

C2-SENSE – Pilot Scenarios for Interoperability testing in Command & Control Systems for crises and disaster management: Apulia example

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C2-SENSE

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

- C2-SENSE Objectives (overall)
- Interoperability & Collaboration & Organization
- Micro Scenarios and Testing (approach and verification)
- Web-based platform (to support, monitor, trace requirements and testing)
- Summary

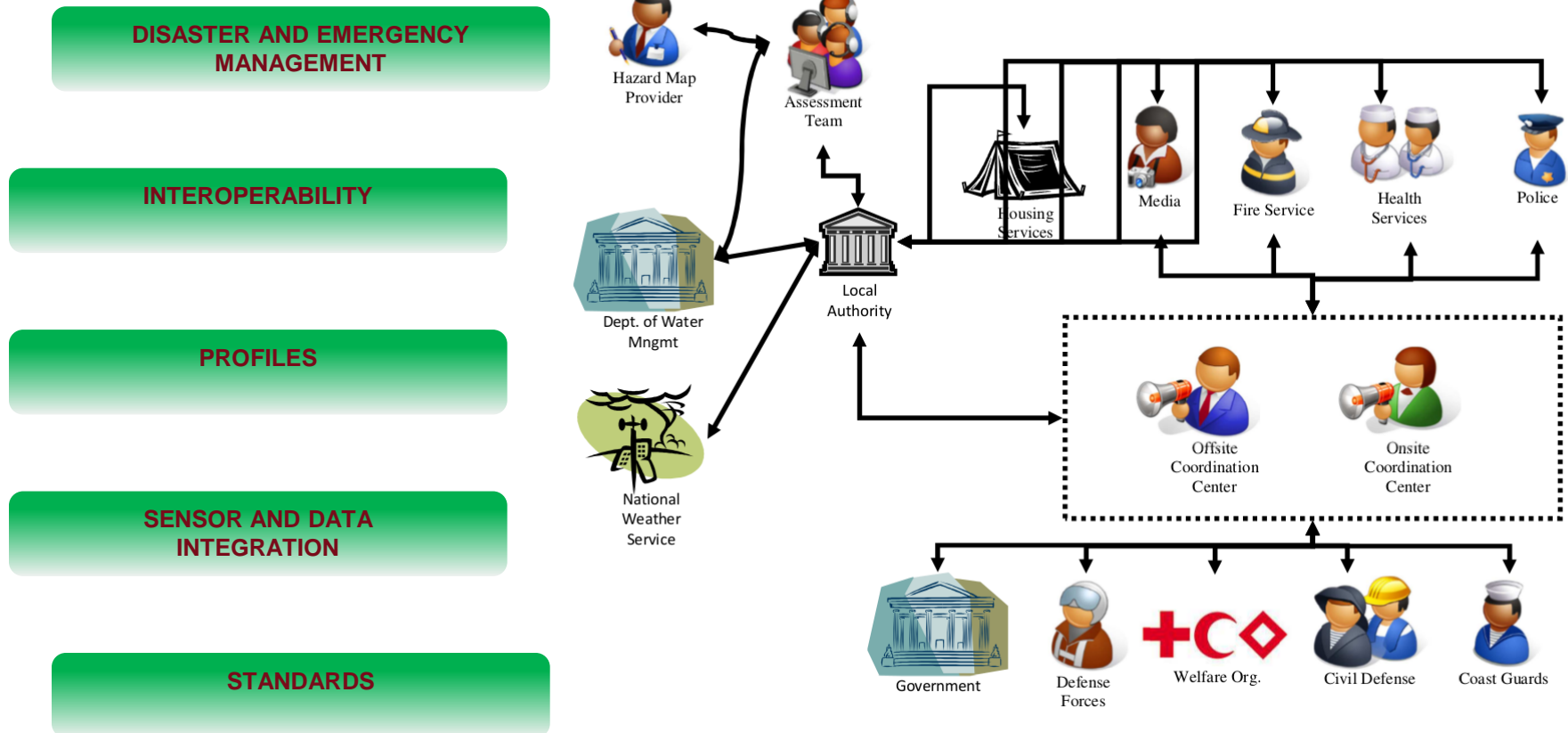
C2-SENSE Objectives

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

- 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
- Interoperability framework for heterogeneous networks composed of sensors and control centers via protocol profiles for crisis management and service oriented architecture
- Common operational picture of the crisis situation and the support of collaboration for joint decision making

C2-SENSE Framework

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



C2-SENSE Framework

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

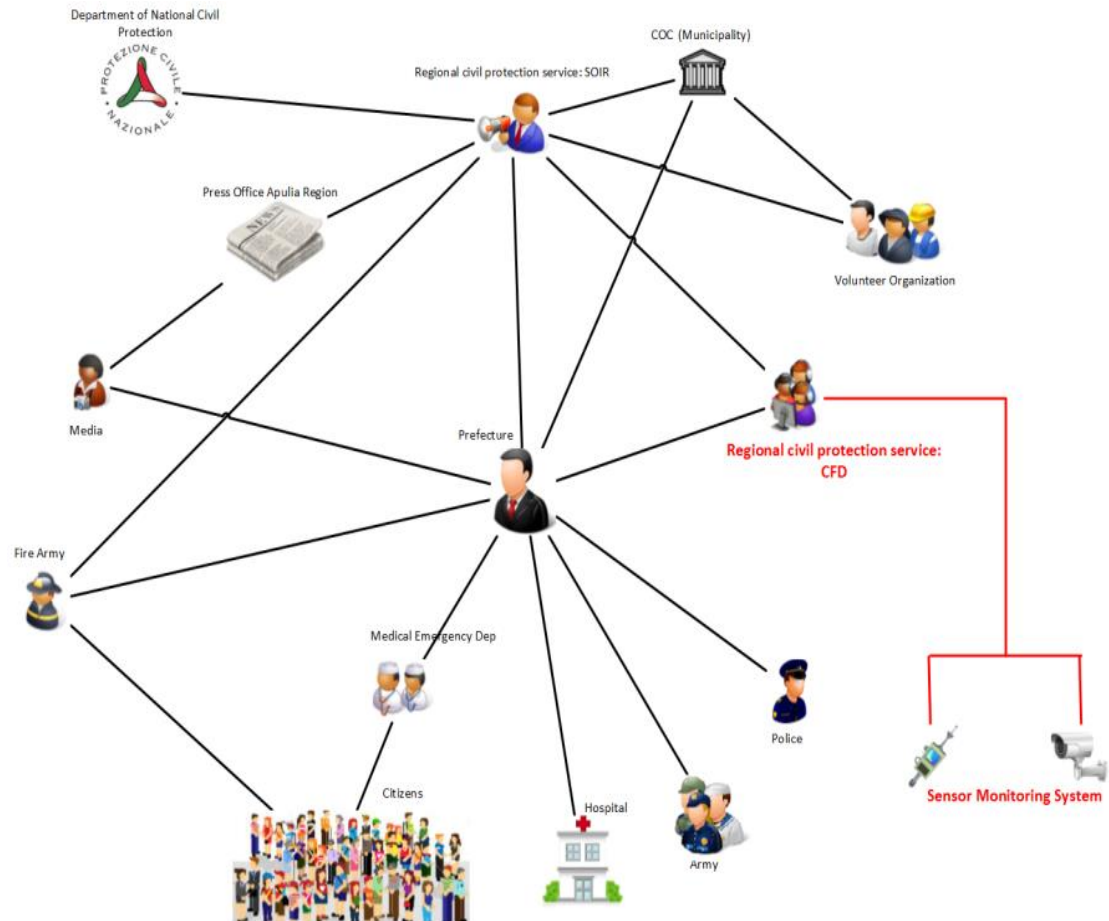
Workflows reflected in many different Micro-Scenarios

