



Security And Interoperability in Next Generation PPDR
Communication Infrastructures



Project Number: 313296

Deliverable 2.1

SALUS PPDR use cases – Intermediate

Scope	Scheduled deliverable
Lead Beneficiary	Airwave
Dissemination level	Public
Document creation date	27/Nov/2013
Document release date	13/Dec/2013
Contractual Date of Delivery	30/Nov/2013
Version	1.0
Status	Final

Abstract: Deliverable 2.1 describes the SALUS use cases as a result of multiple PPDR user inputs, focussing on maximising the return on investment of their existing networks recognising today's market and financial realities, whilst addressing the pressing future communications needs.

EXECUTIVE SUMMARY

The main objective of this document is to present the interim version of the SALUS use cases developed from the three proposed SALUS scenarios. These use cases will be used to address the needs of the Public Protection and Disaster Relief (PPDR) user community as they migrate into the next generation PPDR network with their continuing exacting voice requirements augmented with ever increasing data needs and multimedia capabilities.

The following three use cases have been developed:

- Scenario 1 – Public order demonstration or riot
- Scenario 2 – Olympic-style sporting event
- Scenario 3 – Heavy flooding due to prolonged periods of rain

The use cases have been developed to a relatively high level and have been updated and refined following initial end user feedback.

Following this deliverable, the next stages are to collect additional feedback from end-users, drill down into a more detailed level and further update these use cases that will feed into the technical development phase of the project.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
TABLE OF CONTENTS	4
TABLE OF FIGURES	5
1 Introduction	6
2 Methodology for the SALUS Use Cases Development	7
2.1 High Level Delivery Plan	8
3 The Intermediate SALUS Use Case Scenarios	9
3.1 City Security Use Case	9
3.1.1 Abstract.....	9
3.1.2 Use case description	9
3.1.3 Expected Users (Use case actors)	10
3.2 Temporary Protection Use Case	11
3.2.1 Abstract.....	11
3.2.2 Use case description	11
3.2.3 Expected Users (Use case actors)	12
3.3 Disaster Recovery Use Case	13
3.3.1 Abstract.....	13
3.3.2 Use case description	13
3.3.3 Expected Users (Use case actors)	14
4 Next Steps.....	15
Bibliography	16
Acronyms	17
Appendix 1: End User Feedback – Scenario 1	20
Appendix 2: End User Feedback – Scenario 2	24
Appendix 3: End User Feedback – Scenario 3	28
Appendix 4: Matrix of Public Order Events	32

TABLE OF FIGURES

Figure 1 – High level approach for use cases and requirements capture.....	7
--	---

1 Introduction

Public Protection and Disaster Relief (PPDR) agencies in EC member states are relying on digital Private Mobile Radio (PMR) networks for mission-critical voice and data communication. These networks are highly resilient and properly dimensioned to cope with crisis and emergency handling, and are well protected against monitoring and intrusion by means of encryption, authentication and integrity. The two main standards for digital PMR networks in Europe are TETRA (TERrestrial Trunked RAdio) and TETRAPOL.

These networks provide a secure and resilient mobile voice and data infrastructure, however they have limited features matched to the special requirements of PPDR, including broadcast, dynamic secure groups, push to talk, call priority and secure roaming. In addition, there are significant interoperability technological difficulties when using both technologies. These networks also provide limited inter-technology coverage (i.e. interoperability between different technologies) providing very ineffective management of emergency events, both at the national level and in cross-border regions.

The main goal of SALUS is to design, implement and evaluate a next generation communication network for Public Protection and Disaster Relief (PPDR) agencies, supported by network operators and industry.

To achieve this goal, this network needs to fully support the operational activities of the end user community. The development and end user validation of use cases based on operational scenarios is therefore an important first step in the process as it will drive the requirements on which the solution will be based.

This document describes phase 1, the development of the intermediate use cases that have been produced (see figure 1) and the methodology used in which to produce them.

2 Methodology for the SALUS Use Cases Development

The suggested approach to generating the interim use cases was broken down into 4 distinct phases. They were:

- **Phase 1** – Develop the use cases based on the 3 SALUS scenarios i.e. City Protection, Temporary Protection and Disaster Recovery. This includes the identification of PPDR end users that that are likely to be participating in each use case.
- **Phase 2** – Capture the high level requirements for each of the use cases taking into account the participating PPDR end users and their requirements as well as the technologies SALUS foresees to develop and exploit.
- **Phase 3** – Further refine the requirements to a sufficient level of detail.
- **Phase 4** – Further develop the use cases that will be used to develop the technical solutions and test that they deliver against the requirements that were captured in the previous phases.

Throughout all phases, end user feedback will be sought in order to test the credibility and accuracy of the scenarios and ultimately the use cases and requirements (SALUS Deliverable D2.2) [5].

Collected end user feedback can be found in appendices 1 to 3. A matrix of the public order events used by SALUS to further shape the use cases is provided in Appendix 4.

The diagram that reflects the methodology for the use cases development is depicted in Figure 1.

