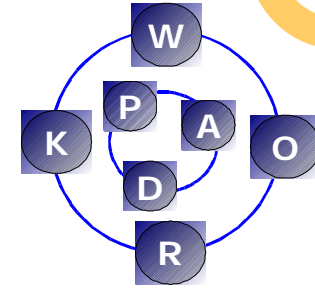


# Analysis of a Real Case Study : the WORKPAD Project

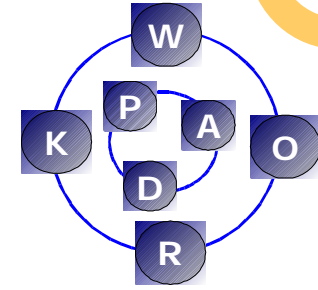
Introduction  
Requirements Engineering  
Interviews-Scenarios-Task Analysis

# General Information



- **Ing. Andrea Marrella**
- **Web Page and slides:**  
[www.dis.uniroma1.it/~marrella/teaching.html](http://www.dis.uniroma1.it/~marrella/teaching.html)
- **E-Mail:** marrella@dis.uniroma1.it
- **Seminars :**
  - ⇒ **03-05-2010** : Introduction and Requirements Engineering (Interviews, Scenarios and Task Analysis)
  - ⇒ **31-05-2010** : Mock-Ups and Evaluation Techniques

# Requirements Classification



- **User requirements**

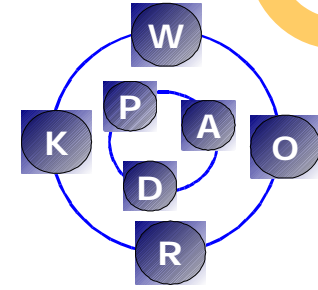
- ⇒ What will the user be able to do with the final system?

- **System requirements**

- ⇒ Which functionalities must be implemented by the engineers?  
(in order to satisfy the user requirements)

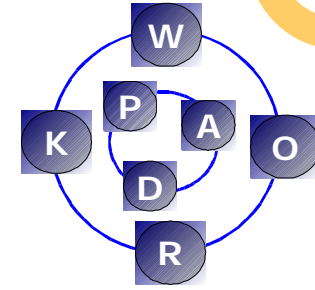


# How to Collect User Requirements in a real project



- Before starting learn about your product and users involved
- Define methods, protocols and prepare all the activities
- Perform the activities
- Analyse the data

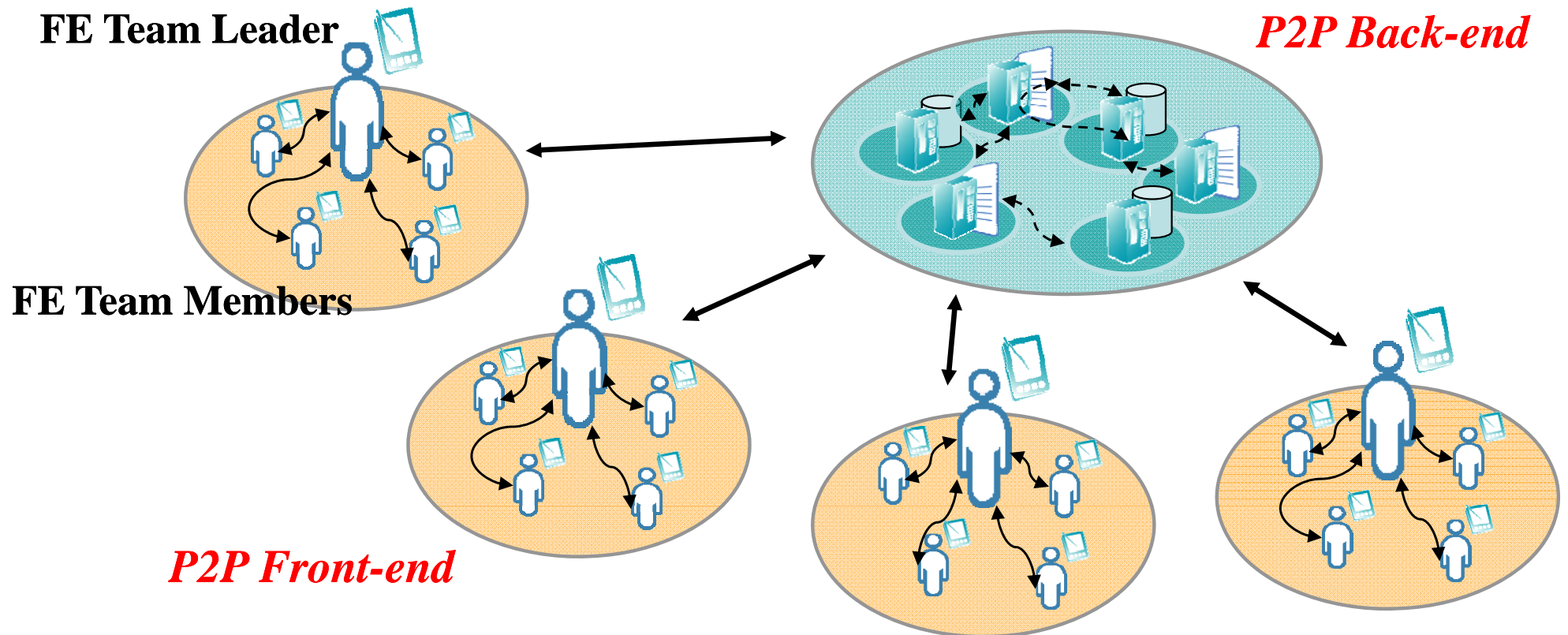
# Before Starting



- Learn about your product and users involved
- The WORKPAD Project (1 Sept.2006-31 August.2009)
  - ⇒ High-Level Architecture
  - ⇒ Context
  - ⇒ Users involved
    - Main User = Protezione Civile Calabria

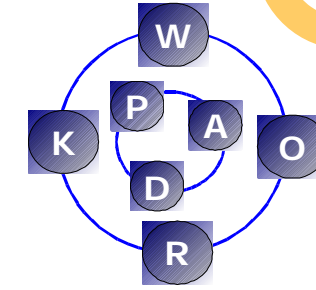
# • High-level Architecture of the WORKPAD Project

- ⇒ An adaptive peer-to-peer service-oriented software infrastructure for supporting collaborative work of human operators in emergency/disaster scenarios.



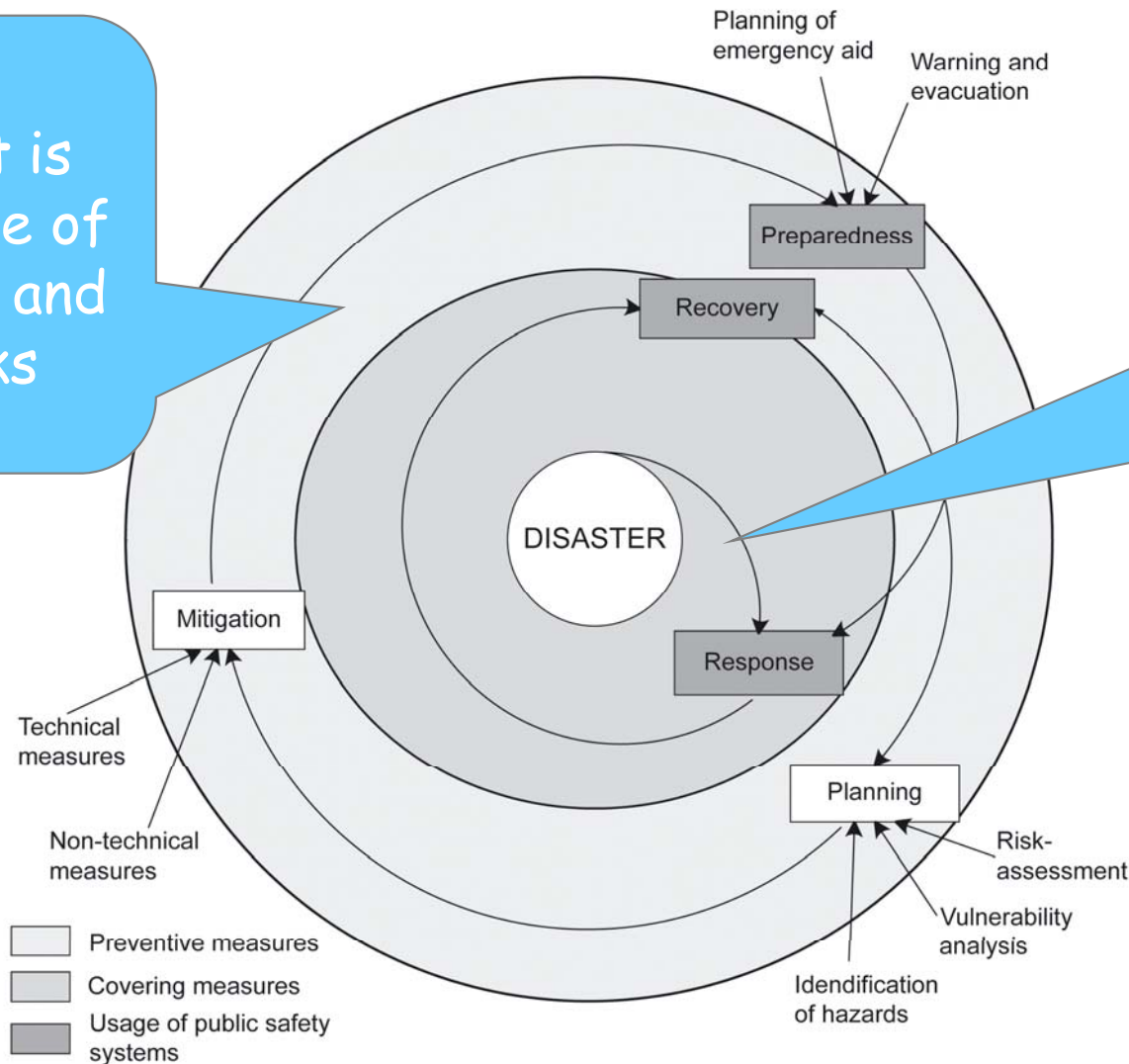


# Dealing with Emergencies

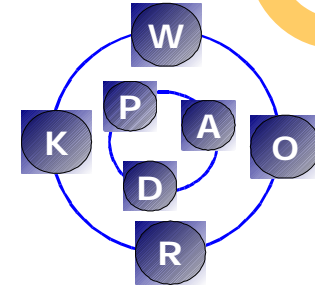


Emergency management is the discipline of dealing with and avoiding risks

The project addresses response and short-term recovery



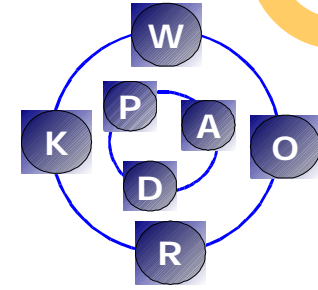
# Types of calamitous events



- The Italian laws identify 3 levels of emergencies, with different responsibilities:
  - ⇒ Micro-Emergencies
  - ⇒ Middle-Emergencies
  - ⇒ Macro-Emergencies

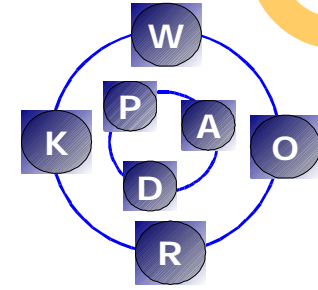


# Micro-Emergencies



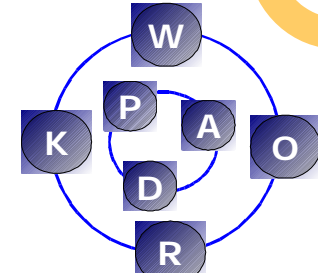
- Mayors coordinate Micro-Emergencies involving their own territory by using **COCs** (Centro Operativo Comunale).

# Middle and Macro-Emergencies



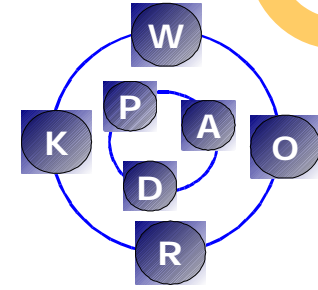
- Middle-emergencies involve provinces or regions and are coordinated by Prefect(s).
  - Macro-emergencies (at national level) are handled by National Homeland Security
- ⇒ They are out of the scope of the WORKPAD project.

# CCS (1)



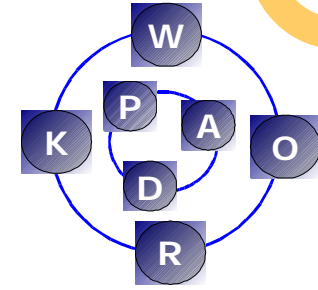
- Middle emergencies are handled by the **CCS (Centro Coordinamento Soccorsi)**
- **CCS is leaded by a Prefect**
  - ⇒ Prefect authorizes and coordinates actions suggested by organizations on the field.
- It is composed by a fixed number of functionaries of the most important emergency organizations: Police, Fire Brigade, Red Cross...
  - ⇒ In specific situations, further organizations can be involved around "the CCS table"
    - For example A.N.A.S. (the organization that manage roads) is involved in emergency concerning nationals roads.

