Security **A**nd Interoperabi**L**ity in Next Generation PPDR
Comm**U**nication Infrastructure**S**

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Deliverable 2.4
User Requirements Definition – Final

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***Abstract**: Deliverable 2.4 describes the SALUS user requirements as a result of multiple PPDR user inputs, and specifically flowing from the PPDR use cases that were produced as deliverable 2.3.*

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EXECUTIVE SUMMARY

The main objective of this document is to present the final version of the PPDR user functional requirements developed from the three proposed SALUS Scenarios and Use Cases. These requirements reflect 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. This deliverable does not address the PPDR user requirements regarding the spectrum needs for next generation systems, as these will be the focus of SALUS deliverables D4.5 (Spectrum requirements) and D4.8 (Frequencies allocations proposals).

The final user requirements have been captured based on the 3 use cases described in SALUS deliverable D2.1[7] and subsequently further developed in D2.3 [8]:

- Scenario 1 – Public order demonstration or riot [1][13][15]
- Scenario 2 – Olympic-style sporting event [14][16][17]
- Scenario 3 – Heavy flooding due to prolonged periods of rain [3][6][11][12]

The requirements captured are relatively high level; however they have been updated and refined where appropriate following end user feedback. Additionally, the requirements developed by the European PPDR organisations under the auspices by the Law Enforcement Working Party (LEWP) have also been taken into account [4]. The LEWP reports officially to JHA (Justice & Home Affairs) within the European Council.

The methodology used to capture and refine the user requirements is described in Chapter 2. User functional requirements and indicative user numbers for a specific event are given in Chapter 3. Considerations and remarks are provided in Chapter 4. The end user feedback received for each of the 3 scenarios developed can be found in Annexes 1 to 3. Scenario independent feedback received is provided in Annex 4.

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1 Introduction

This document provides user numbers and functional requirements for public safety communication systems including types of information needed by PPDR users at operational, tactical and strategic level and types of services needed by PPDR users.

The requirements documented here have been captured based on the 3 final use cases that have been developed as part of deliverable 2.3 [8].

- Scenario 1: – City Security
- Scenario 2:– Temporary Protection
- Scenario 3:– Disaster Recovery

The requirements capture is phase 3 of 4 in the methodology and approach (as described in figure 1) taken to develop the solution based on the operational needs of the users in the given scenarios.

In addition to the functional requirements stated in this document, there are a number of largely technical requirements needed from any PPDR communication system. The functionality needs to be supported on systems that provide adequate security – for the air interface or typically for covert users e2e, have low latency, have high availability, are resilient and are delivered over a geographically wide area. These are largely technical system-design requirements driven by national considerations following risk-threat analysis. Security is typically all encompassing as it is more than just about confidentially. It also includes availability, which is linked to resilience, and other factors such as coverage as the prime requirement is that PPDR must be able to communicate seamlessly wherever and whenever they need to whatever the circumstance. Security is covered in Work Package 5.

It is recognised that across the European member states, specific communications needs may vary depending on organisational and regulatory factors of an individual country. The approach therefore has been to engage with end users across a variety of public safety organisations and EU countries to create a high level framework for PPDR that is comprehensive and is capable of efficient cross-border PPDR operations.

2 Methodology for the SALUS User Requirements Capture

A 4-phase iterative approach was developed to capturing and subsequent refinement of the requirements using a process encompassing both the use case development and the requirements capture. The 4 phases are as follows:

- **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 has been sought in order to test the credibility, relevancy and accuracy of requirements.

The collected end user feedback used to produce and refine this deliverable can be found in Appendixes 1 to 4 at the end of this document.

The diagram that reflects the methodology for the requirements capture is depicted in Figure 1.

