

Framework for Enabling Technical and Organizational Interoperability in the Management of Environmental Crises and Disasters

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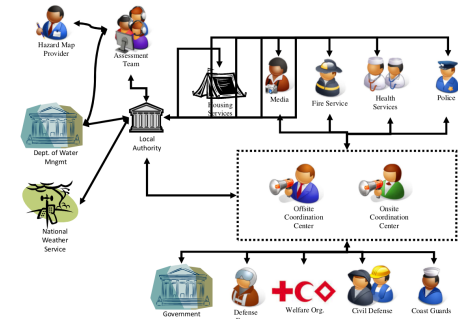
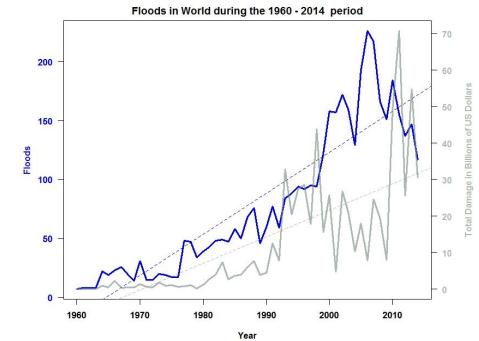
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OUTCOMES/OVERVIEW

- There are a lot of crisis events in the world, and the number is rising
 - Majority weather-related
 - Millions of people affected, economies suffer
- Necessity of effective response and crisis management
 - Interoperability issues on technical and organizational level
- Presented Framework offers a solution
 - Conforming data and communication standards
 - Alignment of operations and procedures

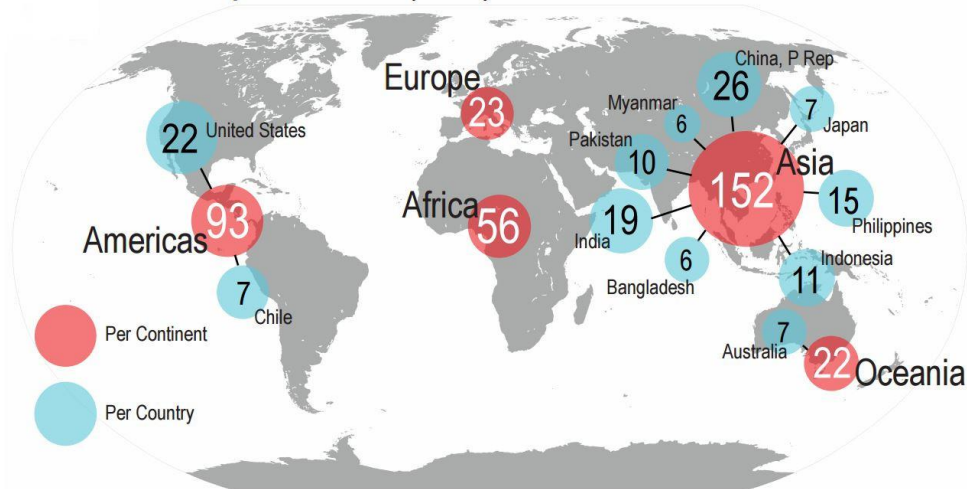


1. DISASTERS AND CRISES CHALLENGES

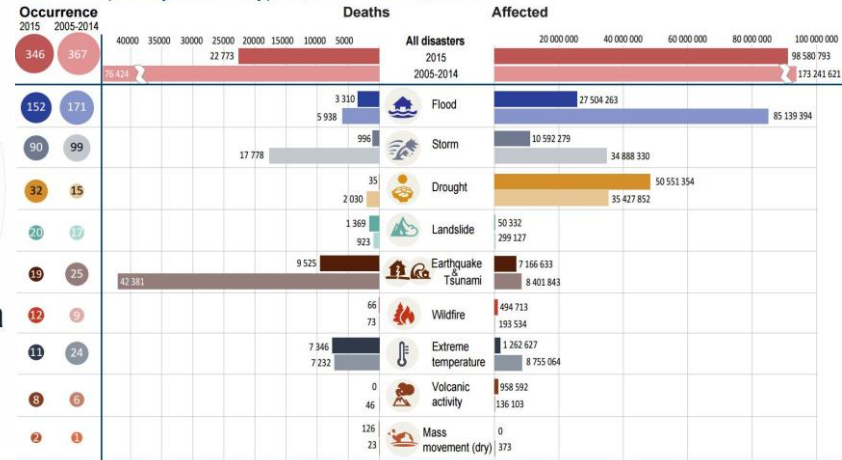


EMERGENCY EVENTS WORLDWIDE IN 2015

Number of **reported** disasters by country



Human impact by disaster types (2015 versus average 2005-2014)