# CCS (2)



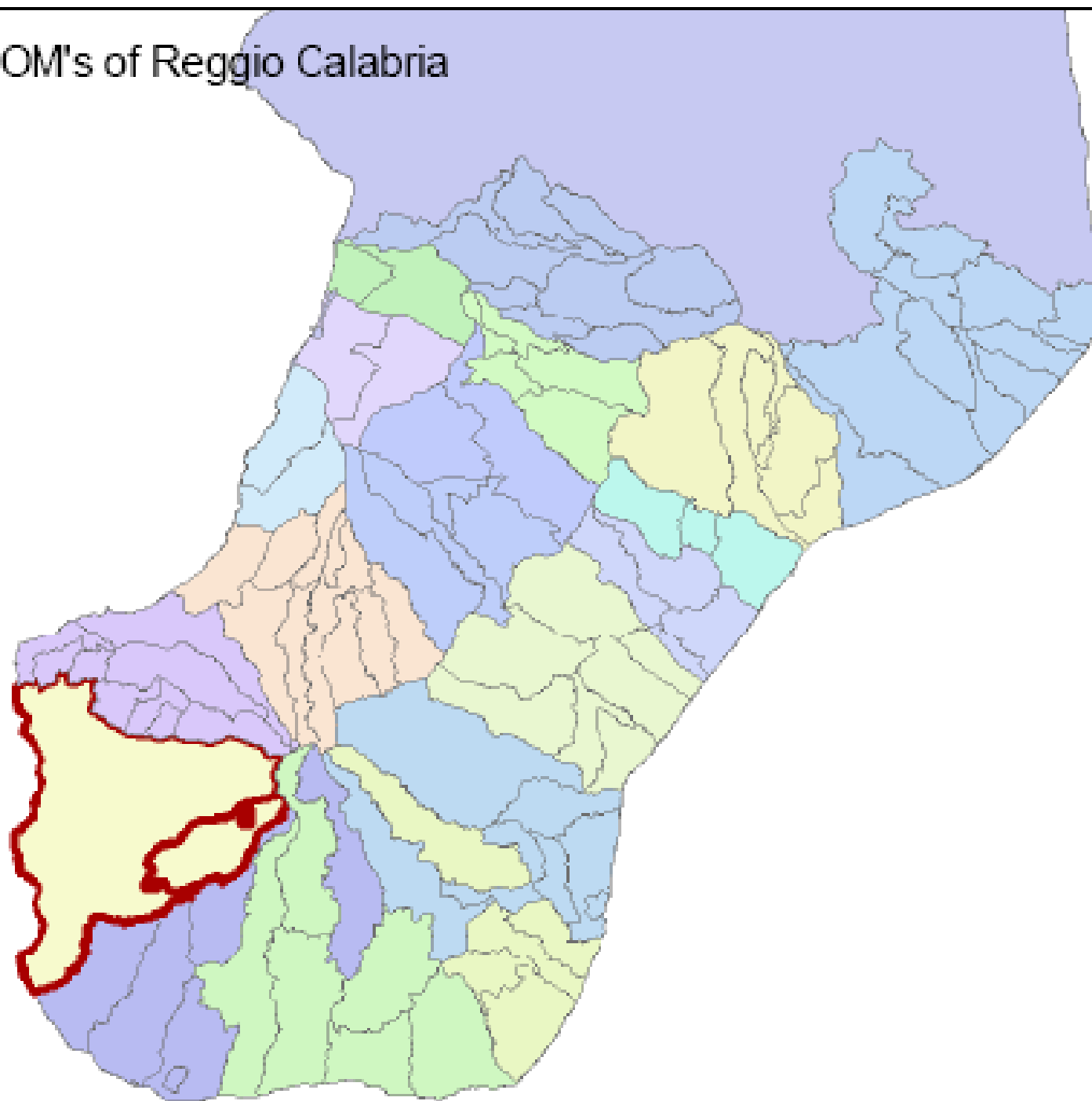
- **Tasks of the CCS:**
  - Collection and elaboration of data and information about the evolution of the situation.
  - Coordination of the whole activity performed in the COMs (Centro Operativo Misto).

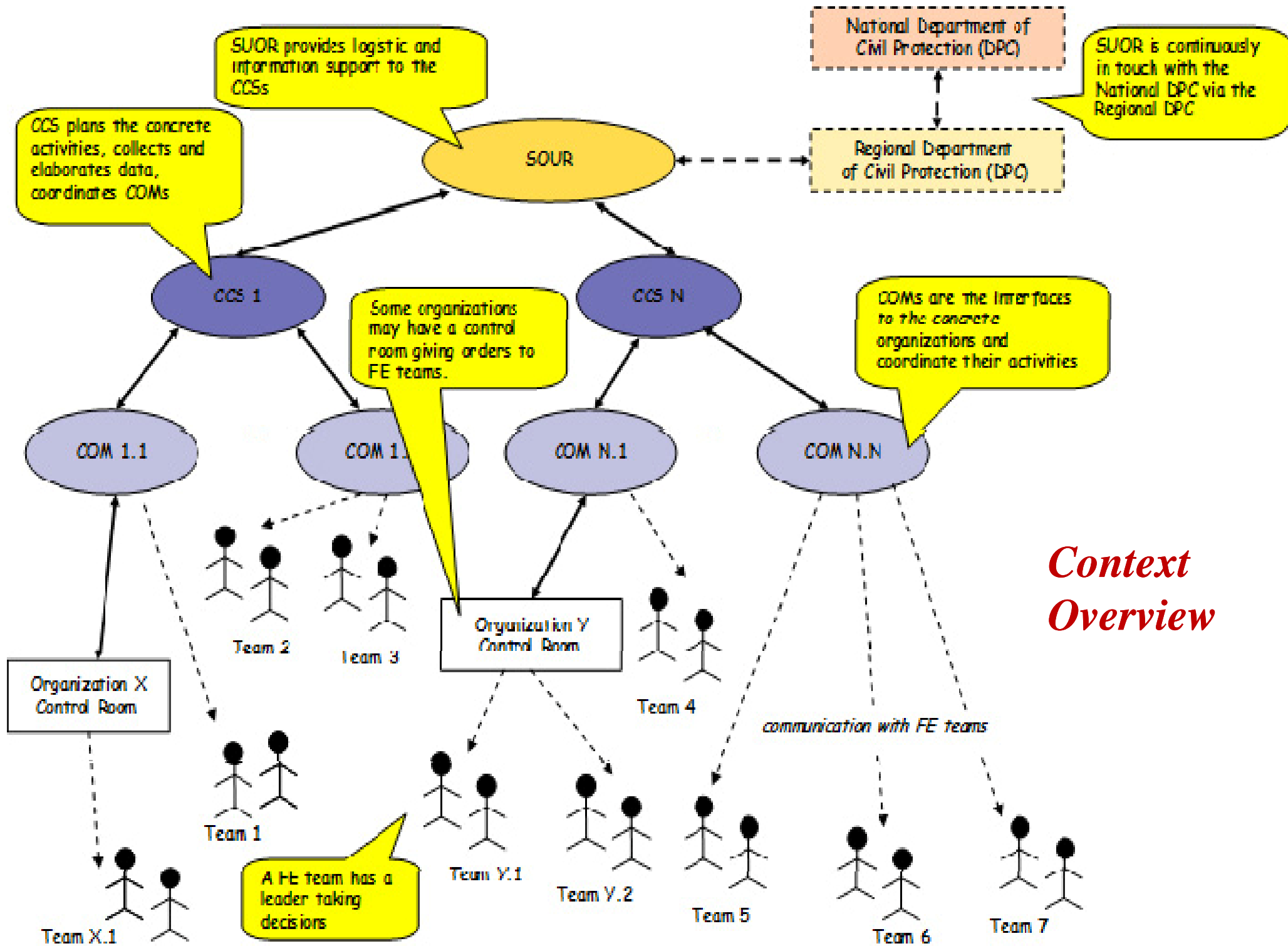
# COM



- **COM** is an operative decentralized structure depending on the **CCS**.
- The constitution of a **COM** is important to efficiently organize relieves on the affected territories.
- **COM** is intended to react quickly to local demands and to guarantee the needed coordination.
  - ⇒ For instance, Reggio Calabria has 19 **COMs**.

# COM's of Reggio Calabria

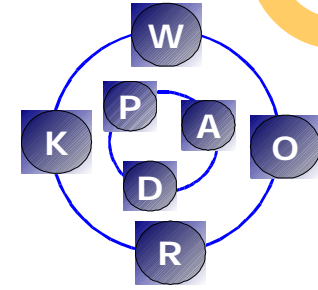




*Context Overview*



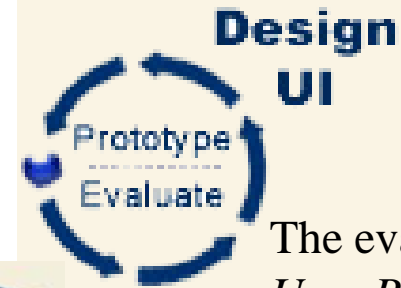
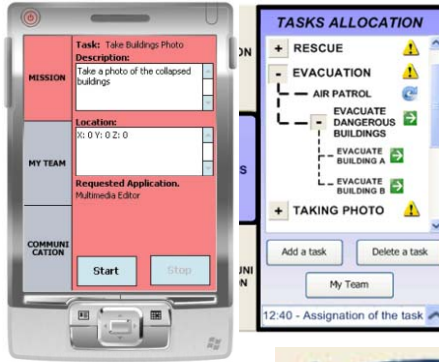
# How to Collect User Requirements in a real project



- Before starting learn about your product and users involved
- Define methods, protocols and prepare all the activities
- Perform the activities
- Analyse the data

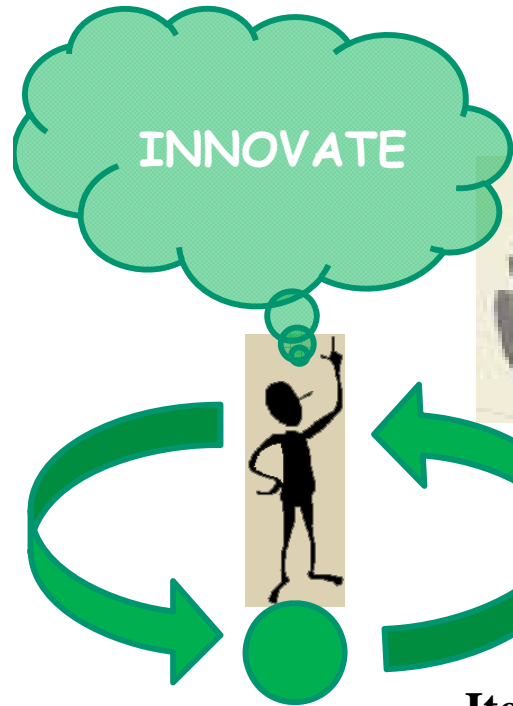
**Incremental design of the components of the system, with a step-by-step realization of :**

Mock-Ups  
Working Prototypes

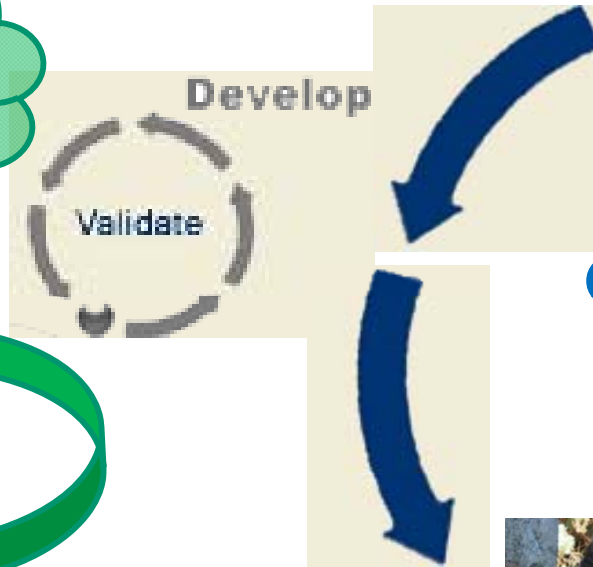


The evaluation of *User Requirements* allows to understand how the final user should interact with the system :

- Scenarios Analysis
- Task Analysis
- Use Case Analysis



**Iterative evaluation and refinement of the prototypes**



**USER CENTERED DESIGN**



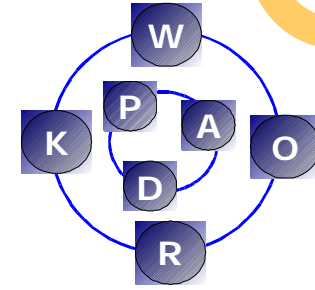
**A twofold approach :**

**Top-Down** = used to get information regarding the related works

**Bottom-Up** = used to get requirements from the practical work carried in the field.

Experience (Technician)

Related Work  
(Top-down)

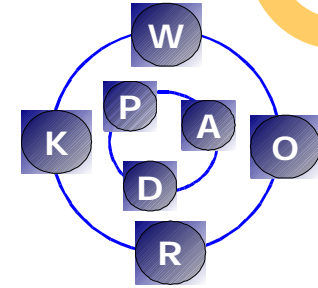


Experience (User)



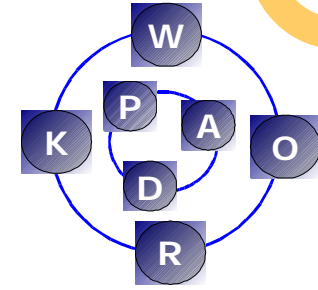
Practical Work (Bottom-up)

# Two-fold Requirements Elicitation Approach



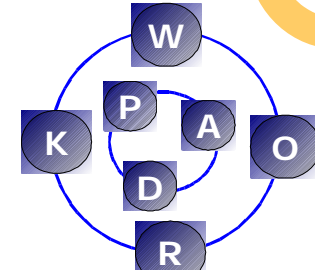
- **“Top down”**
  - ⇒ Regulations, laws, initiatives and projects on a European basis
- **“Bottom up”**
  - ⇒ Case study: EM of Civil Protection
  - ⇒ Experience of users and system engineers

# Top-Down Approach



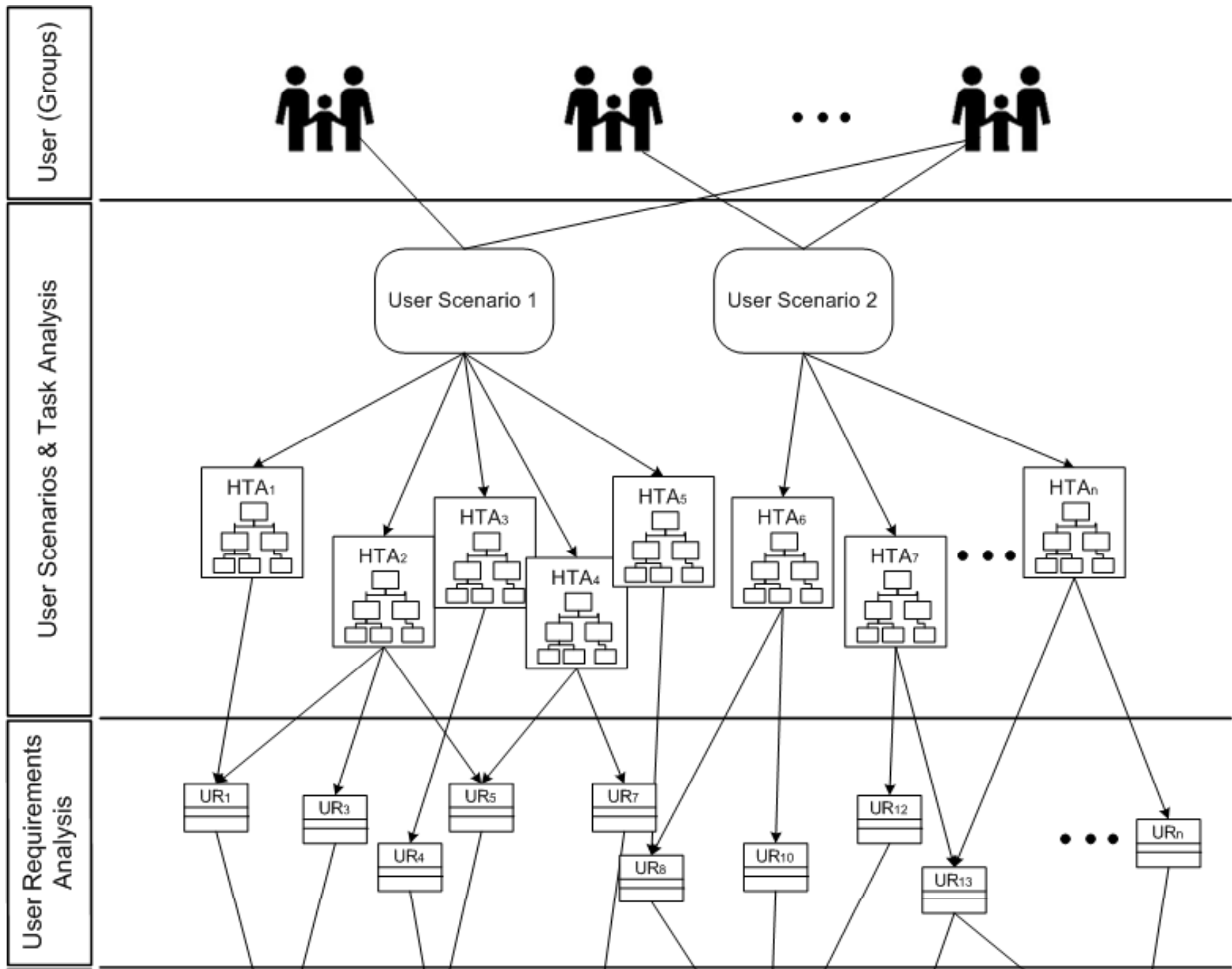
- Analysis of Emergency Management in other European countries
  - Austria, Czech Republic, Spain
- Analysis of EU regulations concerning Emergency Management
  - MIC, CECIS, Training Program
- Analysis of related European Projects
  - Amira, Oasis, Pompei ...

