



PSCE (winter) Conference

What is the roadmap for PPDR 4G?

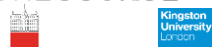
Oxford, UK - 09 December 2015



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Aveiro-Portugal



Security And Interoperability in Next Generation
PPDR Communication Infrastructures





{about SALUS}

3 slides



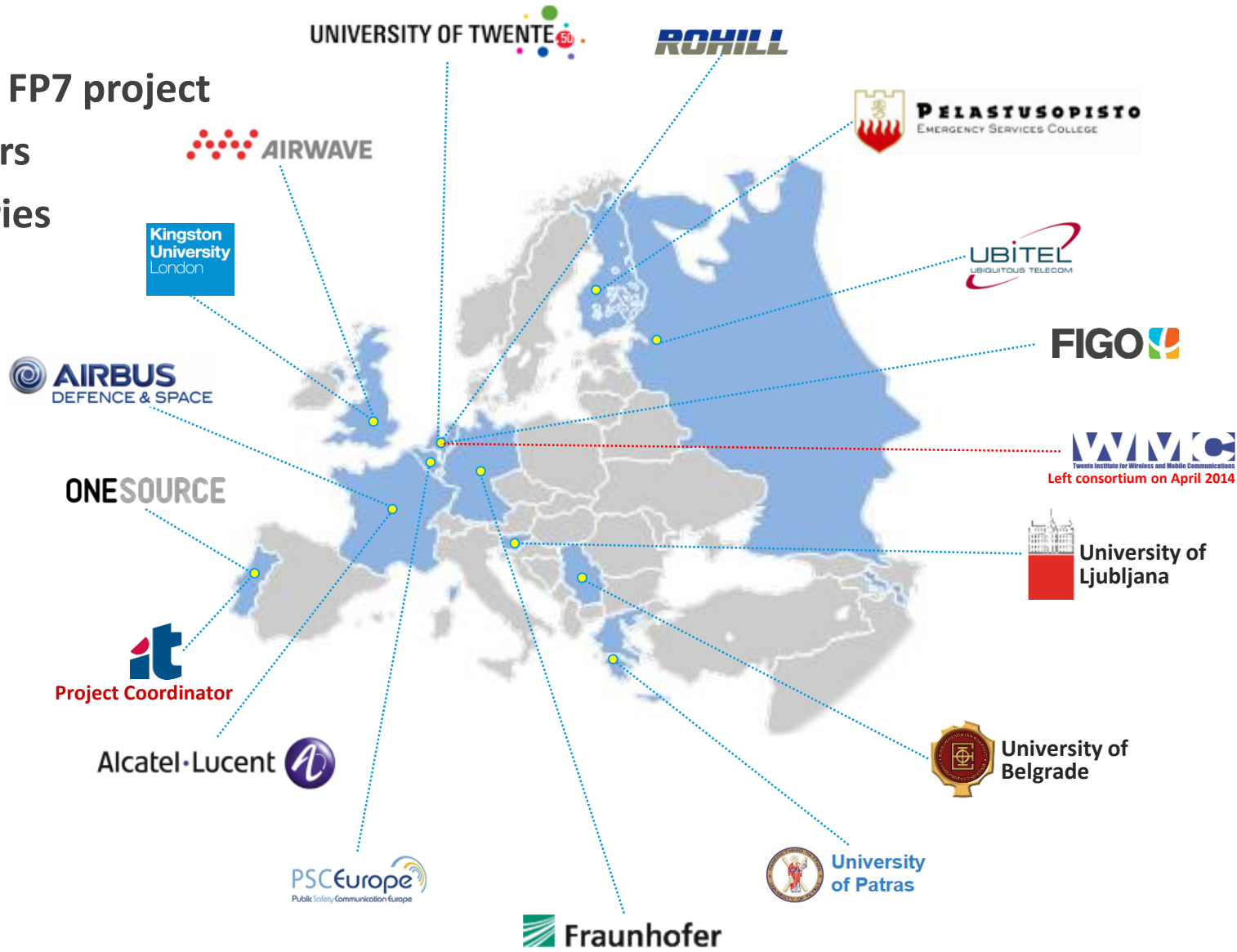


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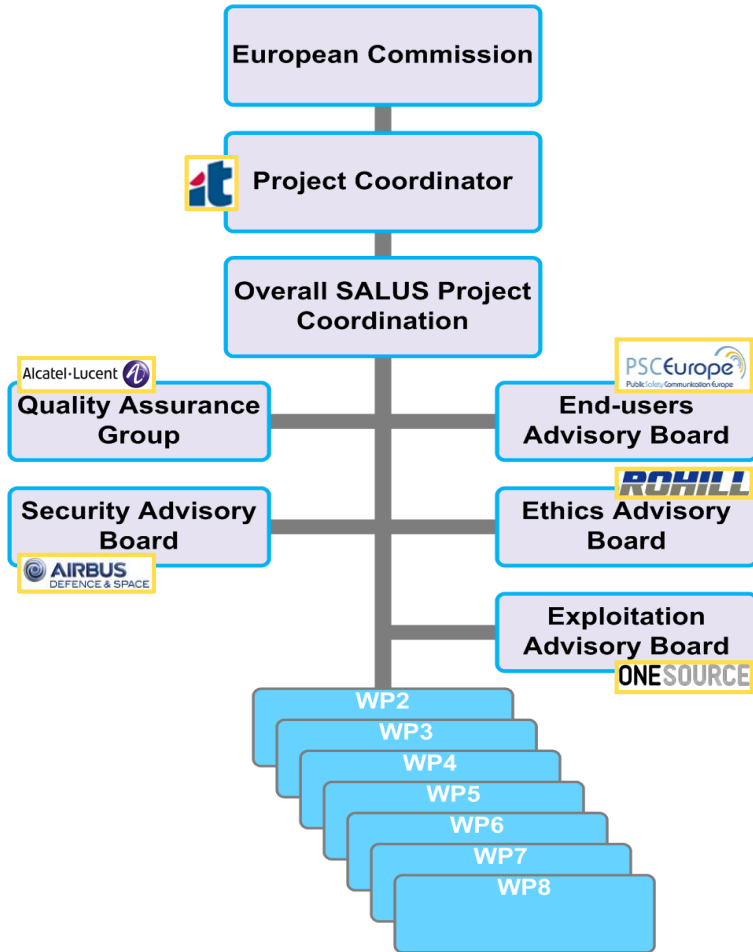
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Project Consortium

