



HELP Project – Enhanced Communications in Emergencies by Creating and Exploiting Synergies in Composite Radio Systems

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**Project HELP - Enhanced Communications in Emergencies by Creating
and Exploiting Synergies in Composite Radio Systems**

FP7-SEC-2010-1 Coordination and Support Action (CSA) on topic "Aftermath crisis management - phase I".

- 1. Major challenges**
- 2. Project HELP objectives and overall strategy**
- 3. Scenario**
- 4. Three main focus areas defining requirements and proposed solutions**

Major challenges

Major challenges of nowadays Public Protection & Disaster Relief (PPDR) wireless communications systems in emergency and disaster relief scenarios:



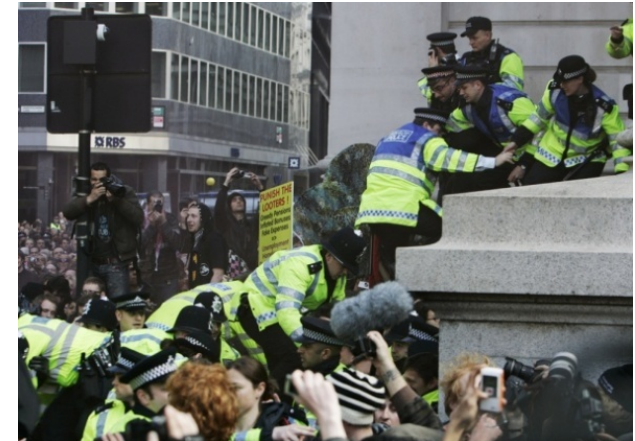
- Lack of interoperability
 - Different technologies in place
 - Lack of network interworking

Major challenges

Major challenges of nowadays PPDR wireless communications systems in emergency and disaster relief scenarios:

- Lack of broadband and capacity

- Lack of proper technology (high peak bit rate)
- Lack of dense network deployment
- Lack of sufficient spectrum (or more efficient usage of it)



Project HELP - Objectives

Project HELP will pursue two major objectives

1) To define a **solution framework** based on:

- network sharing
- spectrum sharing
- coordination

In available wireless communications systems in an incident zone.

2) To **identify**:

- operational features
- management features
- related functionalities

of the established communications framework

Project HELP - Objectives

Project HELP will provide a system concept and associated management framework, which will be able to:

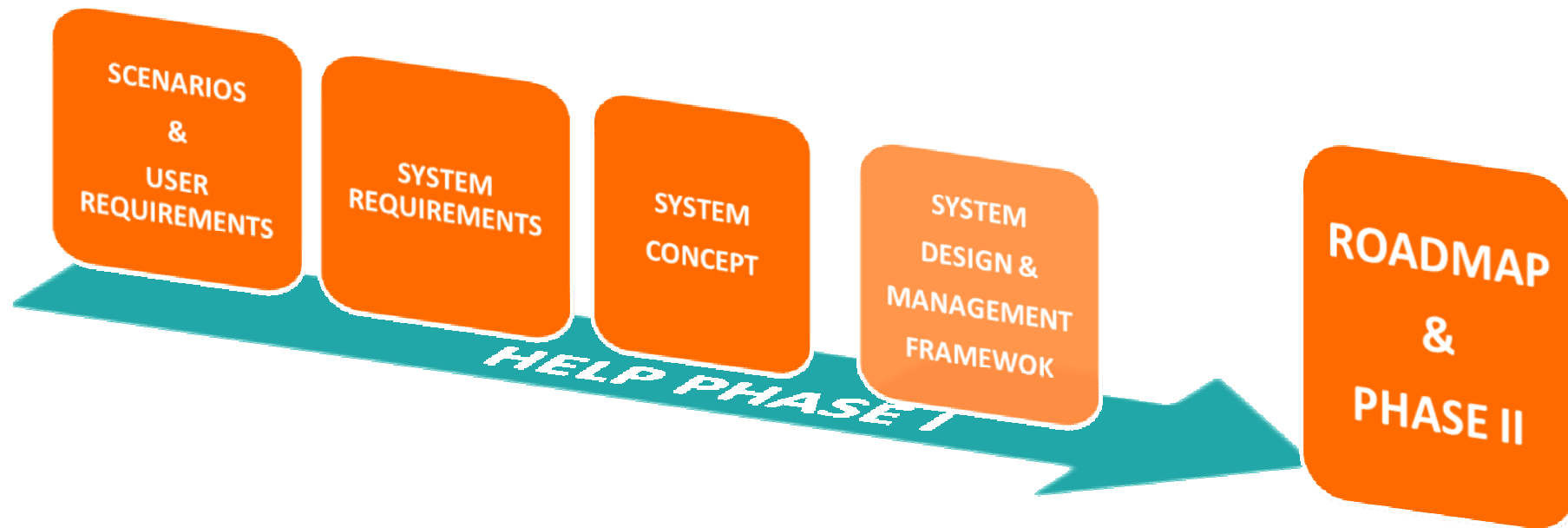
- Provide emergency communications services, including broadband communications.
- Provide required interoperability among communication infrastructures.
- Operate across a wide frequency range with different spectrum management mechanisms.
- Facilitate the operation of ad-hoc networks in the incident area
- Flexibly and smartly adapt coverage and capacity to dynamically varying operative conditions.
- Ensure that data is protected according to its sensitivity.