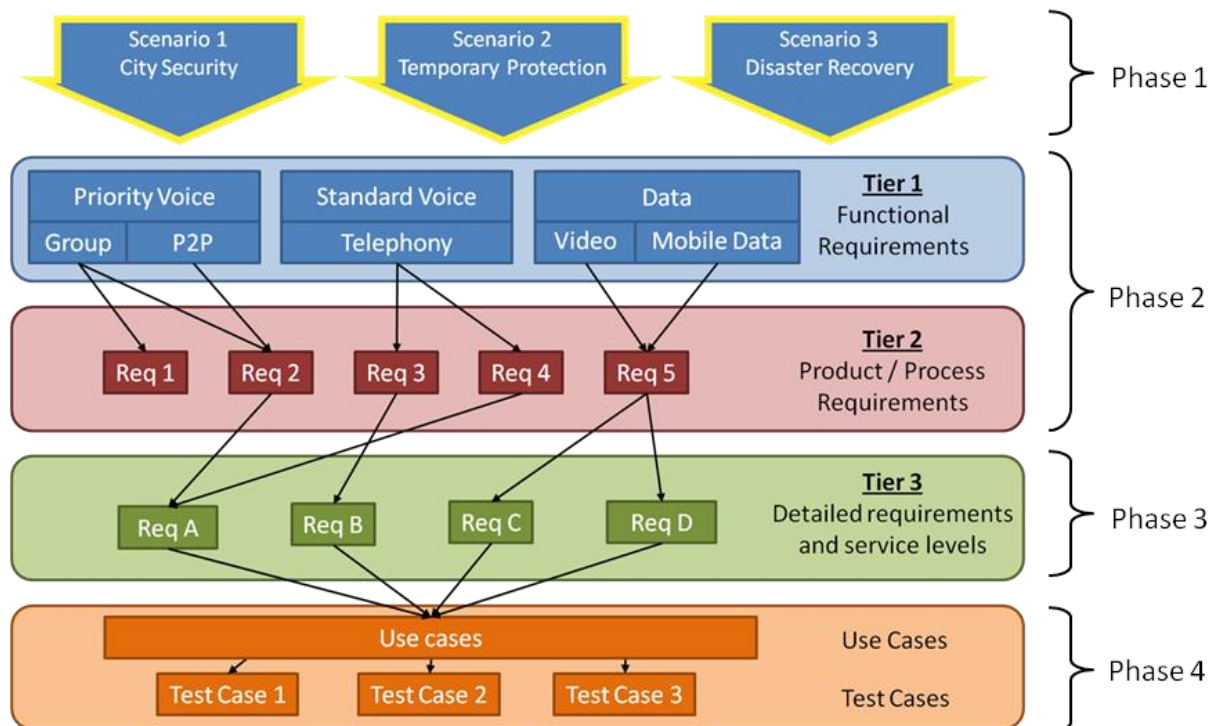


Figure 1–High level approach for use cases and requirements capture

In order to synchronize the developed uses cases with the test use cases in work package (WP) 7, each use case development was led by the correspondent Task leader in WP7.

2.1 High Level Delivery Plan

The following high level delivery plan was developed and agreed to manage these initial deliverables:

Table 1–High Level Delivery Plan

No.	Item	Owner	Due Date
1.	Work package start-up <ul style="list-style-type: none"> ▪ Develop delivery plan ▪ Identify participants ▪ Kick off meeting with participants 	AW	19/09/13
2.	Collect examples of historic public order events from across the partner countries	All	18/10/13
3.	Initial draft of intermediate use case scenarios and requirements for discussion at kick off meeting	AW	18/10/13
4.	Collect end user feedback of initial draft of scenarios	AW / TI-WMC / PSCE / IT / ESC	14/11/13
5.	Update intermediate scenarios and requirements incorporating feedback	AW / TI-WMC / CAS	26/11/13
6.	Document updated scenarios and requirements and circulate for feedback	AW	27/11/13
7.	Feedback on final document	ALL	28/11/13
8.	Release of Pre-final document	AW	29/11/13
9.	Additional end user feedback on scenarios	AW	03/12/13
10.	Quality check by the Quality Assurance Group	UTWENTE, IT, ROH,	11/12/13
11.	Final version release (v1.0)	AW	16/12/2013

3 The Intermediate SALUS Use Case Scenarios

This section describes the three SALUS use cases based on the three SALUS scenarios (City Protection, Temporary Protection and Disaster Recovery).

Each use case will have its own actions however similar events may occur during the first days of the crisis:

- Surveillance for security purposes (limitation of criminality);
- Investigation actions to evaluate the current status on the crisis;
- Broadcast information to the public (through television, radio and other means);
- Reparation attempts for some parts of the communication network infrastructure;
- Deployment of ad-hoc communication and possibly broadcast infrastructures after an engineering phase (i.e. performed by the military or the operators).
- Reorganization of the cohabitation between the deployed and existing communication networks in the neighbourhood of the crisis zone.

The following subsections will provide the details for each particular SALUS use case.

3.1 City Security Use Case

3.1.1 Abstract

The City Security use case is based on the City Security scenario, which considers the management of a public disorder event with permanently deployed PPDR infrastructure in a city location. The development of this use case builds on the secure communications needs for voice, video and data applications-services capabilities used by Police, Fire and Ambulance during normal day to day activities, typically supported today by a combination of their current PMR solution (TETRA or TETRAPOL) and commercial network technologies (2G/3G/LTE).

This use case identifies the services used and the technologies and suppliers that the PPDR end users are reliant upon, and how the availability of these services is impacted upon by a significant security Incident in the city. These services will include remote controlled closed-circuit television (CCTV), aerial surveillance from a helicopter or fixed wing, automatic vehicle and personnel location, finger print scanning, and database searching for example.

This use case addresses the interoperability with state-of-the-art technologies (e.g. LTE, long range Wi-Fi ad-hoc networks, body area networks (BAN), and private mobile radio (PMR) broadband) in order to provide novel operational capabilities, and how these address the shortfall in necessary mission critical services as a consequence of the security incident. In defining the restoration of services, this use case will identify the security, interoperability, system integration and quality of service requirements as the Incident develops and evolves. This will provide a baseline for the candidate technologies and actors to be validated in Task 7.2.

