



# C2-SENSE

The Emergency Interoperability Framework

## D1.2 – Project Presentation V2.0

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The Emergency Interoperability Framework

## Interoperability Profiles for Command/Control Systems and Sensor Systems in Emergency Management

Effective management of emergencies, crises and disasters depends on timely available, reliable and intelligible information.

To achieve this, different Command and Control (C2) Systems and Sensor Systems have to cooperate, which would only be possible through interoperability.

However, unless standards and well-defined specifications are used, the interoperability of these systems can be very complex.

C2-SENSE project's main objective is to develop a *profile based Emergency Interoperability Framework* by the use of existing standards and semantically enriched Web services to expose the functionalities of C2 Systems, Sensor Systems and other emergency/crisis management systems.



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 607729 (Funding scheme: SEC-2013.5.3-1, Duration: 36 months, from April 01, 2014 to March 31, 2017).



<http://www.c2-sense.eu>





# The Project





# C2-SENSE Project

*(Funding programme)*



Grant Agreement:	607729
Project Acronym:	C2-SENSE
Project Title:	Interoperability Profiles for Command/Control Systems and Sensor Systems in Emergency Management
Funding Scheme:	SEC-2013.5.3-1
Project Start Date:	April 01, 2014
Duration:	36 months
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# C2-SENSE Project

*(Introduction)*

## Interoperability Profiles for Command/Control Systems and Sensor Systems in Emergency Management

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C2-SENSE will assess its outcomes in a realistic "Flood Scenario in Italy" pilot to ensure that the developed technologies are generic and applicable in a real life setting.



# C2-SENSE Project

(Partners - <http://c2-sense.eu/>)

**AIT Austrian Institute of Technology**, Austria's largest non-university research institute, is among the European research institutes and specialist in the key infrastructure issues of the future.

**Regola** has been designing software solutions and applications in the ICT since 1995 and most of products are *decision-making support* Platforms or Tools targeted to Healthcare and Public Administration, with a remarkable expertise in the Emergency Management.

**PIAP** has been developing new technologies since its formation in the year 1965. Nowadays it belongs to the top ten of Polish Research Institutes. It is a state owned entity supervised by the Ministry of Economy.

**Sagem**, a high-tech company in the Safran group, holds world or European leadership positions in optronics, avionics, electronics and safety-critical software for both civil and military markets.

**SRDC Ltd.** is a spin-off company of the Middle East Technical University (METU), Software Research and Development Center, located in the METU's techno park. SRDC enjoys strong backing from the university for transferring the R&D efforts to the industry and public administrations.

**Servizio Protezione Civile Regione Puglia** - In the field of Civil Protection the Apulian regional Government regulates the organization of functions and administrative tasks, for which it is invested or it is entitled, related to the care of the interests and the promotion of the development of its community according to cooperation principles with security forces, Provinces, and other local authorities.

**InnovaPuglia S.p.A.**, an Apulia Region's in-house company, drives the Apulia Region in the setting of a Regional Digital System for the development of innovative smart services that achieve the goal of improving the citizens life quality.