Project HELP - Objectives

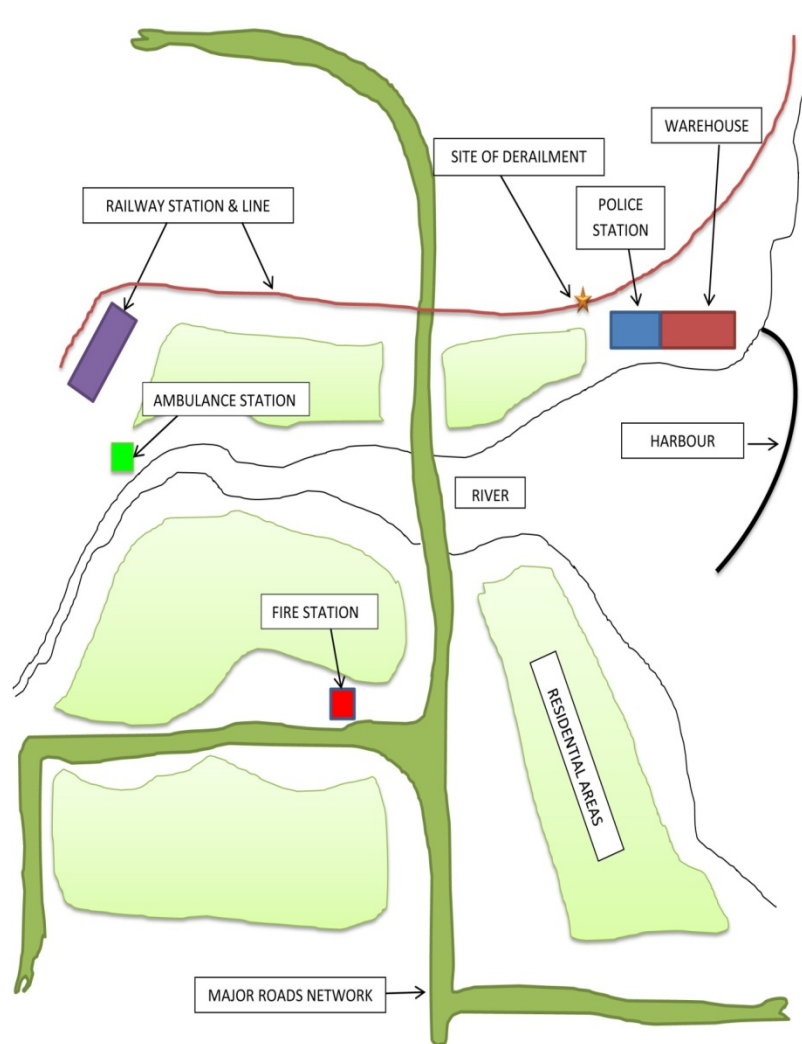
- Objective 1: To identify operational user requirements, scenarios and overall system requirements.
- Objective 2: To define a solution framework (system concept) for the provision of public safety communications over diverse wireless infrastructures.
- Objective 3: To define a framework for the management of the composite emergency network.
- Objective 4: To conduct a techno-economic analysis.
- Objective 5: To establish a consolidated basis and roadmap for the realisation of the envisioned solution framework.