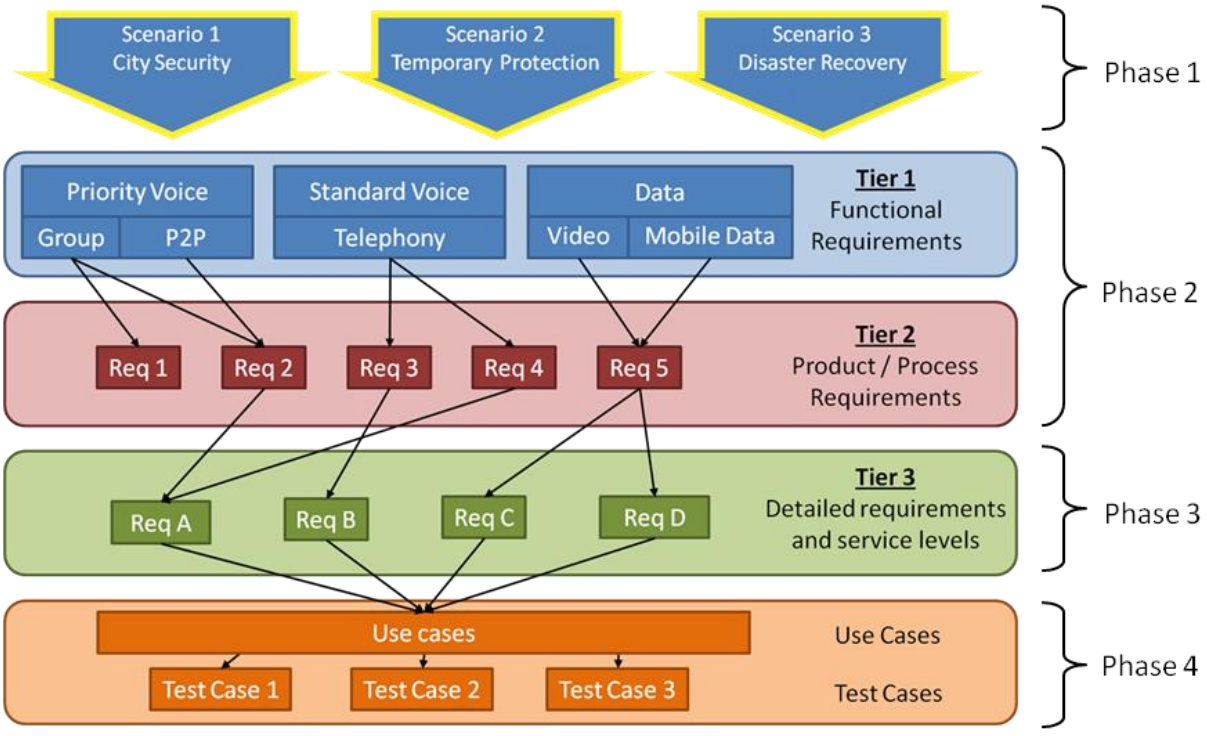

Figure 1–High level approach for use cases and requirements capture

2.1 High Level Delivery Plan

The following high level delivery plan for this Deliverable was developed and agreed:

Table 1–High Level Delivery Plan

No.	Item	Owner	Date
1	Update user requirements based on WP2 output in January	AW, FIGO,CAS	01/02/2014
2	Further development of user requirements	AW, FIGO,CAS	30/05/2014
3	Partner participation in user requirements in WP2 workshop	All Partners	10/06/2014
4	Review and test user requirements with end users	All Partners	26/09/2014
5	Update final requirements	AW, FIGO,CAS	03/10/2014
6	QAG of user requirements	ROH, IT, UTWENTE	17/10/2014
7	Update of user requirements	AW, FIGO,CAS	31/10/2014
8	SALUS Conference - partner and end user input to user requirements	All Partners	28/11/2014
9	Final update user requirements	AW, FIGO,CAS	05/12/2014
10	QAG final review of user requirements	ROH, IT, UTWENTE	12/12/2014
11	Final document update	AW, FIGO,CAS	19/12/2014
12	Submission of deliverable 2.4	AW	31/12/2014

3 The SALUS Final User Requirements

Following on from the development of the interim use cases in SALUS deliverable D2.1[7] and further refined in D2.3[8], the final requirements were captured based on those use cases and the participating end users.