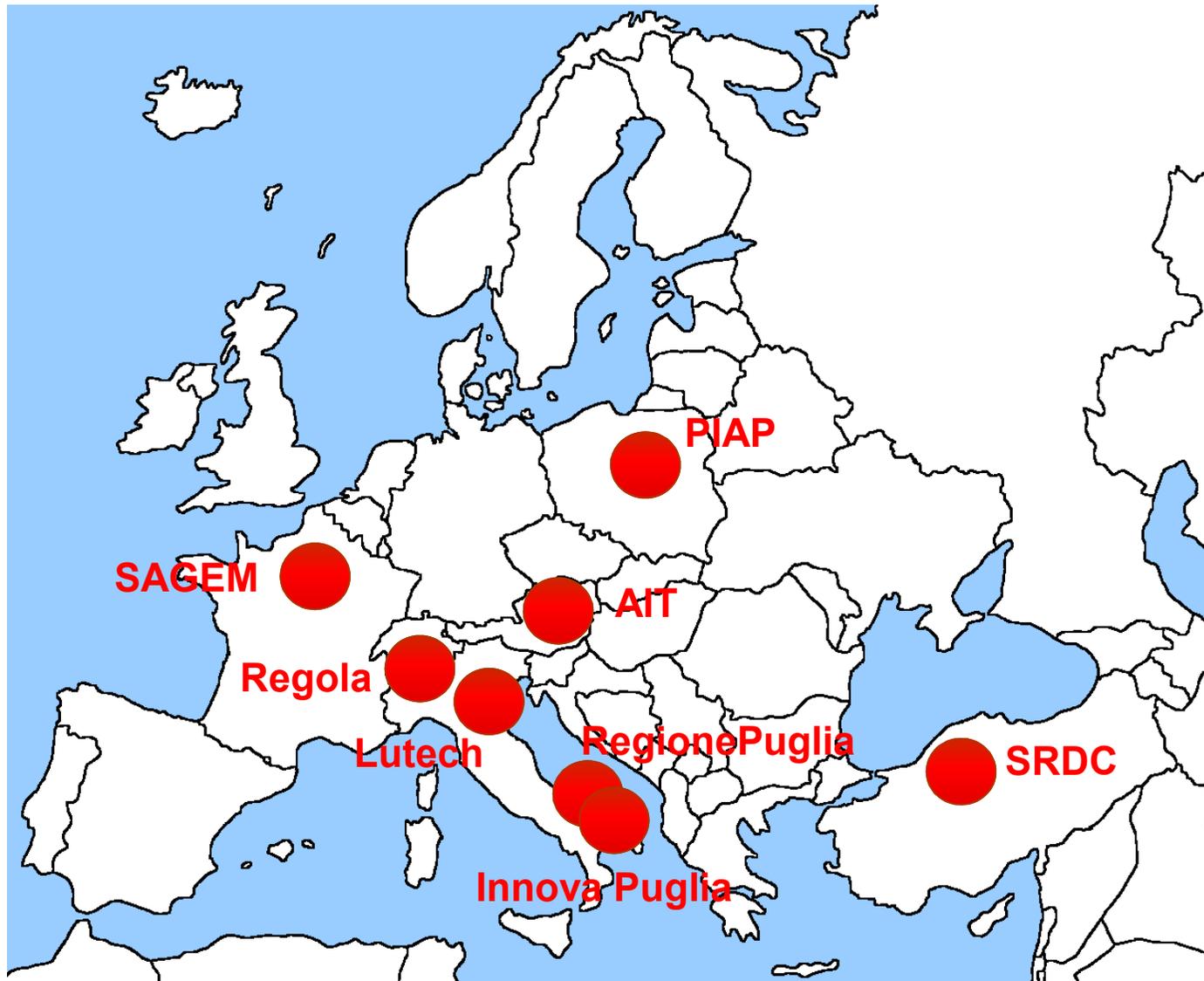


**Lutech S.p.A.**, part of the Laserline Group, is an Italian ICT engineering and services company, working successfully for more than ten years and delivering robust and timely solutions to leading corporate Clients.



# C2-SENSE Project

*(Where we are)*





# C2-SENSE Project

*(Roles)*

<b>SAGEM DEFENSE SECURITE</b>	France	Project Coordinator. Data / Object model interoperability.
<b>LUTECH</b>	Italy	Protocol interoperability. Software integration.
<b>Austrian Institute of Technology</b>	Austria	Knowledge interoperability. Standardization activities.
<b>SRDC</b>	Turkey	Information interoperability. Profiles integration. Certification and testing mechanisms.
<b>Servizio Protezione Civile Regione Puglia</b>	Italy	Pilot application – requirements and validation.
<b>InnovaPuglia</b>	Italy	Pilot application – design and deployment.
<b>Industrial Research Institute for Automation and Measurements</b>	Poland	Organizational and physical interoperability.
<b>REGOLA</b>	Italy	Harmonized doctrines. Validation.



# The Emergency Management





# Emergency Management

*(Scenario)*



Emergency situations: disasters (hazards for human beings and/or public properties) caused by:

- *Twisters*
- *Floods*
- *Earthquakes*
- *Wild Fires*
- *Crisis*
- ....

in an environment that is:

- *Vast*
- *Unpredictable*
- *Dynamic*





# Emergency Management

*(Enterprise)*

Many different stakeholders (i.e. organizations/actors/agencies/entities/...) having different Command and Control Systems and Sensing Systems have to cooperate:

- *Army*
- *Police*
- *Fire Fighters*
- *Hospitals*
- *Volunteer organizations*
- *Municipality*
- *Civil Protection units*
- *Rescue units*
- ....



- Responding organizations can change at run time, have different countries' cultural, linguistic and legal issues (especially in an international intervention case) and may be dispersed, creating an Emergency Organisations Heterogenous Ecosystem



# Emergency Management

(Sensors)

Real-time Situational Awareness is paramount before, during and after emergency scenarios:

- Before (Prevent): Sensors implanted in infrastructures could aid in studies of human and physical world patterns and trigger maintenance actions
- During (Manage): Sensors embedded in everyday objects could be used to locate persons during search and rescue efforts.
- After (Recovery): Mobile phone, clothing and bracelet sensors could help track evacuees' status and locations (estimation and accomodation)



IoT is becoming affordable and widespread, so sensors may be:

- pre-existing (e.g. monitor infrastructure,...)
- installed on site in real-time (e.g. patients handling, search&rescue operations,...)