- 36 month FP7 project
- 16 partners
- 11 Countries
- 4,8M€



Project Management Structure



- IT
- All Partners

Overall SALUS Project Coordination

- UTWENTE
- IT
- ROH
- UPAT
- PSCE
- ALU-I

Quality Assurance Group

- CAS
- IT
- AW
- FhG
- UL
- KU
- UTWENTE
- ESC

Security Advisory Board

- PSCE
- CAS
- AW
- FIGO
- ALU-I
- ESC

End-users Advisory Board

External Advisory Panel

- ONE
- CAS
- ROH
- AW
- FIGO
- ESC

Exploitation Advisory Board

- ROH
- FhG
- UL
- UPAT
- PSCE
- ALU-I

Ethics Advisory Board



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Project Goals

Top 10

#1:

To design Use Cases and gather end-user requirements for the next generation PPDR communication system

[most wanted capabilities, usage statistics]

#2

To validate LTE as the next generation PPDR network

[PMR services on top of LTE , enhanced services for mission-critical operations, seamless handovers & mission-critical security compliance]

#3

To further extend current available TETRA/TETRAPOL services

[integration with sensors, location, new codecs (possibly)]

#4

To 'proof-of-concept' the interoperability between TETRA/TETRAPOL and LTE

[voice, data and support for PMR services]

#5

To provide guidelines towards the medium/long term evolution of PPDR networks

[evolution roadmaps , services, security, interoperability, spectrum]

#6

Collect data related to police forces and first responders

[# organizations per country | # people involved | wireless communication needs | # of events]

#7

To investigate procedural needs and workflows of headquarters and operators involved in PPDR based operations

[Enterprise Architecture integrated with System Architecture]

#8

To develop/integrate new services/applications that would improve situation awareness for the PPDR Command & Control Centre

[wireless body area networks, location privacy, multi-hop wireless networks, drone surveillance, physical layer security]

#9

Training Activities

[events for specialists, inform & train PPDR operators and end-users in selected new functionalities]

#10

Dissemination and Standardization Activities

[technology, protocols, security (including privacy-by-design)]





{past, present and future}

...on European research for *nextgen* PPDR communication system

1 slide

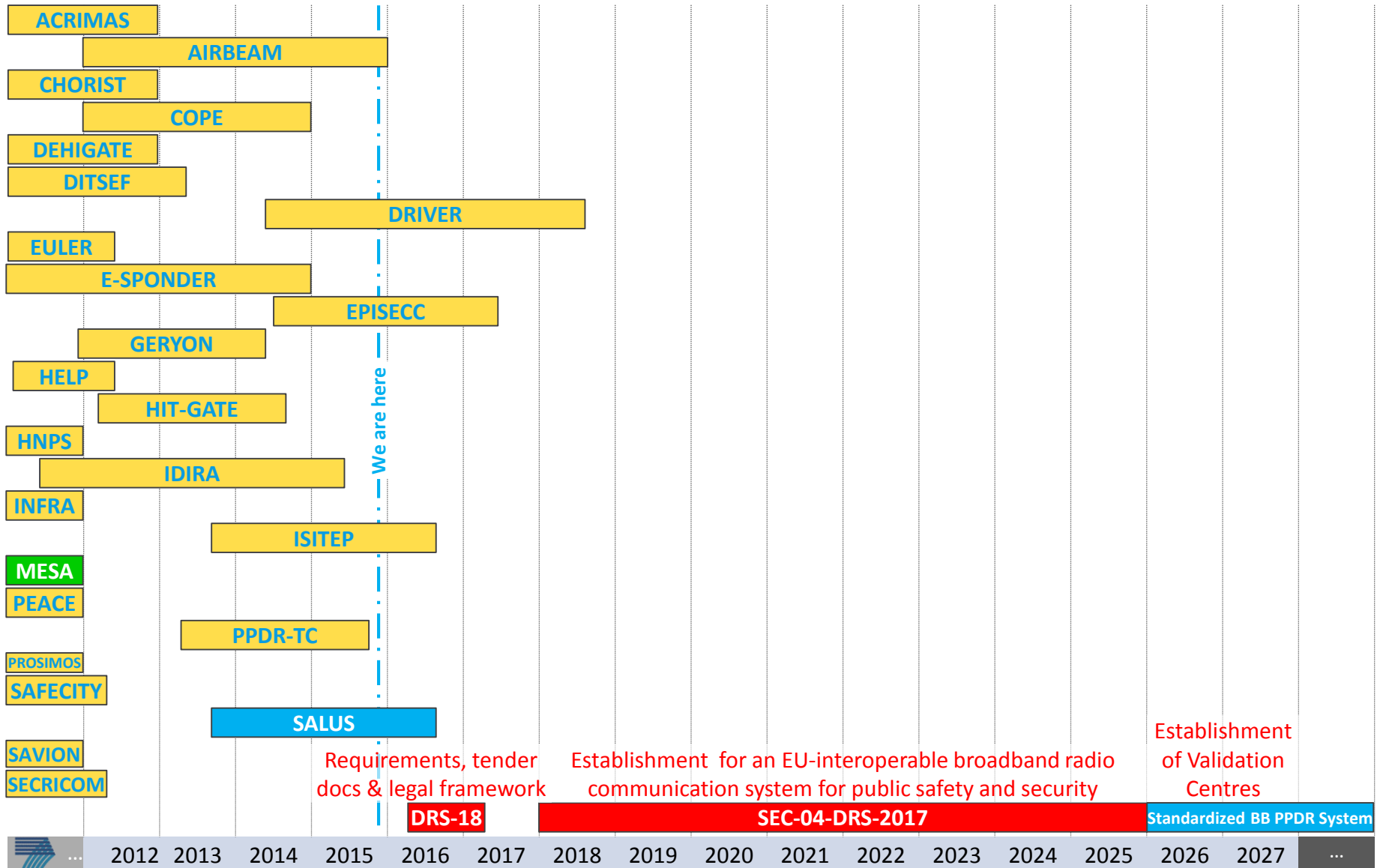




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The Past, Present and Future

European research (sample) for nextgen PPDR communication systems





{expected support for legacy PMR}

1 slide



TETRA

- ETSI seems to have no plans to develop a new technology standard for use by large traditional PMR user organisations.
- TETRA networks are expected to be available for at least another 15 years, thereby ensuring a very good return on investment for user organisations as well as manufacturers and suppliers
- TETRA is expected to continue to evolve beyond Release 1 and Release 2 to provide additional enhancements as driven by user needs, technology innovations and other parallel standard developments.