# Bottom-Up Approach

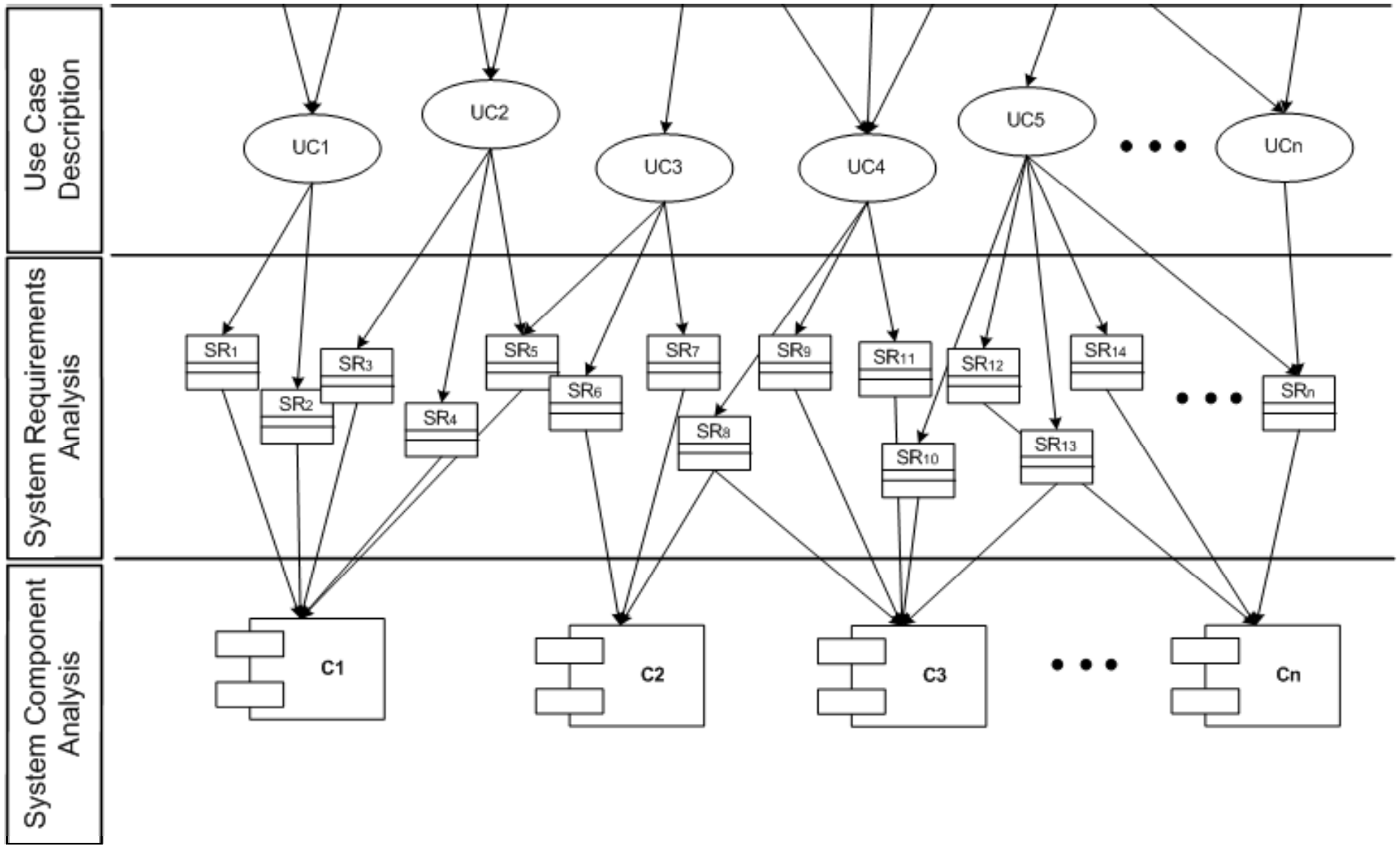


- **Deployed HMI techniques**

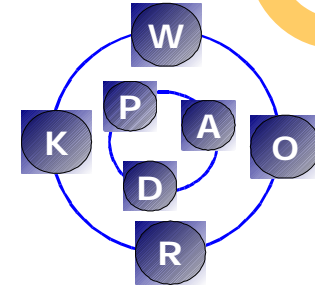
- ⇒ User group categorisation
- ⇒ Semi-structured interviews
- ⇒ Focus groups
- ⇒ Scenario development
- ⇒ Storyboards
- ⇒ Hierarchical task analysis
- ⇒ Usability tests
  - Mock-ups and real prototypes





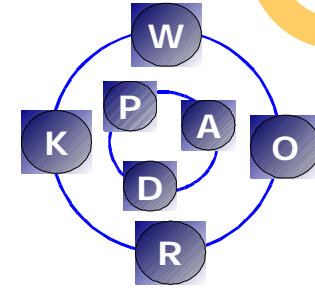


# Interviews



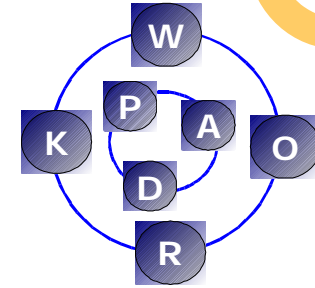
- Interviewing is a technique that involves **structured or unstructured** discussion between requirement engineers and potential users of the application or system.
- Structured interviews can be conducted if the requirements engineer already has a fairly good knowledge about the user's requirements.

# WORKPAD Interviews



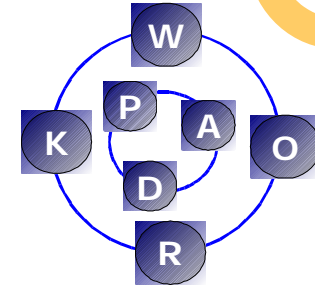
- Semi-structured interviews using prepared set of questions.
- Open-end discussion with the potential user.
- Questions are included in the Interview Form combined with Interview Guidelines.
- Interview guidelines provided instructions for the moderator.

# Interview Guidelines - Example



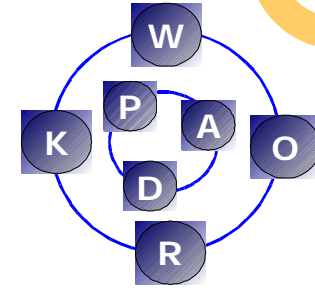
- *The moderator is the leader of the interview and guides the potential user through the personal interview by asking questions that are specified in this document. The answers are recorded by one more person who also takes part to the interview. The interview is videotaped and tape-recorded by a third (technical) person, so that all statements are backed up.*
- *The moderator gives a short summary about the WORKPAD project to the users. The WORKPAD project aims at building and developing an innovative software infrastructure (software, models, services, etc.) for supporting collaborative work of human operators in emergency/disaster scenarios....*

# Interview Form - Example



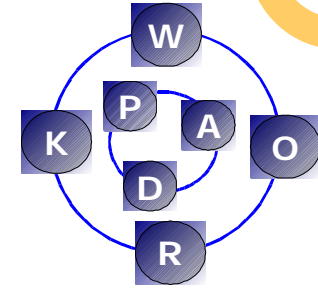
<b>Date:</b>	
<b>Name of the interviewed person:</b>	
<b>Organisation:</b>	
<b>Position in the organisation</b>	
<b>Moderator:</b>	
<b>Present Persons:</b>	

# Execution of Interviews



- Calabria, November 22-24, 2006
- 32 interviews
- 3 experts involved
- User groups
  - ⇒ Public Security
  - ⇒ Public Administration Operators
  - ⇒ Voluntary Service
  - ⇒ Essential Services
  - ⇒ Professional Orders
  - ⇒ Health Board
  - ⇒ Regional Technical Services

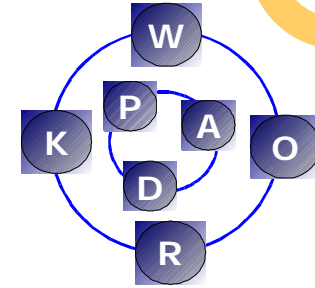
# Execution of Interviews



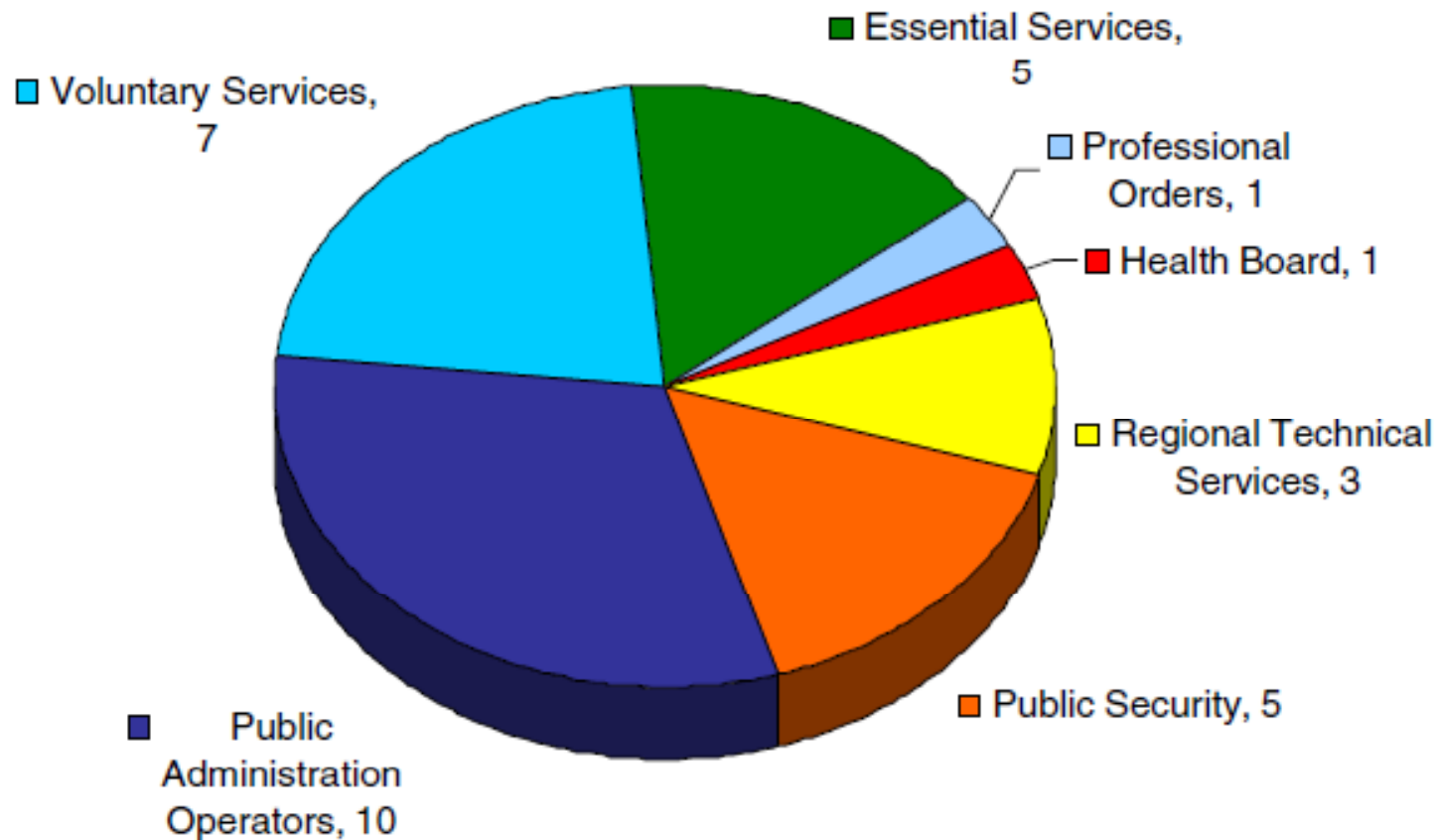
- **Results: a collection of (unstructured) information useful to :**
  1. Collect user requirements.
  2. Understand how Homeland Security works.
  3. Get information about existing infrastructures.



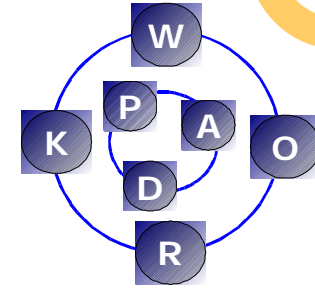
# Interviews



**Total Interviews: 32**



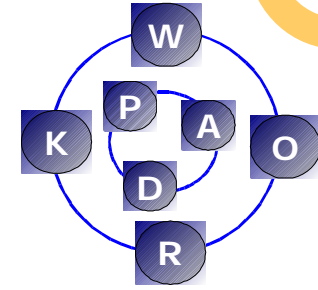
# List of questions



## • 1) User Group Definition

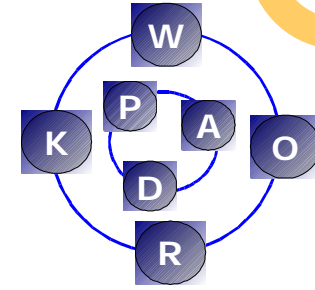
- ⇨ **Question 1:** What are your main responsibilities within this organisation ?
- ⇨ **Question 2:** In what kind of emergencies is your organisation involved ?
- ⇨ **Question 3:** What is your role during an emergency ? In which phase of an emergency are you involved ?
- ⇨ **Question 4:** Do you know the statistical frequency according to which an emergency happens in your territory ?

# List of questions



- At this point (it depends by the user), the interview is divided in two trunks: the first one concerns front-end users, whilst the second one focuses on back-end users.
- The main purpose is to involve the user in the context of an emergency, creating a kind of “implicit scenario”.
- The target is to investigate which steps a user performs when preparing himself to face the emergency.