3.1.2 Use case description

Trigger: Government's continued austerity drive increasingly impacting on people's lives

- High unemployment, high inflation, reduced wage packets, reduced social benefits, reduced central/local government support [3][13].

- Social media communications escalates as a result of a new government money saving initiative [8][12][14].
- Police aware as a result of social media scanning of planned demonstration and resources deployed accordingly [8][12][14].
- Originally a peaceful protest.
- Police crowd control tactics aggravate the crowd and protest escalates into violence.
- Public dislike to government response therefore protests organised for subsequent days and nights.
- Criminal elements join in with looting and arson being increasingly prevalent [12].
- Police increase their resources to help combat the existing violence.
- Protesters become increasingly better organised through the use of social media, ring leaders emerged and started to co-ordinate some of the rioting activity [12].
- Many casualties and fire damage to properties [8].
- Certain areas become no-go areas for emergency services.
- Innocent members of the public impacted, frightened to leave their homes [12].
- There will be several governmental and first responder organisations in action. Some will use some central control room structure (maybe a joint one), others an additional mobile command post. Efficient wireless communications between those command structures is key for success, cross-agency communication an important aspect in dealing with the incident(s).

3.1.3 Expected Users (Use case actors)

In the City Security use case, the following users have been identified:

Table 2 - List of users for the City Security use case

<ul style="list-style-type: none"> ▪ Police (Gendarmerie) <ul style="list-style-type: none"> ○ Overt ○ Covert ○ Mutual aide/out of area forces ▪ Ambulance services, incl. volunteer organizations as red cross ▪ Fire Brigades 	<ul style="list-style-type: none"> ▪ Security Services (covert) ▪ Transport ▪ Military ▪ CCTV operators ▪ Traffic management ▪ Mayor's office in the City Hall, ▪ Defence, civil defence
--	---

3.2 Temporary Protection Use Case

3.2.1 Abstract

The Temporary Protection use case is based on the Temporary Protection scenario which considers the management of public disorder in a sports arena with a combination of permanent and temporary PPDR infrastructure. The development of this use case will define the technologies used to provide portable secure communications needs for voice, video and data applications-services capabilities at major events. This use case defines the services that remain private to the Public Safety at the venue, such as remote controlled cameras, detection of threats (chemicals, explosives etc), criminal intelligence and patient records, whilst also addressing the need to share and interoperate with local PMR solutions where appropriate.

This use case addresses the interoperability with state-of-the-art technologies (e.g. LTE, long range Wi-Fi ad-hoc networks, BANs, and PMR broadband) and emerging technologies in order to provide novel operational capabilities that meet the security and privacy needs of the relevant event management and support. This will provide a baseline for the candidate technologies and actors to be validated in Task 7.4.

3.2.2 Use case description

This use case is based on an Olympic style [11][16] and sized event featuring the following:

- Two or more days in duration.
- High profile international event.
- Many VIP dignitaries from various countries and organisations attending [6] [15].
- Multiple venues in close proximity.
- In addition to the event stadia, large TV screens erected at a number of public areas.
- Approximately 1 Million people daily coming and going to the events and in and around the area [11].
- Screening of spectators revealed potential explosives resulting in the possibility to evacuate the stadium.
- Day 1, steady state. Everything goes according to plan.
- Day 2 Intelligence received that explosives have been planted somewhere at the main venue (could be elsewhere) resulting in the need to evacuate one or all venues [2][6]. The alert occurs just prior to the most popular sporting event starts. Panic breaks out.
- Authorities try to control the crowd using evacuation procedures aided by several means such as loudspeakers, geo-casting alarms to the mobile phones and making use of the large TV screens in the public areas.
- An extension to this scenario could be that in addition of the above, explosions or other attacks take place in several neighbourhoods of the city, increasing the panic even further. Authorities make use of context information for rapid detection and localization of the attack. Information from pre-installed cameras may be complemented with information from social media (using suitable filters) and sound analysis.
- Communication facilities at the location of the incidents due to the large concentration of forces may be insufficient and need to be complemented with ad-hoc networks for local data communication [1].

3.2.3 Expected Users (Use case actors)

In the Temporary Protection use case, the following users have been identified:

Table 3 - List of users for the Temporary Protection use case

<ul style="list-style-type: none"> ▪ Police <ul style="list-style-type: none"> ○ Overt ○ Covert ○ Mutual aide/out of area forces ▪ Ambulance ▪ Fire Brigades ▪ Security Services (covert) ▪ Transport ▪ Civilian/event security ▪ City Councils 	<ul style="list-style-type: none"> ▪ Transport ▪ Military ▪ CCTV operators ▪ Traffic management ▪ Hospitals ▪ Road operators ▪ Weather institutes ▪ Nature conservation institutes ▪ Utilities companies (power, gas, water) ▪ Telecom operators
<p>Note: Fire brigades and Ambulance involvement is low until Day2 scenario occurs</p>	

3.3 Disaster Recovery Use Case

3.3.1 Abstract

The Disaster Recovery use case is based on the analysis of the Disaster Recovery scenario, which considers PPDR communications requirements for both the short and medium terms where all existing infrastructure has been rendered unserviceable by a man made or natural disaster.

This use case focus on the secure communications needs for voice, video and data applications-services capabilities used by Rescue Workers, Military, Police, Fire, Ambulance and other rescue workers during a significant disaster where all or a major part of the existing PPDR communications infrastructure has been destroyed. The use case defines the capabilities and the services that are often established today using deployable communications networks that include PMR and cellular 2G/3G/LTE. The use identifies the applications and services that can be introduced using local deployable data networks, such as video from aircraft, and location based asset management and mapping. This will include how these can be securely integrated into existing deployable solutions, providing the PPDR with a holistic communications capability that addresses their voice, video and data needs both locally at the incident, as well as for remote situational awareness and management. Deployed communications would need to be able to deal with adverse environmental conditions and could include extreme wind speeds, large areas without energy/drinkable water etc., where integration with satellite as a primary communications mechanism or a transmission backhaul could be deployed. Biggest problem will be the maintaining of PPDR communications on 24/7 basis, despite all upcoming problems.