3.1 Requirements for Command and Control

Although operational practices and procedures will vary across different EU member states and across the 3 use cases, the requirements have taken into account the universally accepted convention of users with strategic, tactical and operational responsibilities within a given scenario [5]

- **At the strategic level** the commander has the ultimate responsibility for determining the strategy and any tactical parameters that should be followed at the tactical and operational levels.
- **At the tactical level** the tactical commander commands and co-ordinates the overall tactical response in compliance with the strategy.
- **At the operational level** the operational commander is responsible for a group of resources, and carrying out the functional responsibilities related to the tactical plan. It is primarily at the operational level that the number of resources deployed.

At the three levels, the requirements and the type of information required in order to carry out their responsibilities are different.

The table below illustrates the kind of information required for the 3 levels of command based on the 3 use cases described in detail in SALUS document D2.3 [8]:

Table 2–Information Requirements for Command and Control [5]

	Strategic	Tactical	Operational
Scenario 1 - Public order demonstration or riot	▪ Threat levels ▪ Number of casualties ▪ Volumes of public and extent of public disorder ▪ Criminal intelligence ▪ Copy-cat activities in other locations ▪ Geographical location and spread ▪ Resources available including mutual aide ▪ Situational update from tactical command ▪ Video feeds	▪ Direction from strategic command ▪ Numbers and movement of rioters ▪ Criminal intelligence ▪ Network capability, availability and utilisation ▪ Resources available including mutual aide ▪ Situational update from operational command ▪ Video feeds	▪ Direction from tactical command ▪ Criminal intelligence ▪ Talk group information ▪ Local risk assessment ▪ Location of resources available ▪ Video feeds ▪ Database access
Scenario 2 - Olympic-style sporting event	▪ Threat levels ▪ Crowd movement ▪ Geographical location	▪ Direction from strategic command ▪ Crowd numbers and	▪ Direction from tactical command ▪ Local risk assessment

	Strategic	Tactical	Operational
	and spread ▪ Situational update from tactical command, possibly via video feeds ▪ Resources available including mutual aide	movement ▪ Resources available including mutual aide ▪ Situational update from operational command ▪ Specialist support ▪ Video feeds	▪ Layout of stadia and access points ▪ Talk group information ▪ Location of resources available ▪ Database access
Scenario 3 - Heavy flooding due to prolonged periods of rain	▪ Levels of threat to public safety ▪ Weather information ▪ Extent of damage caused by flooding ▪ Numbers of casualties ▪ Geographical location and spread ▪ Situational update from tactical command, possibly via video feeds ▪ Resources available including mutual aide ▪ Video feeds	▪ Direction from strategic command ▪ Crowd numbers and movement ▪ Extent of damage caused by flooding ▪ Type of terrain and access restrictions ▪ Resources available including mutual aide ▪ Specialist support and equipment ▪ Situational update from operational command ▪ Video feeds	▪ Direction from tactical command ▪ Local risk assessment ▪ Talk group information ▪ Location of resources available ▪ Database access ▪ Video feeds

3.2 Typical User Numbers

The numbers of PPDR users to be deployed at a public event will depend specifically on the nature of the event in terms of severity, duration, number of attendees plus other factors such as policing practices and strategy used to contain the situation. The number of users operating under the coverage foot print of a site is also dependent on the design of the infrastructure, the technology deployed and the frequency band of operation.

However studies undertaken by the UK home office suggest that the number of PPDR end users can increase by up to a factor of 10 when activities change from business as usual (BAU) to a high level public order event.