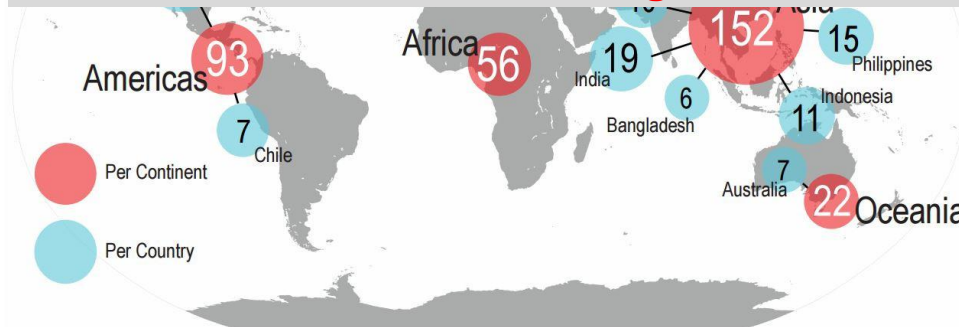
(1): Natural disasters: Epidemic and insect infestations not included

Source: EM-DAT

Figures from unisdr.org

EMERGENCY EVENTS WORLDWIDE IN 2015

- **346 reported disasters**
- **22 773 people dead**
- **100 million people affected**
- **\$66.5 billion economic damage**

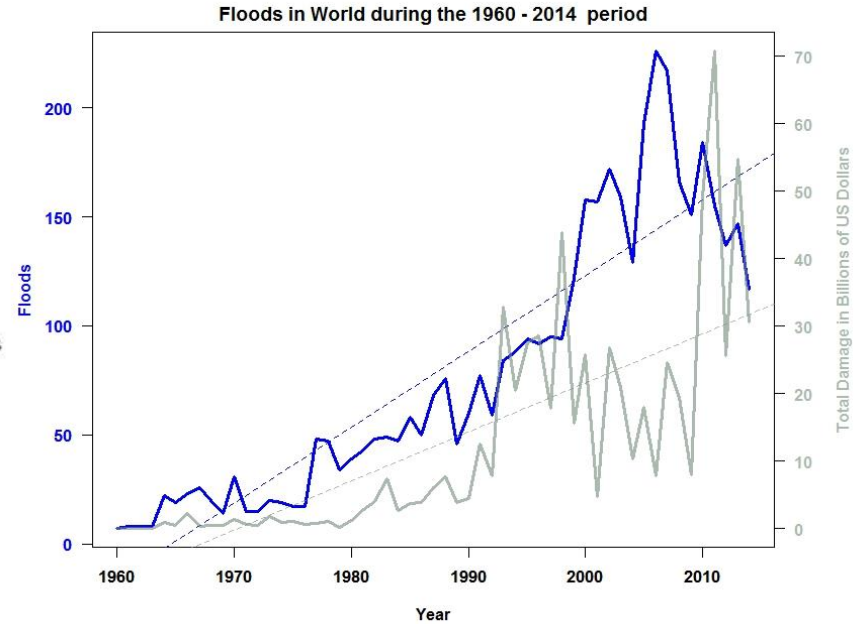
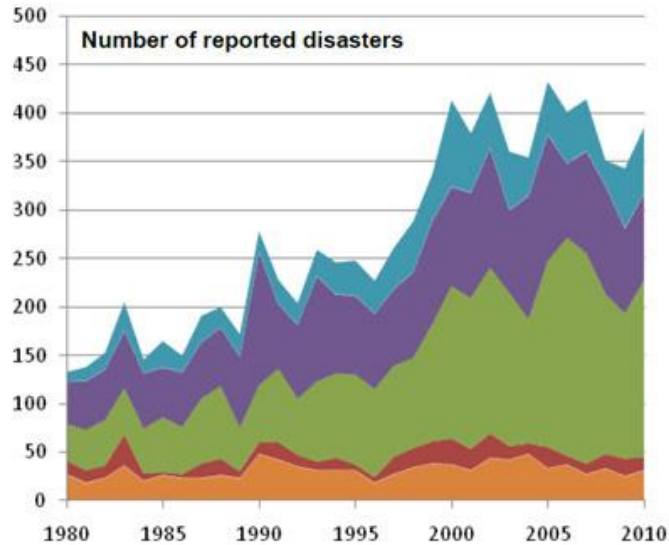