In defining the Disaster Recovery services, the use case also identifies the security, interoperability, system integration and quality of service requirements as the incident develops and evolves. This will provide a baseline for the candidate technologies and actors to be validated in Task 7.4.

3.3.2 Use case description

This use case is based on a flooding situation due to extended periods of heavy rainfall. The rational for this is the common occurrence that impacts Europe and elsewhere with a number of examples from which to draw experience [4]. Also flooding is likely to increase in the future due to environmental changes (e.g. climate change and man-made changes such as construction).

The flooding will most likely occur in a riverbank area and it features the following events:

- Prolonged heavy rain and heavy winds gives rise to flooding and landslides and power outages.
- Flooding as a result of prolonged rain over several days causes rivers and reservoirs to fill and ground becoming waterlogged. Intensity of rain increases causing floods.
- High speed train derailed due to rail damage caused by land slide [9] (despite rail-checks on a daily basis to avoid derailing because of stolen tracks, stolen copper wiring, or other).
- Energy fails, water level monitoring at upstream dams (embankments) is not reported, which increases further flooding unawareness.
- Setting – low lying (valley) sub-urban totally surrounded by rural area, possibly across geographical boundaries, country or PPDR regional boundaries.
- Population assumed to be between 50 thousand to 300 thousand. The maximum impact depends on the considered country but the response needs to be scalable.

- Loss of communications – first public communications, then PPDR communications as the resilience is stretched beyond PPDR communication systems design limits [1].
- Transport access to sites is difficult due to flooding, therefore ability to refuel generators lost resulting in PPDR networks going down.

3.3.3 Expected Users (Use case actors)

In the Disaster Recovery use case, the following users have been identified:

Table 4 - List of users for the Disaster Recovery use case

<ul style="list-style-type: none"> ▪ Police (High involvement) <ul style="list-style-type: none"> ○ Overt ○ Mutual aide/out of area forces ▪ Ambulance (High involvement) including charity based services (e.g. Red Cross or RNLI in the UK) ▪ Fire Brigades (High involvement) ▪ Transport ▪ Military ▪ Environment agency, ▪ Volunteer mountain rescue type units ▪ Highways agency, 	<ul style="list-style-type: none"> ▪ CCTV operators ▪ Traffic management ▪ NGO/Volunteers ▪ Critical Infrastructure Operators ▪ Public Transport ▪ All sorts of Utility (Power, Gas, Water, ...) ▪ Telecom Operators ▪ Defence ▪ Civil defence ▪ Hospitals ▪ City councils
--	---

4 Next Steps

Building on the intermediate use cases the next steps is to further develop them to a greater level of detail, incorporating the technological capabilities that are associated with each scenario. This will require detailed planning for each scenario and further engagement with PPDR end users at regular intervals. Therefore the next steps are to: (i) further refinement of scenarios; (ii) further consultations with end users for validation; (iii) improving and adding more detail to the use cases.

A WP2 Workshop to further develop the use cases, drill down into the detail of some of the operational situations for each scenario and determine in a deeper level what the users require to manage each of those situations will take place between 16 and 17 of January 2014, collocated with the SALUS 2nd General Assembly. In addition to this Workshop, it is envisaged that at least other workshop, involving PPDR end-users, will be required to finalize the SALUS Use Cases. The workshop is foreseen to take place early/middle 2014.

BIBLIOGRAPHY

- [1] Dragland, Å. (2013, May 9). *Improving Communications During Disasters*. Retrieved October 2013, from Science Nordic: <http://sciencenordic.com/improving-communication-during-disasters>
- [2] *List of Terrorist Incidents*. (2013). Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/List_of_terrorist_incidents
- [3] Municipality of Rotterdam. (2009). *COT Rapport: Strand rellen in Hoek van Holland*. Municipality of Rotterdam.
- [4] *Recent Natural Disasters*. (2013). Retrieved from <http://www.disaster-report.com/>
- [5] SALUS. (2013). *SALUS Deliverable D2.2*. London : SALUS.
- [6] Wikipedia. (n.d.). Retrieved October 2013, from Wikipedia: [http://nl.wikipedia.org/wiki/Troonswisseling_in_Nederland_\(2013\)](http://nl.wikipedia.org/wiki/Troonswisseling_in_Nederland_(2013))
- [7] Wikipedia. (2013). *7 July London Bombings*. Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/7_July_2005_London_bombings
- [8] Wikipedia. (2011). *England Riots 2011*. Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/2011_England_riots
- [9] Wikipedia. (2009). *Grayrigg Derailment*. Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/Grayrigg_derailment
- [10] Wikipedia. (2013, November). *Kings Cross Fire*. Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/King%27s_Cross_fire
- [11] Wikipedia. (2012). *London 2012 Olympic and Paralympic Games*. Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/London_2012_Olympics
- [12] Wikipedia. (2012). *Project-X Haren*. Retrieved October 2013, from Wikipedia: http://nl.wikipedia.org/wiki/Project_X_Haren
- [13] Wikipedia. (2013). *Protests in Slovenia*. Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/2012%E2%80%9313_Slovenian_protests
- [14] Wikipedia. (2009). *Riots beach of Hoek van Holland* . Retrieved October 2013, from Wikipedia: http://nl.wikipedia.org/wiki/Strandrellen_in_Hoek_van_Holland
- [15] Wikipedia. (2011). *Royal Wedding of Prince William and Kate Middleton*. Retrieved November 2013, from Wikipedia: http://en.wikipedia.org/wiki/Wedding_of_Prince_William_and_Catherine_Middleton
- [16] Wikipedia. (2013). *Ski-World Championship 2013, Schladming, AUSTRIA*. Retrieved October 2013, from Wikipedia: http://en.wikipedia.org/wiki/FIS_Alpine_World_Ski_Championships_2013

