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<tr>
<td>ESD</td>
<td>Emergency Services D-Band (800 MHz)</td>
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<tr>
<td>ETSSG</td>
<td>Emergency Telecommunications Services Steering Group</td>
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<tr>
<td>JOG</td>
<td>Joint Operations Group</td>
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<tr>
<td>MAF</td>
<td>Ministry of Agriculture and Forestry</td>
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<tr>
<td>MCDEM</td>
<td>Ministry of Civil Defence and Emergency Management</td>
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<tr>
<td>MED</td>
<td>Ministry of Economic Development</td>
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<tr>
<td>NZFS</td>
<td>New Zealand Fire Service</td>
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<tr>
<td>ODESC</td>
<td>Officials Committee for Domestic and External Security Co-ordination</td>
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<td>OECD</td>
<td>Organisation of Economic Co-operation and Development</td>
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<tr>
<td>PPDR</td>
<td>Public Protection and Disaster Relief</td>
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<tr>
<td>RRN</td>
<td>Police Replacement Radio Network</td>
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<td>SOP</td>
<td>Standard Operating Procedure</td>
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<tr>
<td>SWOT</td>
<td>Strengths, Weaknesses, Opportunities, Threats</td>
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<tr>
<td>TETRA</td>
<td>Terrestrial Trunked Radio</td>
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<tr>
<td>UHF</td>
<td>Ultra High Frequency (300 MHz to 3GHz)</td>
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<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>VHF</td>
<td>Very High Frequency (30 MHz to 300MHz)</td>
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<tr>
<td>WGRN</td>
<td>Whole-of-Government Radio Network</td>
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</table>
Appendix 1 - Technology Issues

8.1 Other Network Standards

A number of standards were considered. They were either open standards with multiple vendors providing equipment or proprietary standards with only one vendor able to provide equipment for that standard. Proprietary standards were rejected as these would lock New Zealand into only one supplier.

Of the open standards APCO P25 was preferred over the Terrestrial Trunked Radio (TETRA) standard, common in Europe as:

- TETRA operates only on UHF and would require significantly more radio repeater sites to provide the required radio coverage making it significantly more expensive to install a network in New Zealand.
- TETRA is not as internationally compatible with Australia and the United States.
- TETRA does not provide a progressive migration from existing analogue radio systems used by PPDR agencies.

As PPDR agencies commence discussions to join the WGRN, Police will engage in full consultation on methods to achieve maximum technical interoperability with legacy networks that are to remain in use. There is precedence within PPDR agencies where APCO P25 compliant radio technology has been successfully used for approximately five years by both New Zealand Customs Service and limited Police specialist groups.

8.2 Bandwidth

Most current PPDR applications are classified as narrowband applications, being in the main voice and low speed data, and as such are well understood. With the inclusion of the APCO P25 standard within the e-GIF framework, standards and technology issues are well settled for the medium to long term as far as these narrowband applications are concerned, although the continuing evolution of the APCO P25 Standard will need to be managed within the e-GIF context established by Government policy.

8.3 Spectrum

It is expected that narrowband spectrum requirements will be met within VHF and UHF Emergency Service frequency bands, in particular, the ESB band and the ESC band and possible expansion into the ESD band. The final choice of which bands are used will in part be determined by the spectrum available and in part by the type of coverage required.

8.4 Coverage

Narrowband coverage requirements depend on the types of applications as well as on the nature, extent and severity of the incident or emergency events that the PPDR agencies are required to manage. Coverage requirements range from:

- Ubiquitous coverage over most of the geographical area of the country.
- Wide area coverage over the majority of populated areas and connecting traffic routes.
- Specific area coverage to unique geographical areas either for business as usual operational needs or ad hoc temporary requirements for incident coverage purposes.
Whole of Government Plan for Public Protection and Disaster Relief Radio Communications.
April 2010

8.5 Mission Critical Applications

Mission critical PPDR applications are where human life, rescue operations and law enforcement are at stake, and where public safety organisations cannot afford the risk of having either outright transmission failures, unacceptable delays in their transmissions, or where public safety could be compromised through unauthorised interception or eavesdropping. It is recognised best practice for these types of applications, whether narrowband, wideband or broadband, to be supported over purpose-built professional public safety networks dedicated to and engineered for PPDR activity.

While current PPDR wideband applications in New Zealand are not generally classified as mission critical, they are expected to evolve over time into mission critical applications as more reliance is placed upon them by operational staff. Indeed, for law enforcement agencies, some wideband applications involve security and safety of staff. Already there are staff members who are starting to regard these applications as if they were mission critical because of the benefits that are being gained through their use.

8.6 Use of Commercial Networks

Coverage requirements count against the use of commercial networks for PPDR applications, particularly for “mission critical” applications, as they provide coverage based on population. These networks are also unreliable in an emergency as they become overloaded with commercial traffic. The exceptions are for non-mission critical applications and routine day-to-day communications.

The findings of the official inquiry into the London bombings of 2007 are worthy of note, especially in regard to mission critical applications. In the inquiry report, the London Authority drew attention to the conflict that exists between members of the public and PPDR agencies when they are both reliant on using a commercial network during an emergency. Activation of the priority access procedure for the PPDR agencies was found to worsen the situation since victims and survivors were unable to communicate with family and others which caused much distress. In areas where the priority access was not activated, although there was congestion, at least people had the opportunity to call as demand and capacity allowed. The network congestion however forced London hospitals to rely on runners to discover the state of the emergency and the status of emergency Ambulance crews and their patients. The London Authority concluded that it is a paramount requirement for PPDR services to utilise the services of a purpose built interoperable network for mission critical applications.

In the meantime, non-mission critical applications and wideband applications are being delivered over commercial networks with the inherent limitations of coverage being restricted to population centres and key roads and a lower level of security being recognised and accepted. For the time being commercial networks will continue to be used.

Commercial networks can provide valuable support to PPDR agencies by:

- Providing capability to support PPDR applications where a purpose built interoperable PPDR network is not available.
Providing a back-up capability for use in the event of a major failure of the purpose-built PPDR network.

Wideband and broadband coverage requirements will follow in a similar way, although it is expected that coverage requirements will be more restricted than for narrowband applications.

In order to establish whether or not commercial operators in New Zealand can support mission critical wideband PPDR applications, it will be necessary to assess:

- The match between PPDR coverage requirements and the coverage available from the commercial networks.
- Traffic prioritisation and pre-emption protocols for granting priority to PPDR applications during emergency events.
- The ability of commercial networks to sustain extreme traffic loading and call attempts as can occur in emergency situations affecting large gatherings of the public.
- The disaster recovery capabilities of commercial networks.

8.7 Encryption

The use of encryption especially by enforcement agencies in which data streams (including voice) are rendered unintelligible through the use of an algorithm is a requirement of the WGRN technology. Additionally, some agencies transmitting private information of a sensitive nature such as medical reports as a routine part of their normal operations have also expressed interest in the use of end-to-end encryption. The business need is for a common encryption standard that will:

- Protect private and/or sensitive information and maintain confidentiality during reconnaissance/surveillance operations.
- Allow interoperability across PPDR agencies and overseas partners during joint operations.
- Enable agencies to join an exercise at short notice when entering the area of an operation.
  - Promote officer safety.
  - Promote tactical effectiveness in the field.
  - Prevent unauthorised eavesdropping.

Most non-enforcement agencies do not require the added expense or management overhead of encryption. Therefore, the WGRN will be required to support both encrypted and non-encrypted modes of operation. PPDR encryption also needs to ensure it meets all appropriate Government Communications Security Bureau standards.