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Source: EM-DAT

Figures from unisdr.org

Trends in Reported Disasters



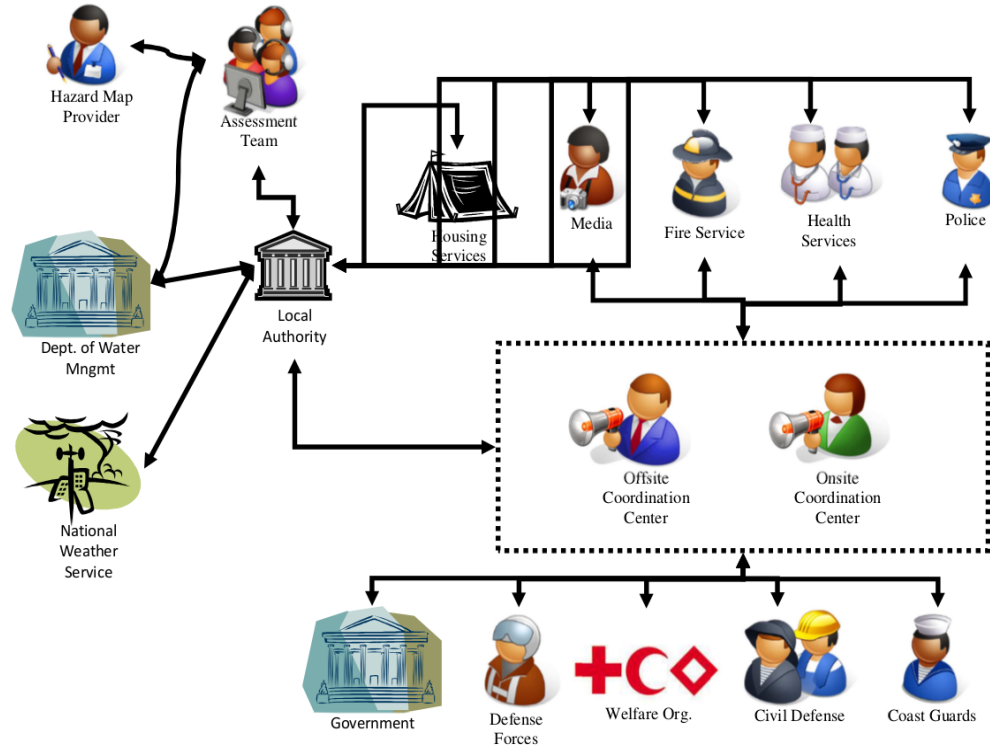
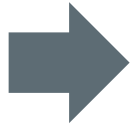
Sources: Oxfam, EM-DAT

2. RESPONSE AND DISASTER MANAGEMENT



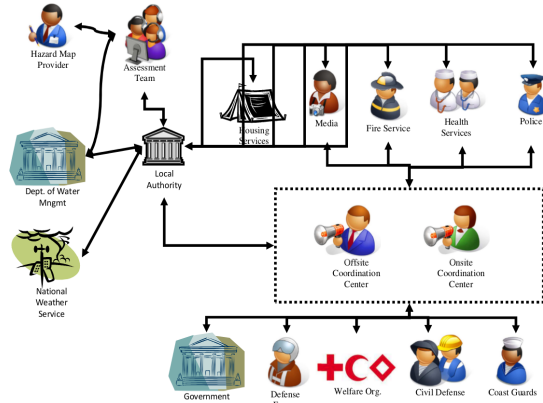
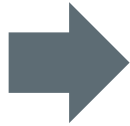
INVOLVED RESPONSE ENTITIES

CRISIS EVENT

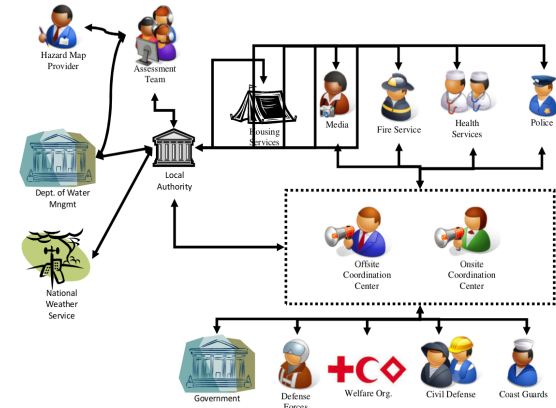


INVOLVED RESPONSE ENTITIES

CRISIS EVENT



Italy



France

Occurred Issues in Known Disasters

Haiti Earthquake (2010) – lack of interoperability of equipment and procedures among the European field hospitals -> less efficient cooperation and response