IoT from different sources generates Big Data in a very short time.



# Emergency Interoperability Framework

*(3 main steps)*

- All the Emergency Interoperability Profiles together form the Emergency Interoperability Framework.
- C2-SENSE can be considered as a framework to enable and develop context-aware applications.
- Emergency Interoperability Framework will be developed in three main steps:
  1. Emergency Domain Inventory (*we survey what's existing on the field assessing all stakeholders' knowledge*).
  2. Emergency Domain Ontology (*let's normalize, summarize and consolidate all of them in a lingua franca: Ontology represents a controlled vocabulary which is structured into a hierarchical taxonomy, where the key concepts are found*).
  3. Emergency Interoperability Profiles (*here we create the real outcomes of the project*).



# Emergency Interoperability Profiles

- Although there are commonly used standards and specifications (addressing different layers in the stack), there is no single specification of using these standards together especially in an emergency situation.
- Emergency Interoperability Profiles in emergency domain are not yet another information model or data format: best practice documents on the use of existing dispersed standards to enable timely, effective and efficient exchanges of information among all the layers without requiring any prior special technical arrangements, eliminating the need for a prior bilateral agreement between any two information exchange partners.
- A profile helps the information system to deliver the most relevant data in the right form at the right place and the right moment.
- An emergency profile is a formalization of actors, mutual interactions and information exchange.
- A profile is a machine-readable, machine-understandable and machine-executable process.



# Interoperability Stack

All the layers of the Interoperability Stack must be addressed (to avoid chaotic responses, unnecessary duplication, waste of time and resources,...). :