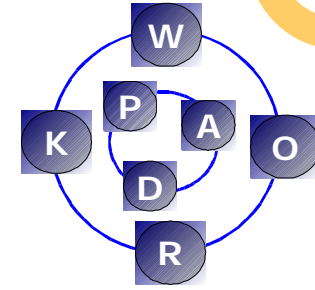
# List of questions



- **2A) Front-End Users (*Shortly after the emergency has happened*)**

- ↳ **Question 5a:** Which steps do you perform shortly after the emergency has happened ?
- ↳ **Question 6a:** What kind of information (related to the emergency) do you get from the control centre ?
- ↳ **Question 7a:** How long is the front-end team actively involved in this phase of the emergency (average) ?
- ↳ **Question 8a:** What kind of information do you exchange with other members of the team during the transport to the place where the emergency has happened ?

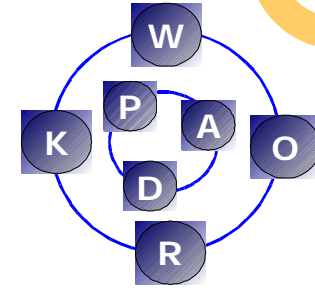
# List of questions



- **2A) Front-End Users (During the emergency)**

- ⇒ **Question 9a:** Describe the composition of the team and the various roles of the team members allocated to them during the emergency.
- ⇒ **Question 10a:** What kind of technical devices do you currently use in emergencies ?
- ⇒ **Question 11a:** How do you communicate with the other team members and the back-end centre?
  - Does your team use a separate communication channel ?

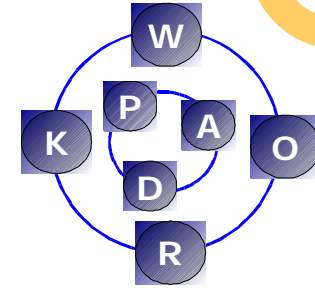
# List of questions



- **2A) Front-End Users (*During the emergency*)**

- ↳ **Question 12a:** What kind of technology do you currently use in/after emergency situations ?
- ↳ **Question 13a:** What kind of information (and in which form) do you exchange with the team leader ?
- ↳ **Question 14a:** Do you co-operate with members of other organizations ? (for example police, etc.) ?
  - Do you exchange information and/or data ?
  - Do you share a common technology ?

# List of questions

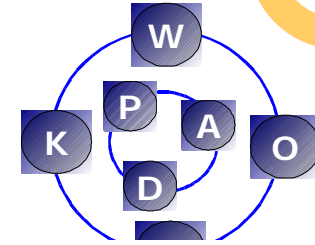


- **2B) Back-End Users (*Shortly after the emergency has happened*)**

- ↳ **Question 5b:** Which steps do you perform shortly after the emergency has happened ?
- ↳ **Question 6b:** How much time are the back-end team actively involved in this phase of the emergency (average) ?
- ↳ **Question 7b:** What kind of information do you send to front-end operators, who have to prepare them to face the emergency ?
- ↳ **Question 8b:** In what way do you obtain such information and in which format ?



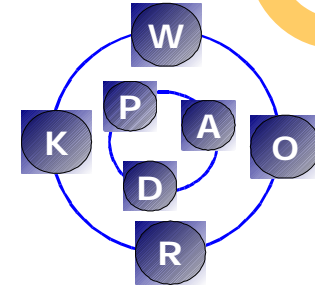
# List of questions



- **2B) Back-End Users (*During the emergency*)**

- ⇒ **Question 9b:** What kind of technical devices do you use for the communication with the front-end operators ?
- ⇒ **Question 10b:** What kind of communication technology do you use ?
  - Does your team use a separate communication channel ?
- ⇒ **Question 11b:** Does the communication take place with a particular team member(s) or can you communicate arbitrarily with everybody (how strict are the hierarchical and the communication structures defined within your organisation) ?

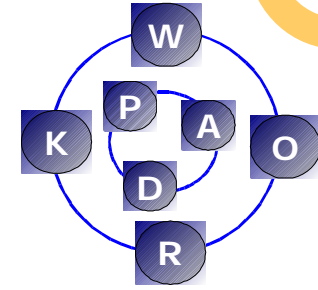
# List of questions



- **2B) Back-End Users (*During the emergency*)**

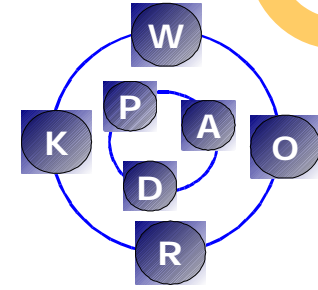
- ↳ **Question 12b:** What kind of information do you send to the front-end users ?
- ↳ **Question 13b:** What kind of information do you receive from the front-end users ?
- ↳ **Question 14b:** Do you share technology and data with other organizations ?
  - Which kind of data / technology ?
  - In which way does this exchange of information take place ?

# List of questions



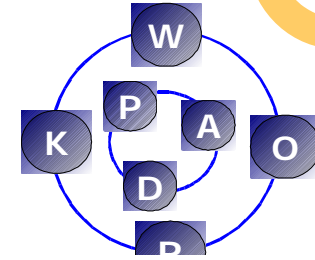
- 3) Last questions are the same for each kind of user
  - ⇒ **Question 16:** Do you currently use Geographic Information Systems (GIS) ?
    - If yes, which software and data do you use ?
  - ⇒ **Question 17:** Do you think that the devices and technologies used to face the emergency are conform to the purpose for which they are used ?
  - ⇒ **Question 18:** What do you think would be a big improvement concerning the technology part ?
    - What kind of improvement would you propose ?

# How to Collect User Requirements in a real project



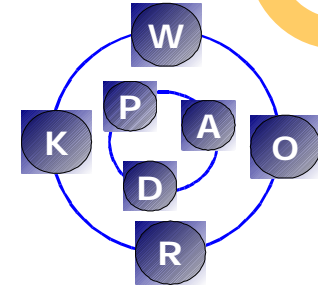
- Before starting learn about your product and users involved
- Define methods, protocols and prepare all the activities
- Perform the activities
- Analyse the data

# Public Security Organizations



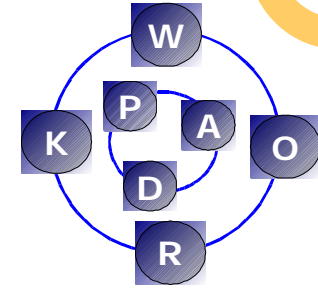
- **Public Security organizations are in first line in the emergency management**
  - ↳ Usually they are in charge to collect warning signals sent by people.
  - ↳ They immediately reach the place stricken to analyze the situation.
- **Each public security organization perform its own specific tasks**
  - ↳ Policemen and Carabineers guarantee the maintenance of people security.
  - ↳ The urban police deals with traffic.
  - ↳ Fire Brigade coordinates actions on the field suggesting to Prefecture what actions should be done.
- **Each Public Security organization provides a control room which communicate both with the CCS and COMs and with operators on the field.**

# Public Administration



- Each COM differs from any other...
  - ⇒ Some COMs are fully equipped with local network, laptop computers and internet...
  - ⇒ Some others do not even have internet access: they may communicate and get information only by phone.

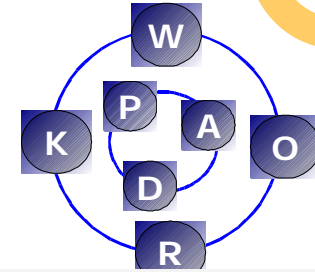
# Essential Services (1)



- They have specialistic competences in specific sectors (for example, A.N.A.S. for road management)
- Each essential service organization takes part in an emergency whenever its skills are requested.
- They communicate through mobile phones.

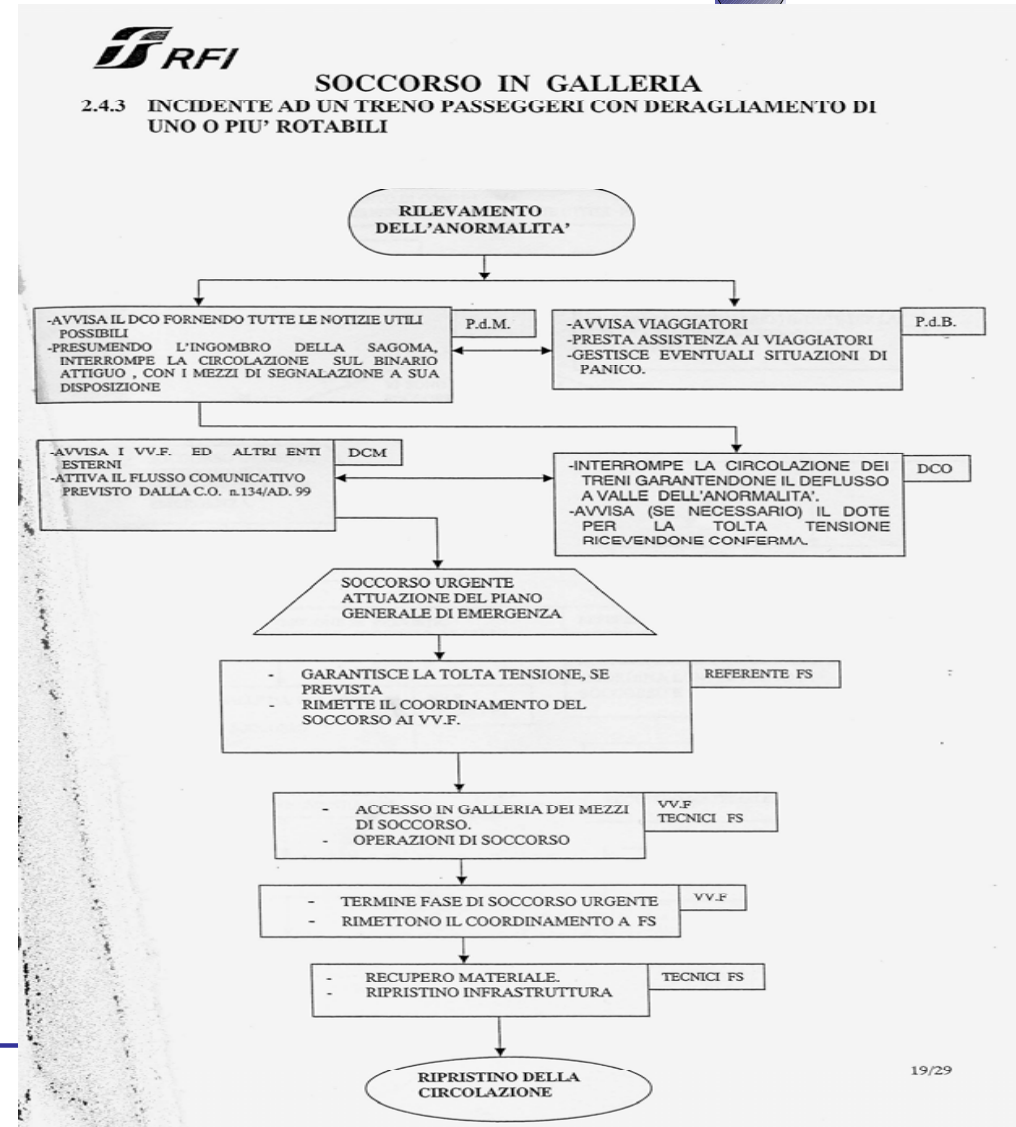


# Essential Services (2)



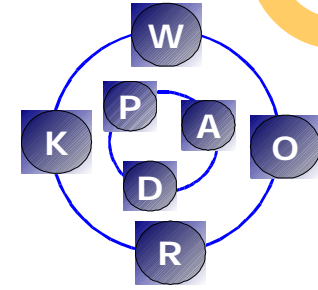
- Some organizations (i.e. R.F.I. - Italian Railway Networks) have got precise action plans for emergencies.

⇒ For example this figure depicts the workflow to deal with emergencies happened inside tunnels.



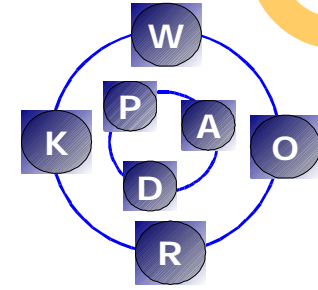


# Voluntary Service



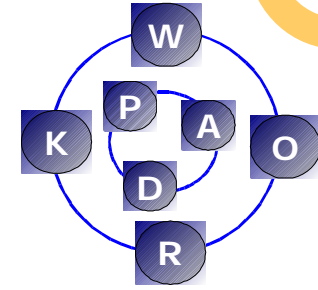
- The Voluntary organizations cooperate with Homeland Security in the first aid response.
  - ⇒ Their rule is fundamental: they can support people and institutional territorial forces.
- Some organizations are characterized by high specializations: dog units, free divers, radio amateurs, etc...
- They communicate mainly using transceivers and mobile phones.

# Health Board



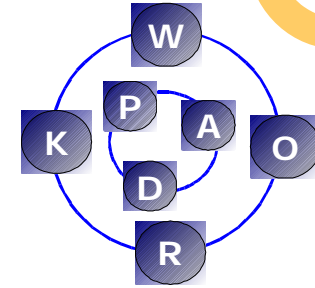
- It takes part to all emergencies where public health is involved
  - ⇒ Often Public Health and volunteers overlap in interventions.
- The communication always happens through phones.

# Professional Orders



- Professional orders are composed by qualified persons (Geologists, Architects, Engineers, Druggists etc.)
- Usually, they aren't directly involved by Prefecture in the majority of emergencies
  - ⇒ Each freelancer act by himself without coordination when he/she realizes he/she can be useful.

# Other notes



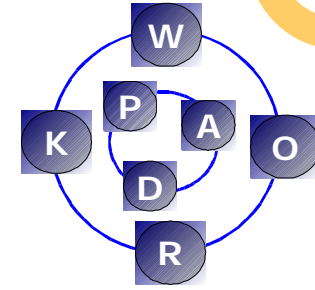
- **At Back-end**

- ⇒ Usually, control rooms have an informative system where data collected about emergency are stored.
- ⇒ This information is not directly shared among organizations.

- **At Front-end**

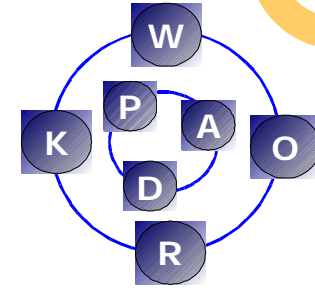
- ⇒ Currently, inside a team the communication takes place by transceivers and mobile phones.