Table 3 below presents real Public Safety user equipment (UE) and group distribution data from an urban area in the UK. The data was captured on a day representing typical BAU activity. The data represents a snapshot of usage patterns at a particular instant in time; chosen to represent the peak total usage in the day. The selected 9 sites each of which is divided into 3 radio sectors represent the most concentrated contiguous area of activity within the urban area [10]

Table 3–Snapshot of User Numbers during BAU Activity [10]

Site	Sector	Footprint (km2)	# of groups	# of UEs
Site 1	A	0.84	16	43
	B	2.53	26	230
	C	1.07	8	18
Site 2	A	2.44	6	29
	B	1.86	9	40
	C	2.57	20	86
Site 3	A	1.07	19	63
	B	0.81	5	5
	C	0.52	5	7
Site 4	A	0.87	27	93
	B	1.19	23	154
	C	1.07	2	2
Site 5	A	1.5	26	109
	B	1.26	11	40
	C	0.62	11	29
Site 6	A	0.82	6	8
	B	3.16	14	29
	C	1.02	34	205
Site 7	A	2.6	13	32
	B	1.05	16	66
	C	1.7	18	63
Site 8	A	1.13	17	67
	B	3.43	8	30
	C	1.23	11	36
Site 9	A	0.52	8	18
	B	0.36	3	5
	C	0.42	5	7
Site 10	A	0.61	11	71
	B	0.52	21	63
	C	0.45	19	50
Site 11	A	1.16	2	2
	B	0.52	4	11
	C	0.73	15	77
Site 12	A	0.46	22	140
	B	1.06	11	155
	C	0.64	13	29

Table 4 below presents UE and group numbers during a significant large planned event, requiring a much greater PPDR users' presence.

The event occurs in a smaller concentrated area of fewer sectors. With the existing TETRA mission-critical voice network it is necessary to introduce additional cell sectors to the event area to handle the high user numbers [10]

Table 4–PPDR user numbers during a large planned event [10]

Site	Sector	Footprint (km2)	# of groups	# of UEs
Site 7	C	1.7	32	155
Site 8	A	1.13	69	452
	B	3.43	30	133
	C	1.23	42	147
Site 10	C	0.45	20	54
Temporary Additional Site	A	1.6	83	2025
	B	1.4	58	1153

An example of this occurred when during the rioting in the UK in 2011, sixteen thousand additional police officers were drafted in from surrounding forces into London to assist the Metropolitan police contain the situation [1].

The above figures are for a specific high-visibility policing fast-moving event using a 400MHz TETRA infrastructure designed to deliver a high communications probability. A different event in the same area will not provide identical results but if of similar magnitude could produce similar numbers to those above.

3.3 PPDR Final Requirements

Taking the 3 use cases from D2.3, the final requirements of the PPDR users are summarised in the list below:

- **Voice -** Users can make a variety of voice call types including group, announcement/broadcast, emergency, individual and telephony interconnect calls. The infrastructure must ensure that emergency calls have priority over other calls, releasing capacity for an emergency call to be connected pre-empting other users where necessary.
- **Video –** Users can send and receive video imaging to all users, specific user groups or individuals, either from a dispatcher to the group or vice versa.
- **Data Applications –** Users can have mobile access to various data applications such as messaging services and email, organisation-specific databases and other data-rich applications such as location services, augmented reality and DNA/Fingerprint scanning.
- **Air to Ground – Seamless** communications are possible between users in aircraft and users on the ground.
- **Ad Hoc Mobile Networks –** Additional network coverage or capacity can be deployed quickly and easily where such a requirement exists, for example in remote locations.
- **Interoperability –** Communications are possible between users from different organisation whether operating on a common infrastructure or connected via different technologies or networks.
- **Crowd Control –** The communication system can be utilised to manage large crowds of people using a combination of loud speakers, video, social networking applications etc.