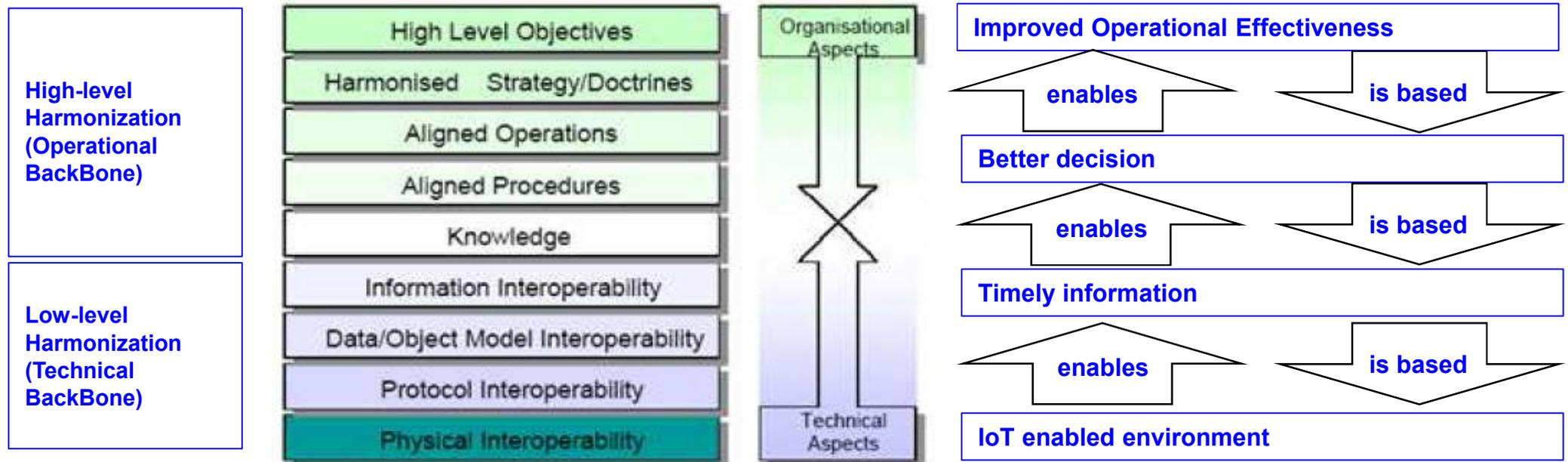
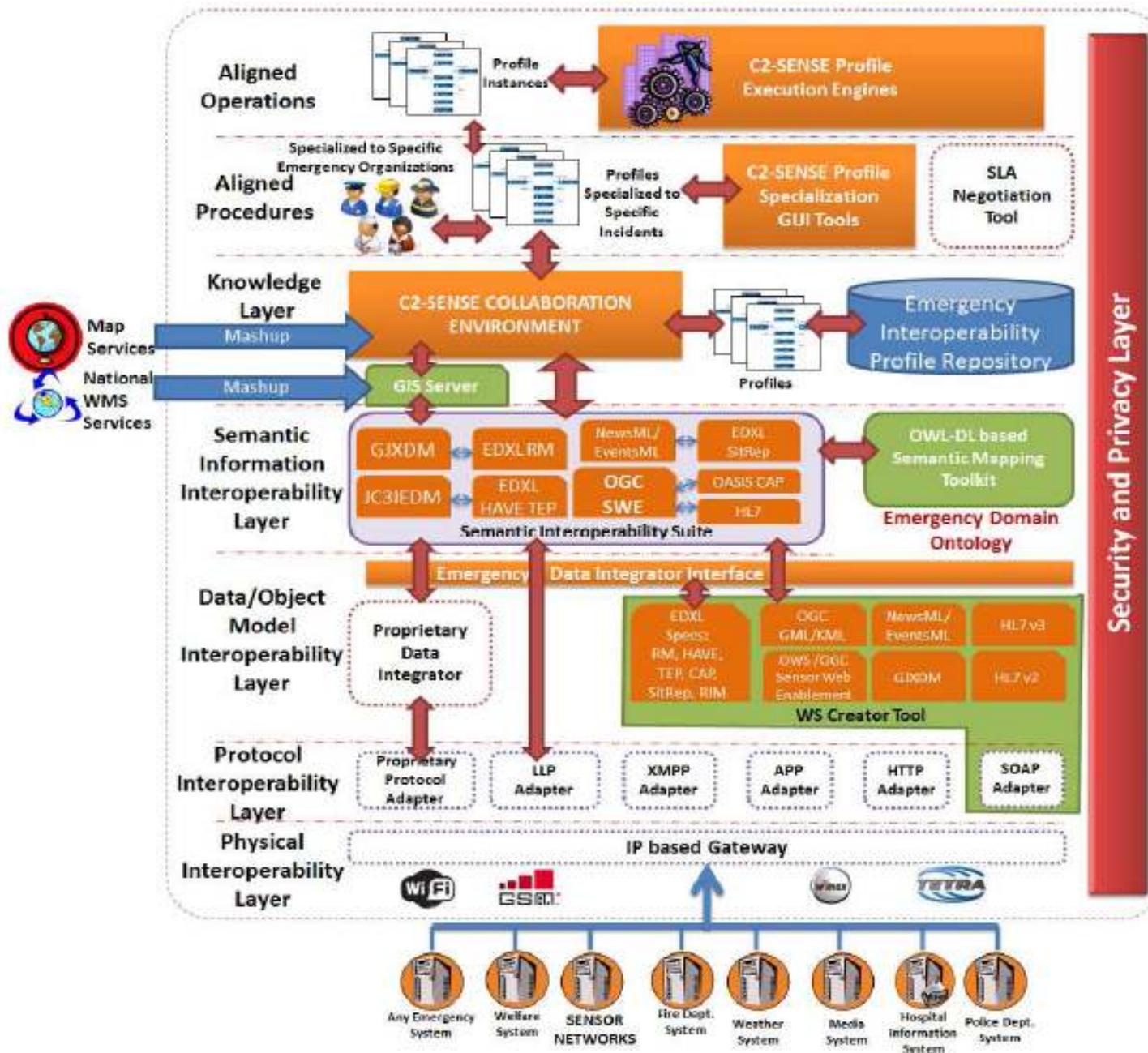


Figure 1 Interoperability Stack



# C2-SENSE Modular and Functional Architecture

(for systems related to emergency situations)





# Validation





# Benefits

*(Validation on-the-field: Pilot application in a flood scenario)*

- **Acquisition and sharing of information:** The information coming from the disaster site is the input for the decision making process. Therefore the need for such *information to be complete, reliable and obtained in real time* is highly critical.
- **Simplicity and immediacy:** It is essential to provide an *immediate picture of the situation*, due to urgency with which different actions must be performed. It also must be *simple to understand and easily actionable*.
- **Availability of communication technologies:** one of the main problems encountered in the management of emergencies is related to communication. Therefore, it is useful to *have different communication channels* that operate in parallel and that complement each other (radio, SMS, etc ...)
- **Useful support for the human operator:** In decisional aspects the *intervention of a human operator must remain irreplaceable* and thus cannot and should not be automated. The enterprise interoperability system needs to be a support tool and should serve to provide a detailed and comprehensive picture of the current situation, proposing appropriate solutions for intervention, but leaving the operator the option to choose alternative solutions.