TETRAPOL

- TETRAPOL, due to legal commitment, is also expected to be available for at least another 15-20 years
- A converged solution between TETRAPOL and TETRA still could be possible, but this would require:
 - Spectrum harmonisation
 - 'Affordable' set of patent license fees
 - Single terminal chipset ecosystem

NOTE: TETRAPOL is currently deployed in 85 networks across 35 countries and represents more than 1.85 million users

@www.tetrapol.com



{LTE: the *nextgen* PPDR communication technology}

2 slides





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LTE: the nextgen PPDR communication technology

LTE Market status – October 13, 2015

LTE Market Status

GSA's Evolution to LTE report – OCTOBER 13, 2015

692 operators investing in LTE in 181 countries

- 657 operator commitments in 177 countries
- 35 pre-commitment trials in 4 more countries

442 commercially launched LTE or LTE-Advanced networks in 147 countries

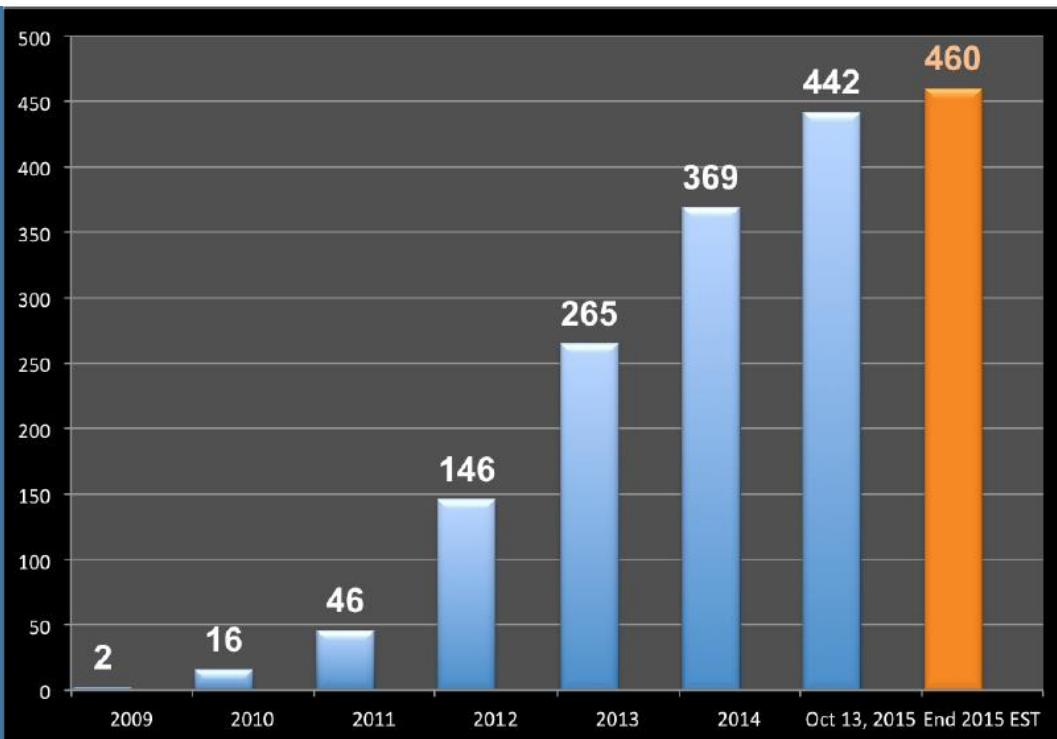
incl. 62 LTE TDD (TD-LTE) launched in 37 countries

GSA forecasts 460 commercially launched LTE networks by end 2015

3,253 LTE user devices announced
(GSA - June 2015)

755 million LTE subscriptions globally: Q2 2015

© GSA www.gsacom.com



LTE network commercial launches: 2009 – 2015

- From ECC Report 218 (published on October 2015):

“The PPDR user community has stated that **PPDR, from a technical standard point of view, wants to be part of the global LTE ecosystem** because of several advantages including more choice of terminals, lower prices, roaming with commercial networks and long term further developments”



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SALUS vision on LTE for PPDR communications

- LTE can be **deployed in a large range of spectrum** bands starting from 450 MHz up to 3.8 GHz (450, 800, 1800, 2600, 3800)
- LTE has been **selected by major PPDR end-users associations** such as the Association of Public Safety Communications Officials (APCO) and the TETRA + Critical Communications Association (TCCA) **to be the follower technology of existing narrowband** specialised voice-centric systems
- LTE **does not provide mission critical communication functionalities yet**
- It is envisaged that **first mission-critical LTE systems will be available from 2018**
 - After 3GPP Release 13, additional enhancements will be defined
- It is also to be noted that some non-European suppliers (Huawei and ZTE) are **offering today proprietary solutions with a subset of the features** (especially the PTT and pre-emption). However, these solutions are not in-line with the 3GPP standard)



{SALUS technologies}

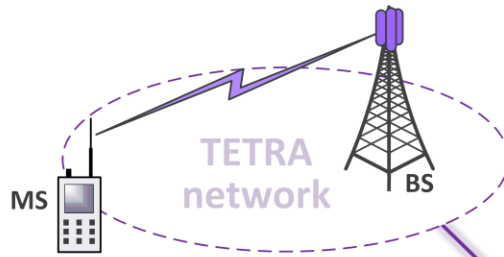
8 slides





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- GROUP CALL
- BROADCAST CALL
- INDIVIDUAL CALL
- TALKING PARTY ID
- CALL ID
- PRIORITY CALL
- PRE-EMPTIVE PRIORITY CALL
- EMERGENCY CALL