Table 5 expands on the above how they specific requirements relate to the 3 use cases:

Table 5–User Requirements Matrix (Final)

Category	Item	Use Case 1				Use Case 2				Use Case 3			
		P	F	A	O	P	F	A	O	P	F	A	O
Group Voice	*Group call	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Late entry	✓	✓	✓		✓	✓	✓			✓	✓	
	Dynamic reassignment	✓	✓	✓		✓	✓	✓			✓	✓	
	Prioritisation within group	✓	✓	✓		✓	✓	✓			✓	✓	
	Only 1 person to speak	✓	✓	✓		✓	✓				✓		
	Fast call set-up	✓	✓	✓		✓	✓	✓		✓	✓	✓	
1-2-1 Voice	Point to point	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Telephony	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Group video	*Group video streaming	✓	✓			✓	✓			✓	✓	✓	✓
	Late entry	✓	✓			✓				✓	✓	✓	
	Dynamic reassignment	✓	✓			✓				✓	✓	✓	
	Prioritisation within group	✓	✓			✓				✓	✓	✓	
	*Video from ad-hoc fixed locations to CC					✓	✓				✓		
	*Video on location for local use (unit-commander)										✓		
1-2-1 Video	Video streaming	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Emergency voice	Pre-emptive priority	✓	✓	✓		✓	✓	✓			✓	✓	
	Open microphone	✓	✓	✓		✓	✓				✓	✓	
Data Applications	Instant messaging	✓	✓	✓						✓	✓	✓	
	Email	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Automatic number plate/license plate recognition	✓				✓							
	Picture messaging	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Remote controlled CCTV	✓	✓			✓	✓	✓		✓	✓		
	*Sending location data (vehicle/person) to CC	✓	✓	✓						✓	✓		
	*Broadcasting location from CC to units	✓	✓	✓						✓	✓		
	Augmented reality	✓	✓										
	Augmented reality - text to voice	✓	✓										
	*Fingerprint scanning	✓				✓						✓	
	DNA testing	✓				✓		✓				✓	

Category	Item	Use Case 1				Use Case 2				Use Case 3			
		P	F	A	O	P	F	A	O	P	F	A	O
	*Patient monitoring (e.g. ECC)							✓				✓	
	*Monitor personnels' vital signs (drop detection, stress, toxicity levels...)					✓	✓			✓	✓	✓	
	Location services	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Air to ground	Integration with aircraft communications	✓	✓	✓		✓		✓		✓	✓		
Mobile ad hoc networks	Local broadband data communication facilities					✓	✓	✓	✓	✓	✓	✓	✓
	Capacity extensions					✓	✓	✓	✓	✓	✓	✓	✓
Database searching	*(Operational database search)	✓	✓	✓		✓	✓	✓		✓	✓	✓	
	*Query cargo information (from crashed vehicles)		✓	✓		✓	✓			✓	✓		
	*Remote medical database services			✓				✓				✓	
	*Car crash recovery system (cutting open crashed cars)	✓	✓			✓	✓				✓		
Broadcast Voice	*Site related	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Talk Group related	✓				✓				✓			
	Geography related	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Function related	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Broadcast Image	Site related	✓	✓			✓	✓			✓	✓		
	Talk Group related	✓	✓			✓	✓			✓	✓		
	Geography related	✓	✓			✓	✓			✓	✓		
	Function related	✓	✓			✓	✓			✓	✓		
Interoperability	Interoperability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Local range extender	Incident comms	✓	✓	✓						✓	✓	✓	✓
Crowd Control	Loudspeakers					✓			✓				
	Geo-cast (via LTE) of alarms					✓			✓				
	Evacuation procedures, etc via mobile phones,					✓			✓				
	Use of the screens at the stadium and outside					✓			✓				

P = Police, F = Fire, A = Ambulance, O = Other

* Fields referenced in the Law Enforcement Working Party (LEWP) requirements Matrix [4]

4 Considerations and Remarks

The intermediate user functional requirements documented in D2.2 have been updated through additional PPDR user engagement across Europe and now incorporates the technological capabilities that are associated with each scenario. This has included monitoring and factoring-in to the requirement capture exercise the activities undertaken by CEPT and LWEP [2].