Hurricane Katrina (2005) – lack of data interoperability -> reduced evacuation cooperation between the governmental and voluntary organizations

Danube river floods (2002+) – Transboundary issues (regulations, procedures)

Crisis Management Issues and Needs

- Lack of interoperability in heterogeneous and multi-user environments
 - among systems, sensor networks
 - communication
- Responders have needs:
 - accessing data provided by the first responders in the field
 - having a joint operational picture of a crisis by accessing sensor data and maps
 - having a possibility of real-time effective communication with other crisis managers
- Typical Issues
 - usage of different hardware and software solutions, conforming to different data and communication standards
 - not fully adjusting to the legal and administrative policies and procedures of involved organizations and responders
 - using communication-error-prone technologies (fax, phone, etc.)

3. C2-SENSE FRAMEWORK AS A SOLUTION



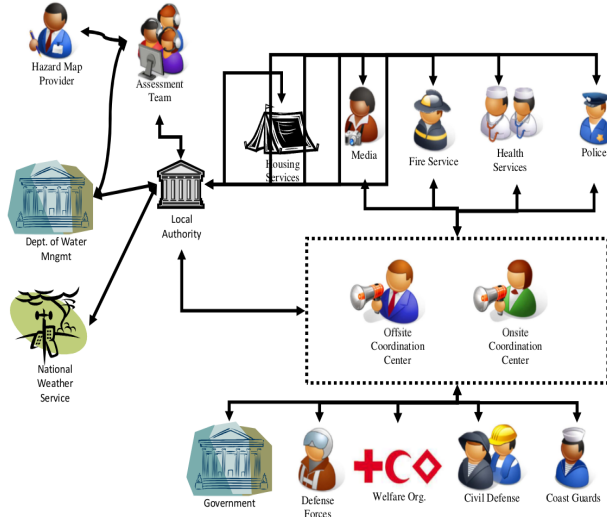
Challenges and Goal of the Framework

Challenge: enhanced level of cooperation, where technical, linguistic, legal, procedural and information exchange barriers are no longer an obstacle

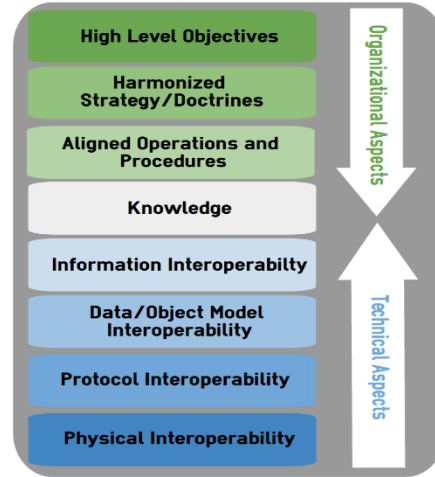
Goal of the Framework:

- fully interoperable response
- every organization has the possibility to use any software, data and communication formats and language that best suits their procedures and methods of operation, *while*
- maintaining independence, *but*
- being able to take part in a joint crisis response