It is expected that the resulting solution framework will firmly constitute a solid basis and establish a clear roadmap to drive future research activities, in particular, throughout the development of a large scale phase II demonstration project.

Overall strategy



Scenario: The Scene of the Incident



- Coastal town divided by river
- 5000 inhabitants + 25% summer tourism
- Rural area
- Railway line and station
 - Transport police responsibility
- Single road bridge
- Emergency Services:
 - 24 hour police – max. 4 officers
 - Nearest assistance = 30Km
 - Part-time fire – 1 appliance + boat
 - Nearest assistance = 30Km
 - 24 hour ambulance – rapid response
 - Nearest assistance = 30Km
 - Maritime rescue – IRB with 3 crew

Scenario: The Incident

- Freight train derailment
 - Cargo of liquid propane gas (LPG)
- Wagons collide with nearby houses
 - Large explosion & fire
 - Fire spreads to harbour-side buildings housing paint
- On-shore wind blows toxic fumes across residential area
- People trapped in paint building
- Police station is adjacent to the paint store
 - Has local PSN base-station on roof

•End users

The users of the communication devices used to establish any type of communication flow across communication components. It is distinguished between:

– PPDR users

Individual **PS officers** or **institutions** and **agencies** authorised by public service and other PPDR users to play a key role in handling of an emergency case. Besides personnel, PPDR users also encompass supporting **machines/IT** systems that will be communicating through the system. In large natural disasters, **military organisations** may also participate to the disaster response.

– Citizens

These are also considered end users of the system inasmuch as they will be using capacity in involved PMNs.

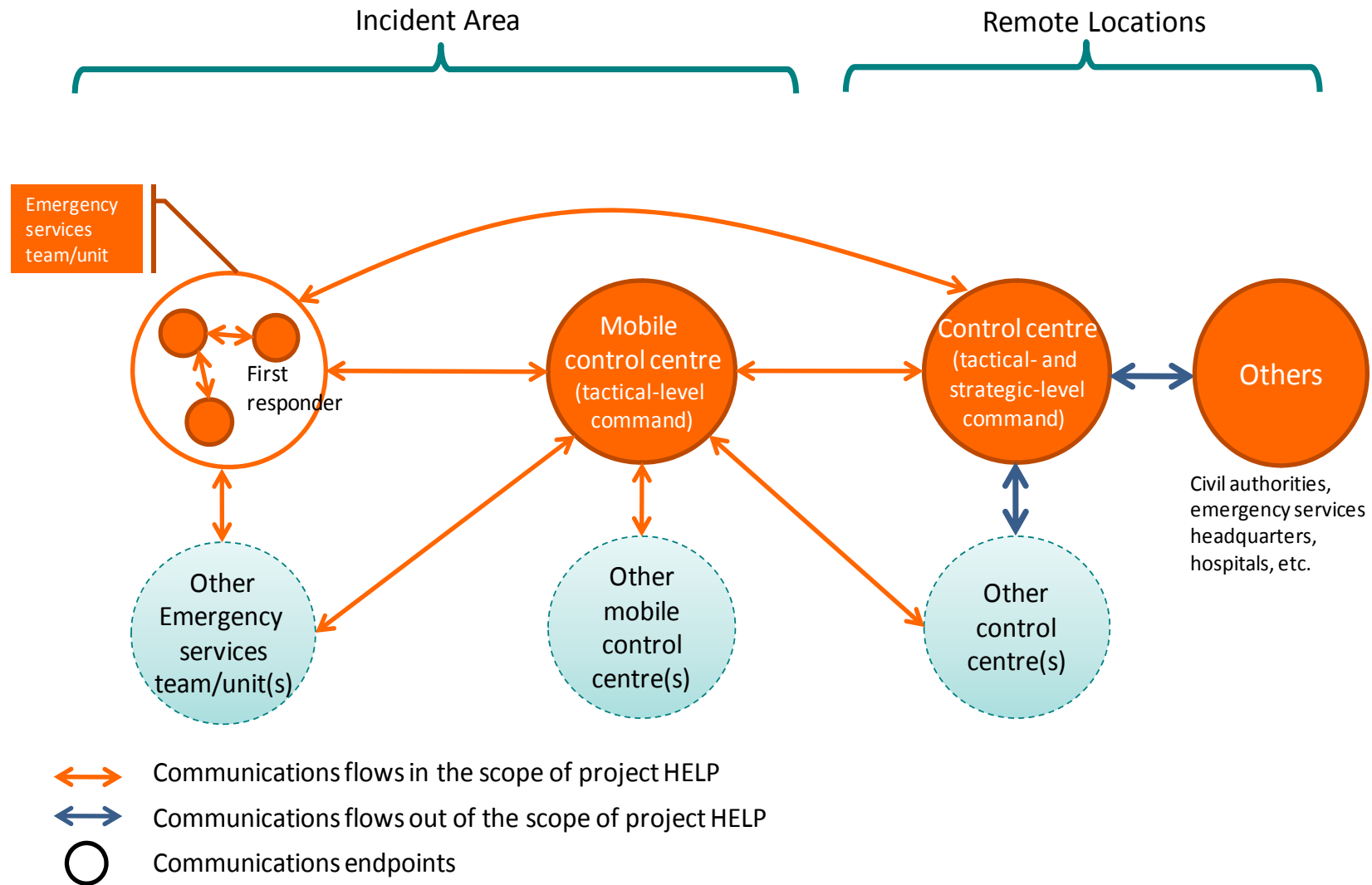
•Mobile Network Operators (MNO)