Workflows are defined and stored so-called Profiles

Micro-Scenarios reflect specific tasks to be executed (→ specialized profiles)

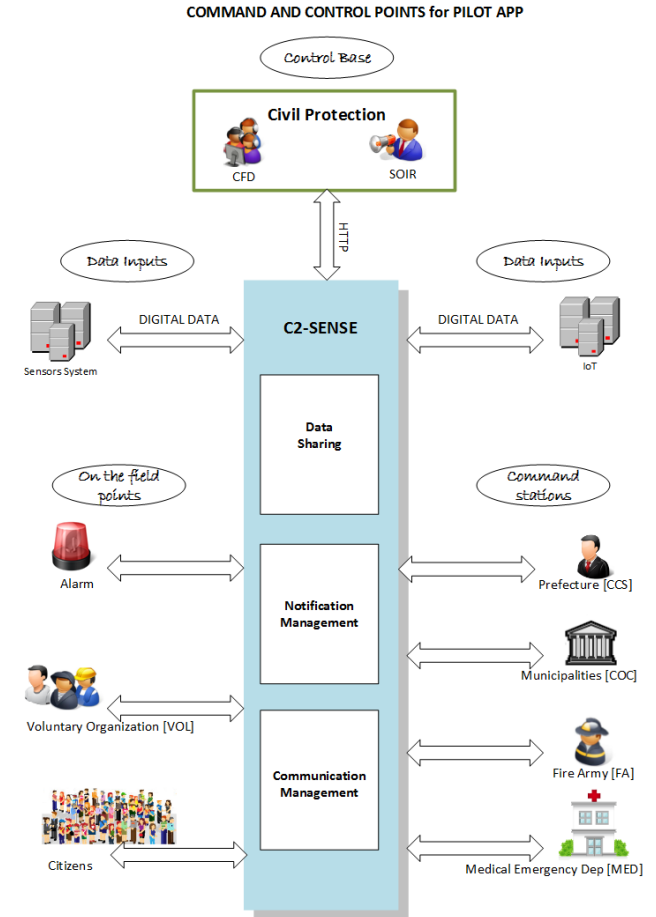
TESTING of Micro-Scenarios (exe. of functional and integration test)

ReDo-Replay-Improve



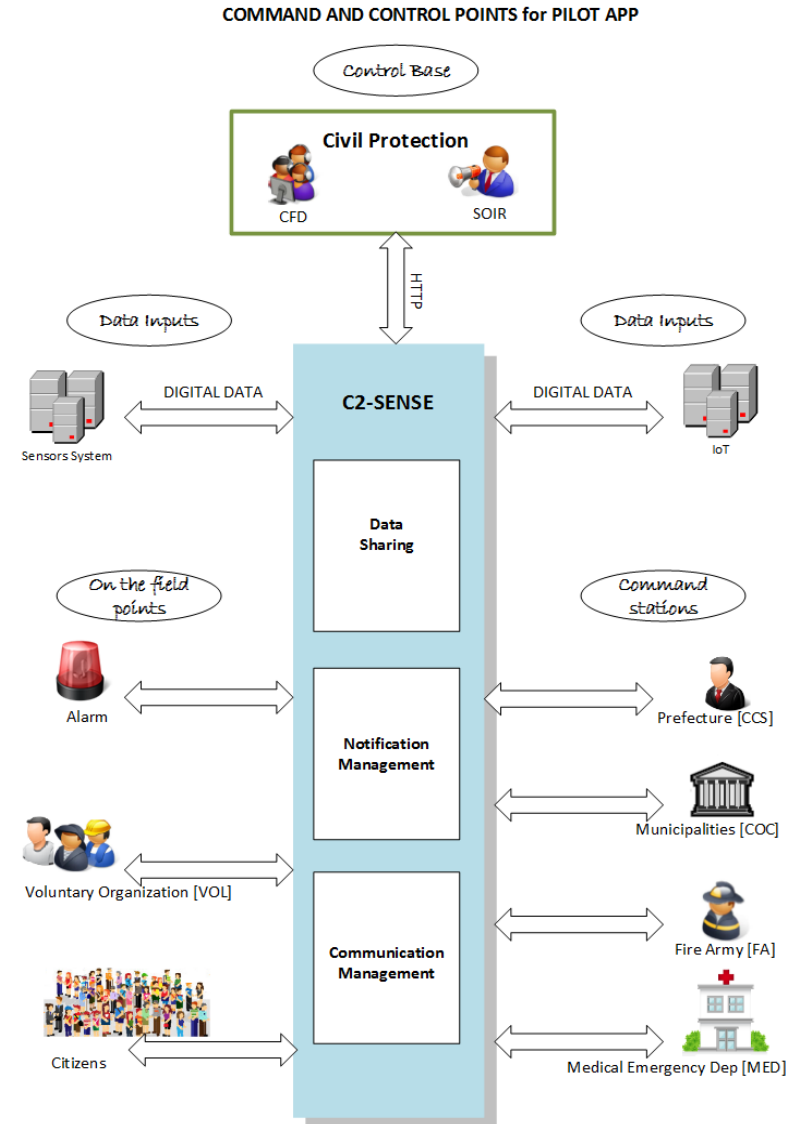
Criticalities

- **Currently → no IT tool support!**
 - During an emergency situation, currently all information are managed through telephone communications (mainly), email, radio and fax machines that are simultaneously collected by involved stakeholders; → leads to huge challenge and considerable difficulties in managing all the diverse and heterogeneous information.