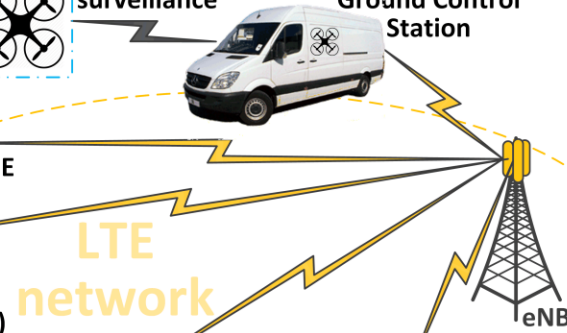
- SPEECH ITEM PRIORITY
- TELEPHONY CALL
- CALL FORWARDING
- CALL TRANSFER
- AMBIENT LISTENING
- STATUS MESSAGING
- TEXT MESSAGING
- END-TO-END ENCRYPTION



- Wi-Fi Extension add-on
- Intrusion Detection System
- Man-down detection
- Location and KPI assistance
- Wi-Fi to LTE handover
- OTT PMR functionalities



LTE UE



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Command & Control Center

SALUS RELAY

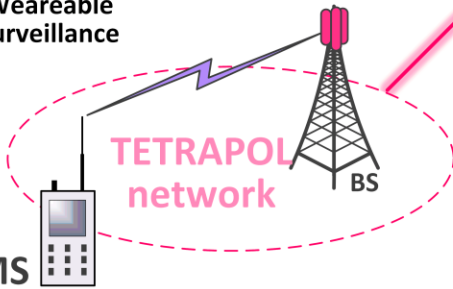
- Video Management System
- Improved Situational Awareness
- Dynamic QoS Controller
- Interoperability LTE/PMR
- LTE/PMR Dispatchers
- Message Brokering
- Intrusion Detection System



Security solutions (including privacy), physical layer propagation in crowded environments and jamming detection



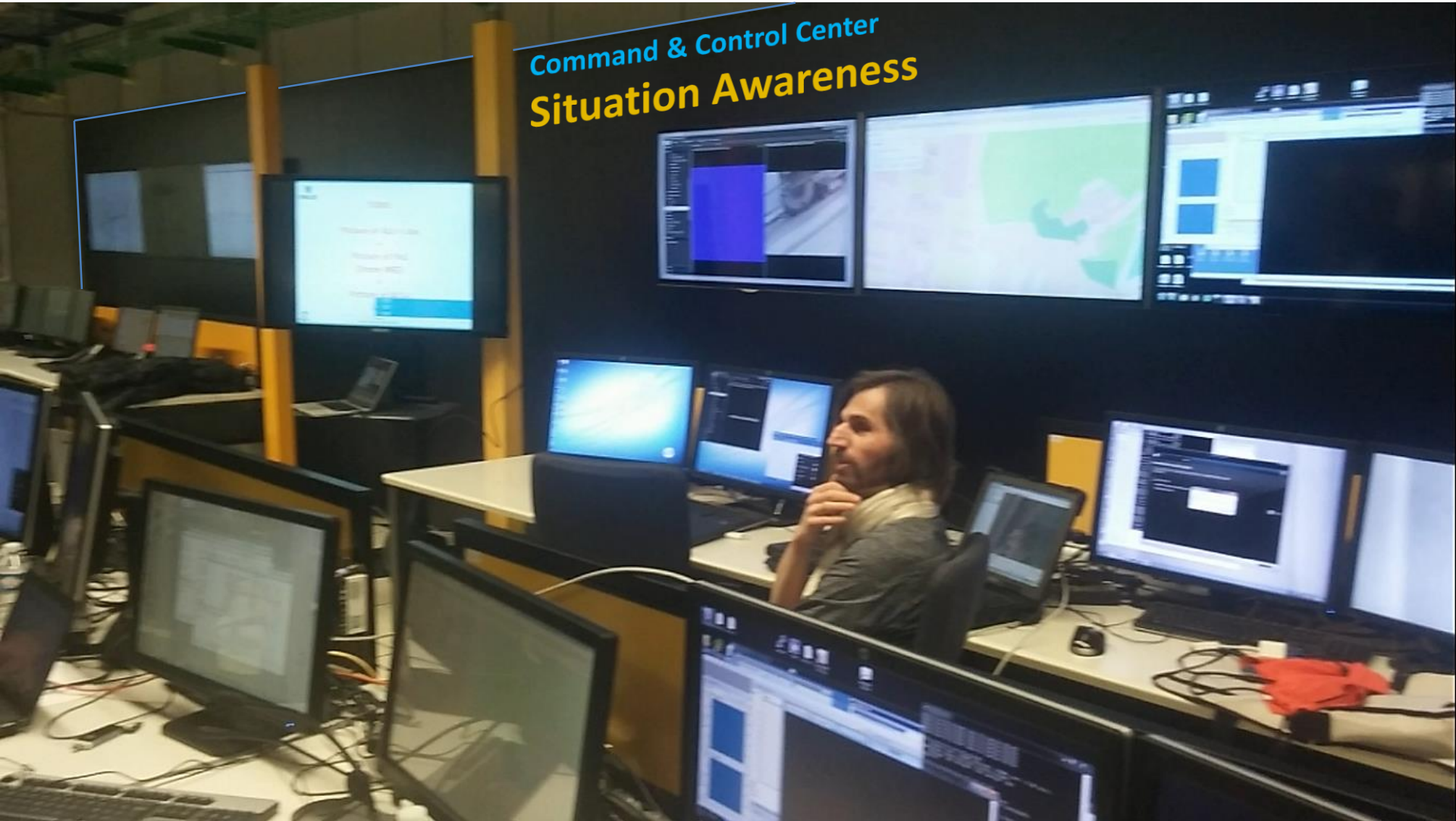
- Improved Situational Awareness
- Dynamic QoS Controller
- Interoperability LTE/PMR
- LTE/PMR Dispatchers
- LTE/PMR extended coverage
- Wi-Fi extended coverage
- Fallback to Island mode
- Message Brokering
- Intrusion Detection System



- GROUP CALL
- BROADCAST CALL
- INDIVIDUAL CALL
- TALKING PARTY ID
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- SPEECH ITEM PRIORITY
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Weareable camera

SALUS weareable
Communications's hub
(1st prototype)