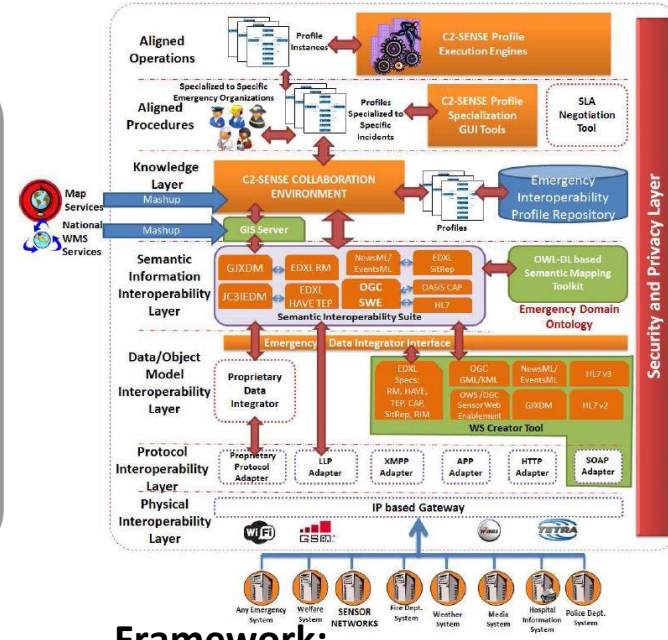
THE FRAMEWORK AND COLLABORATION ENVIRONMENT



Responder Network



Interoperability Stack



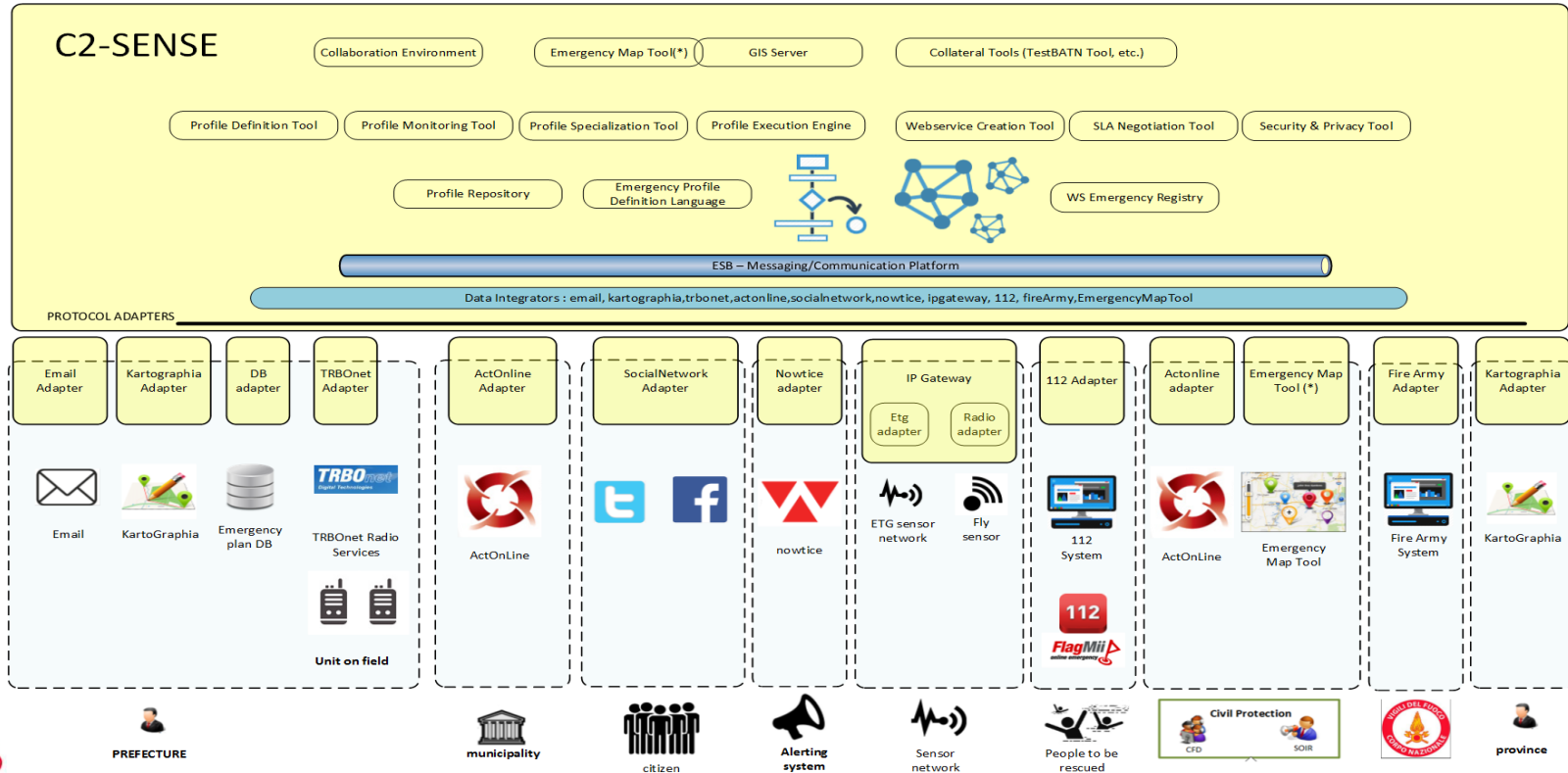
**Framework:
Components, Applications & Rules**