Pilot Application Functions

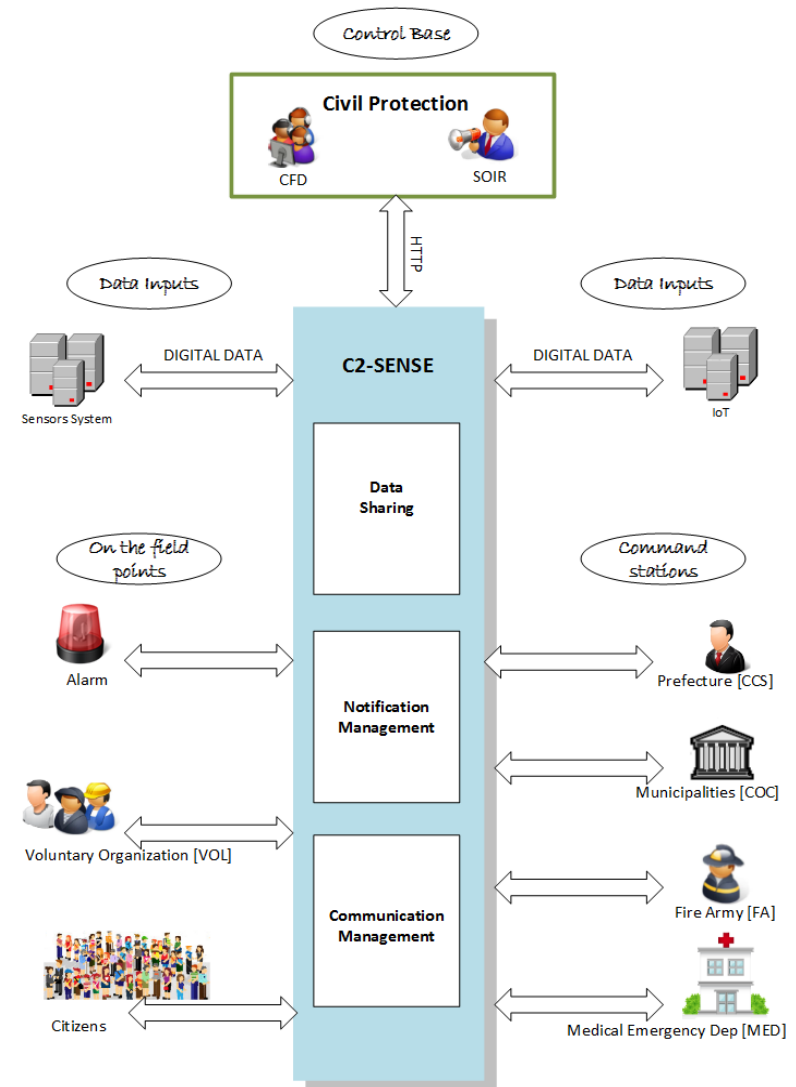
- **Pilot Application Scenario – three main functionality ...**
 - Data Sharing
 - Notification management
 - Communication management
-to be tested



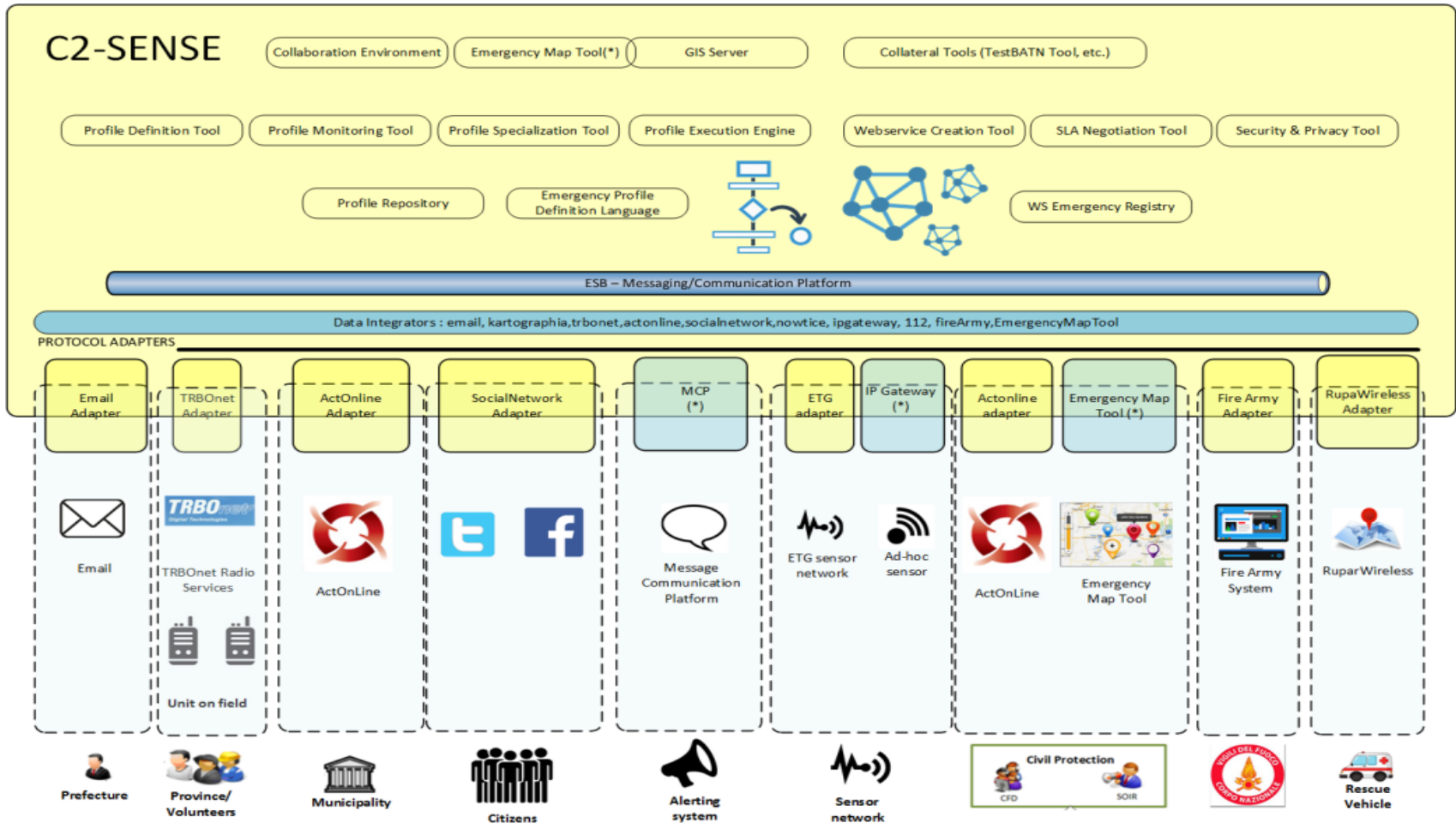
Pilot Application Organizations

- **Prefecture**
 - Coordination, Emergency management, Decision making on higher level
- **Province of Foggia**
 - Governance of local authorities
- **Municipality<->Province**
- **Civil Protection**
 - Local “integrated regional control room” for the Apulia region
- **Voluntary Organization**
 - To carry out specific tasks
- **Fire Army/Brigade**
 - Notification, Alarming

COMMAND AND CONTROL POINTS for PILOT APP



C2-SENSE Pilot Application Environment



(*) Adapter's implementation is not required

Pilot Scenario & Test Area



Test phases and procedures

At the end of the deployment phase of the Pilot Application, the C2-SENSE system will be tested in order to demonstrate the effectiveness and feasibility of the project.