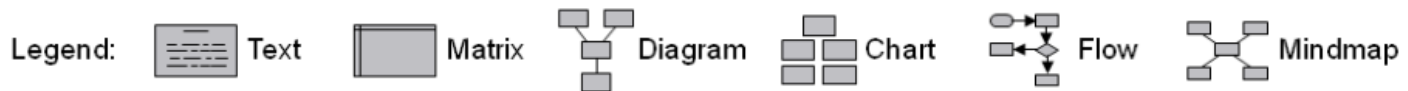
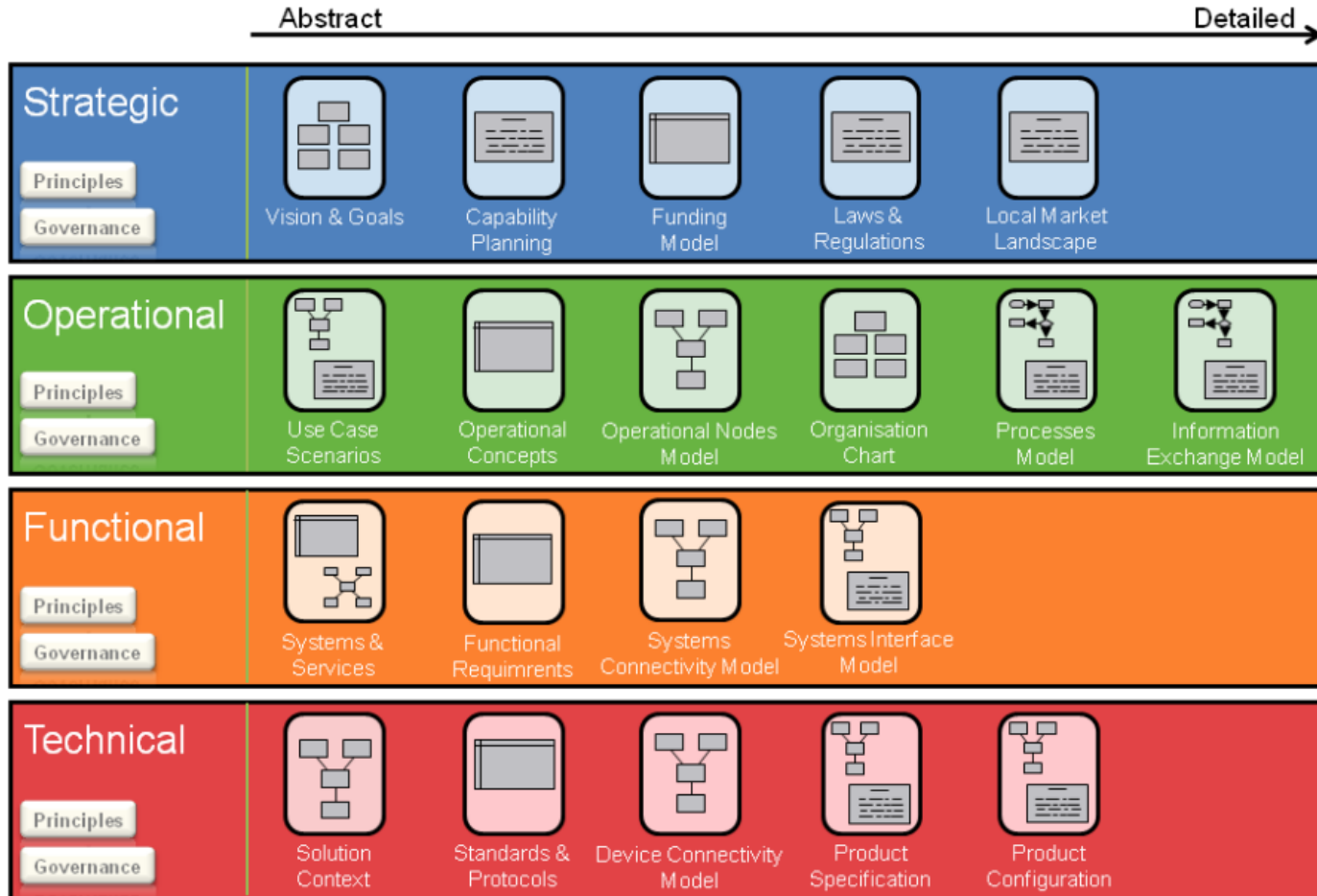