The feedback received in general validated the 3 scenarios and the functional requirements captured within them. Therefore, the scenarios are deemed typical and accurately reflect the requirements of the PPDR community.

This deliverable does not address the PPDR user requirements regarding radio spectrum needs for next generation systems or considerations of future frequency harmonisation of the PPDR sector, as these will be the focus of SALUS deliverables D4.5 (Spectrum requirements) and D4.8 (Frequencies allocations proposals).

This document will provide guidelines for the prioritisation of the functionalities that are currently being developed in WP5 and WP6 as part of the prototype intermediate and final validations in WP7.

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ACRONYMS

3G	Third Generation
3GPP	Third Generation Partnership Project
AIE	Air Interface Encryption
AIRBUS	Airbus (company – purchased Cassidian)
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
BAU	Business As usual
BS	Base Station
CA	Certification Authority
CAS	Cassidian (company) – Now part of Airbus
CCSR	Centre for Communication Systems Research
CEPT	The European Conference of Postal and Telecommunications Administrations
CISM	Computing, Information Systems and Mathematics
COSI	Standing Committee on Internal Security
DMO	Direct Mode Operation
DoW	Description of Work
e2e	End-to-End
EAP	Extensible Authentication Protocol
EC	European Commission
ECC	Electronic Communications Committee
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
FIGO	FIGO
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
LEWP	Law Enforcement Working Party
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
RAN	Radio Access Network
RFC	Request For Comment
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
UE	User Equipment
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 3

Do you think there are applications that would be used that are not covered in this scenario?

Feedback	By	Organisation
Suggestions: Reaction of for example hasty intervention of police officers (Necessary) use of weapons, for example shots in the air,	Granig, Lt.Col, translated by Manfred Blaha	Austrian Federal Police Ministry of the Interior, Austria
Means for quickly reaching employees that are not on duty – a mechanism to call them into work quickly; for instance with an SMS message or via some pager. Slovenian ambulance forces currently use http://www.intervencije.net.	Via David Jelenc, UL	Medical dispatch, Ljubljana
The use of augmented reality may be bigger with location data directly from user to applications for automatic friendly forces tracking. This will also include augmented reality from helicopters and UAVs. All data used by the Police shall be E2E encrypted so traffic handover from LTE to Wi-Fi shall still be secured by a higher level of security. The use of shared maps and locations data on scene between commanders in different agencies is not part of this scenario.	Geir Myhre	National Norwegian Police, Computing and Material services
Cameras from helicopter or remote controlled helicopter are used even to day	Raine Luukkonen	Pelastusopisto, Finland
There might also be unmanned vehicles that could be armed by powerful water jets to stop lootings and to calm down the riots. Further, there might be aerial drones with cameras which could be used for reconnaissance to cover those locations that cannot be covered by CCTV cams	Not Known	A member of the Finish emergency services
Maybe controlling of the Commercial LTE network in case of that kind of riot scenario would be useful. It could prevent agitation to riot via social media. But that doesn't need any special applications?	Raimo Savola	Emergency Services College, Finland
I cannot think of any at the moment.	Not Known	A member of the Finish emergency services
No.	Not Known	MSB, Sweden
I have read the 3 scenarios and they are corresponding to what we are training in our exercises – from the content as well as realism and technically (e.g. at the national disaster management „Wintertag“ and the scenario „Flood Puchberg“), and also what happened in real incidents several times.	Richard Feischl	Lower Austria Fire brigade's Association
Thinking too much about technology – which can assist – but not on the how beneficial and time consuming to use. On the ground these are fast moving dynamics. There is not time to consult PDAs and video streams on devices. Pictures can be useful, but getting	Tom Blair	Airwave Solutions (Previously Strathclyde Police)

Feedback	By	Organisation
useable images from ground level doubtful. Elevated positions always bests and CCTV most useful.		
18: Could use personnel and vehicle location here, emphasising inter agency as in Collaborate (it's mentioned in 20 but could be emphasised more 20: There will be a post-event investigation phase, scope for, as an example, forensic evidence capture and transmission of photos etc back to base, identification of suspects by remote fingerprint and other ID processes	Jim Strother	Airwave Solutions (Previously Metropolitan Police Service, UK)

APPENDIX 2: END USER FEEDBACK – SCENARIO 2

Question 3

Do you think there are applications that would be used that are not covered in this scenario?