(C2-SENSE) Framework

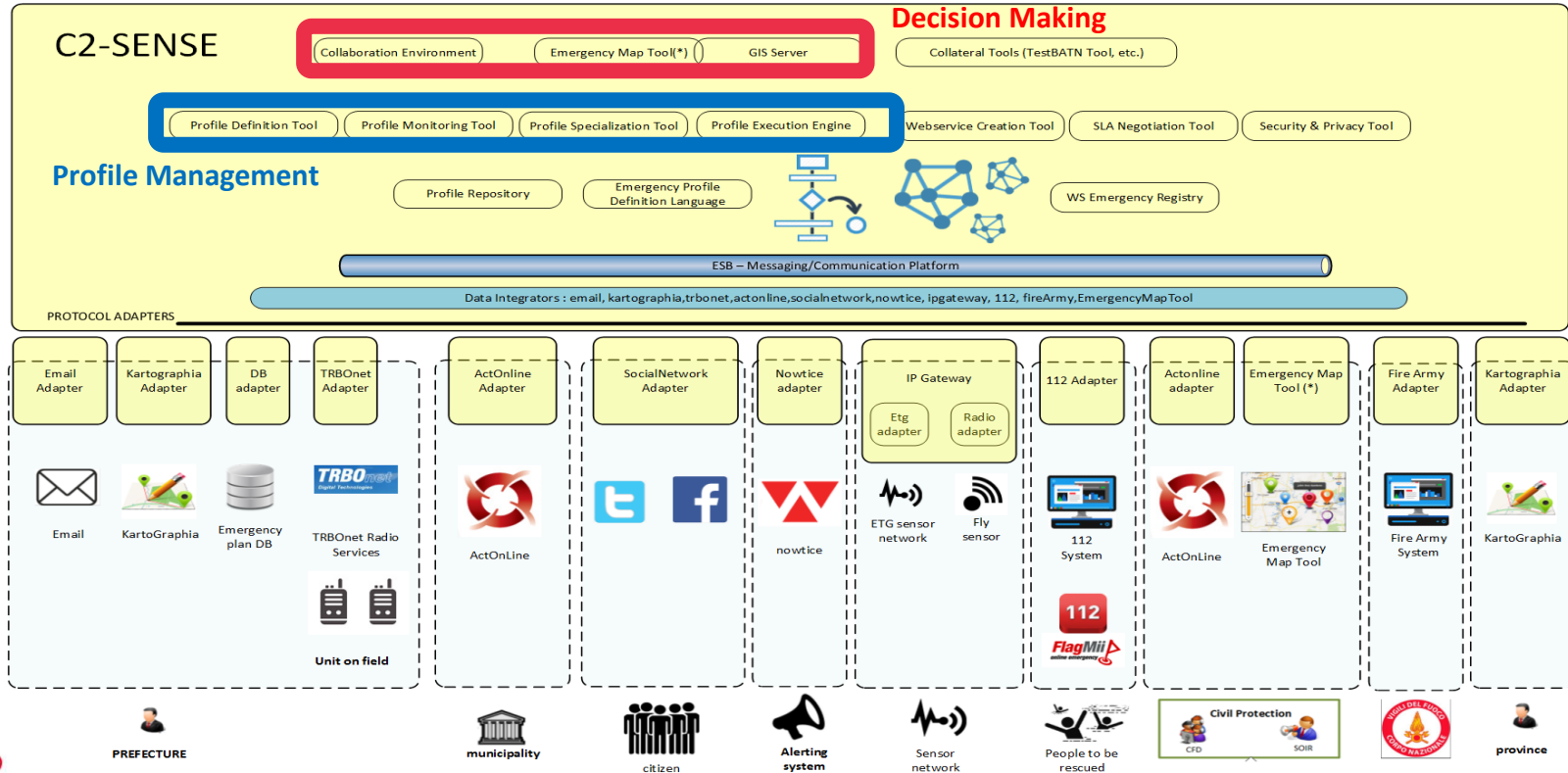
Two parts to it:

1. **Components related to the physical nature of the Framework, software/hardware (“body”)**
2. **Profiling approach – incorporation of rules orchestrating the functionalities of those components and rules for achieving interoperability (“soul”)**