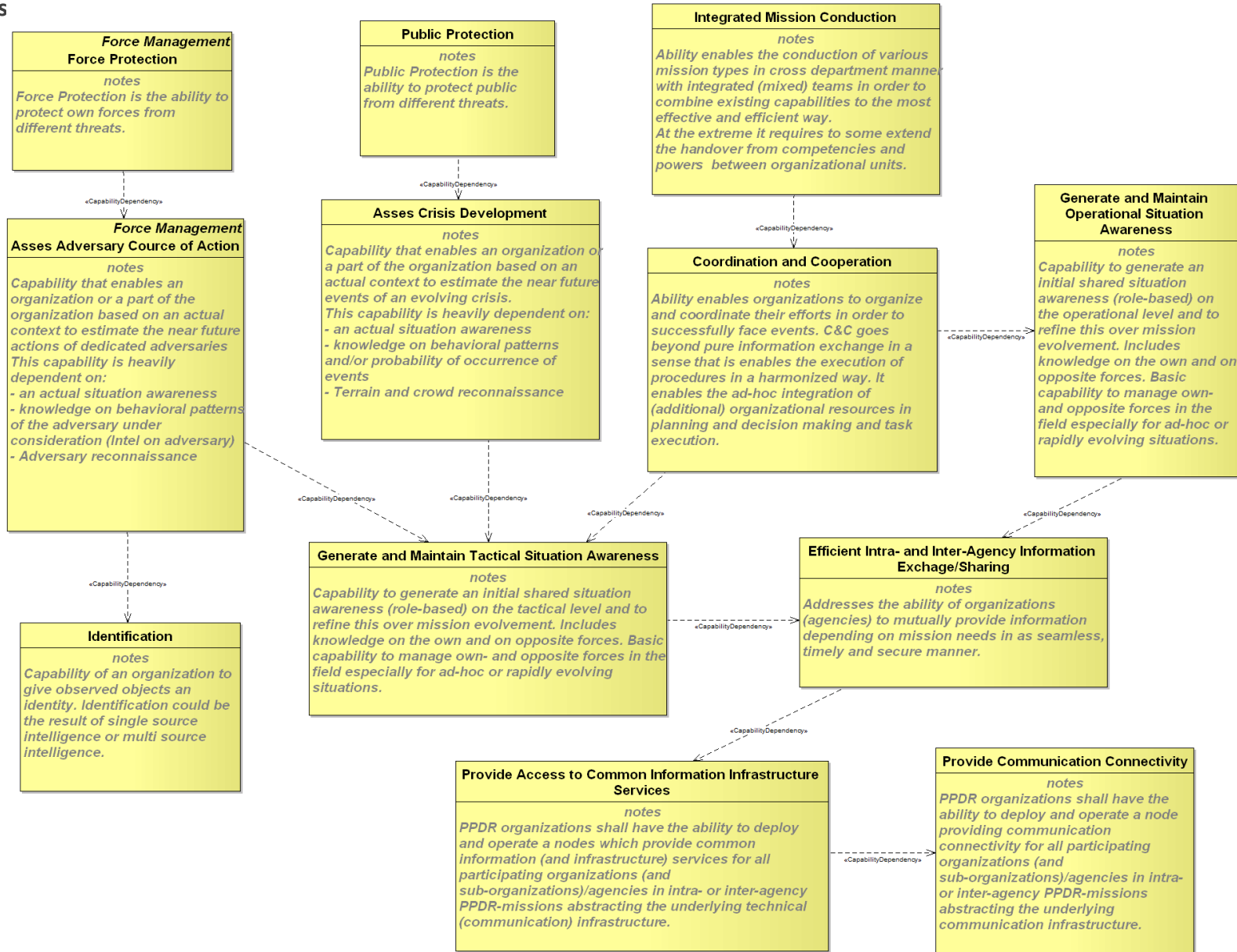


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Enterprise Architecture



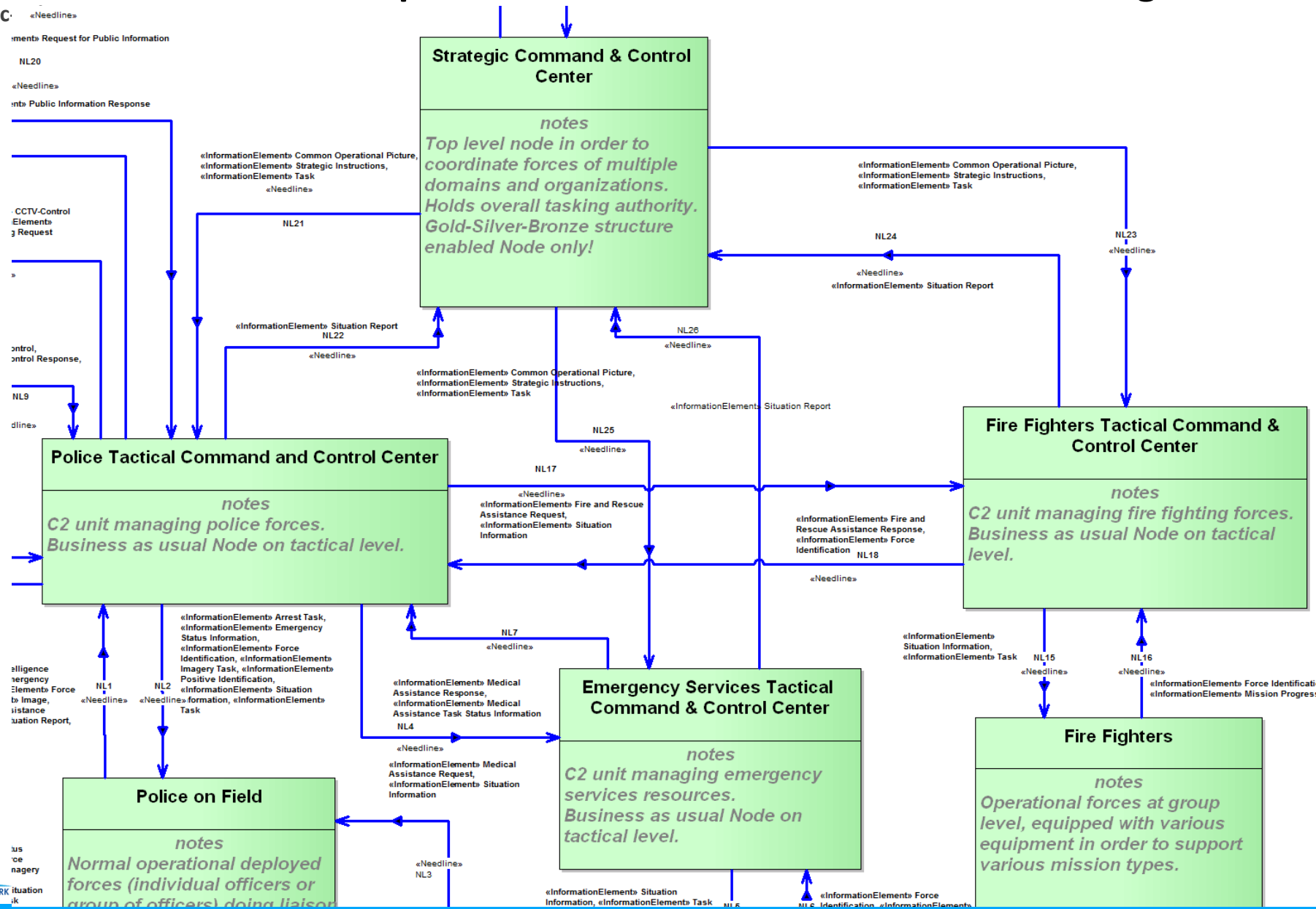




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www.sec «Needline»

PPDR Enterprise Architecture and SALUS Operational Nodes and Information Exchange Needs





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SALUS Techno-Economic Tool

- The goal is to help PPDR organizations on choosing the best **roadmap** towards the nextgen PPDR system.
- The tool takes into account input parameters associated with **LTE, Wi-Fi, coverage area** and their **interworking** with existing TETRA and TETRAPOL system.
- The tool determines the Capital Expenditure (**CAPEX**), Operational Expenditure (**OPEX**) and the Total Cost of Ownership (**TCO**) indexes for a period of pre-defined number of years.
- **The tool will be made available soon;**

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Security and interoperability in next generation PPDR communication infrastructures

Techno - Economic Tool

Budget Calculation

BOTH
Select an option
CAPEX
OPEX
BOTH

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Security and interoperability in next generation PPDR communication infrastructures