ACRONYMS

3G	Third Generation
3GPP	Third Generation Partnership Project
AIE	Air Interface Encryption
AODV	Ad hoc On demand Distance Vector Protocol
AP	Access Point
ASFPG	Association Security and Fraud Prevention Group
ATHO	ATHENS Olympic Games
ATIS	Alliance for Telecommunications Industry Solutions
AUTOCON	Ad-Hoc Network Autoconfiguration
AW	Airwave Solutions
BAN	Body Area Networks
BS	Base Station
CA	Certification Authority
CAS	Cassidian (company)
CCSR	Centre for Communication Systems Research
CISM	Computing, Information Systems and Mathematics
COSI	Standing Committee on Internal Security
DMO	Direct Mode Operation
e2e	End-to-End
EAP	Extensible Authentication Protocol
EC	European Commission
EC/EU	European Commission / European Union
ECRIT	Emergency Context Resolution with Internet Technologies
ECS	Emergency College Services (Finland)
EOS	European Organization for Security
ERIC	Emergency Response Interoperability Center
ESA	European Space Agency
ESRIF	European Security Research and Innovation Forum
ETSI	European Telecommunications Standards Institute
FP5/6/7	Framework Programme 5th/6th/7th
FRONTEX	European External Borders Agency
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
IAP	Integrated Applications Promotion
ICT	Information and Communication Technologies
IDABC	Interoperable Delivery of European eGovernment Services to public Admin., Businesses, Citizens

IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ISO	International Organisation for Standardisation
iSOF	interoperable Secure Operation Framework
IST	Information Society Technologies
IT	Instituto de Telecomunicações
ITU	International Telecommunication Union
KU	Kingston University
LTE	Long Term Evolution
MAC	Medium Access Layer
MANET	Mobile Ad-hoc Network
MCR	Multi Channel Routing
MIMO	Multiple Input Multiple Output
MSK	Master Session Key
NATO	North Atlantic Treaty Organisation
OLSR	Optimized Link State Routing
OTAK	Over The Air Keying
P2P	Peer-to-Peer
PAS	Tetrapol Publicly Available Specification
PC	Project Coordinator
PCC	Project Coordination Committee
PHY	Physical layer
PKI	Public Key Infrastructure
PM	Project Manager
PMs	Person Months
PMC	Project Management Committee
PMR	Professional Mobile Radio
PSTN	Public Switched Telephone Network
QMR	Quarterly Management Report
QoS	Quality of Service
R&D	Research and Development
RFC	Request For Comment
RNLI	Royal National Lifeboat Institute
ROH	Rohill Technologies B.V.
SAE	1: Simultaneous Authentication of Equals

SAE	2: System Architecture Evolution (3GPP)
SDS	Short Data Services
SIP	Session Initiation Protocol
SME	Small Medium Enterprise
SON	Self-Organizing Networks
STREP	Specific Targeted Research Project
SwMI	Switching and Management Infrastructure
TC	Technical Committee
TEA	TETRA Encryption Algorithms
TETRA	TErrestrial Trunked RAdio
TFEU	Treaty on the Functioning of the European Union
TL	Task Leaders
TM	Terminal Manager
TMO	Trunked Mode Operation
UCIF	Unified Communications Interoperability Forum
UMTS	Universal Mobile Telecommunications System
UPAT	University of Patras
VoIP	Voice over IP
WBAN	Wireless Body Area Networks
WG	Working Group
Wi-Fi	IEEE 802.11
WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless LAN
WMN	Wireless Multimedia and Networking
WP	Work Package
WWRF	Wireless World Research Forum

APPENDIX 1: END USER FEEDBACK – SCENARIO 1

Question 1

Do you think the high level scenario outlined is realistic (i.e. could be real) and therefore provides a suitable base on which to develop use cases for operational deployment of functionality.

Feedback	By	Organisation
The scenario sounds realistic.	Manfred Blaha	Ministry of the Interior, Austria
It's ok for me and quite topical. You might want to consider at any early stage in the development of the scenario whether or not there was/is a requirement for mutual aid i.e. planned for and in place prior to the event or whether or not mutual aid is called for during the event. Realistic and testing.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Plausible, but not in a big scale scenario	Geir Myhre	National Police Computing and Material services
No. Please number the scenario steps, this makes it easier to reference them.	J.W. van Aalst	Imergis
Yes, we think that the scenario is realistic.		Special Telecommunications Service - Romania
The scenario is realistic. The user base could be wider and may include Local Authority Users also Public Transport users in relation to diversions from affected areas (Airwave Direct). Mutual Aid for generalist and specialist resources will be an issue. In addition one has to remember that business as usual will continue in the demand profile of the emergency services in localities not affected by the incident, as well as affected localities.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)
The scenario appears to be based over a number of days. There is no mention of the impact upon any relevant communities (and subsequent Local Authority involvement) There is also no mention of impact / use of media sources both for intelligence and impact into the wider communities on possibly 'fuelling' any ongoing disorder [Broken Window syndrome / copycat actions]	Mark Swift	Airwave (previously Metropolitan Police)

Question 2

If not, what elements of the scenario need to be changed to make them more realistic or appropriate?