# Focus Groups

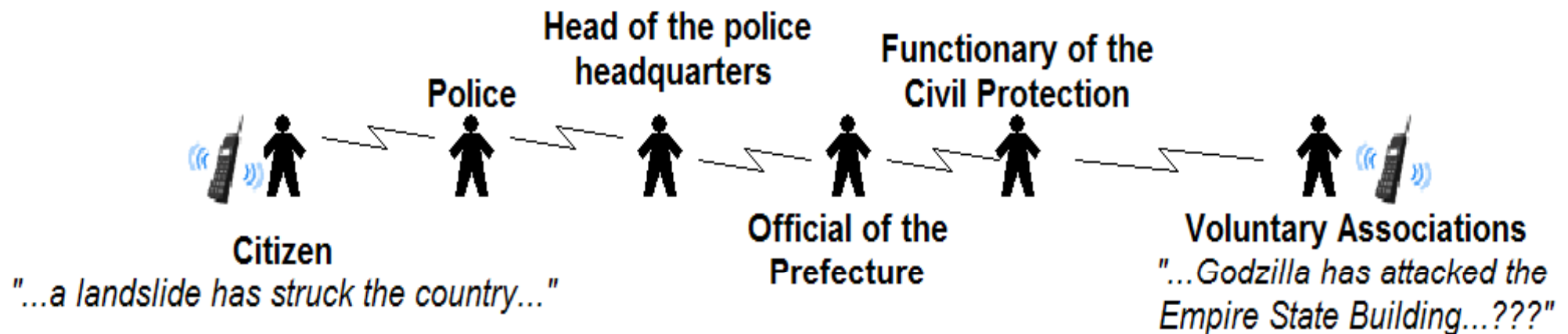


- Six/ten individuals are brought together to discuss their experiences or opinions around topics introduced by a moderator.
- It is used for having a quick understanding of user's perception about a topic.
- Very useful
  - ↳ to individuate with precision problems and possible solutions not still clear
  - ↳ to build user scenarios and to perform task analysis

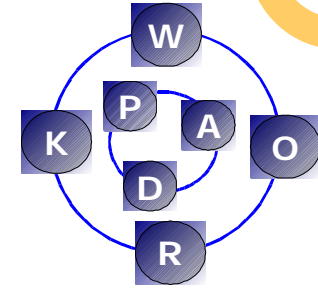
# How is activated each organization?



- The activation of the organizations involved happens with a 'chain of phone calls'...
- ...often a 'chain of phone calls' can distort the information...



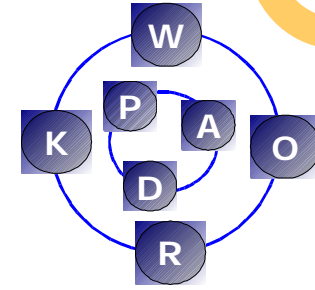
# How to obtain information and data?



- When an emergency happens, currently the only way to exchange information is through mobile phones.
- This happens because the collected data are considered as “strictly reserved” ...



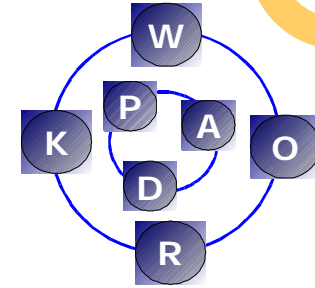
# The WORKPAD solution for the back-end side



- WORKPAD Project proposes to “build” a grid of systems where each operator can get or set relevant information to the situation faced...
- ...this information will be potentially spread over the network...
- ...so, this could guarantee a consistent gain of time in the management of the emergency...

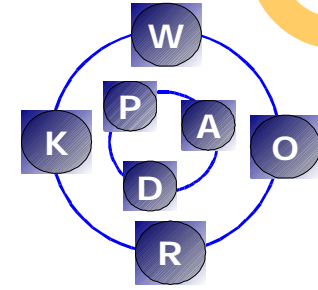


# How do communicate the members of a team? (1)



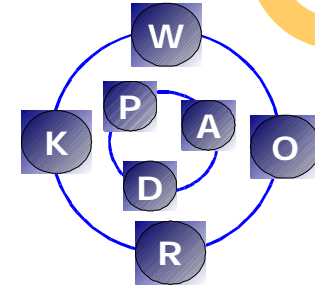
- On the front-end side, users have underlined some problems...
  - The radio communication often dead...so they are forced to use mobile phones...
  - ...unfortunately in a lot of zones the mobile phones don't have field...
- So, a big improvement concerning the way to communicate would be very useful...

# How do communicate the members of a team? (2)



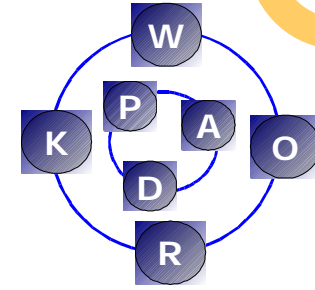
- Moreover, there is a great difficulty to communicate with members of other organizations...
- ...this happens because each team use a dedicated frequency to talk to every other.
- Currently it doesn't exist a way for putting in communication two Teams Leaders (except through mobile phone, if the phone number is known).

# How do communicate the members of a team? (3)



- It is important to note that the communication **MUST BE** dedicated for all the team belonging to the same organization (this is a **USER REQUEST**)
- Some organizations (as the State Forest Corp) are looking for a tool that not only allows to communicate, but also have visual information...exactly a PDA

# The WORKPAD solution for the front-end side

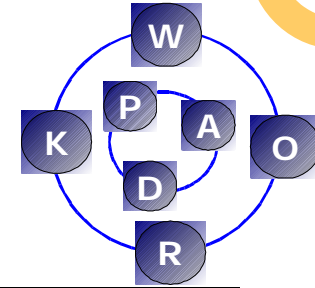


- The WORKPAD project proposes to equip each team member with handheld devices (PDAs), that enable to execute some operations...
- ...moreover, Team Leader's device could be connected using a satellite channel...the team's members could constitute an ad-hoc network...in this way all the limits concerning the "dead" of the radio communication would be overcome ...
- ...the Team Leader's device could be connected with the back-end peer, in order to obtain the information to face the emergency...
- ...the Team Leader's device coordinates the other team member's devices by providing appropriate information (for example, cartography)

# A first definition of User Requirements

<b>ID</b>	A unique identifier, composed of a classifier and a sequential number (eg "G-2"): G ... General requirement C ... Communication requirement B ... Back-End requirement F ... Front-End requirement
<b>Title</b>	A short title of the requirement giving an overview.
<b>Description (optional)</b>	A more detailed description of the requirement.
<b>Classification</b>	A classification according to: G ... General requirement C ... Communication requirement B ... Back-End requirement F ... Front-End requirement
<b>Significance</b>	Depicts the importance of the requirement for an emergency management system in general: Must ... This requirement <i>must</i> be provided. Shall ... This requirement <i>shall</i> be provided. Should ... This requirement <i>should</i> be provided.
<b>Priority</b>	Indicates the priority in terms of an implementation of this requirement within the WORKPAD project: 1 ... Mandatory 2 ... Desirable 3 ... Optional
<b>Relevancy</b>	The requirement is relevant for either scenario 1 or 2 (implying also the storyboards), and the showcase (true/false) (eg "1/false", 'X' would denote "relevant for both")
<b>Source</b>	The requirement was acquired through: U ... User analysis (such as Interviews, user workshops, HTAs) I ... Investigations of related work and/or EU regulations
<b>Dependency (optional)</b>	Indicates a relation between requirements.
<b>Evaluation</b>	The evaluation of this requirement is done via: Ver... Verification: testing (such as software, performance etc.) or review Val ... Validation: user/field test, user feedback

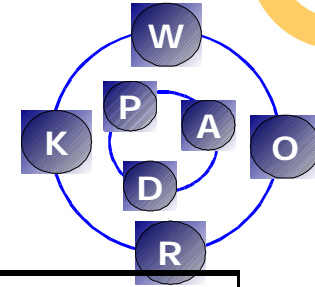
# Example of a User Requirement



<b>ID</b>	<b>B-4</b>
<b>Title</b>	The BE must integrate various data sources and provide them through a well-known interface.
<b>Description</b>	To alleviate information access and to address interoperability, well-known interfaces – ideally based on standards – must be provided at the WORKPAD BE. By this, the BE abstracts from logical and physical data models and implementations of data providers such that they are not visible to knowledge consumers.
<b>Classification</b>	<b>B</b>
<b>Significance</b>	Must
<b>Priority</b>	1
<b>Relevancy</b>	X/true
<b>Source</b>	I
<b>Dependency</b>	<b>G-3, G-12</b>
<b>Evaluation</b>	Ver

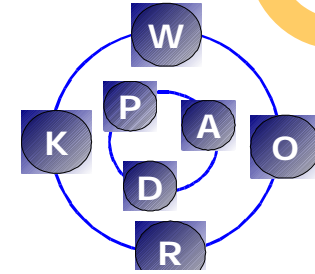


# Example of a User Requirement



<b>ID</b>	<b>F-10</b>
<b>Title</b>	FE application must include some basic GIS functionality.
<b>Description</b>	It must be possible to deliver geographic data to the FE entities and to present it accordingly.
<b>Classification</b>	<b>F</b>
<b>Significance</b>	Must
<b>Priority</b>	1
<b>Relevancy</b>	X/true
<b>Source</b>	<b>U</b>
<b>Dependency</b>	G-3, B-14
<b>Evaluation</b>	<b>Val</b>

# Bottom-Up Approach



- **Deployed HMI techniques**
  - ⇒ User group categorisation
  - ⇒ Structured interviews
  - ⇒ Focus groups
  - ⇒ Scenario development
  - ⇒ Storyboards
  - ⇒ Hierarchical task analysis
  - ⇒ Usability tests
    - Mock-ups and real prototypes



# Refinement of User Requirements

- User Requirements need to be improved more and more...
- ...alone, the interview techniques are unable to go in depth about users tasks and requirements

## SOLUTION???

### → **Scenario-based Requirements Analysis Method (SCRAM)**

- A scenario is a description that envisions a person's interaction with a system.
- A scenario can be plain text/narrative. However, it can be augmented by sketches and pictures. The sketches and pictures are called *storyboards*.
- Note that detail can help make the events in the scenario seem more real.

# User Scenarios

- Scenarios can help to identify characteristics of the user that may impact the design and the tasks that the system needs to support.
- Scenarios force us to think about the design in detail and notice potential problems before they happen; we can therefore verify whether the design would make sense to the user and whether the proposed implementation architectures would work.
- Moreover, scenarios can be used to:
  - ↳ *Communicate with others (e.g. designers, clients, users)*
  - ↳ *Validate other models*
    - A detailed scenario can be 'played' against other models e.g. task and dialog models.
  - ↳ *Express dynamics*
    - Mere screenshots and pictures primarily give a sense of the appearance of the system. A scenario can give a sense of the behavior of the system.
- Note that scenarios can be used and reused throughout the design process

# User Scenarios in WORKPAD

- **Structured (formal) scenarios: written, textual descriptions and structured in a scenario description form**
  - ⇒ **Two main scenarios : Earthquake and Flood**

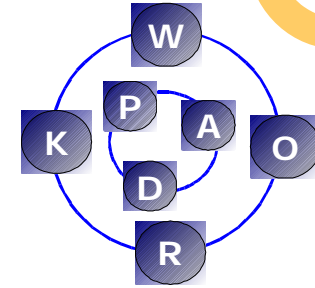
**Their aim is to serve as the basis for:**

- **A better definition of users and user groups**
- **Task Analysis, Use Cases and UML modelling**
- **Show cases : validation and test**

**Scenarios have been organized as follow :**

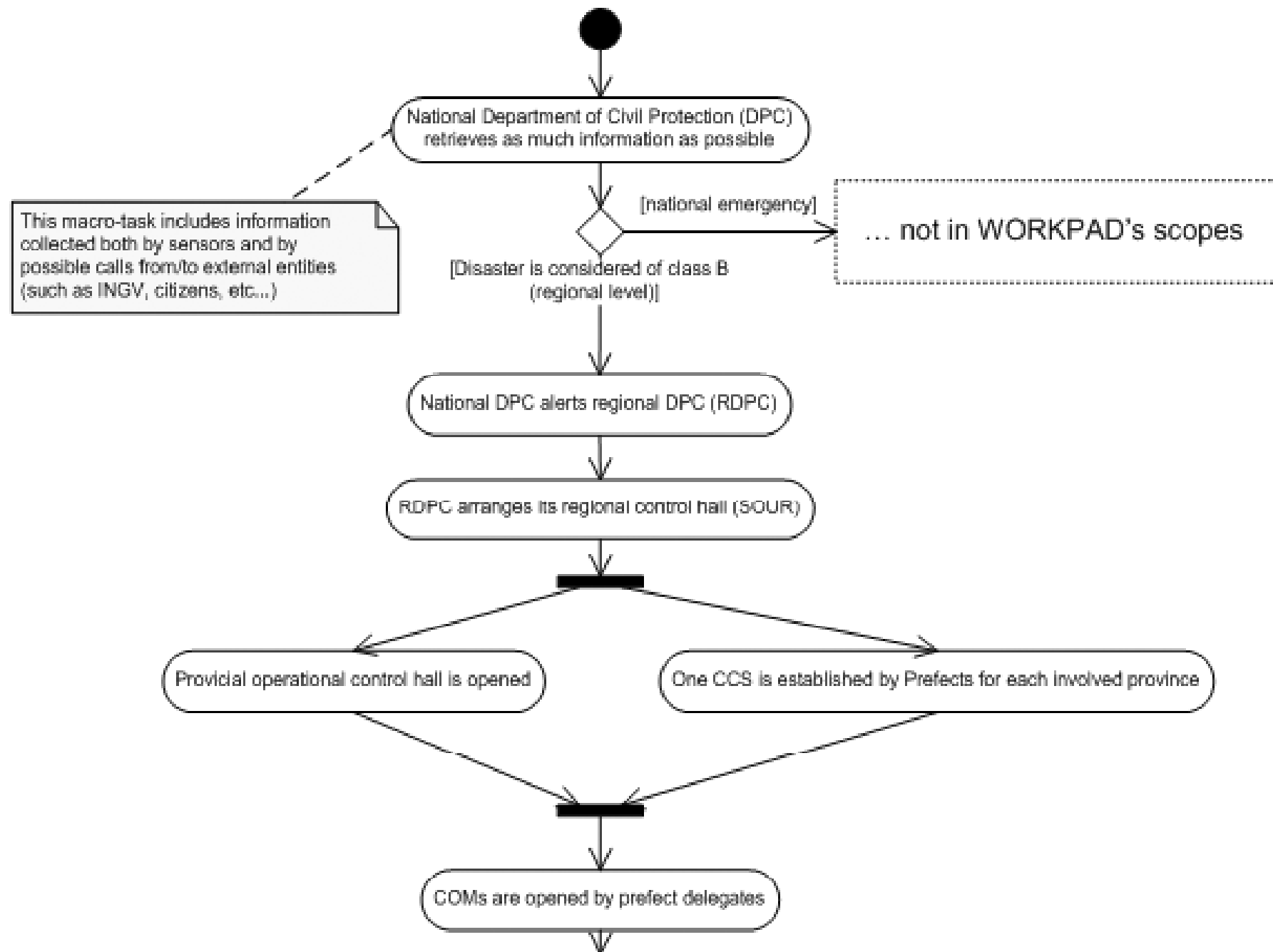
- ⇒ **giving a brief introduction to the scope;**
- ⇒ **containing scenario title, relevant emergency phase, main goal, duration, actors, initial state, final state, and dependencies;**
- ⇒ **designing UML activity diagrams depicting the sequence of involved high-level activities.**