Operates and maintains the PMN infrastructure.

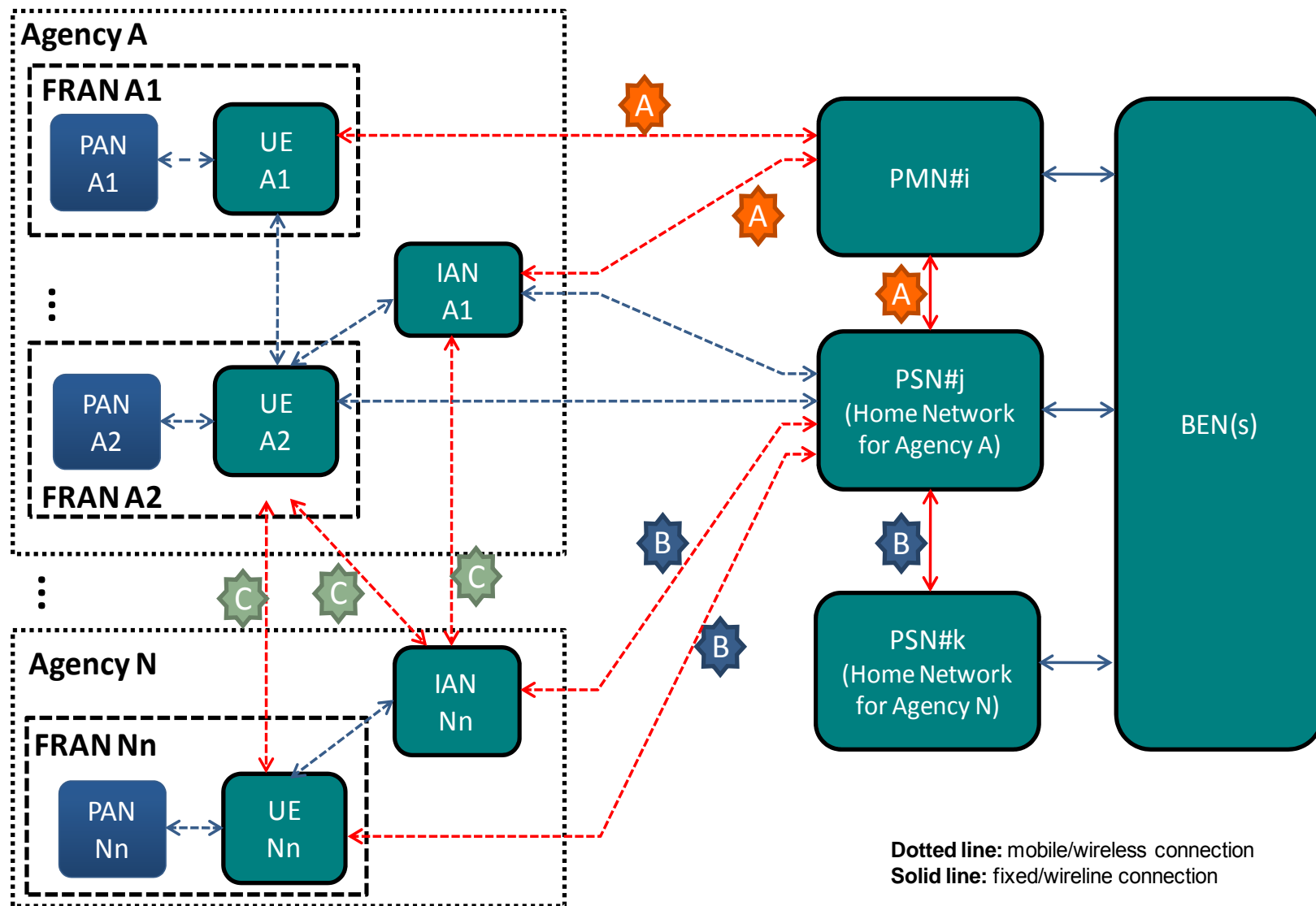
•PS Network Operators (PSNO)