Components and Applications



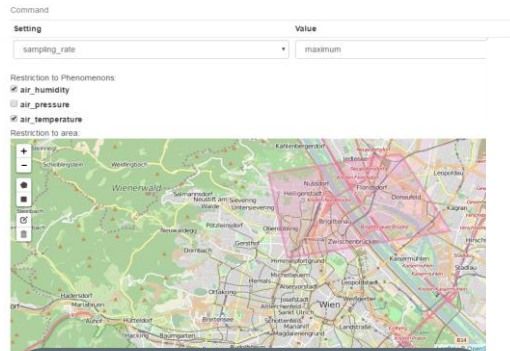
Components and Applications – 2 Groups



Components and Applications for Decision Making

Software components and tools as a part of the Collaboration Environment

Send Command

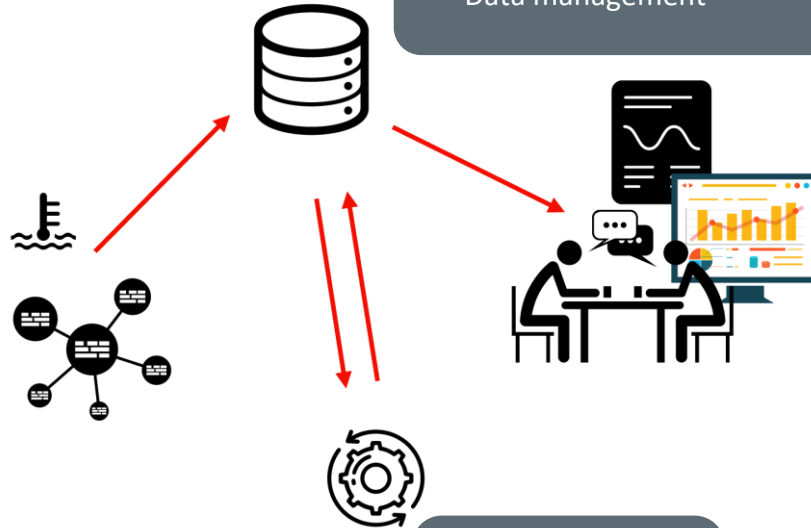


Sensor Management Tool (SMT)

- Overview - available sensors
- Generic, basic configuration for controlling

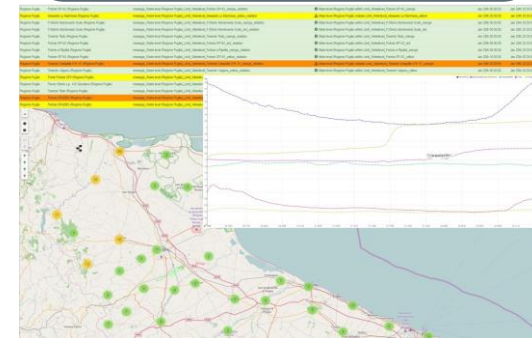
Object of Interest Data Repository (OOI)

- Data management



Emergency Maps Tool (EMT)

- Collaboration tool
- Crisis mapping/visualization
- Communication



Limit Checker (LC)

- Analytics
- Alarms

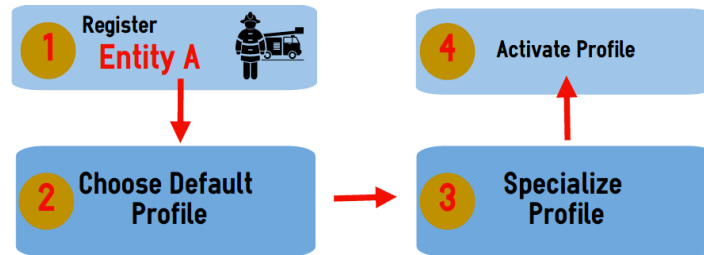
PROFILING APPROACH

Sets of rules orchestrating the functionalities of the Framework

- Profiles define
 - a standard set of messages and documents, business rules, processes, constraints and choreographies that allow even a new entity to join an already existing response network
 - no additional integration efforts, as long as the entity conforms to one or more predefined profiles.
 - otherwise, conformance achieved by adapter implementations
- Approach helps in improving interoperability as it eliminates the need for prior bilateral agreements

Profiling Approach – 4 Steps

1. Register as a new organization (in the C2-SENSE Framework)
2. Choose a *default* profile for data exchange
3. Specialize the chosen profile by providing the network access point (e.g., URL) of the receiver/sender of the data
4. Activate the *specialized* profile



See presentation in tomorrow's session
 "Achieving Semantic Operability", Gençtürk, M.