Feedback	By	Organisation
Need to consider the use of the military, unless you want to demonstrate a complete breakdown of law and order military would not be used. Police public order training will be well versed and practised in this type of scenario so testing their interoperability credentials would be good.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Usage of video from CCTV is restricted in usage due to data act regulations	Geir Myhre	National Police Computing and Material services
The element "Protesters become increasingly better organised" is not going to happen. So the police ends the event, resulting in high-profile political discussions about whether or not the police did a good job.	J.W. van Aalst	Imergis
In the UK The scenario will be played out at UK Government Level (COBR) as well as in the devolved authorities / Government.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

Question 3

Within the context of the scenario, are there any specific mobile communication requirements that you would consider to be particularly challenging to meet.

Feedback	By	Organisation
There will be several governmental and first responders organisations in action. Each of them will use some central control room structure (maybe a joint one), some of them an additional mobile command post. Wireless communications between those command structures is key for success, cross-agency communication an important aspect in dealing with the incident(s).	Manfred Blaha	Ministry of the Interior, Austria
Mutual aid – talkgroups, call signs, different terminals if issued by the requesting Force. You have a large PSU – Police Support Unit – requirement. Lots of officers, some might rely on direction from supervisors and so may not be issued with radios, radios/mics in public order equipment. Lots of officers in an area testing capacity Noise and chaos, dealing with a moving feast, getting full sight of incident to Silver/Gold command. Getting PSU relief. The main issues with large scale public order is getting the most up to date information and then communicating that out to the PSU commanders.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Bandwidth and spectrum. Standardization based on open	Geir Myhre	National Police

Feedback	By	Organisation
standards with good end-to-end encryption.		Computing and Material services
Typically, each such event triggers a government response. This is done by a central command and control centre and several mobile centres, which requires strong and reliable communication means.		Special Telecommunications Service - Romania
The situation itself will be challenging. Governmental Involvement and a Coordinated Multi Agency approach to planning and execution of the plans. The ability to have War Room Communications Hubs to supply sufficient accurate dynamic information to enable multi agency coordination as well as logistical support to a variety of centres of disorder. The spread of disorder and copycat disorder will be an issue as will the fatigue of all involved.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)
Loss of MNO availability owing to congestion of network during significant disorder	Mark Swift	Airwave (previously Metropolitan Police)

Question 4

In additional to police, fire and ambulance services what other organisations are likely to be involved in this scenario with whom mobile communications with the emergency services will be likely

Feedback	By	Organisation
In Austria: Public Transport, Mayor's office in the City Hall,	Manfred Blaha	Ministry of the Interior, Austria
Main one would be council/s and CCTV operators, would imagine requirement for other agency involvement as the incident happens would be limited to emergency services.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Defence, civil defence and volunteer organizations as red cross	Geir Myhre	National Police Computing and Material services
Military forces (perhaps)	J.W. van Aalst	Imergis
In Romania apart of Police, are the Gendarmerie, also organized under the Ministry of Interior, and the Local Police, organized under the Mayor of the City		Special Telecommunications Service - Romania
Governmental Organisations, Local Authority Organisations such as social services and the various transport and cleansing departments. Emergencies Planning/ Civil Resilience, S Emergency Shelters, Department of Health (Hospitals) and casualty clearing. In a worst case scenario Mortuaries / Temp Mortuaries.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

Feedback	By	Organisation
Local Authorities, Govt. Agencies, Military	Mark Swift	Airwave (previously Metropolitan Police)

Question 5

Would you or your organisation be prepared to contribute to developing/validating detailed functionality use cases?

Feedback	By	Organisation
Yes, probably. Depending on the amount of work. Not yet confirmed in the hierarchy.	Manfred Blaha	Ministry of the Interior, Austria
Happy to help – share with customers.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Yes, we are prepared to contribute.	Geir Myhre	National Police Computing and Material services
No (no work schedule space available)	J.W. van Aalst	Imergis
We are prepared to contribute to developing/validating detailed functionality use cases.		Special Telecommunications Service - Romania
Yes	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

APPENDIX 2: END USER FEEDBACK – SCENARIO 2

Question 1

Do you think the high level scenario outlined is realistic (i.e. could be real) and therefore provides a suitable base on which to develop use cases for operational deployment of functionality.

Feedback	By	Organisation
Yes, this is realistic.	Manfred Blaha	Ministry of the Interior, Austria
Seems a lot of people, venues etc for a 2 day event? Does it matter if its four days and this happens on day 2??? Again realistic and topical for me	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Yes, the scenario is realistic but in “Norwegian scale”	Geir Myhre	National Police Computing and Material services
Yes, we think that the scenario is realistic.		Special Telecommunications Service - Romania
Military teams do not allow civil forces to use their frequency bands. Military forces have their own command and control centre. To include military forces, a TETRA device needs to be provided to their liaison officer, who then makes the bridge between civil and military 'synchronized' actions.	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
Yes, but the over complication of technologies would be a hindrance. Mobile Information / Data is of limited use unless specifically targeted for Strategic/ Tactical and Operation Use – Commanders do not have time to read loads of information. The best approach is to keep it as simple as possible with Operations Coordination Centres providing multi emergency services multi agency support at the three tiers of command.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)
Day 2 would only invoke a level of panic should an actual attack be carried out and/or the emergency services response is slow / inadequate (i.e. they are completely overwhelmed) The alternative scenario of ‘rampage’ is very highly unlikely owing to the demographic of persons attending such an event and lack of sufficient triggers in order to invoke such.	Mark Swift	Airwave (previously Metropolitan Police)

Question 2

If not, what elements of the scenario need to be changed to make them more realistic or appropriate?