Operates and maintains the PSN infrastructure.

Communication flows to be supported



Deployment scenarios to be supported



Three main focus areas

1. Providing enough communication capacity for PPDR units in the incident area
2. Facilitating communications interoperability between local PPDR units, support units and tactical-level command units at scene
3. Coping with sudden network base-station failure during the incident response



Focus area #1: Enough communication capacity

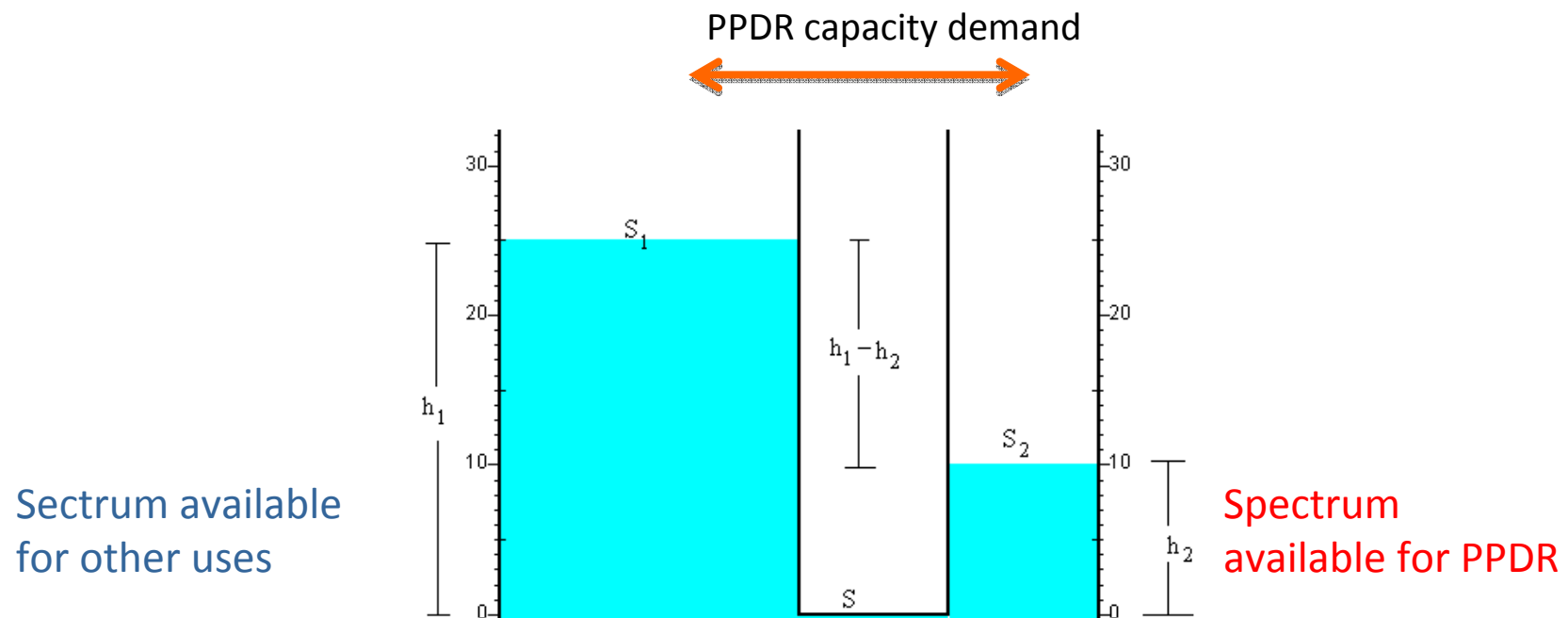
Focus area #1: Enough communication capacity