In particular:

- In **Phase 0** the C2-SENSE system is configured and made ready to be used in an emergency situation. In this phase, the Emergency Interoperability Profiles will be created.
- **Phase 1** is located between before and during emergency situations. It can be regarded as a transition phase. In this phase, the generic Emergency Interoperability Profiles will be specialized for the Apulia region according to organizational structure and emergency procedures of this region.
- In **Phase 2** the C2-SENSE system is used in a real life emergency situation, e.g. flood in Apulia region. The profiles specialized for Apulia region will be executed through Profile Execution Engine. Execution of the specialized profiles means that organizations taking part in the emergency plan of Apulia region will exchange information among themselves according to the specifications in the profiles. C2-SENSE system will control, monitor and track these operations and display the progress through Profile Monitoring Tool.

Flooding Scenario (1)

The Situation: During the **first day**, the Pilot Scenario describes what are the institutions involved in the “Forecasting Phase” and what are the documents produced.

In particular:

- The National Weather Service (CFN) announces bad weather conditions for the next 24-36 hours;
- The Regional Functional Center (CFD) issues a Bulletin about the regional criticality.
- The manager of the Regional Civil Protection publishes and sends an alert message to Prefectures, Municipalities, and other organization as far as they are concerned.

Flooding Scenario (2)

For the **second day**, the Pilot Scenario describes what happens during the flooding along the Fortore River, and the institutions and organizations involved including their roles and responsibilities.

In particular:

- CFD (Regional Functional Center) follows the evolution of the situation through the regional monitoring network installed in the territory (monitoring and surveillance activities).
- SOIR ensures emergency operations and H24 service to update the information related to the activities carried out, the type and amount of resources needed.
- The Prefecture opens its Assistance Coordination Center (CCS) at the provincial level with the presence of Healthcare Service, Police Department, Fire Brigade, Red Cross, etc.
- Municipalities, the responsible body in their territory, activate its own emergency procedures and keep in contact with the voluntary organizations and other involved organizations.

The events described in the Pilot Scenario are grouped into **micro-scenarios** (MS1-10).

Micro-Scenarios

Are used to describe in detail the interactions between two or more involved end-users.

In particular:

- which are the triggering systems,
- which are the target systems,
- what has to be tested, and what the positive/negative evaluation criteria are.

Micro-Scenarios

MS01-MS10 (verifying the main functions of data sharing, notification and communication)

- Sensor value display
- Ad-hoc sensor adding
- COC Opening (Municipality Emergency Control Room)
- Volunteers involvement
- Risk detection
- Internal Civil Protection communication
- Closure of main roads
- Alert messages
- Fire Brigade involvement

Pilot Test Scenario MS01-Sensor values display

MS01 – Sensor values display			
Interaction Step	Initiator	Target	Test Modality
1	Sensor network (ETG sensors)	CFD (EMT)	Activate the function (or the layer) on the emergency Map Tool.

The Situation:

Decentralized Functional Centre (CFD) wants to show all the regional official sensors connected. They activate 'Emergency Map Tool (EMT)' and start the sensor data acquisition. The Emergency Map Tool acquires sensor data using the C2-SENSE system and displays them on the map. In this case all existing sensor networks are connected directly to C2-SENSE.

ActOnline is a tool used for events and communications management during an emergency event. It is used by Civil Protection and municipalities.

TRBOnet is a tool installed on radio device used by volunteers in the Province of Foggia

Pilot Test Scenario MS02-Ad-hoc Sensor adding

MS02 – AdHoc sensor adding			
Interaction Step	Initiator	Target	Test Modality
1	CFD (AOL)	Volunteers (TRBOnet devices)	Insert a new request about ad-hocsensor to Volunteers of Foggia.
2	Ad-hocsensor (new sensor)	CFD (EMT)	New values are displayed on Map Tool.

The Situation:

Decentralized Functional Centre (CFD) decides to put additional sensor(s) in the field. They use the ActOnline (AOL) application to ask a volunteer organization to install (an) ad-hoc sensor(s) and activate them. ActOnline adapter catches this request and forwards it to the Enterprise Service Bus (ESB), further on another service catches it on ESB and forwards it to volunteers using TRBOnet application. Sensors are connected to the IP based gateway. They communicate with C2-SENSE using mobile phone network. Once activated, the sensor(s) immediately start sending data, and the data becomes visible in Emergency Map Tool.

ActOnline is a tool used for events and communications management during an emergency event. It is used by Civil Protection and municipalities.

TRBOnet is a tool installed on radio device used by volunteers in the Province of Foggia.




Pilot Test Scenario MS05-Risk detection

MS05 - Risk detection			
Interaction Step	Initiator	Target	Test Modality
1	Volunteers (TRBOnet devices)	COC (AOL)	Volunteers send a message to COC.
2	COC (AOL)	SOIR (AOL)	COC operator sends message to SOIR to communicate the risk.
3	SOIR (AOL)	COC (AOL)	SOIR operator reads the message and mark it as read.