Feedback	By	Organisation
I would take out screening of spectators; the stadia would have been swept beforehand with explo dogs. I would just leave it that it was good intelligence received.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Lower number of spectators in the areas	Geir Myhre	National Police Computing and Material services
Military do have radio jam devices that can jam any frequency band (including satellite) to block remote detonation by cell phone.	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
Communications Plan would require to be articulated for the whole event and all venues including the “what if” scenarios. The Event should be exercised to test comms and other procedures including understanding roles and accountabilities prior to the event taking place.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

Question 3

Within the context of the scenario, are there any specific mobile communication requirements that you would consider to be particularly challenging to meet.

Feedback	By	Organisation
High volume communication in a dense area. Limited usability of commercial 2G/3G networks due to congestion/overload	Manfred Blaha	Ministry of the Interior, Austria
Volunteers with radios, untrained, limited functionality and with poor radio discipline so as well as the Emergency Services users you may need to consider management of the volunteer base and getting them to direct people. Lots of people on the streets heading for local transport when not expected – much trickier if panicked. Ability/inability to transmit with the danger of triggering an explosive device not only around the venue but also potential RV/muster points. Radio discipline i.e. users not mentioning bombs!	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Live video streaming. Distribution of public location based information will be challenging	Geir Myhre	National Police Computing and Material services
Concentration of forces in a relatively small area may require increasing communication resources at the level of networks which may be difficult to attain in a very short time.		Special Telecommunications Service - Romania

Feedback	By	Organisation
<p>A desirable functionality is to allow a first responder to broadcast his own voice on a louder level (as in loudspeaker), this way it could make his message reach a larger area of citizens (make them understand).</p> <p>Alternatively, the first responder device at the location could be used as a relay to actually transmit the voice (louder) of a commander at the command and control centre.</p>	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
<p>Mobile Data would be challenging – people need to gather, collate, type and send – time taken to receive, digest and understand – can take too long. Much better to have dynamic systems operating with real time information to support voice communications and verbal commands. The Comms plan needs to fit the roles, responsibilities and accountabilities of the various players.</p>	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

Question 4

In addition to police, fire and ambulance services what other organisations are likely to be involved in this scenario with which mobile communications with the emergency services will be likely

Feedback	By	Organisation
<p>In Austria: Province Crisis Management Centre Office of the Mayor (City Hall) Key players of Critical Infrastructure Operators:</p> <ul style="list-style-type: none"> Public Transport All sort of Utility (Power, Gas, Water, ...) Telecom Operators 	Manfred Blaha	Ministry of the Interior, Austria
Certainly bomb disposal, council CCTV, transport, highways.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Defence, civil defence and volunteer organizations as red cross	Geir Myhre	National Police Computing and Material services
Other organizations that are likely to be involved are the city utilities companies. Mobile communications with their field technicians and their command and control centre may be required.		Special Telecommunications Service - Romania
Strongly advise to include: Hospitals, City councils, different road operators, weather institutes and nature conservation institutes	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
Multi faceted surveillance may well be in place – the communications Hub needs to be aware and provide appropriate priority to messaging.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)
Local PCTs and designated Hospitals for Casualty / Mortuary receptions.	Mark Swift	Airwave (previously Metropolitan Police)

Feedback	By	Organisation
Local Authority		

Question 5

Would you or your organisation be prepared to contribute to developing/validating detailed functionality use cases?

Feedback	By	Organisation
Yes, official commitment of the hierarchy still pending.	Manfred Blaha	Ministry of the Interior, Austria
Happy to help – share with customers.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Yes, we are prepared to contribute.	Geir Myhre	National Police Computing and Material services
We are prepared to contribute to developing/validating detailed functionality use cases.		Special Telecommunications Service - Romania
Yes, we would be much interested in following and participating in the SALUS use cases.	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
Yes.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

APPENDIX 3: END USER FEEDBACK – SCENARIO 3

Question 1

Do you think the high level scenario outlined is realistic (i.e. could be real) and therefore provides a suitable base on which to develop use cases for operational deployment of functionality.

Feedback	By	Organisation
<p>Yes, this is a very realistic scenario.</p> <p>(maybe the derailed train maybe a little too much, as e.g. Austrian Railway is doing a rail-check on a daily basis to avoid derailling because of stolen tracks, stolen copper wiring, etc.)</p>	Manfred Blaha	Ministry of the Interior, Austria
<p>Again, no issues from me – I have a contact who has a derailed train for testing such scenarios for network rail – based at fire training college. He does training all the time with a similar response.</p>	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
<p>Very likely to happen also in Norway but the impact will not likely affect as many people as 300,000.</p>	Geir Myhre	National Police Computing and Material services
<p>Yes. That is, flooding is most likely to occur through the riverbanks (that is, water flowing to the sea). See also http://www.imergis.nl/map/200910NLOverstroomd3D1280px.jpg</p> <p>For a maximum flooding scenario based on the national risk map.</p>	J.W. van Aalst	Imergis
<p>Yes, we think that the scenario is realistic.</p>		Special Telecommunications Service - Romania
<p>Yes the scenario(s) are realistic.</p>	Tom Blair	Airwave Solutions (Previously Strathclyde Police)
<p>May be difficult in managing scenario as merging the Critical Incident of the Train Derailment (as you specify High Speed, I am assuming numerous fatalities / injuries) and the Flooding / Resilience issue, you are dealing with 2 differing scenarios where the multiple fatalities / spontaneous incident is being covered by scenario 2.</p>	Mark Swift	Airwave (previously Metropolitan Police)

Question 2

If not, what elements of the scenario need to be changed to make them more realistic or appropriate?