# Earthquake Scenario

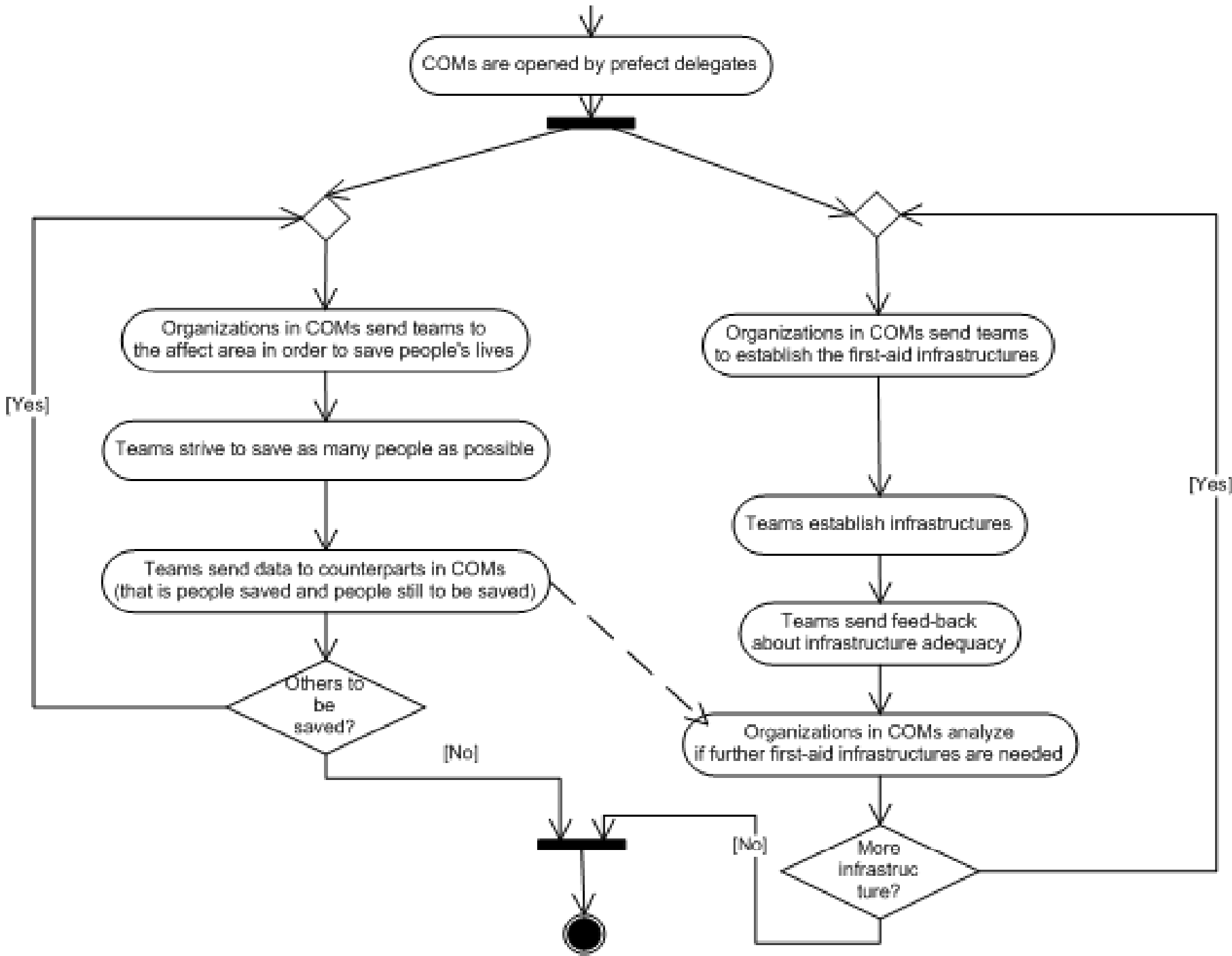


<b>Scenario</b>	Earthquake
<b>Phase</b>	Response Phase
<b>Main goal</b>	First aid to population
<b>Duration</b>	2-3 days
<b>Actors</b>	National and regional Civil Protection Departments, Police (State Police, Carabinieri, etc.), Hygenic Public Health department, Voluntary Services, Transportation & Infrastructure (e.g., Railway) Providers, Fire Brigades, State Forest Corp
<b>Initial State</b>	Emergency incident → notification about seismic activities
<b>Final State</b>	Teams are present in the field and received appropriate commands
<b>Dependencies</b>	Predecessor to second phase (Short-term Recovery Phase)
<b>Task overview</b>	See Figure : Macro Description of the Response phase process

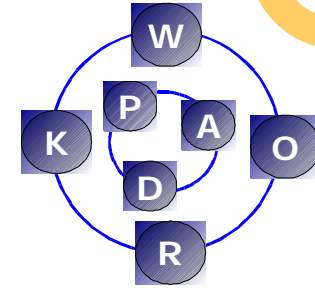
# Earthquake Scenario



# Earthquake Scenario



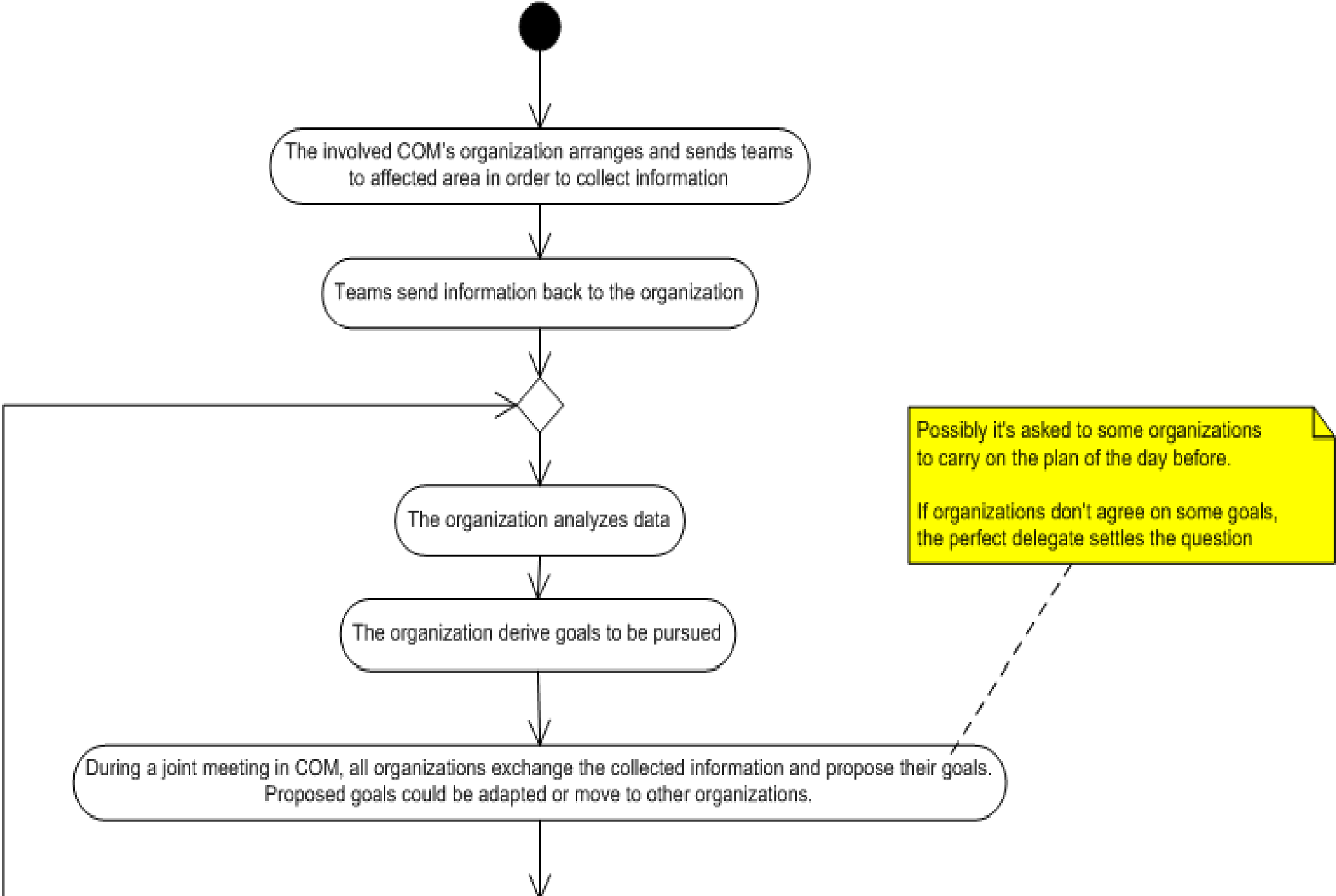
# Flood Scenario



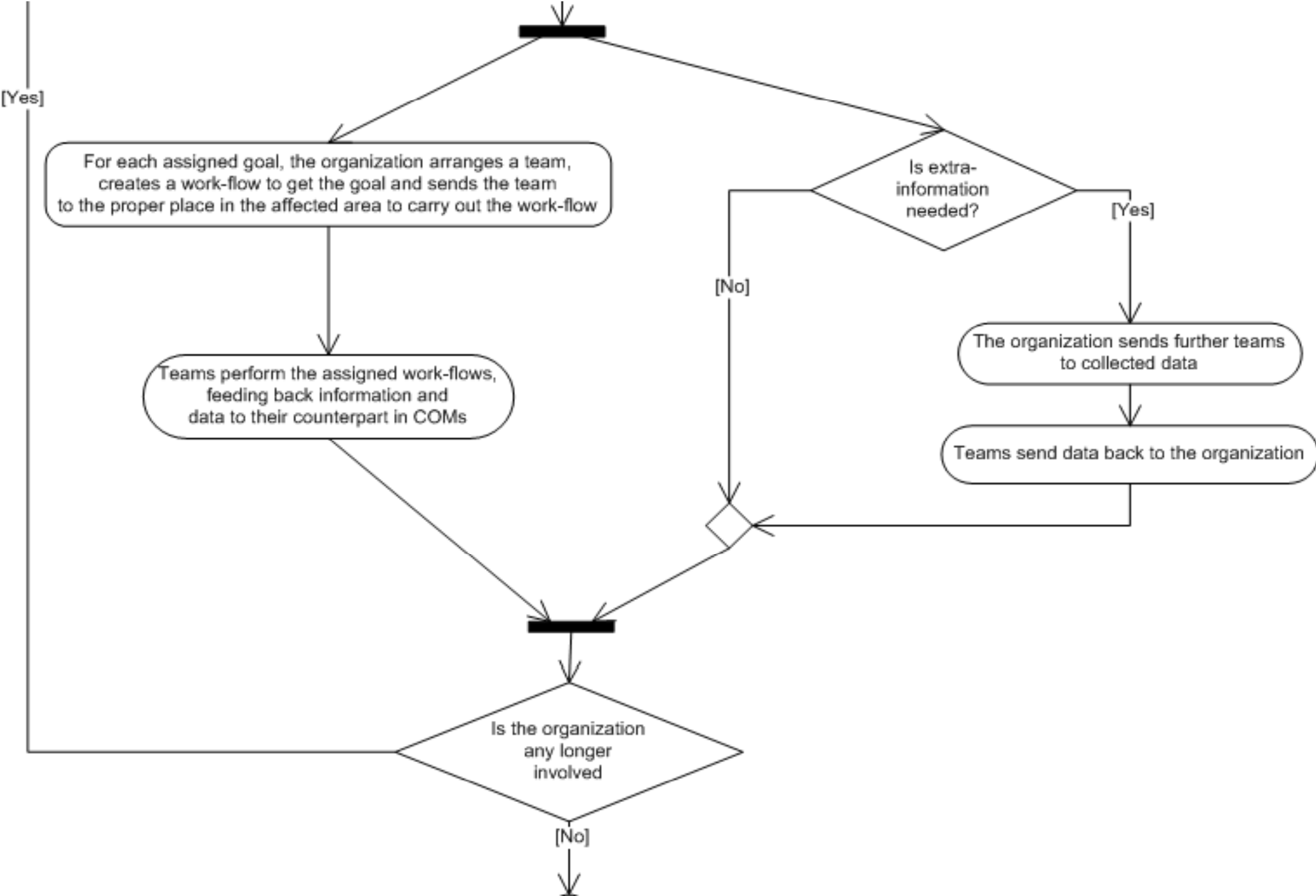
<b>Scenario</b>	Flood
<b>Phase</b>	Short-term Recovery Phase
<b>Main goal</b>	Recovery of the affected area, restoring infrastructure/essential service
<b>Duration</b>	14 days
<b>Actors</b>	DPC (national and regional), Fire Brigades, Army, Police (State Police and Carabinieri), Hygienic Public Health department, Voluntary Services, Transportation & Infrastructure Providers, State Forest Corp
<b>Initial State</b>	Initial assistance is provided, situation is stabilised → living conditions can not yet be sufficiently provided
<b>Final State</b>	Basic living conditions can be provided up to a certain degree → CCS are closed
<b>Dependencies</b>	Ancestor to response phase and predecessor to further long-term recovery phases
<b>Task overview</b>	See Figure : Macro description of the Short-Term Recovery phase process



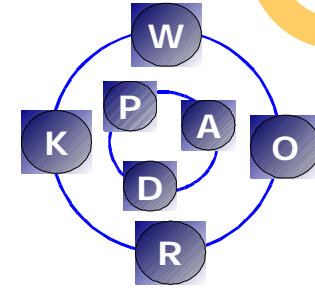
# Flood Scenario



# Flood Scenario



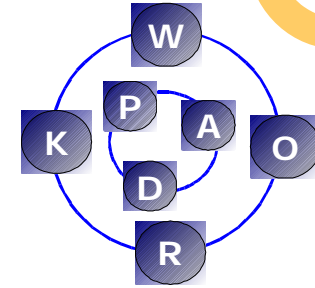
# Storyboards and HTA for the Earthquake Scenario



- Some storyboards have been derived from earthquake scenario
- Each storyboard is analyzed through HTA, that describes the low-level tasks performed by the actor involved to reach the goal proposed.
- In order to understand better the analysis carried out, we propose a summary of the earthquake scenario used for obtain storyboards:

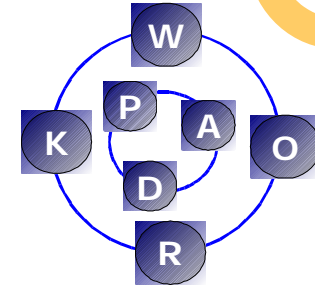
*"At 10:30 A.M. a violent earthquake of 6 degree on the Richter scale hit the south of Italy, with severe damages in a Calabrian town of 34.000 inhabitants. Furthermore, it is reported that the earthquake has provoked damages to things and people in many other Calabrian cities."*