Spectrum:

1. The system should support dynamic spectrum management mechanism to obtain or lease exclusive rights of spectrum usage for a specific area and for a specific period of time
2. The system should be aware of unused spectrum that can be utilised on as secondary basis
3. The system should support mechanisms to implement (exploit and enable) secondary spectrum access
4. The system should support mechanism to share spectrum bands with no exclusive transmission rights in place

Focus area #1: Dynamic Spectrum Management

- Scope:
 - Management of spectrum availability for PPDR communications in the composite scenario. Two-fold target:
 - Provide additional spectrum for PPDR communications in a emergency situation:
 - Unleash dedicated PPDR spectrum for other uses when no needed for PPDR:



Focus area #1 :Dynamic Spectrum Management

- Solution approaches:
 - Solution #1: Dynamic transfer of exclusive rights of use
 - Solution #2: Secondary access based on coordination mechanisms
 - Solution #3: Secondary access based on coexistence mechanisms
 - Solution #4: Collective use of spectrum based on coordination mechanisms
 - Solution #5: Collective use of spectrum based on coexistence mechanisms



Focus area #2: Communication interoperability

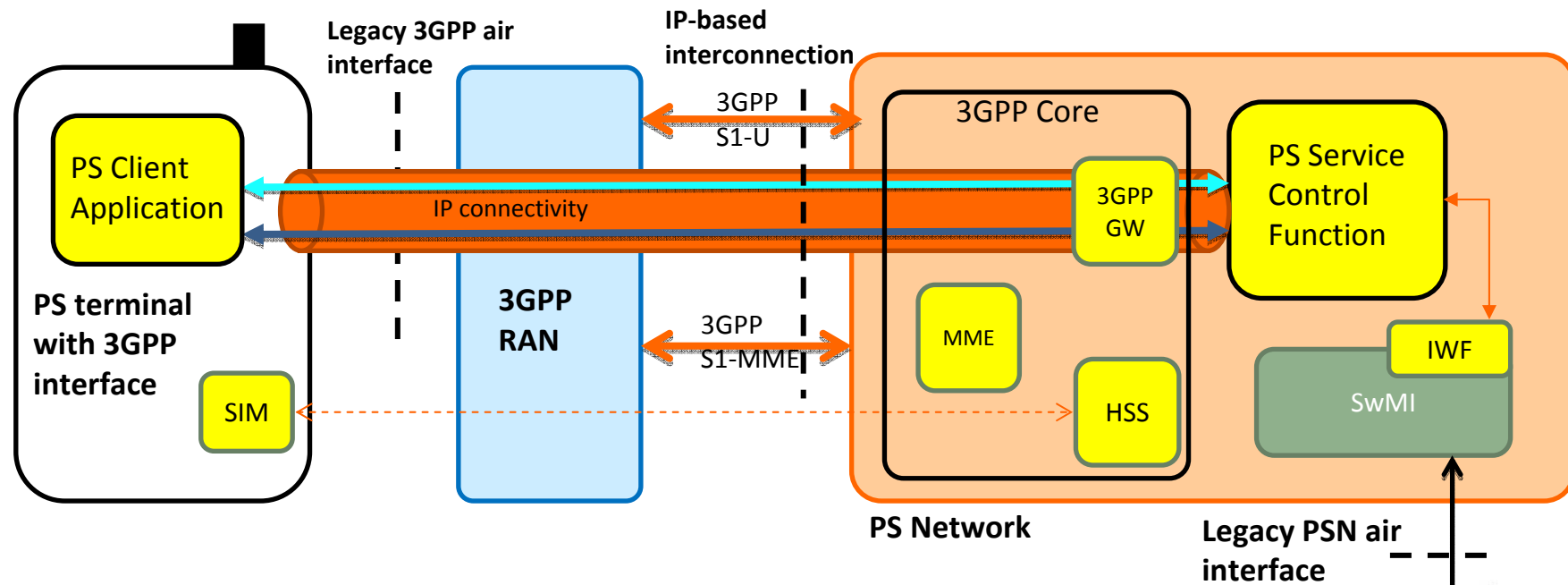
Focus area #2: Communication interoperability