Feedback	By	Organisation
If energy fails, water level monitoring at upstream dams (embankments) is not reported. This issue may cause further flooding unawareness.	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
Just concentrate on the flooding / natural disaster management / displacement of communities / business continuity aspect and remove the High Speed derailment	Mark Swift	Airwave (previously Metropolitan Police)

Question 3

Within the context of the scenario, are there any specific mobile communication requirements that you would consider to be particularly challenging to meet.

Feedback	By	Organisation
Biggest problem will be the maintaining of PPDR communications on 24/7 basis, despite all upcoming problems.	Manfred Blaha	Ministry of the Interior, Austria
I think you mention them, main one being loss of infrastructure – batteries then genies failing due to their being no power – how long is the scenario due to last. Coverage and temp coverage solutions being required, getting these to and from the area given the area and people exiting the area.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Coverage on public communication and PPDR to be a challenge in rural areas. Distribution of public location based information will be challenging	Geir Myhre	National Police Computing and Material services
Communicating data, that is, a common actual picture: Satellite images of the “day after the flood” as Google Crisis Response did after Hurricane Sandy in NYC.	J.W. van Aalst	Imergis
No.		Special Telecommunications Service - Romania
Currently, in Portugal, at disaster coordination level, the coordinator needs to use multiple radio devices (each with different frequency bands, and different technologies) to reach the different First responder teams (police, ambulance, etc...). The vests sometimes need to transport 4 or 5 different radio device types.	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)

Feedback	By	Organisation
Within reason any communications relying on permanent ground based infrastructure routed to the low lying geographies will be at risk. In large part TETRA masts tend to be located in higher positions than other technologies and are thus less susceptible (in general terms) – utilise Cumbria Flooding as an example.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

Question 4

In addition to police, fire and ambulance services what other organisations are likely to be involved in this scenario with whom mobile communications with the emergency services will be likely

Feedback	By	Organisation
In Austria: Provincial Crisis Management Key players of Critical Infrastructure Operators: <ul style="list-style-type: none"> Public Transport All sort of Utility (Power, Gas, Water, ...) Telecom Operators 	Manfred Blaha	Ministry of the Interior, Austria
Environment agency, volunteer mountain rescue type units, highways agency, network rail, maybe TOCS, utilities – gas, electricity, water, council.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Defence, civil defence and volunteer organizations as red cross	Geir Myhre	National Police Computing and Material services
The list on page 2 seems to cover most of it.	J.W. van Aalst	Imergis
NGO's and Volunteer rescue organizations, using citizen band mobile radios or any other publicly available radio communications devices (usual amateur band).		Special Telecommunications Service - Romania
Strongly advise to include: Hospitals, City councils, different road operators , weather institutes and nature conservation institutes.	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
As per list already given. If significant then other countries may supply specialist resource to the UK. Those resources will require liaison and alignment with UK counterparts in order that best use is made.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)
Local Authorities heavily – displaced residents / emergency accommodation / feeding etc	Mark Swift	Airwave (previously Metropolitan Police)

Question 5

Would you or your organisation be prepared to contribute to developing/validating detailed functionality use cases?

Feedback	By	Organisation
Yes, even if official “ok” from the hierarchy is still pending.	Manfred Blaha	Ministry of the Interior, Austria
Happy to help – share with customers.	Darren Chamberlain	Airwave Solutions (previously Humberside Police)
Yes, we are prepared to contribute.	Geir Myhre	National Police Computing and Material services
No, no space in working schedule available.	J.W. van Aalst	Imergis
We are prepared to contribute to developing/validating detailed functionality use cases.		Special Telecommunications Service - Romania
Yes, we would be much interested in following and participating in the SALUS use cases.	Comandante Rui Esteves	Associação Nacional de Protecção Civil (ANPC)
Yes.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

APPENDIX 4: MATRIX OF PUBLIC ORDER EVENTS

Item	Scenario 1	Scenario 2	Scenario 3
2010 Slovenia floods			✓
Earthquakes in Slovenia (1998 and 2004)			✓
Protests in Slovenia (2013) [13]	✓		
Enschede fireworks disaster (13 May 2000)	✓		
Turkish Airlines flight 1951 crash (Schiphol, 25 February 2009)	✓		
Royal Wedding UK [15]		✓	
Ski-World Championship 2013, Schladming, AUSTRIA [16]		✓	
Floods (Germany, Czech, Hung, Aus)			✓
England Riots 2011 [8]	✓		
2012 Olympics and Paralympics (Jul, Aug, Sept 2012) [11]		✓	
Boscastle floods of 2004 (Boscastle, Cornwall, England)			✓
Buncefield Fire, Buncefield, Herts, England Dec 2005	✓		
Grayrigg derailment, 2009 Cumbria England [9]	✓		
7/7 bombing London, England [7]	✓		
The Coronation of Holland's King Willem-Alexander [6]		✓	
Attack on the Dutch Royal Family (Apeldoorn, 30 April 2009)	✓		
Riots beach of Hoek van Holland [14]	✓		
Nuclear reactor going out of control	✓		
Serious radiation leak	✓		
Lockerbie aircraft terrorist attack	✓		
Snow storm of 25 November 2005			✓
Nuclear Security Summit 2014		✓	
Project-X Haren (21 September 2012) [12]	✓		
International Four Days Marches Nijmegen (Mid July every year)	✓	✓	
Rotterdam Marathon (April every year)		✓	
SAIL Amsterdam (every 5 years; next time August 2015)		✓	
Pinkpop Festival (Landgraaf, every year in the Pentecost)		✓	
Life I Live festival (The Hague, every year)		✓	
Serious Request (every year in Christmas)		✓	
Kings Cross Fire [10]	✓		
Hyde Park Bombings 1982, London	✓		
Notting Hill Carnival, London, every year over the August bank holiday	✓		
New Year's Eve celebrations in London	✓		