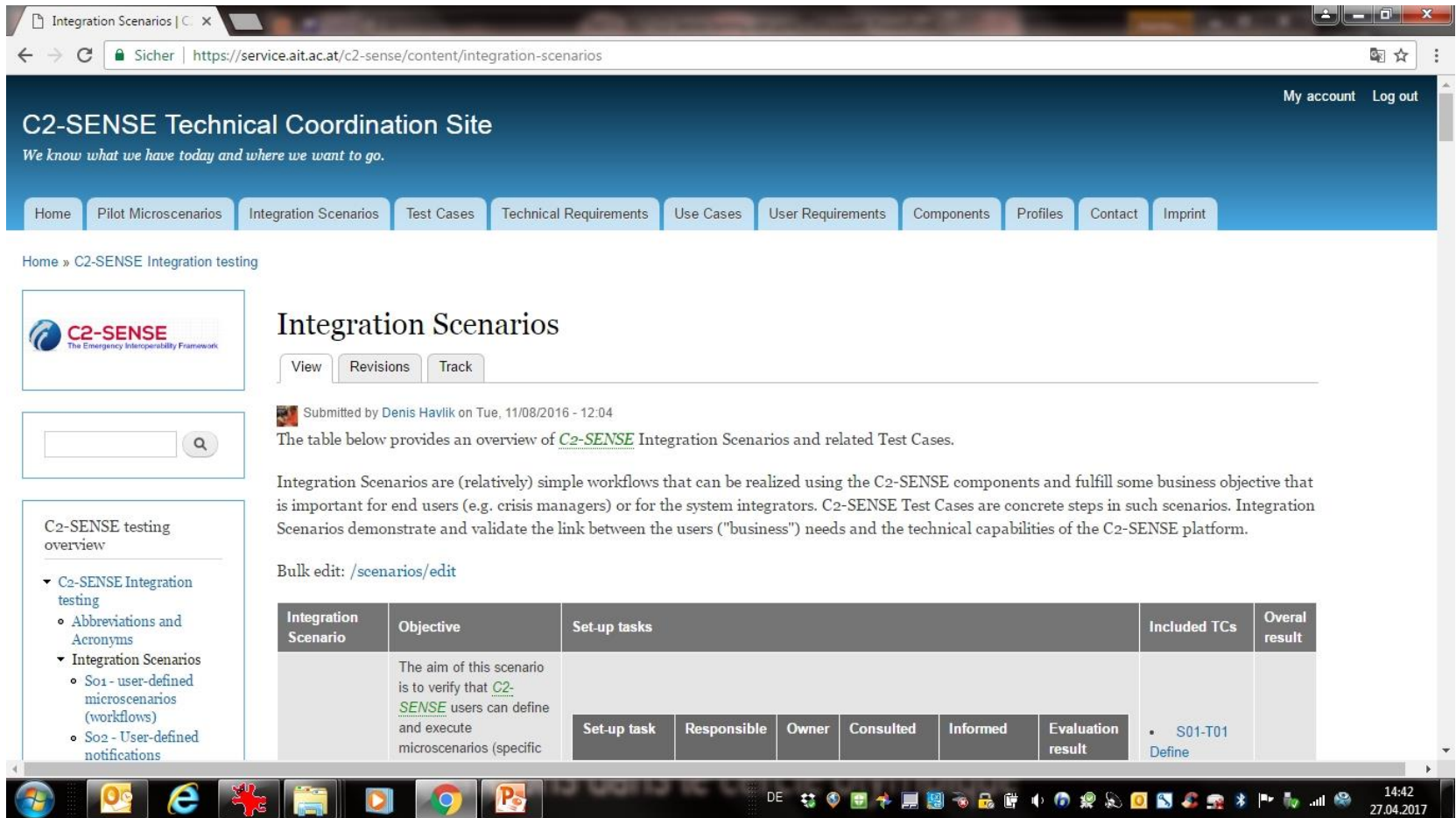
The Situation:

Volunteers of Foggia report a dangerous flooding situation to the Municipality Emergency Operating Room (COC) using TRBOnet radio devices. The COC informs the SOIR (Regional Civil Protection Operating Room about the evolving situation (ActOnLine of COC sends a reply message to SOIR). SOIR reads the message and using its ActOnLine (AOL) that sends a 'read notification' to the COC.

Micro-Scenario and Test

Microscenario	Related	Test log	Evaluation result									
<p>MS02 - AdHoc Sensor adding</p> <p>CFD decides to put additional sensor(s) on the field.</p> <p>They use the ActOnline to ask to a volunteer organization to install an ad-hoc sensor(s) and activate them.</p> <ul style="list-style-type: none"> ActOnline LAR catches this request and forwards it to ESB, then another LAR catches it on ESB and forwards it to volunteers using trbonet. Sensors are connected to IP based gateway or to AnySen They communicate with C2-SENSE using WLAN or mobile phone network or some low-energy wireless protocol (tbd) <p>Once activated, the the sensor(s) immediately start sending data, and the data is visible in Emergency Map Tool.</p>	<p>(EMI)</p> <p>5. Profile Definition and Specialization Tool (PDST)</p> <p>6. LAR Prefecture Units on field (trbonet)</p> <p>7. IP Based Gateway</p> <p>8. LAR Civil Protection (SOIR) AOL</p> <p>Scenarios:</p> <ol style="list-style-type: none"> S06 Integration of the physical resources in C2-SENSE system S05 - Working with Mobile and Stationary Sensors S04- Human to Human communication S01 - user-defined microscenarios (workflows) <p>Additional TCs:</p> <ol style="list-style-type: none"> S06-T01- 	<table border="1"> <thead> <tr> <th>Test result</th> <th>Edit</th> <th>Delete</th> </tr> </thead> <tbody> <tr> <td> <p>Test date: 04/04/2017</p> <p>Test summary: all steps work as expected.</p> <p>Test logs:  C2-SENSE-TEST microsenario Report-04-04-2017.pdf</p> </td> <td>Edit</td> <td>Delete</td> </tr> <tr> <td> <p>Test date: 03/20/2017</p> <p>Test summary: Has been working for a while. Final testing later this week in Puglia. Johannes (AIT) also tested with mobile sensor platform in-house. It works as designed, but there are still some issues with presenting the data on the map.</p> <p>Team: IP (Domenico, Agostino), PIAP (Jan), AIT (Johannes), REG (Biagio)</p> </td> <td>Edit</td> <td>Delete</td> </tr> </tbody> </table> <p>Add</p>	Test result	Edit	Delete	<p>Test date: 04/04/2017</p> <p>Test summary: all steps work as expected.</p> <p>Test logs:  C2-SENSE-TEST microsenario Report-04-04-2017.pdf</p>	Edit	Delete	<p>Test date: 03/20/2017</p> <p>Test summary: Has been working for a while. Final testing later this week in Puglia. Johannes (AIT) also tested with mobile sensor platform in-house. It works as designed, but there are still some issues with presenting the data on the map.</p> <p>Team: IP (Domenico, Agostino), PIAP (Jan), AIT (Johannes), REG (Biagio)</p>	Edit	Delete	4
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Integration Scenarios and Test



Integration Scenarios | C x

Sicher | https://service.ait.ac.at/c2-sense/content/integration-scenarios


My account Log out

C2-SENSE Technical Coordination Site

We know what we have today and where we want to go.

Home Pilot Microscenarios Integration Scenarios Test Cases Technical Requirements Use Cases User Requirements Components Profiles Contact Imprint

Home » C2-SENSE Integration testing



Integration Scenarios

View Revisions Track

Submitted by Denis Havlik on Tue, 11/08/2016 - 12:04

The table below provides an overview of C2-SENSE Integration Scenarios and related Test Cases.

Integration Scenarios are (relatively) simple workflows that can be realized using the C2-SENSE components and fulfill some business objective that is important for end users (e.g. crisis managers) or for the system integrators. C2-SENSE Test Cases are concrete steps in such scenarios. Integration Scenarios demonstrate and validate the link between the users ("business") needs and the technical capabilities of the C2-SENSE platform.