1. IAN, PSN and PMN shall provide roaming capability.
2. Service interworking shall be possible between end users attached to different serving networks (i.e. IAN, PSN or PMN)
3. Inter-agency PPDR communications shall be possible
4. The system shall support mechanisms for dynamic PPDR service provisioning
5. Service continuity should be supported for a PPDR user handing over networks.
6. Interfaces between communication elements (i.e. PMNs, PSNs, IANs, UEs) should be open.
7. Interfaces between infrastructure communication elements (i.e. PMNs, PSNs) should support IP-based transport.
8. UE terminals should be able to operate the most common PPDR and commercial radio access technologies (e.g. TETRA/TETRAPOL and 3GPP UMTS/LTE).

Focus area #2: Interoperability & Interworking

- Scope:
 - Roaming and service interoperability across the composite wireless scenario through:
 - Management of users (network subscriptions)
 - Service interworking capabilities and management of service provisioning.
- Solution approaches for PSN/PMNs:
 - Solution #1: Service capabilities entirely provided by PSN:
 - Solution #1.1: Transparent access
 - Solution #1.2: Mobile Virtual Network Operator (MVNO)
 - Solution #1.3: 3GPP RAN Sharing
 - Solution #2: Service capabilities provided by both PMN and PSN:
 - Solution #2: MNO operates IMS-based platforms for PPDR service provisioning.

Focus area #2: Example Solution 3GPP RAN Sharing



- This solution exploits RAN sharing features considered in 3GPP standards:
 - The PS user deploys a complete 3GPP core network
 - RAN is shared with commercial operators.
 - Facilitates support for service continuity between 3GPP RAN and PS network.

Legacy PS terminal (e.g. TETRA, TETRAPOL)



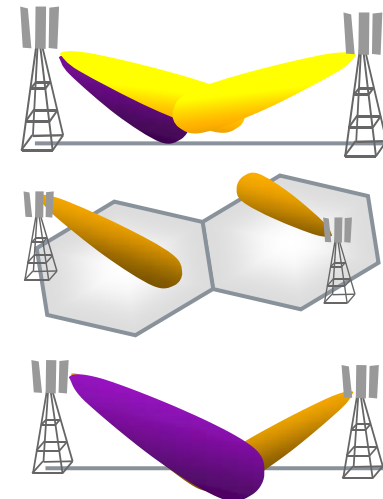
Focus area #3: Sudden network base-station failure

Focus are #3: Sudden network base-station failure

1. The system shall support mechanisms to enable an efficient and effective use of available radio communication resources of coexisting PSNs, PMNs, IANs and UEs (e.g. coordinated operation of resource management functions).
2. Radio parameters (e.g. transmit power level, operating frequency, etc.) of PSNs, PMNs, IANs and UEs shall be dynamically configurable.
3. The mechanisms for resource management should be able to adapt radio parameters under changes in the internal network structure of PNMs and PSNs (e.g., addition of a portable base station, base station failure).
4. The mechanisms for resource management shall be able to control the capacity distribution among PPDR users.

Focus are #3: Dynamic capacity and coverage management

- Scope:
 - Management of the distribution of capacity and coverage in the incident area
 - Management of the gathering of capacity/coverage operational needs
 - Configuration of RRM capabilities and transmission parameters in base stations, terminals and deployables
- Potential approaches
 - Coverage
 - Antenna and transmission parameters adjustments
 - New temporary BS deployment
 - Capacity
 - New temporary BS deployment
 - Dynamic frequency planning
 - Traffic distribution across networks
 - Network parameters readjustment



Conclusions

- This presentation captures the preliminary system view of the envisioned Project HELP solution framework
- First potential design approaches have been proposed for:
 - Service interworking and management of user& service provisioning between PSN/PMNs
 - Management of priority access services
 - Dynamic spectrum management
 - Dynamic capacity and coverage management



Thank you

For more information on HELP project please visit our website at

<http://www.fp7-sec-help.eu/>