# Storyboard "Restore Railway Service"

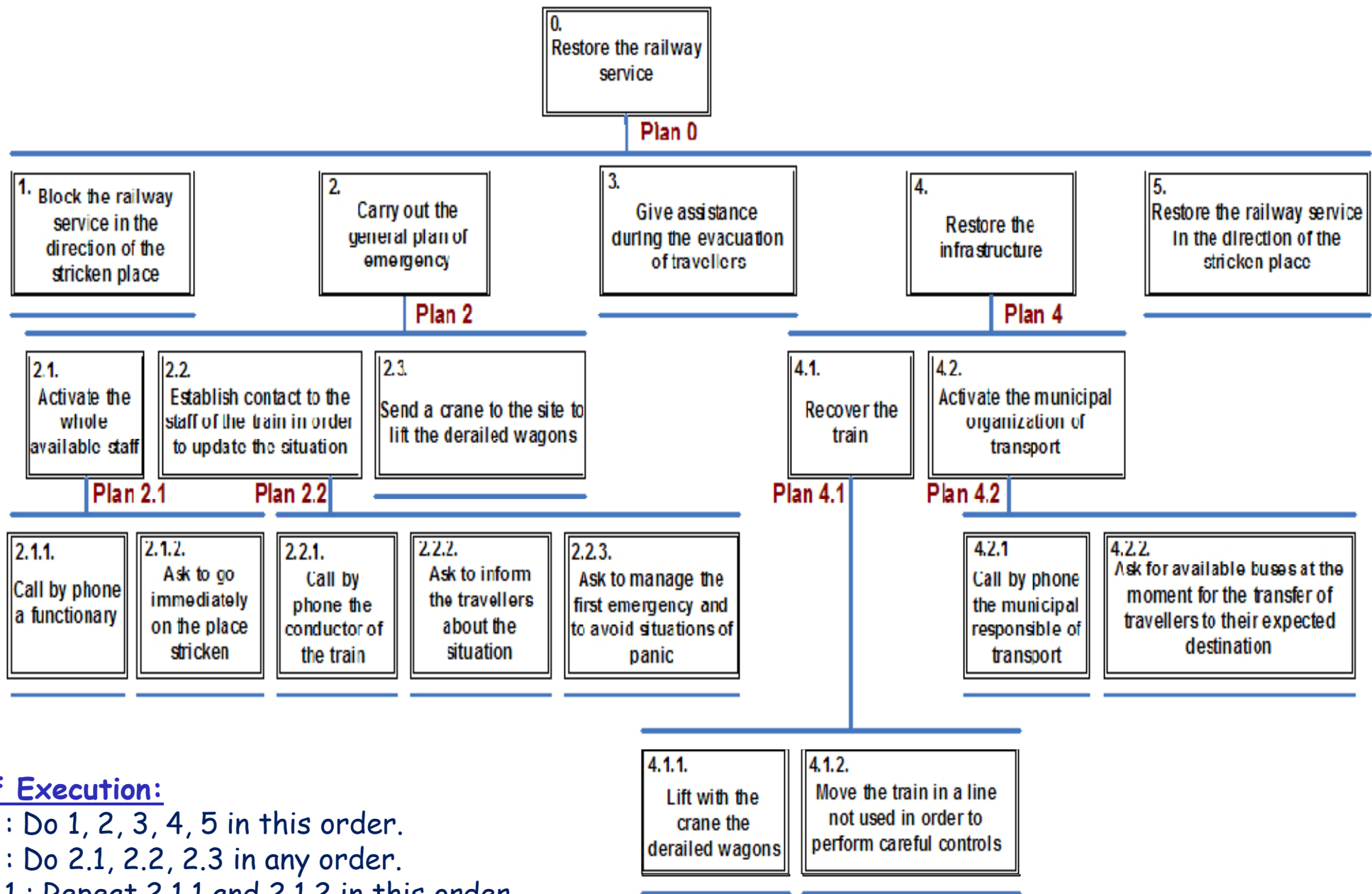


- **Actor** : Ferrovie dello Stato (State Railways)
- **Phase** : Response and Short-Term Recovery Phase
- **Initial State** : The COM which was opened in the catastrophe zone alerts the State Railways of the city. This heavy downpour has provoked an interruption of the electricity in some areas of the city and therefore created problems to the railway practicability. A short-circuit caused fire on a passengers train standing in a gallery.
- **Relevant Conditions** : Fire Brigade, Police and Red Cross have already been alerted to intervene and lead the operations of first help at the operational area. Volunteers of Civil Protection also join them.
- **Final State** : The railway service can again be activated.

# Storyboard "Restore Railway Service"



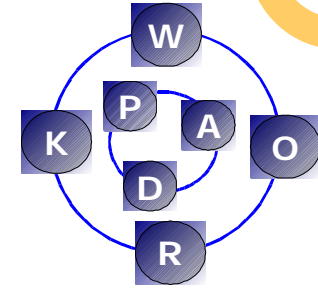
- **Main Goal :** Restore the railway service
- **Duration :** 2-3 hours
- **Dependencies :**
  - ↳ **Fire Brigade:** firemen move with functionaries of State Railways into the gallery. Their task is to extinguish the fire and to evacuate all people out of the train.
  - ↳ **Voluntary Associations:** the people who have been evacuated are transported out of the gallery by volunteers who afterwards give them assistance.
  - ↳ **Police:** policemen secure the area in order to guarantee maintenance of the public security.
  - ↳ **Red Cross:** Red Cross operators move with functionaries of State Railways into the gallery in order to conduct the operations of first help. The ambulances stay outside the gallery.



### Plan of Execution:

- Plan 0 : Do 1, 2, 3, 4, 5 in this order.
- Plan 2 : Do 2.1, 2.2, 2.3 in any order.
- Plan 2.1 : Repeat 2.1.1 and 2.1.2 in this order while all available functionaries haven't been alerted to go on the place stricken.
- Plan 2.2 : Do 2.2.1; then do 2.2.2 and 2.2.3 in any order
- Plan 3 : Do 3.1 and 3.2 in any order. Then do 3.3 and 3.4 in this order.
- Plan 4 : Do 4.1, 4.2 in this order. Then, if 4.2 has been successful, do 4.3; else do 4.4.
- Plan 4.1 : Do 4.1.1, 4.1.2 in this order.
- Plan 4.4 : Do 4.4.1, 4.4.2 in this order.

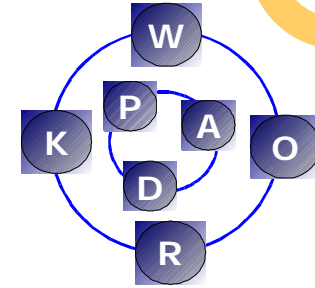
# Storyboard "Evacuation of People"



- **Actor** : Vigili del Fuoco (Fire Brigade)
- **Phase** : Response Phase
- **Initial State** : The Fire Brigade headquarter of the zone is alerted by the Regional Civil Protection Department. In a building of 6 floors, 7 kilometers out of the city centre, water has partially flooded the ground floor (not inhabited). 40 people are captured - women, elderly and children. The number of the wounded people is not yet known.
- **Relevant Conditions** : Two ambulances move to the operational area. Some functionaries of Civil Protection are already at the place to manage the situation. Two police teams have already closed off the area in order to avoid safety problems.

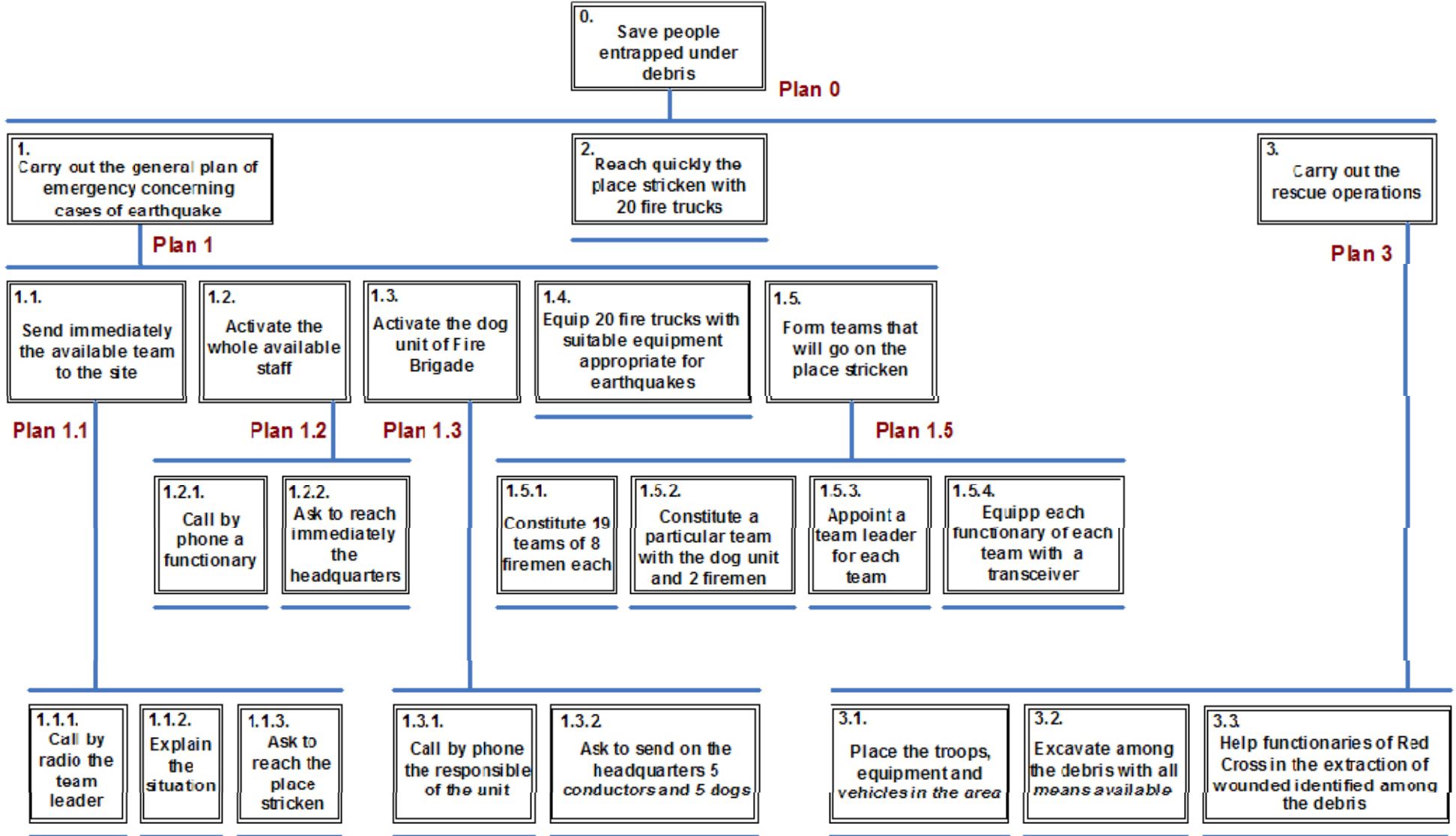


# Storyboard "Evacuation of People"



- **Final State** : The building must be evacuated in the shortest possible time in order to rescue all inhabitants.
- **Main Goal** : Rescue all people captured in the building
- **Duration** : 4-5 hours
- **Dependencies** :
  - ↳ **Civil Protection**: At first functionaries of Civil Protection make a census of inhabitants. After the arrival of the Fire Brigade at the operational area, their order is to give assistance to the already evacuated people.
  - ↳ **Police**: The policemen have a focus on maintenance of public security and on avoidance of rape.
  - ↳ **Red Cross**: Functionaries of Red Cross intervene when there are wounded people who have to be helped.

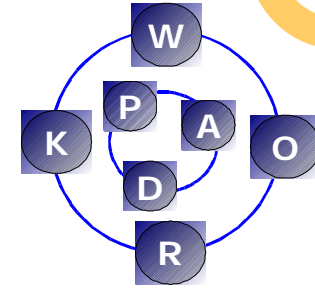




### Plan of Execution :

- Plan 0: Do 1, 2 in this order. When the fire trucks arrive on the place stricken, do 3.
- Plan 1: Do 1.1, 1.2, 1.3 in the same time. Then do 1.4.
- Plan 1.1: Repeat 1.1.1, 1.1.2 in this order while all available functionaries haven't been alerted to reach the headquarters.
- Plan 1.2: Do 1.2.1, 1.2.2 in this order.
- Plan 1.4: Do 1.4.1, 1.4.2 in any order. Then do 1.4.3, 1.4.4 in any order.
- Plan 3: Do 3.1, 3.2, 3.3 in this order.
- Plan 3.2: Do 3.2.1, 3.2.2, 3.2.3 in this order

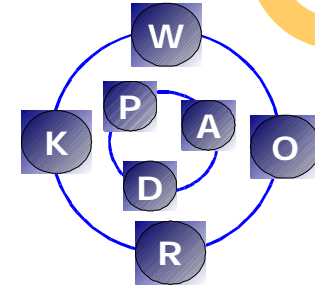
# Storyboards and HTA for the Flood Scenario



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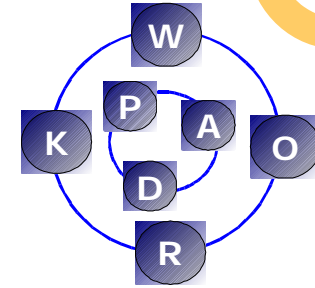
*“During the night a violent and unexpected downpour hit a Calabrian town of 34.000 inhabitants. The town is flooded, which makes the lifesaving operations difficult.”*

# Storyboard "Verifying the habitability"

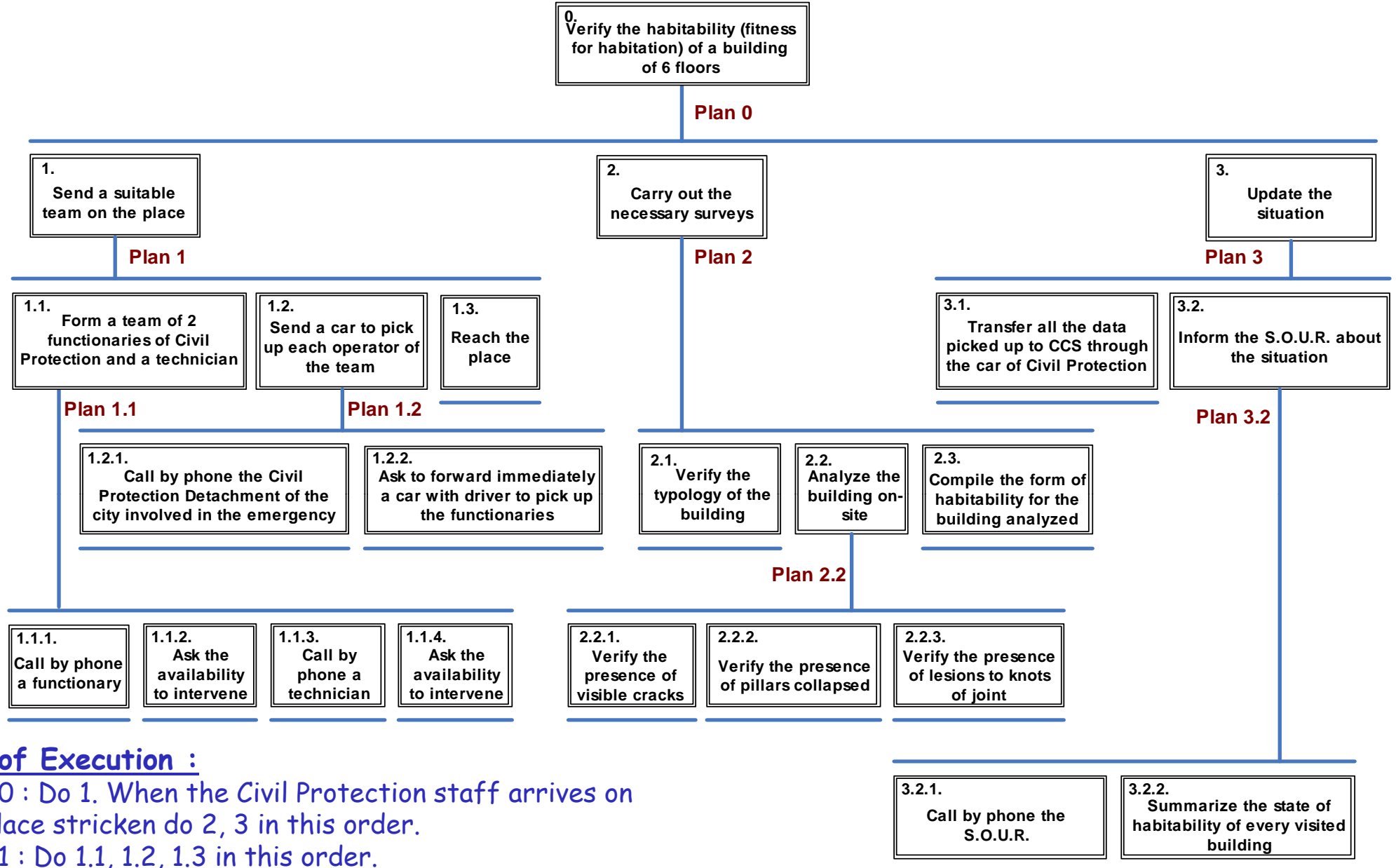


- Actor : Civil Protection
- Phase : Response Phase
- Initial State : S.O.U.R. is alerted by the CCS activated in prefecture. According to some notifications of citizens, the violent downpour that hit the city in the night has provoked the collapse of some pillars in a building of 6 floors situated in the city centre. It is necessary to go to the place to verify the habitability (fitness for habitation) of the building.
- Relevant Conditions : Since the great distance of the S.O.U.R. from the city affected by the emergency, it would be desirable to involve the Civil Protection Detachment of the city.