Bulk edit: </scenarios/edit>

Integration Scenario	Objective	Set-up tasks					Included TCs	Overall result
	The aim of this scenario is to verify that <u>C2-SENSE</u> users can define and execute microscenarios (specific	Set-up task	Responsible	Owner	Consulted	Informed	Evaluation result	<ul style="list-style-type: none"> S01-T01 Define

C2-SENSE testing overview

- ▼ C2-SENSE Integration testing
 - Abbreviations and Acronyms
- ▼ Integration Scenarios
 - S01 - user-defined microscenarios (workflows)
 - S02 - User-defined notifications

14:42 27.04.2017

Integration Scenarios and Test

Integration Scenario	Objective	Set-up tasks	Included TCs										
<p>S07 Data visualization, common situation picture and commands</p>	<p>This scenario demonstrates the capability of the <u>C2-SENSE</u> system to visualise sensor- and other data. In addition, it also illustrates how this data is processed, shared and used to trigger crisis management actions (workflows).</p> <p>Several aspects of this scenario are of high interest to practitioners: (1) visualisation of all data on a map, in tables in different types of diagrams; (2) filtering to show only the data that is relevant and interesting for the current user / user type; (3) flexible visualisation based on regular expressions; (4) summaries and alerts for the higher-ups and to</p>	<table border="1"> <thead> <tr> <th>Set-up task</th> <th>Responsible</th> <th>Owner</th> <th>Consulted</th> <th>Evaluation result</th> </tr> </thead> <tbody> <tr> <td>ESB available</td> <td>Lutech</td> <td>Lutech</td> <td>Lutech</td> <td>0</td> </tr> </tbody> </table>	Set-up task	Responsible	Owner	Consulted	Evaluation result	ESB available	Lutech	Lutech	Lutech	0	<ul style="list-style-type: none"> S02-T03 User uses the Emergency Map Tool to create an alert event (test=4) S05-T03 Validate connection between sensor platforms and C2-SENSE Framework (test=4)
		Set-up task	Responsible	Owner	Consulted	Evaluation result							
		ESB available	Lutech	Lutech	Lutech	0							
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		Regione Puglia data available	Regione Puglia	AIT	AIT	4							
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Set-up task	Responsible	Owner	Consulted	Evaluation result									
AnySen sensor data available	AIT	AIT	AIT	5									
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Set-up task	Responsible	Owner	Consulted	Evaluation result									
IPGW sensor data available	PIAP	PIAP	PIAP	0									
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Set-up task	Owner	Consulted	Evaluation result										
install WireCloud	AIT	AIT	3										

C2-SENSE Objectives

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

Link to the scenarios:

<https://service.ait.ac.at/c2-sense/microscenarios>

[https://service.ait.ac.at/c2-sense/content/integration-
scenarios](https://service.ait.ac.at/c2-sense/content/integration-scenarios)

Summary

Micro Scenarios are a good approach within complex systems to prepare

- Workflows together and
- To do step by step tests and verifications with the end users.
- Easier to understand and to verify from both sides (technicians and end-users)
- Easy to document on the online repository – getting a pretty good overview about all the related (user and technical) requirements up-to the different use-cases and involved tools and scenarios.

Acknowledgement

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement nr. 607729.