Feedback	By	Organisation
If the number of wounded is large, it makes sense to support the triage process; one could use sensors to gain additional insights about the wounded, their location, triage category, identification and the subsequent medical procedures that follow (iv channel, …), the location of his ward, the identity of his driver, etc.	Via David Jelenc, UL	Medical dispatch, Ljubljana
All data used by the Police shall be E2E encrypted so traffic handover from LTE to Wi-Fi shall still be secured by a higher level of security. This is especially important for SWAT, tactical information and intelligence data in the networks	Geir Myhre	National Norwegian Police, Computing and Material services
Jammers which blog the frequency of remote controlled firing device. 27-450 Mhz	Raine Luukkonen	Pelastusopisto, Finland
The "tera Herz" cameras might also be available for bomb squads and maybe on the drones too to search and find the bombs before explosions. There might also be automatic analytics for scanning suspicious behavioural patterns in footage and video material to detect the bomb setters		A member of the Finish emergency services
Cannot think of any		A member of the Finish emergency services
No		MSB, Sweden
I have read the 3 scenarios and they are corresponding to what we are training in our exercises – from the content as well as realism and technically (e.g. at the national disaster management „Wintertag“ and the scenario „Flood Puchberg“), and also what happened in real incidents several times.	Richard Feischl	Lower Austria Fire brigade’s Association

APPENDIX 3: END USER FEEDBACK – SCENARIO 3

Question 3

Do you think there are applications that would be used that are not covered in this scenario?

Feedback	By	Organisation
The network of radio systems "ZARE" and "ZARE+", computer software "ProZIR", firemen information system "Vulkan", information system for managing intervention reports "SPIN", computer database of hazardous substances "NevSnov".	Via David Jelenc, UL	Slovenian fire brigade association
The use of sensor technology will be used in predictions of possible scenario s and SCADA data can be transferred from e.g. dams to report water flow / water levels etc. Satellite phones will be used to control room for strategic decisions.	Geir Myhre	National Norwegian Police, Computing and Material services
VHF- radios of hunters and car sport clubs and sport clubs can be useful in emergency communication.	Raine Luukkonen	Pelastusopisto, Finland
Buses and taxis might also have to be employed to transport stranded and injured people to the evacuation centres (rest areas). Triage and first aid arrangements might be needed in evacuation centres which means that there should be measures to transmit patient data to the makeshift medical centres where instructions on treatments are given to apply in the evacuation centres		A member of the Finish emergency services
Long transmission range communication (VHF?)	Raimo Savola	Emergency Services College, Finland
Yes, we already have IR camera drone solutions available, why not use them? Also, satellite based communication can be used both for voice and limited data. Some rescue organisations already have satellite phones as ultimate backups.		A member of the Finish emergency services
No.		MSB, Sweden
I have read the 3 scenarios and they are corresponding to what we are training in our exercises – from the content as well as realism and technically (e.g. at the national disaster management „Wintertag" and the scenario „Flood Puchberg"), and also what happened in real incidents several times. I am especially thinking on our operations in Slovenia with communications- and power-failure over several days, where a mobile TETRA-basestation, Sat-Com connection and mobile power generators (more than 150 kVA) partially brought back normality. [comment: Lower Austria Fire brigade sent some 100 fire-fighters for disaster relief after an ice-storm-rain in Slovenia in Feb. 2014] At the large area flood scenario I would propose to add surveillance [comment: better: observation] from the air (AIRWATCH) and integrate satellite-based systems like COPERNICUS into the phase of coping with the disaster. These systems had been operational in real incidents – AIRWATCH at the Danube river floods in 2013 and COPERNICUS sat-system in Bosnia & Herzegovina [comment: flood 2014]	Richard Feischl	Lower Austria Fire brigade's Association