Techno - Economic Tool

CAPEX

	Quantity	Original Cost(Euros)	Yearly Price Trend(%)
TETRA/Tetrapol BS			
TETRA/Tetrapol Gateways			
TETRA/Tetrapol Devices			
Cameras	10	55	4
Control Rooms			
Mobile Command Room			
LTE Base Stations			
LTE Gateways			
Spectrum License at 700 MHz			
Extra LTE 10 MHz			
LTE Wi-Fi Units	15	250	1
Wi-Fi Base Stations	110	15	3
(Wireless) Body Area Networks			
SALUS Gateway			

Calculate

© SALUS (FP7)





{medium and long term (co-existing) operating scenarios}

5 slides





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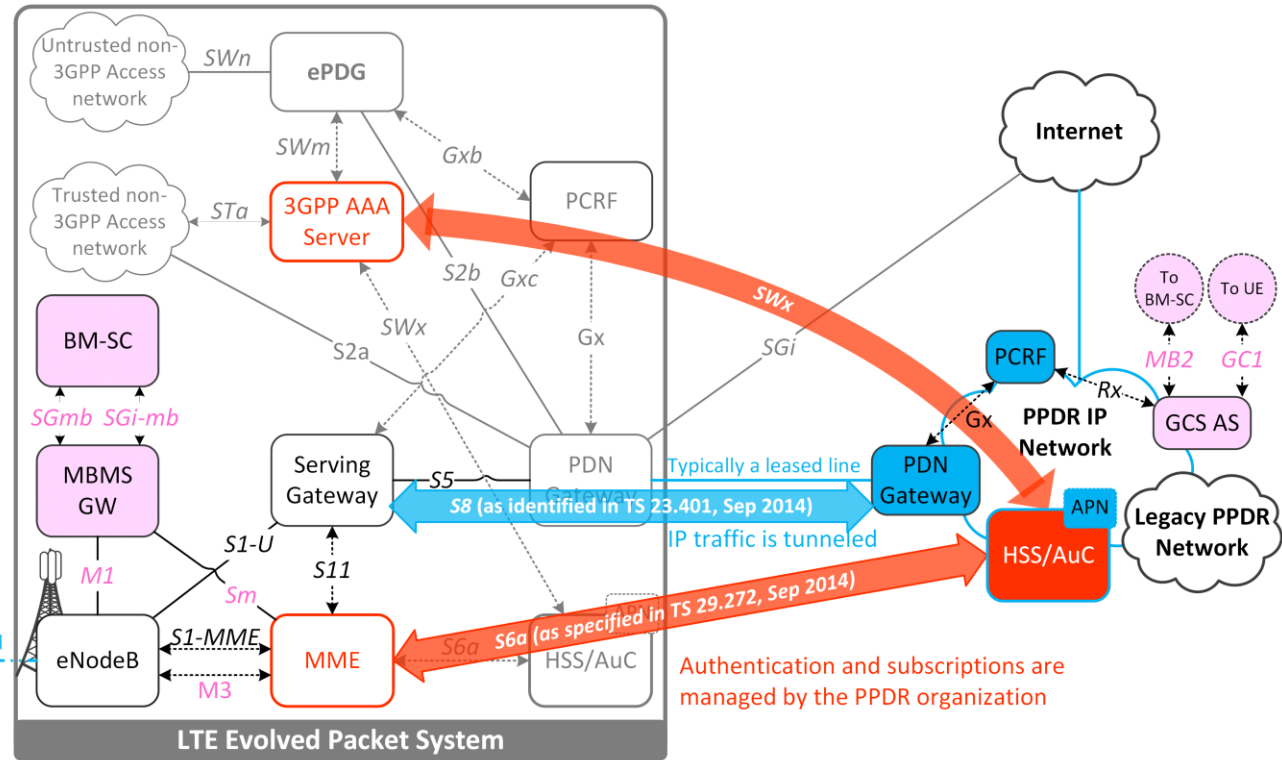
Medium and Long Term Operating Scenarios

Migration roadmap: **phase 2** –PPDR organizations as Full LTE MVNOs

Subtitle

- ←-----→ Control Data only
- .-.-.-.- Wireless link
- ==== Wired link
- ◻ Evolved Multimedia Broadcast Multicast Service components
- APN - Access Point Name
- AuC – Authentication Centre
- MBMS – Multimedia Broadcast Multicast Service
- BM-SC – Broadcast Multicast Service Centre
- ePDG – evolved Packet Data Gateway
- GW – Gateway
- HSS – Home Subscriber Server
- MME - Mobility Management Entity
- PDN - Packet Data Network
- PCRF - Policy and Charging Rules Function

(Terminal belonging to the PPDR organization)



- PPDR organization (MVNO) controls authentication procedures and subscriptions
- PPDR organizations may have a single sign-on both on TETRA/TETRAPOL and LTE (even though inter-system-interfaces need to be designed)
- PPDR organizations do not have direct control over the LTE network (e.g. maintenance outages), even though this could be specified in the cooperation agreement
- Even though IP QoS mechanisms are applicable, assuring seamless operation in cross network (inter-domain) scenarios is complex, hence **QoS assurances may not be safeguarded**
- **Network equipment may not comply with mission-critical operations**



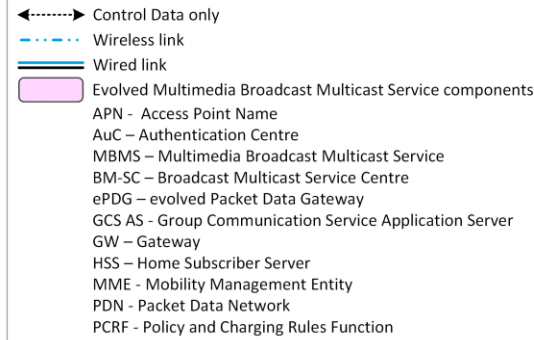
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Medium and Long Term Operating Scenarios