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

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Regione Puglia



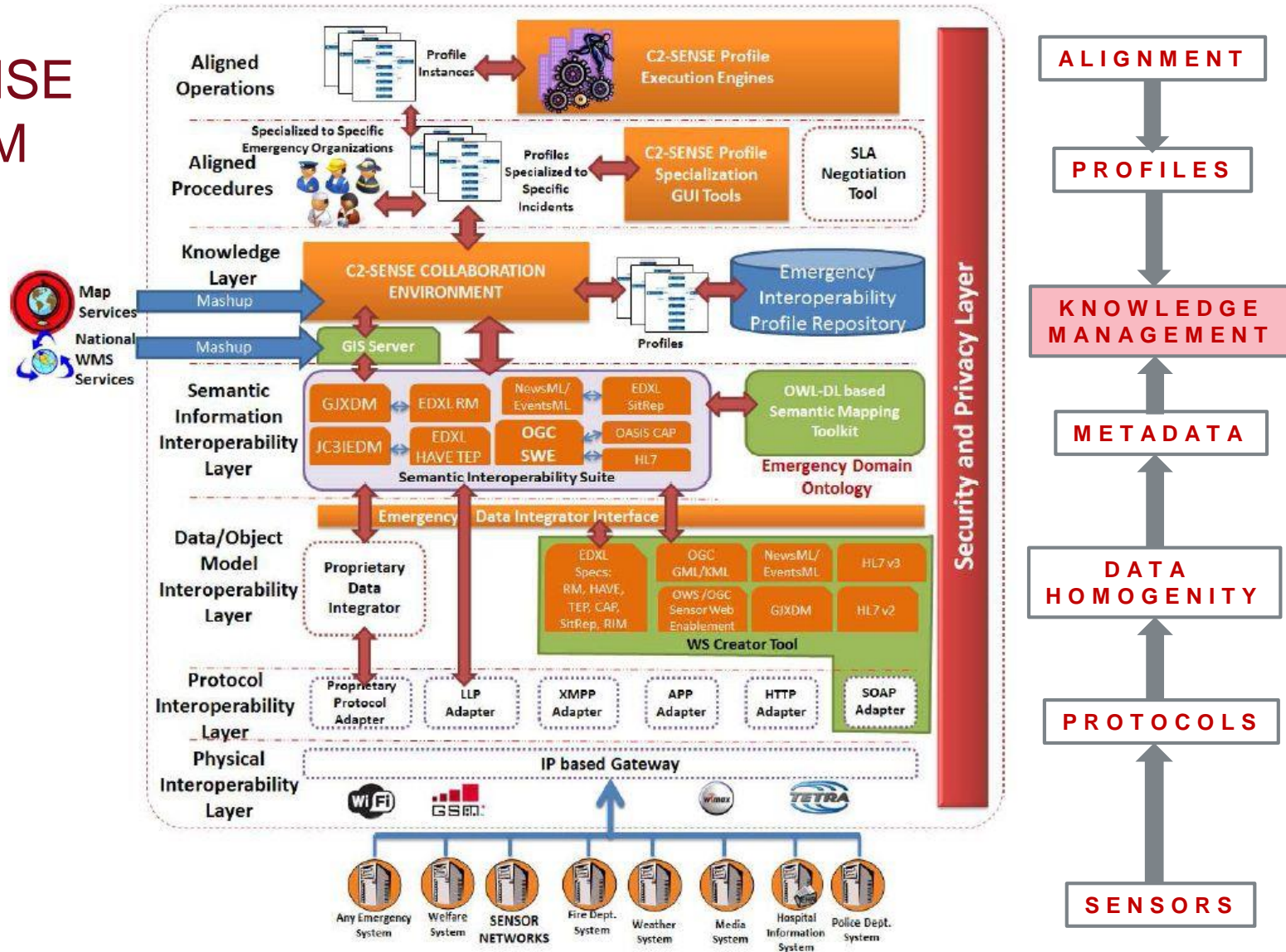
C2-SENSE Objectives

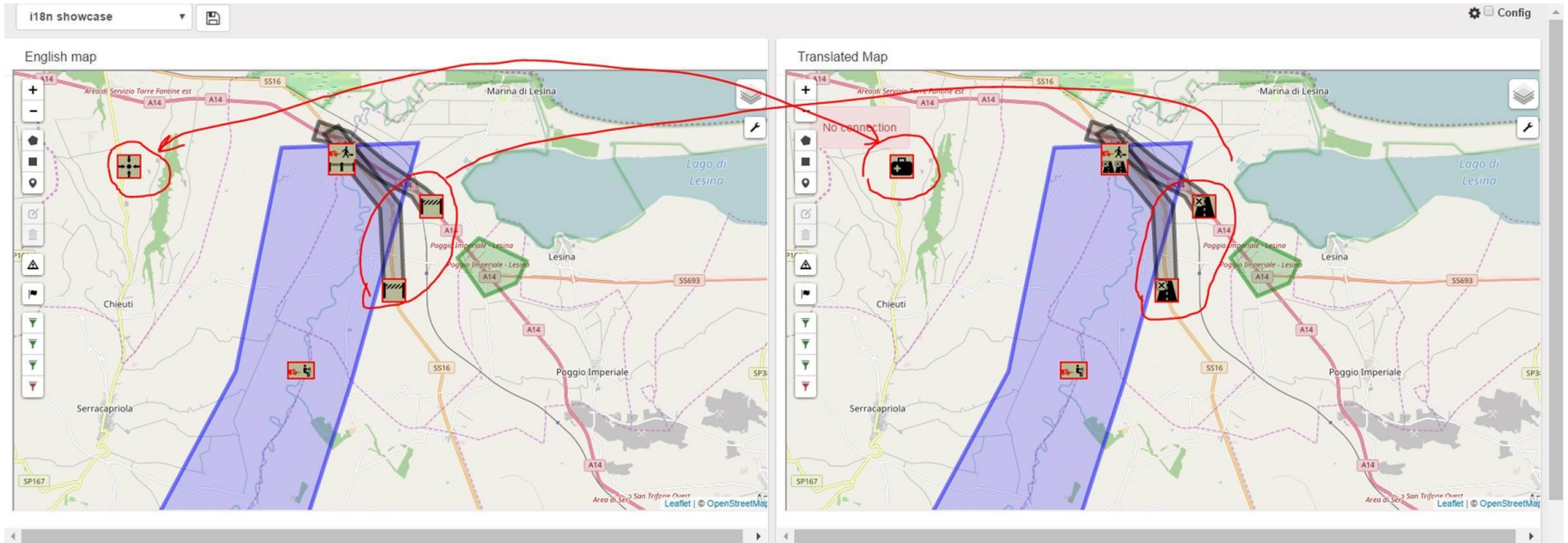
Interoperability Profiles for Command/Control Systems and Sensor Systems in
Emergency Management

THANK YOU

Backup

C2-SENSE SYSTEM





English Table

Entity-Type	Entity Name	Property	Value	Time
WeatherStation	C2-SENSOR	message_temperature_in_Limit server temperature_violation	⚠ temperature_in violates Limit server temperature!	25th 07:29:46
WeatherStation	C2-SENSOR	temperature_in	39 C	11:10:50
Road Problem	Road Problem_18f8295e-5b21-4700-bb20-3843831745ff	message_info	📍 Active staging area 22.	25th 16:57:53
Road Problem	Road Problem_e4f815e3-68cd-4a02-9c9c-ef152b1d3860	message_info	📍 Evacuate 7 elderly people from this location to staging area 41.	25th 13:26:22
Road Problem	Road Problem_b44c32c9-630b-4d0c-bdec-acc110b77d3e	message_info	📍 345 vehicles stuck in area flooded	24th 17:56:16
Road Problem	Road Problem_5134569b-2ad4-4528-bcaf-298d927eb7b8	message_info	📍 Active staging area Freedom.	24th 17:08:05

Translated table

Entity Typ	Entity Name	Property	Wert	Zeit
WeatherStation	C2-SENSOR	message_temperature_in_Limit server temperature_violation	⚠ temperature_in verletzt Limit server temperature!	25. 07:29:46
WeatherStation	C2-SENSOR	temperature_in	39 C	11:10:50
Road Problem	Road Problem_18f8295e-5b21-4700-bb20-3843831745ff	message_info	📍 Aktiviere Sammelplatz 22.	25.
Road Problem	Road Problem_e4f815e3-68cd-4a02-9c9c-ef152b1d3860	message_info	📍 Evakuire 7 ältere Leute von hier nach der Sammelplatz 41.	25.
Road Problem	Road Problem_b44c32c9-630b-4d0c-bdec-acc110b77d3e	message_info	📍 Überflutung: 345 Fahrzeuge im überfluteten Bereich blockiert.	24.
Road Problem	Road Problem_5134569b-2ad4-4528-bcaf-298d927eb7b8	message_info	📍 Aktiviere Sammelplatz Freedom.	24.

Emergency Maps Tool with a map and two table views, one configured as a command log, the other as a table of the currently active alerts. → Internationalization

comando e controllo ▾
📄

Mappa di comando

Map showing command area with various markers and a blue highlighted region. The map includes roads labeled SP167, SP166, and SP11, and locations like Serrano, San Paolo di Civitate, and Torremaggiore. A blue polygon highlights a specific area, and several red-bordered icons are placed on the map.