Components and Applications for Profile Management

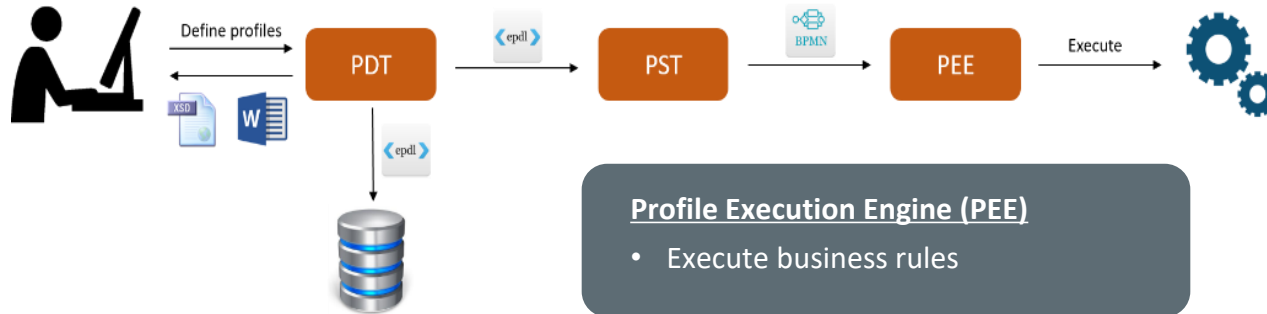
Software components and tools for management of profiles

Profile Definition Tool (PDT)

- Create, update and maintain default profiles

Profile Specialization Tool (PST)

- Customize generic profiles
- Create business rules



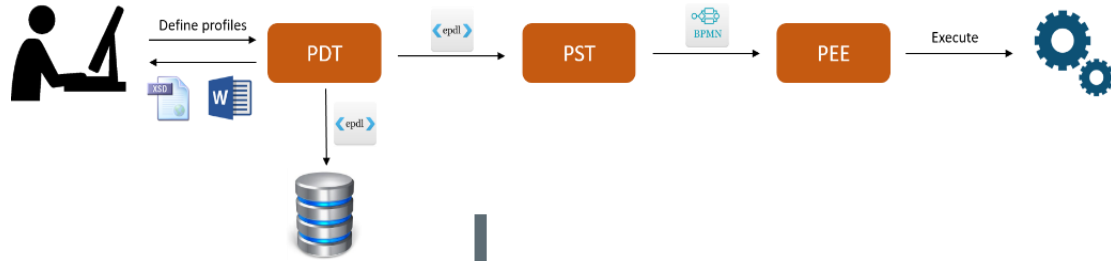
Profile Execution Engine (PEE)

- Execute business rules

Profile Monitoring Tool (PMT)

- Visually trace the execution of profiles
- Monitor status, bottlenecks, tasks, etc.

HOW DOES THIS PLAY OUT?



1. Use Profile Management Tools

Define (PDT)

Customize (PST)

Execute (PEE)

2. Use Decision Making Tools

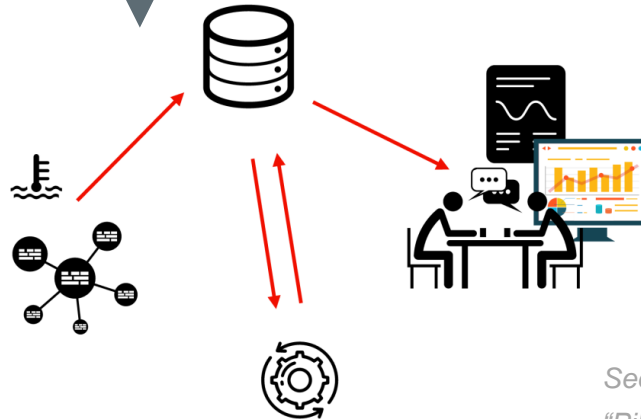
Access sensor data (SMT)

Visualize maps with data (EMT, OOI)

Request data analysis (LC)

Send messages to other actors (EMT)

3. Make decisions



See presentation in tomorrow's session

"Pilot Scenario: Apulia Example", Schimak G.

OUTLOOK / DISCUSSION / CONCLUSION

- Increase of environmentally challenging events (floods, heatwaves, etc.)
- Challenging crisis response (heterogeneous and multi-user environments, lack of appropriate tools and joint operational picture, no access to relevant data, etc.)
- Technical *and* organizational interoperability needed
- C2-SENSE offers framework enabling interoperability in crisis management domain:
 - Profiling approach facilitating interoperability on a level that relieves a crisis manager from most burdens related to crisis response (access sensor data, reliable and accurate communication, etc.)
 - Tools and Applications for profile management and decision making
 - Flexible, adjustable (to the end-user needs), easily implementable, etc.
- Tested in a pilot few days ago

C2-SENSE CONSORTIUM



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c2-sense.eu

THANK YOU!

Refiz Duro, 10.05.2017