Migration roadmap: **phase 3** –PPDR organizations as owners of LTE networks

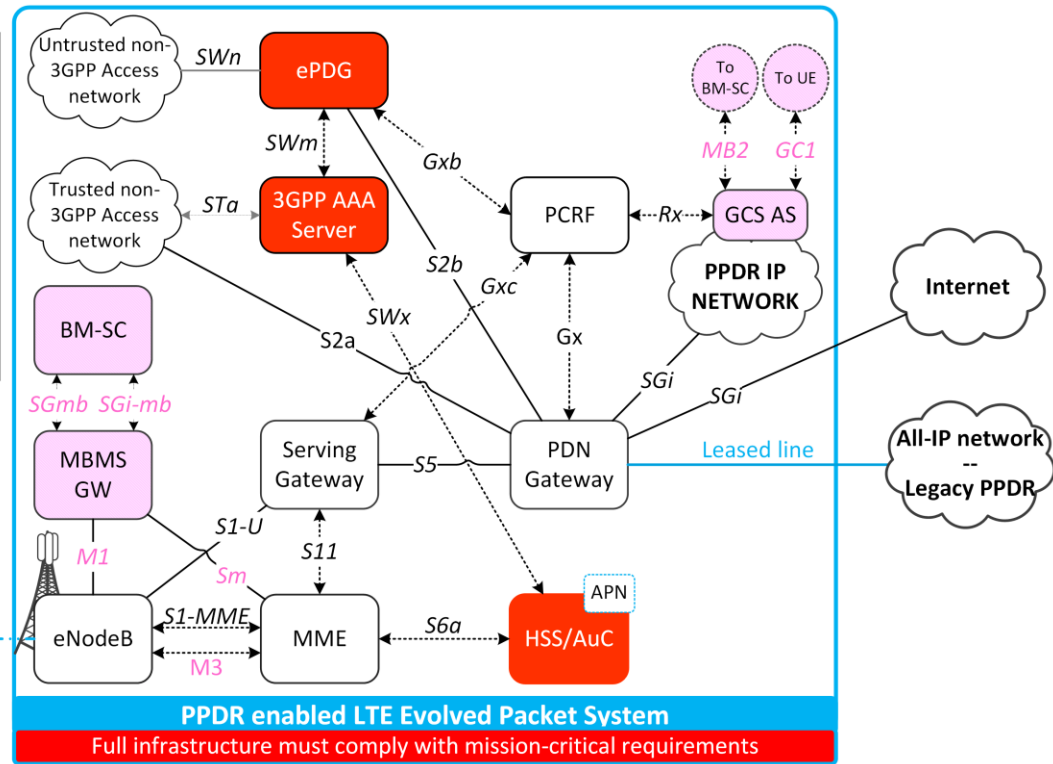
Subtitle



(Terminal belonging to the PPDR organization)



APN pre-configured



- **Dedicated spectrum is required**
- PPDR organization has full administrative control over the network equipment (including authentication procedures and subscriptions);
- PPDR organizations may have a single sign-on both on TETRA/TETRAPOL and LTE (even though inter-system-interfaces need to be designed (SALUS));
- PPDR organization decides on timeliness of management/maintenance operations
- QoS assurances can be safeguarded, network equipment must comply with mission-critical operations;
- Broadband network is capable of supporting mission critical communications (voice + data).



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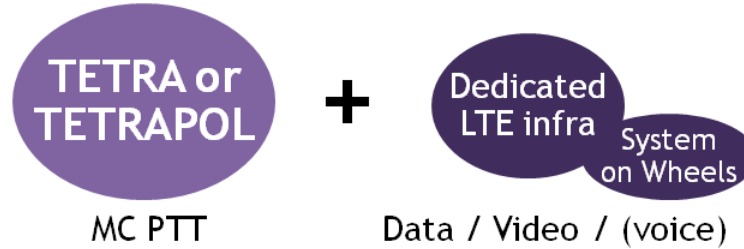
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Possible migration roadmaps for PPDR infrastructure

With dedicated broadband frequency

Early LTE adopters

Now
(Broadband
Data Overlay)



2016/2017
(LTE/TETRA
integration)

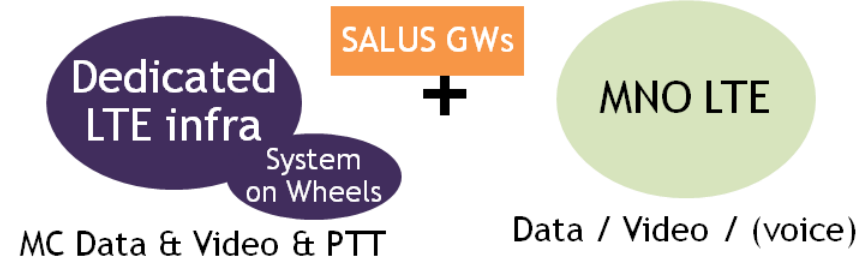


Late LTE adopters

Post 3GPP R13
(Mission Critical
LTE)



End of migration
(Broadband only)





Possible migration roadmaps for PPDR infrastructure

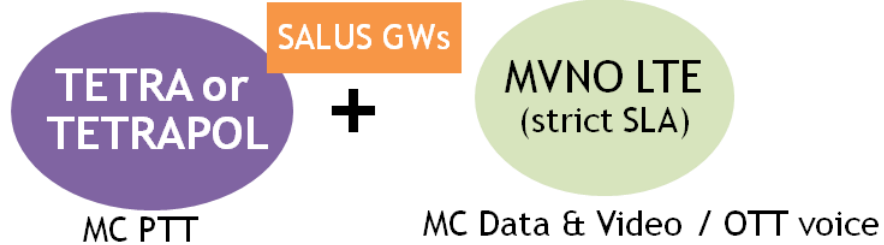
Without dedicated broadband frequency

Early LTE adopters

Now
(Broadband bubbles)

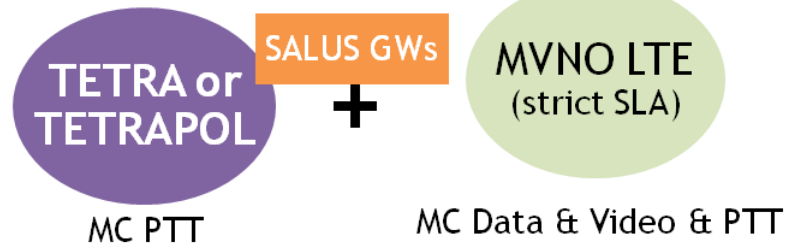


2016/2017
(LTE/TETRA integration and dedicated LTE in cities)



Late LTE adopters

Post 3GPP R13
(Mission Critical LTE -dedicated in city + MNO)



End of migration
(Broadband only)





Thanks for your attention

Questions?

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