Comandi attivi

Configuration

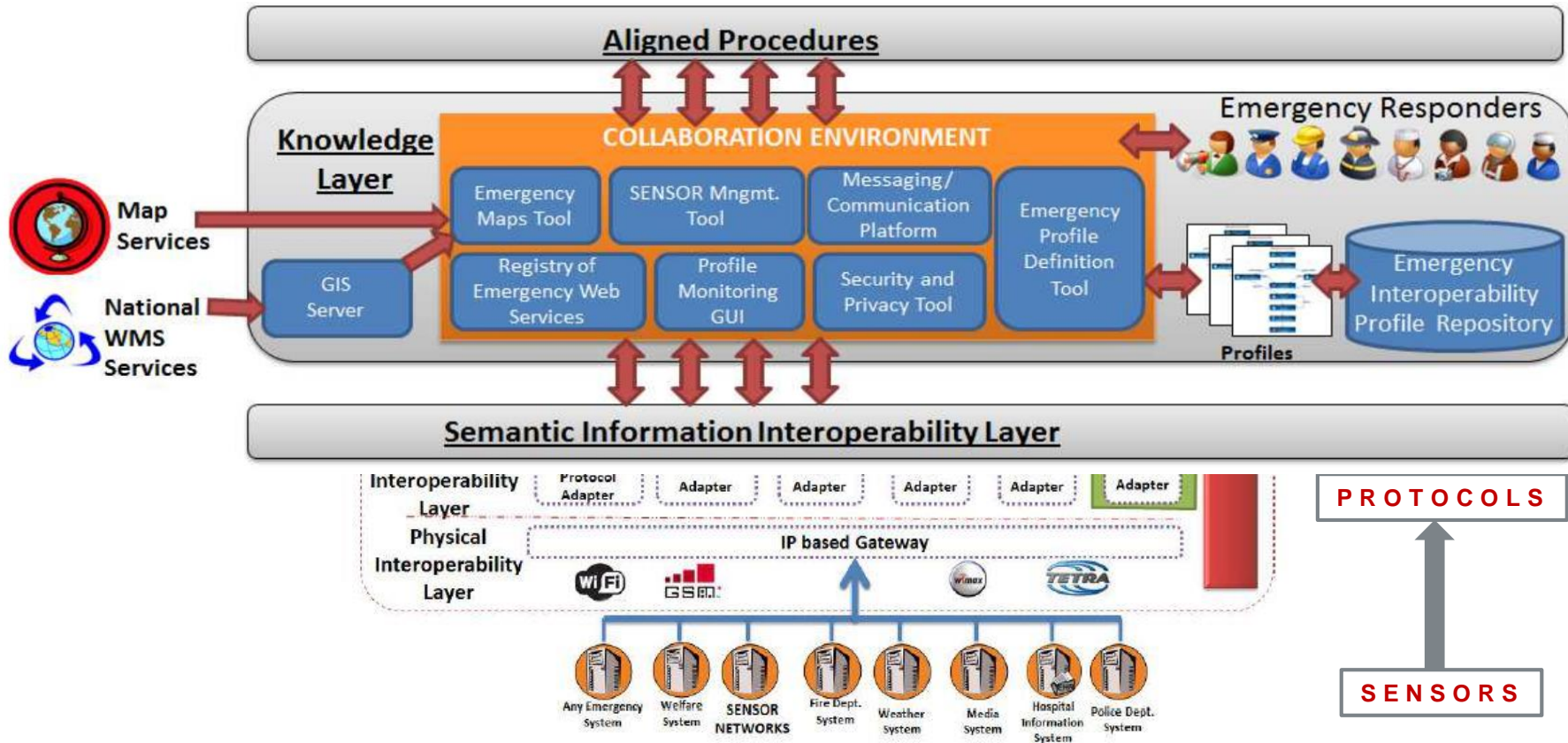
Property ▾	Value ▾	Start Time	Stop Time ▾
message_info	🚨 Evacuate 6 victims from this location to staging area A1.	22:29:06	22:29:06
message_info	🚨 Road blocked!	22:27:08	22:27:08
message_info	🚨 Active staging area A1.	22:26:15	22:26:15
message_info	🚨 10 vehicles	22:24:31	22:24:31

Avvisi

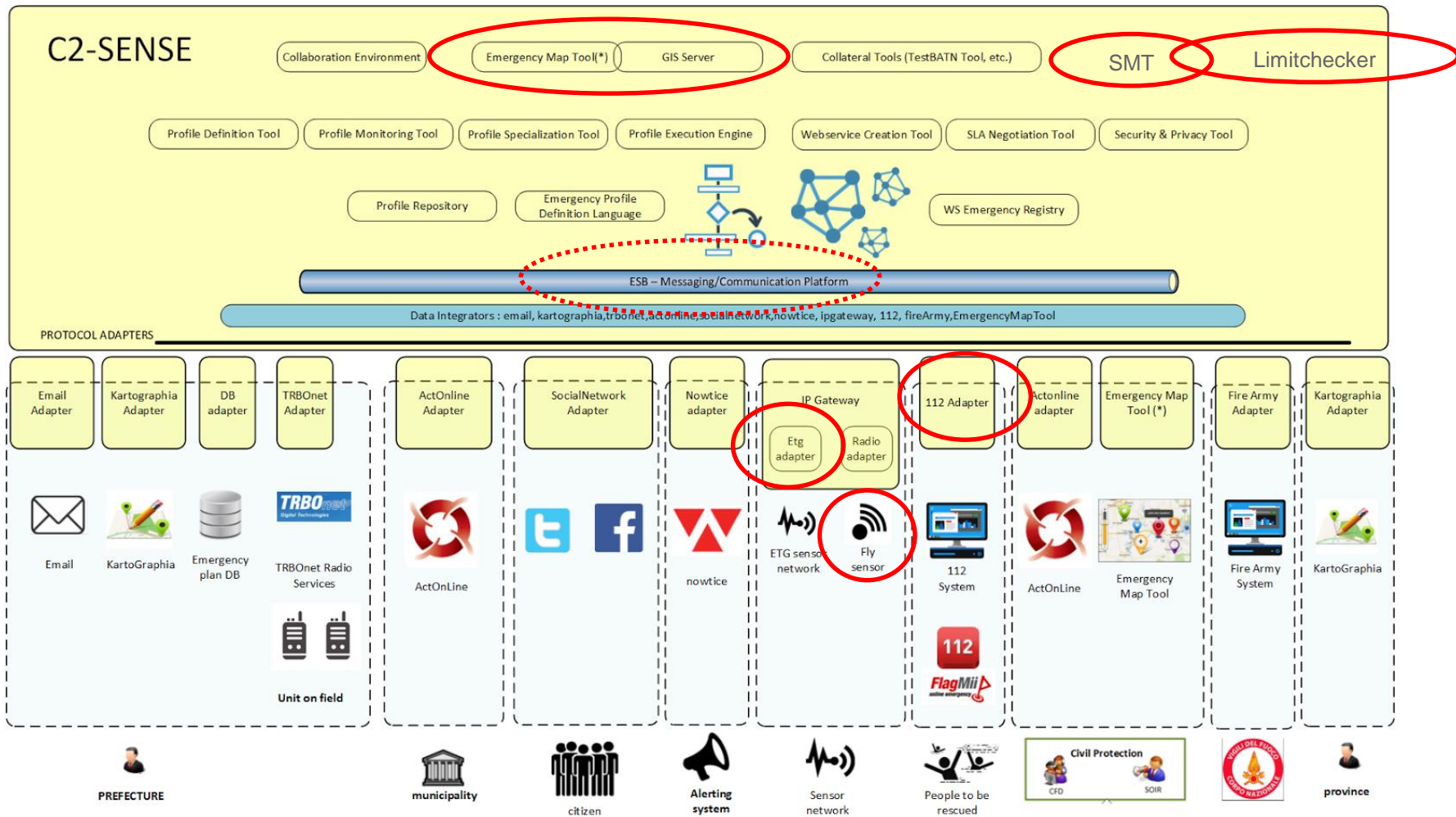
Configuration

Value ▾	Start Time	Stop Time
⚠️ Proprietà Water level (Regione Puglia) violata Limit_Waterlevel_Fortore a Ripalta_yellow!	22:23:59	22:30:06
⚠️ Proprietà Water level (Regione Puglia) violata Limit_Waterlevel_Fortore SP142_orange!	22:05:38	22:30:06

C2-SENSE SYSTEM



Pilot Organizations



Partners



Outcomes and future use