# Storyboard "Verifying the habitability"



- **Final State** : The habitability of the building must be verified in the briefest possible time and the CCS must be informed about the results of the verification.
- **Main Goal** : Verify the habitability of a building
- **Duration** : 2-3 hours
- **Dependencies** :
  - ⇒ **Civil Protection**: It acts directly in the city involved in the emergency. It is coordinated by S.O.U.R.



## Plan of Execution :

- Plan 0 : Do 1. When the Civil Protection staff arrives on the place stricken do 2, 3 in this order.
- Plan 1 : Do 1.1, 1.2, 1.3 in this order.
- Plan 1.1 : Repeat 1.1.1, 1.1.2 in this order while at least 2 functionaries haven't been alerted to intervene. Then repeat 1.1.3, 1.1.4 in this order while at least a technician hasn't been alerted to intervene.
- Plan 2 : Do 2.1, 2.2, 2.3 in this order for the villa in which the collapse has happened. Then repeat these tasks while all the buildings in the immediate proximities have not been verified.
- Plan 2.2 : Do 2.2.1, 2.2.2, 2.2.3 in any order.
- Plan 3 : Do 3.1, 3.2 in any order.
- Plan 3.2 : Do 3.2.1, 3.2.2 in this order.

# From Task Analysis to Use Cases

- **The design of :**

- ⇒ scenarios (the macro level)
- ⇒ storyboards (the medium level)
- ⇒ task analysis (the micro level)

**allows to define very detailed User Requirements and Use Cases**

- **In WORKPAD User Requirements have been categorized according to forms categories:**

- ⇒ **general, communication, Back-End and Front-End.**

# A Summary of final User Requirements listing

## General (G)

- **G-3** The user must be able to access spatial as well as non-spatial information through one platform.
- **G-11** The user must be able to exploit the WORKPAD system in all kinds of disasters (natural, technical and man-made).
- **G-12** The user must be able to access relevant data-sources of different organizations involved in the emergency management process through WORKPAD.
- **G-17** The user must be supported in her relevant work-flows in emergency situations by appropriate and adaptive process management techniques within WORKPAD.
- **G-29** Usability issues shall be taken into account.
- **G-31** The user shall be able to get (quasi) real-time and comprehensive information about the current status of the situation.
- **G-37** The user shall be supported in her coordination activities by geographic data.



# A Summary of final User Requirements listing

## Communication (C)

- **C-1** By using WORKPAD, the user must be able to be connected between different organizations involved in an emergency.
- **C-4** The user's communication must be guaranteed via fault-tolerant network services.
- **C-6** The user must not notice dynamic joins or leaves of network nodes; instead the network must be able to (re-)configure itself.

## Back-End (B)

- **B-4** The user must be able to access various data sources integrated in the BE through a well-known interface.
- **B-11** Users must be able to get notifications about (generic) information updates at the inter-organizational level related to subscriptions.
- **B-14** The user must be able to query geographic data from the BE.

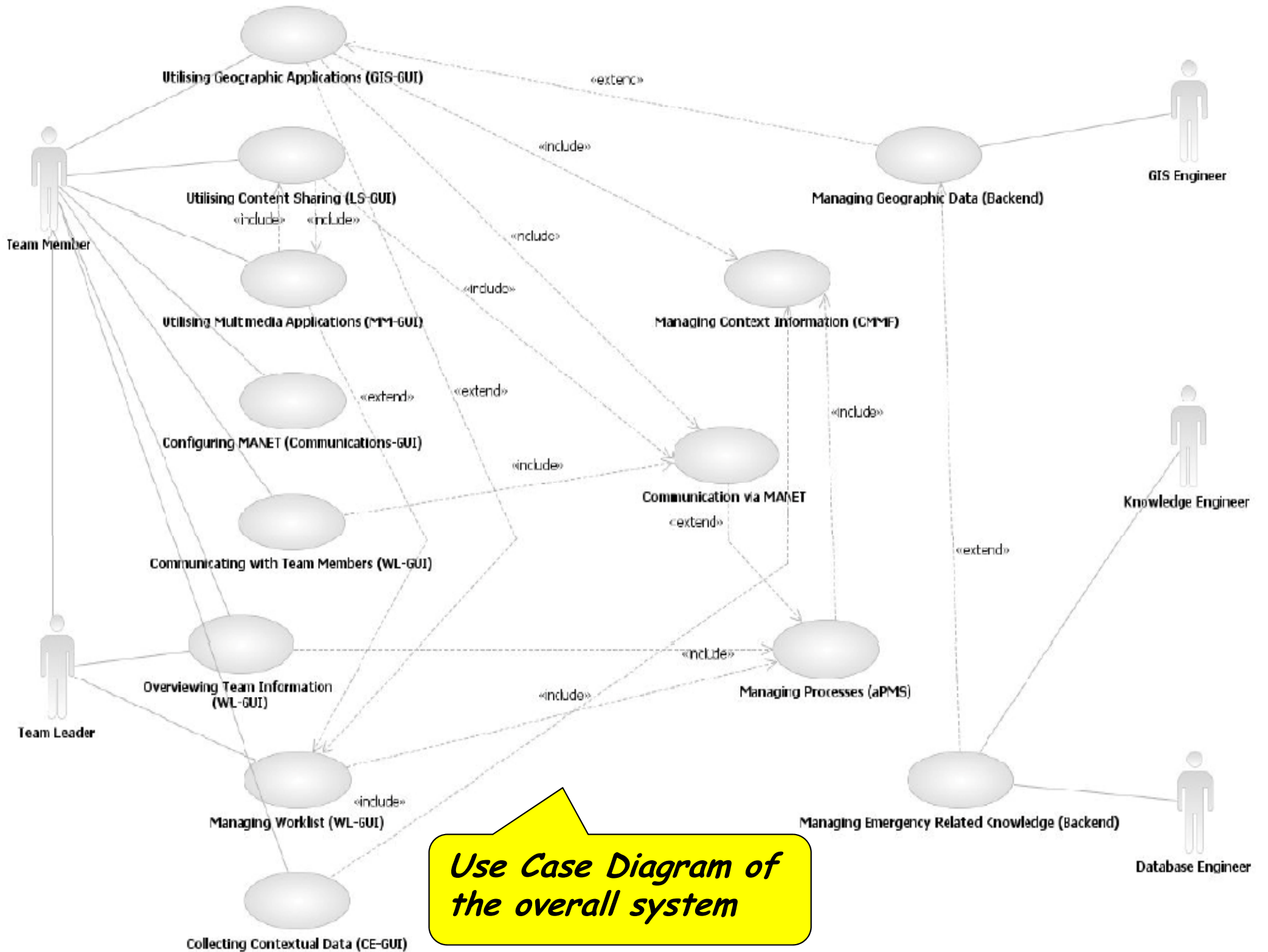
# A Summary of final User Requirements listing

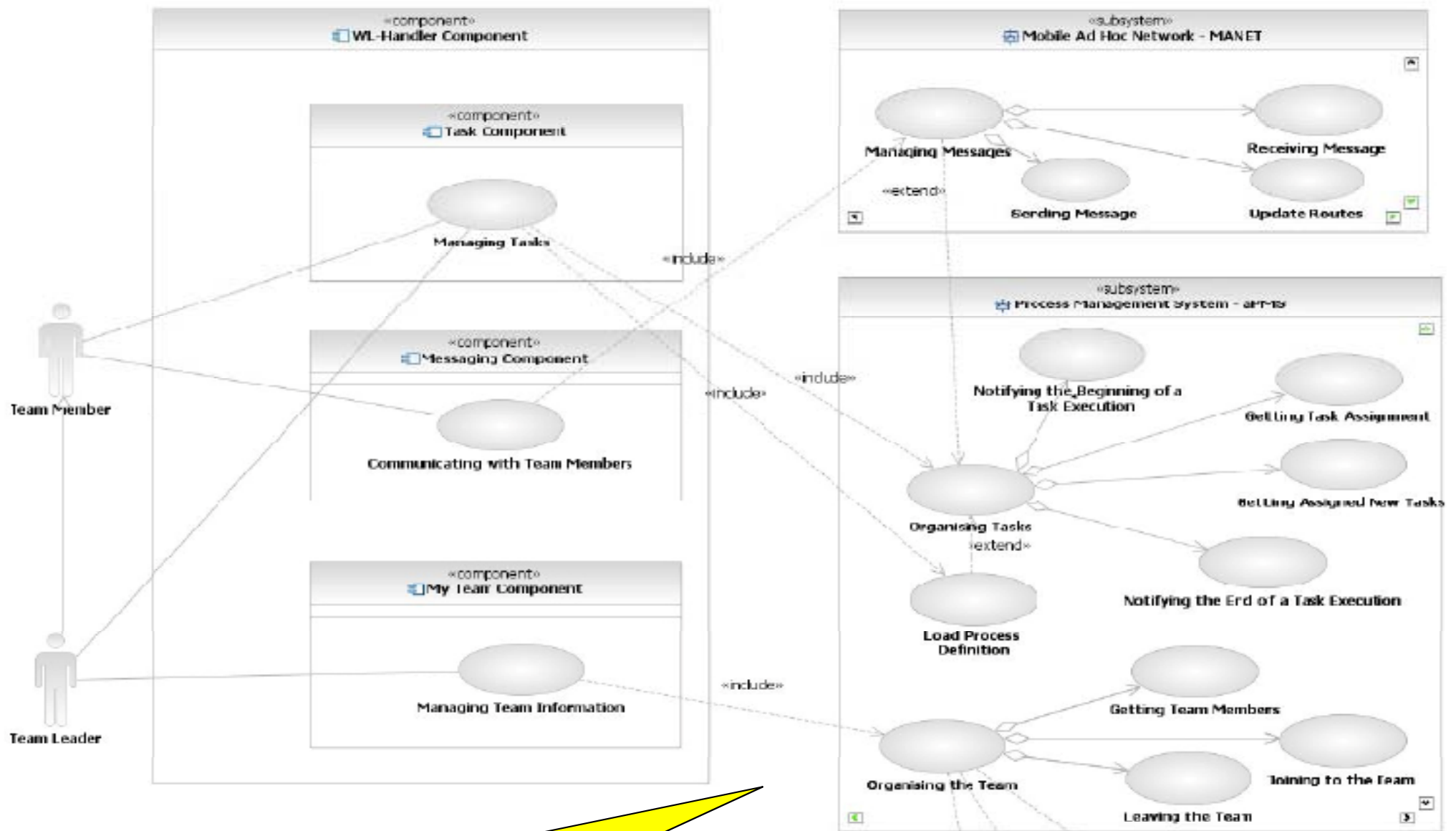
## Front-End (F)

- **F-1** The users in FE teams must be able to electronically communicate with the BE and request data.
- **F-2** The users in FE teams must be able to deliver information to the BE.
- **F-7** The user must be supported by notification mechanisms.
- **F-9** Information must be presented to the user in an appropriate, user-friendly (i.e. usable) way.
- **F-20** The users of FE teams should be supported by the WORKPAD system in collaboration, data exchange, and the exploitation of distributed services and information when operating in the field.
- **F-21** The user must be able to communicate with other team members via text\audio messages.
- **F-24** The user must be provided with current positions of objects (e.g., vehicles, buildings) or persons (other team members) of interest.
- **F-25** The user must be able to create, modify, or annotate points of interests on a digital map.

User Requirements serves as  
input for the use cases...

...and System Requirements  
are the outputs.





*Focus on Use Case Diagram of the main component of the system :*

*the WorkList Handler*

# An Example of System Requirement

<b>ID</b>	UC-WLH-2
<b>Use Case Name</b>	Communicating with Team Members
<b>Brief Description</b>	Interact with each other by an audio or textual communication.
<b>Actors</b>	Team Member, Team Leader
<b>Preconditions</b>	Communication devices
<b>Final State(s)</b>	Sended audio or textual messages.
<b>Main Flow</b>	<ol style="list-style-type: none"><li>1. The actor receives an incoming message.</li><li>2. The system displays it.</li><li>3. The system broadcasts new message to all team members and also to the team leader.</li><li>4. The system displays overview of the received messages.</li></ol>
<b>Alternatives</b>	None.
<b>Related System Requirements</b>	WH-F-2
<b>Related User Requirements</b>	G-28, F-21, F-22
<b>Included Use Cases</b>	UC-Abstract-MANET-1
<b>Extended Use Cases</b>	None.
<b>Frequency of Execution</b>	Very often.
<b>Created by</b>	Andrea Marrella
<b>Date created</b>	13/12/2008
<b>Last Updated By</b>	Andrea Marrella
<b>Date Last Updated</b>	22/02/2008

# Lesson Learned

*Advantages and Disadvantages of User Centered Design Techniques in a real project*

Advantages	Disadvantages
Products are more efficient, effective, and safe	It is more costly
Assists in managing users' expectations and levels of satisfaction with the product	It takes more time
Users develop a sense of ownership for the product	May require the involvement of additional design team members (i. e. ethnographers, usability experts) and wide range of stakeholders
Products require less redesign and integrate into the environment more quickly	May be difficult to translate some types of data into design
The collaborative process generated more creative design solutions to problems.	The product may be too specific for more general use, thus not readily transferable to other clients; thus more costly