Feedback	By	Organisation
Tetra Voice and Satellite Comms the best solution. Mobile networks would quickly come down – use the examples in England of the recent and near past flooding in Cumbria.	Tom Blair	Airwave Solutions (Previously Strathclyde Police)
A couple of thoughts: I worked on an EU project ABSOLUTE which concludes soon, which used airborne (fast-deployable balloon) to provide emergency networks including satellite backhaul. An interesting addition if you wanted to extend the potential for emergency networks where existing ones are compromised In this situation, informing the public is essential – you could add some provision for the transmission of vital messages to the public e.g. a temp network that could be used by any mobile phone or other device to access such messages	Jim Strother	Airwave Solutions (Previously Metropolitan Police Service, UK)

APPENDIX 4: END USER FEEDBACK – SCENARIO INDEPENDENT RESPONSES

Users attending a PSCE and TCCA event that took place in Brussels at the end of June were asked the following scenario independent question:

What are the two most needed capabilities/functionalities do you foresee for the future PPDR communications (e.g. high data rate?)

No.	Capability/functionality #1	Capability/functionality #2	Organization	Country	Name
1	Video - Uplink and Downlink	Sensoring - location; Huge Data	Telefonica - AS TETRAPOL Operators	Spain	Miguel Crisostomo
2	*****	Spectrum to supply *****	PSNI	n/a	n/a
3	Resilience using multiple infrastructures	Massive Sensor networks with automatic intelligent interpretation of data	FIGO	Netherlands	Frank Brouwer
4	Interoperability / roaming	Video transmission	Swiss Thechnical Police Commission / Geneva State Police	Switzerland	Mancastroppa Marc
5	Usability of Now Technology / Interoperability / Training + Exercises	Balance between protection of Data (security) vs. Information sharing	NATO	Belgium	Andrew Wright
6	low latency in the access network	high security in any layers	Ministère d'État	Luxembourg	Hoscheid Steve
7	Cognitive Optimised User Interfaces both fixed and mobile	Information Analytics, Prediction, Consistent Semantics, Sharing, Management	HW Communications	UK	David Lund
8	High Speed Data	Resilience + ISI	Belgian Federal Police	Belgium	Jacquard Claude
9	High data rate for hungry application and bandwidth consuming services. As such video can be considered (CCTV, for automatic plate recognition, surveillance)	Interconnection with external sources such as databases, intranet, ICT legacy systems. Fall back capability by providing resilience through backup, using different network for voice and different for data transmission.	EXUS S.A.	Greece	Christos Katsigiannis
10	TETRA-like talk services in LTE	technology to share LTE capacity with commercial operators while still assuring dedicated capacity	Suomen Erillisverkot Oy	Finland	Antti Kauppinen
11	Resilience	Ubiquity	TCCA	Europe	n/a

12	Common protocol to handle all datatypes - heavily ; lets say that video capabilities nowadays needs "on the site engineering"	Speech services; Wide/broadband data (IP); Data mining	Suomen Erillisverkot Oy ; Finland, PSS Operator	Finland	Yrjö George Pylvänäinen
13	Mobile Broadband integrated to ***** service	999 + Usability	Finnish National Police Board	Finland	Heikki Riippa
14	Interoperability of info systems	Citizens access/communication to first responders (data)	KU Leuven	Belgium	n/a
15	high-speed mobile data capability integrated with voice	Resilience of networks and devices	Commission	Belgium (czeck Republic)	n/a
16	Higher bandwidth (of course), but also easiness (human and data interfaces) of access to data and convergent devices	secure and resilient infrastructure, in particular backbone involving several parties and ***** responsibility => product developed needs to support these needs in products brought to market	Directorate for Emergency Communication (DNK)	Norway	Jostein Hesthammer