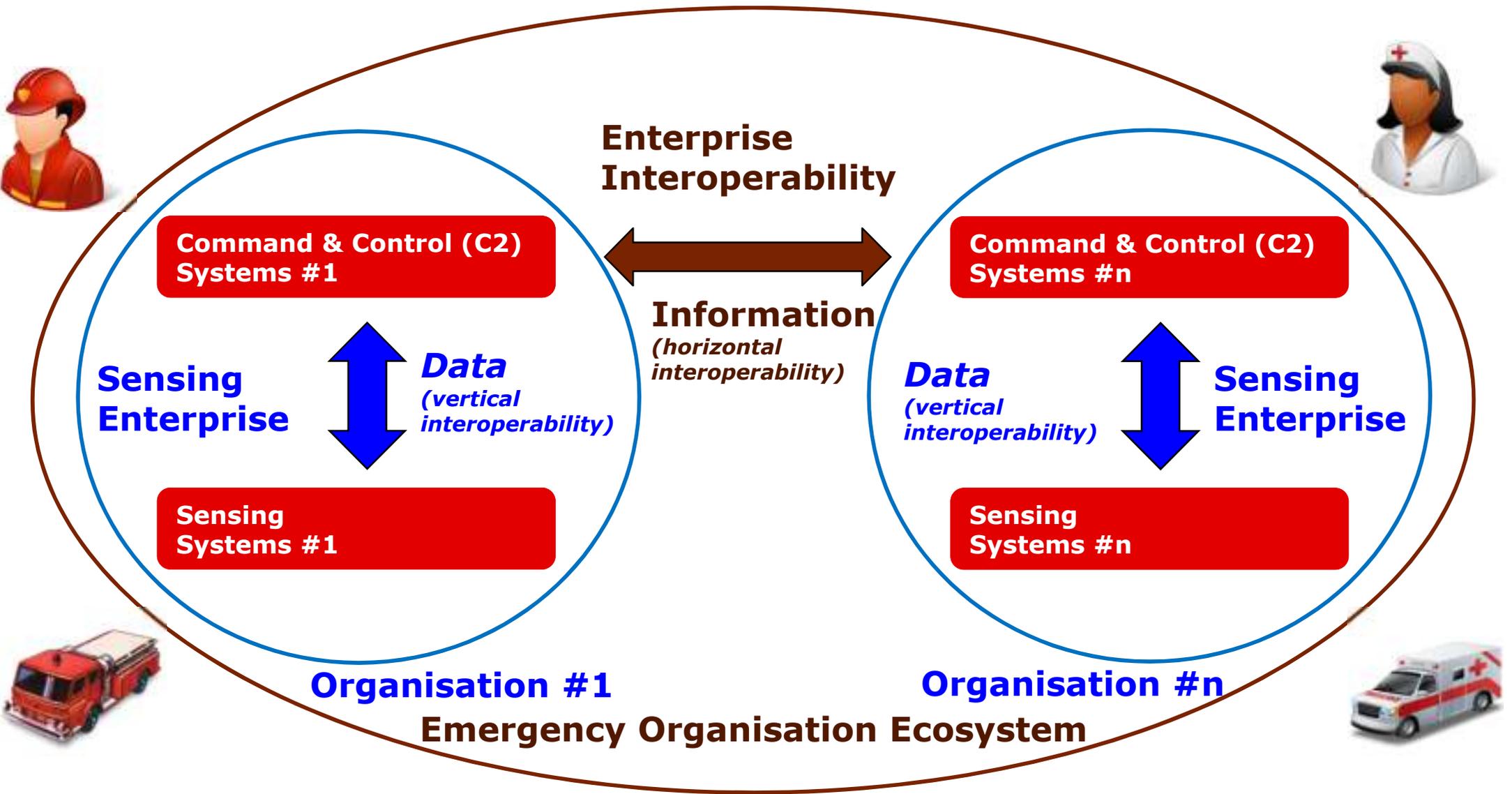
# Challenge and Solution





# The Challenge

*(Make the organisations cooperate through interoperability)*





# The Solution

(Every organisation is C2-SENSE Certified)



**Enterprise Interoperability**



**Information**  
(horizontal interoperability)



**Data**  
(vertical interoperability)

**Command & Control (C2) Systems #1**

**Sensing Enterprise Interoperability**



**Sensing Systems #1**

**Sensing Systems #n**

**Organisation #1**

**Organisation #n**

**Emergency Organisation Ecosystem**





# How to get more information





# Contacts

*(Get in touch with us)*

Web <http://www.c2-sense.eu>



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